

Haunted by Nightmares: Factors Associated with Nightmare Frequency and Experiences

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Abstract

Previous research has reported relationships between nightmares, including nightmare frequency and variables such as gender, cognition, sleep habits and quality, and beliefs about dreams and their meaning. Using a convenience sample of undergraduate and graduate students enrolled at a small Evangelical Christian university, a number of potential factors were examined for their respective influence on aspects of dream frequency and content and the typical emotional tone of dreams. Specifically, the primary goal of the present research was to examine the personality characteristics and academic background of participants on the frequency of nightmares among a cohort of college students of different academic ranks, undergraduate and graduate, and the impact of majoring in an area of science versus nonscience majors. In addition, the potential role of stress and anxiety on nightmare frequency was explored. Finally, but central to the goals of the present research, various measures of sleep quality, beliefs about the experience of dreaming, the meaning ascribed to personal dreams, and the MADRE Interactions and Uses of Dreams subscale were considered as drivers impacting the frequency, severity, and distress individuals experience when confronted with nightmares. The results, their implications, and suggestions for future research are discussed.

Keywords

Dreams, Nightmares, Nightmare Frequency, Beliefs about Dreams, Stress, Anxiety, Academic Rank, Academic Major

1. Introduction

Dreams and nightmares have been a subject of interest across various disciplines, including psychology, neuroscience, and cultural studies. The interpretation and significance of nightmares are often influenced by an individual's dream beliefs,

which can shape the experience and impact of nightmares. Dream beliefs are deeply embedded in cultural contexts. Different cultures attribute varying levels of significance to dreams and nightmares, often integrating them into broader spiritual or religious frameworks. For instance, many Indigenous cultures view dreams as messages from ancestors or spiritual entities, guiding daily life and community decision-making (Tedlock, 1992). In contrast, Western cultures, influenced by psychoanalytic theories, often interpret dreams as expressions of the subconscious mind (Freud, 1900; Jung, 1964). These cultural frameworks significantly shape how individuals perceive and react to their dreams, including nightmares.

As a result, although considerable research has focused on dreaming, much of the research has failed to recognize the complexity of this cognitive state or how this dream-related phenomena are affected by many psychological, medical sleep, and social variables (Pagel, 2012), including differing beliefs about the content and meaning of dreams (Hong, 2022; Neil, 2015; Silvasy, 2021). Among many factors, dream content is associated with measures of sleep quality (Sándor et al., 2020). For example, a link between negative dream content and concomitant sleep difficulties has been reported (Simor et al., 2012). Further, examinations of dream content, narratives, and content analysis suggest a link between daytime emotional states and dreams (Cartwright et al., 2006; Hartmann, 2010; Nielsen et al., 2000).

1.1. Nightmares

Nightmares are distressing dreams that typically occur during rapid eye movement (REM) sleep, often during the late night (Hartman, 1984; El Sabbagh et al., 2023; Solms, 2000). Nightmares usually seem quite real to the dreamer, and recall is usually high (American Psychiatric Association, 2022). Such experiences are different from night terrors, which occur during non-rapid eye movement (NREM) sleep and are characterized by intense fear and autonomic arousal without detailed dream recall; nightmares involve detailed and often frightening dream content (Nielsen & Levin, 2007). Often quite intense, fear is the dominant emotion associated with nightmares, but other emotions such as sadness, anger, or shame are associated with nightmares as well (Köthe & Pietrowsky, 2001; Robert & Zadra, 2008; Phelps et al., 2018). The physiological and emotional correlates often occur during the nightmare experience but are also experienced upon awakening from the nightmare and even later when recalling the experience (Gieselmann et al., 2019). Idiopathic nightmares characteristically involve rich imaginative elements and usually are not associated with a specific traumatic experience (Gieselmann et al., 2019). The characteristics associated with PTSD nightmares often include reexperiencing traumatic events in dreams. However, these nightmares might include emotion and content closely tied to the traumatic event, often symbolic in nature, with high physiological arousal and greater aggression (Gieselmann et al., 2019; Wittmann & De Dassel, 2015). This is relevant for

understanding the different psychological and physiological mechanisms involved in these sleep-related experiences.

When the experience rises to the level of a clinical disorder, nightmares are defined as a type of parasomnia characterized by repetitions of dysphoric dreams, with high recall, that cause clinically significant distress or impairment (American Psychiatric Association, 2022). As described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR), the frequency of nightmare episodes is used to categorize the severity of the disorder with severe cases involving nightly nightmare experiences, moderate cases including one or more nightmares per week, and mild case distinguished by fewer than one nightmare per week. In addition to the frequency criterion, duration determines the chronicity of the disorder, with acute cases persisting for one month or less and subacute cases lasting from one to six months. The persistent specifier is reserved for six months or longer (American Psychiatric Association, 2022). A pertinent point is that occasional nightmares are a normal part of the human experience. In addition, chronic nightmares are often associated with a range of psychological disorders, including those experiencing elevated stress and anxiety (see Secrist et al., 2019; Schredl et al., 2009, 2010) and individuals who have suffered a traumatic experience (El Sabbagh et al., 2023; Secrist et al., 2019). Last, there is a higher probability of experiencing nightmares among individuals suffering from insomnia or sleep deprivation (El Sabbagh et al., 2023).

In adults, 83% experience at least one nightmare a year, with those experiencing frequent nightmares comprising about 1% to 2% of the population (American Psychiatric Association, 2022), although some estimates place weekly nightmares as high as 5% (Li et al., 2010). However, the prevalence of nightmares is considerably higher among individuals with certain psychiatric disorders. For example, it is estimated that about 50% of individuals diagnosed with borderline personality disorder (Semiz et al., 2008) and as much as 75% of individuals with posttraumatic stress disorders experience more frequent nightmares (Woodward et al., 2000). Indeed, nightmares are considered among the core symptoms of PTSD (American Psychiatric Association, 2022). Further, reports have associated higher levels of psychological distress, including self-harm and suicidal behavior, with nightmares (Semiz et al., 2008; Pigeon et al., 2012a, 2012b).

1.2. Influence of Stress and Affective State

Perhaps unsurprisingly, normal stressors that are part of life experiences have also been linked to the occurrence of nightmares (Loveland et al., 1990). This is true for common albeit stressful events such as examinations (Delorme et al., 2002) as well as more profound life experiences such as the loss of those emotionally close to us (Loveland Cook et al., 1990). In addition, a general negative effect is associated with nightmare frequency (Nielsen & Levin, 2007) and in more severe affective states such as depression (Li et al., 2010).

According to Carona and Fonseca (2022), nightmares and bad dreams should be distinguishable aspects of sleep, with the latter not associated with awakening.

On the other hand, nightmares usually include abrupt awakening, with a more or less total return to wakefulness. In addition, while frequency is used as a criterion for a nightmare disorder, nightmare frequency may or may not be clearly associated with distress induced by nightmares (Zadra & Donderi, 2000). In comparison with so-called bad dreams (see Carona & Fonseca, 2022), nightmare frequency is much more highly correlated with measures of psychological well-being, including stress and psychopathological symptoms (Carona & Fonseca, 2022). Given this finding, nightmares could be considered a somewhat less frequent but more severe manifestation of the same fundamental experience (Zadra & Donderi, 2000). Last, it is important to note that the intense distress associated with nightmares appears to involve the interplay between individuals high in emotional reactivity and those individuals scoring higher in neuroticism and the frequency of nightmares (Schredl et al., 2019). Such hyperarousal can very well be triggered by stress and adversity, suppression of specific distressing thoughts, and even breathing-related sleep disorders (Carona & Fonseca, 2022; Gieselmann et al., 2019).

1.3. Role of Dream Beliefs in Nightmare Frequency and Intensity

Psychological theories suggest that dream beliefs can significantly impact how individuals interpret and respond to their dreams. Cognitive theories propose that dreams are a form of problem-solving or cognitive processing, reflecting waking life concerns and emotional states (Cartwright, 2010). People who believe that dreams have meaningful content are more likely to recall and be affected by their dreams, including nightmares (King & DeCicco, 2009). This heightened emotional response to dreams can amplify the distress caused by nightmares.

It has been proposed that maladaptive dream interpretation, such as catastrophizing or personalizing dream content, can increase the likelihood of experiencing distressing nightmares (Gieselmann et al., 2019). This underscores the significant role of dream beliefs in shaping nightmare experiences. Cognitive restructuring techniques, which involve changing negative interpretations of dream content, have been shown to reduce nightmare frequency and intensity, further enlightening us about the power of our beliefs (Harvey et al., 2005; Krakow & Zadra, 2006; Kunze et al., 2017; Spoormaker, 2008).

Thus, the available research indicates that individuals who ascribe significant meaning to their dreams are more prone to experiencing frequent and intense nightmares. Aviram and Soffer-Dudek (2018) found that individuals with strong beliefs in the meaningfulness of dreams reported higher levels of nightmare frequency. This correlation suggests that the cognitive emphasis placed on dreams can amplify the emotional response to nightmares, making them more distressing and memorable. Belicki's (1992) study further supported this finding, showing that individuals who place high emotional significance on their dreams tend to experience greater distress following nightmares. This emotional amplification can lead to more vivid and impactful nightmare experiences, reinforcing the belief in the significance of dreams and creating a feedback loop that perpetuates distress-

sing dream experiences.

1.4. The Current Study

The purpose of the present study was to investigate the personal and academic-driven factors associated with the frequency of nightmares and severity. Specifically, I was interested in the gender and personality characteristics of the participants and whether these variables were associated with their dream and nightmare experiences. In line with this goal, given that the participants were students at a Christian university, personal perceptions about the function of dreaming and nightmare experiences and whether this impacted nightmare frequency were considered. Further, the impact of sleep quality factors, the effects of anxiety and stress, and sleep emotionality and tone measures were investigated for associations. Last, the impact of academic majors, broadly defined, was investigated. Similarly, because of the emphasis on logic and the scientific method, it was hypothesized that student participants in the natural and social sciences would be less likely to ascribe meaning to nightmare experiences than students in the humanities and arts. Similarly, the year in college was considered since student training in critical thinking presumably occurs as the student progresses through college (see [National Survey of Student Engagement, 2011, 2016](#)).

2. Method

2.1. Participants

The present study included 390 full-time undergraduate and graduate students enrolled at a D/PU university ([Carnegie Classification, 2024](#)) in South Florida. All students were recruited via the official campus email system, and the participants and their responses were treated in a manner consistent with the standards of the [American Psychological Association \(2022\)](#). Of the 390 respondents, some were excluded due to incomplete responses, resulting in a final sample size for analytic purposes of 359. The details associated with the characteristics of the participants are presented in [Table 1](#) and [Table 2](#). Briefly, the participants included students from a number of disciplines, with 82.5% of the respondents reporting as Christian and the remaining 17.5% reporting as non-Christian or atheistic/agnostic. The reported rate of approximately 65% of the participants were white, and 17.8% were reported as Hispanic or Latino. The remaining 17.6% reported a race of Black (9.5%), with the remainder as multi-racial or Asian/Pacific Islander. The racial breakdown was noteworthy as the undergraduate campus population comprises approximately 60% white, 16.4% Hispanic/Latino, and 10.6% Black undergraduates. The majority, 86.6% of the respondents, were female.

In order to reduce categories of majors with small sample sizes, all nonscience and science majors were reclassified into two categories. While recruiting participants, an incentive was included to ensure that a significant number of students took part in the study. To maintain anonymity, the primary survey to collect data did not include questions about personal information (e.g., name, email). Instead,

those who wished to receive a reward for participating were prompted to open a separate link to enroll them in the incentive program. The incentive included extra credit for those eligible and entrance into a raffle where the prize was a \$5 Starbucks Gift Card for those who were not eligible for extra credit in a course. Last, students were asked to fill out additional information about the topics experienced during their nightmares.

Table 1. Participant characteristics.

Gender		Academic Major	
Male	48 (13.4%) ^{a,b}	Nonscience	151 (42.1%)
Female	311 (86.6%)	Science	208 (57.9%)
Race		Academic Rank	
White	233 (64.9%)	Freshman, Sophomore	190 (52.9%)
Black or African-American	34 (9.5%)	Junior, Senior	84 (23.4%)
Hispanic/Latino	64 (17.8%)	Graduate Student	85 (23.7%)
Other	28 (7.8%)		
Religious Faith			
Christian	296 (82.5%)		
Other (Jewish, Muslim)	36 (10%)		
Atheist/Agnostic	27 (7.5%)		

Note: ^{a,b}*n* and proportion of sample.

Table 2. Participant sleep-related experiences.

Sleep Indices (PSQI)			
Subjective Quality		Sleep Disturbances	
Very Good	25 (7%)	Not in Last Month	12 (3.3%)
Fairly Good	187 (52.1%)	Less Than Once Per Week	228 (63.5%)
Fairly Bad	125 (34.8%)	Once or Twice Per Week	114 (31.8%)
Very Bad	22 (6.1%)	Three or More Times Per Week	5 (1.4%)
Sleep Latency		Sleep Medications	
≤15 Minutes	0 (0%)	Not in Last Month	0 (0%)
16 - 30 Minutes	124 (34.5%)	Less Than Once Per Week	233 (64.9%)
31 - 60 Minutes	137 (38.2%)	Once or Twice Per Week	48 (13.4%)
>60 Minutes	98 (27.3%)	Three or More Times Per Week	78 (21.7%)
Sleep Duration		Daytime Dysfunction	
>7 Hours	62 (17.3%)	Not in Last Month	38 (10.6%)
6 - 7 Hours	69 (19.2%)	Less Than Once Per Week	134 (37.3%)
5 - 6 Hours	106 (29.5%)	Once or Twice Per Week	156 (43.5%)
<5 Hours	122 (34.0%)	Three or More Times Per Week	31 (8.6%)

Continued**Habitual Sleep Efficiency**

>85%	317 (88.3%)
75% - 84%	32 (8.9%)
65% - 74%	9 (2.5%)
<65%	1 (.3%)

Dream Indices (MADRE)**Dream Recall**

Almost every morning	33 (9.2%) ^{a,b}	Nightmare Level of Distress	
Several times a week	103 (28.7%)	Not at all Distressing	50 (13.9%)
About once a week	78 (21.7%)	Not that Distressing	92 (25.6%)
Two or three times a month	45 (12.5%)	Somewhat Distressing	113 (31.5%)
About once a month	47 (13.1%)	Quite Distressing	70 (19.5%)
Less than once a month	39 (10.9%)	Very Distressing	34 (9.5%)
Never	14 (3.9%)	Recurring Nightmares Related to Waking Life	

Dream Emotional Intensity

		No	215 (59.9%)
Not at all intense	15 (4.2%)	Yes	144 (40.1%)
Not that intense	89 (24.8%)	Childhood Nightmares	
Somewhat intense	137 (38.2%)	Several times a week	50 (13.9%)
Quite intense	93 (25.9%)	About once a week	49 (13.6%)
Very intense	25 (7.0%)	Two to three times a month	60 (16.7%)

Dream Emotional Tone

		About once a month	46 (12.8%)
Very Negative	22 (6.1%)	About two to four times a year	80 (22.3%)
Somewhat Negative	120 (33.4%)	About once a year	23 (6.4%)
Neutral	148 (41.2%)	Less than once a year	19 (5.3%)
Somewhat Positive	65 (18.1%)	Never	32 (8.9%)
Very Positive	4 (1.1%)	Read About Dreams (Books & Articles)	

Nightmare Frequency

		About once a week	7 (1.9%)
Several times a week	31 (8.6%)	Two to three times a month	12 (3.3%)
About once a week	21 (5.8%)	About once a month	23 (6.4%)
Two to three times a month	56 (15.6%)	About two to four times a year	80 (22.3%)
About once a month	47 (13.1%)	About once a year	90 (25.1%)
About two to four times a year	97 (27.0%)	Less than once a year	60 (16.7%)
About once a year	44 (12.3%)	Never	87 (24.2%)

Literature...helped understand my dreams?

Less than once a year	33 (9.2%)	Not at all	71 (19.8%)
Never	30 (8.4%)	Not that much	69 (19.2%)
		Partly	102 (28.4%)
		Somewhat	98 (27.3%)
		Totally	19 (5.3%)

Note: ^{a,b}n and proportion of sample.

2.2. Materials and Procedure

In order to maximize response rates and collect data from students, invitations to participate were initially sent at the beginning of the third week of the semester, with follow-up emails sent two more times at two-week intervals. All email invitations were sent via the official student Listserv. At the completion of the survey, students were invited to continue to participate by recording and submitting sleep logs.

2.2.1. Five-Factor Model of Personality (TIPI)

Because we felt that different aspects of personality would be relevant variables to consider for the regression models, participants responded to the Ten Item Personality Measure (TIPI; Gosling, Rentfrow, & Swann, 2003). The TIPI includes two items each for five domains associated with the Five-Factor Model of personality (FFM). When considered in terms of its convergence with longer-form measures of the FFM, the TIPI has acceptable levels of reliability and validity (Ehrhart et al., 2009).

2.2.2. Perceived Stress Scale (PSS)

Perceived stress in the participants was assessed using the Perceived Stress Scale (PSS). The PSS is a five-point brief, 10-item scale developed to assess stress levels in adolescents and adults (Cohen et al., 1983). Typical items include questions such as, “In the last month, how often have you felt that you could not control the important things in your life?” The scale consists of total scores between 0 and 40, with high perceived stress associated with scores between 27 and 40, moderate stress scores between 14 and 26, and low perceived stress indicated by scores less than 14. The scale has good internal consistency in studies with young adults and college students, adequate test-retest reliability (Kechter et al., 2019; Lee, 2012), and construct validity (Lee, 2012).

2.2.3. Zung Self-Rating Anxiety Scale (Zung SAS)

The Zung SAS (Zung, 1971) is a self-report 20-item scale designed to assess a number of symptoms associated with anxiety. The anxiety symptoms include items that are somatic in nature (e.g., “My arms and legs shake and tremble” I am bothered by dizzy spells. as well as psychological symptoms (e.g., I feel more nervous and anxious than usual. Both positive and negatively worded items are included. Participants were to base their responses on their experiences in the past week; all items consist of a 4-point scale from 1 (none, or a little of the time) to 4 (most, or all of the time) with scores ranging from 20 to 80, with scores of less than 45 defined as normal, mild to moderate anxiety ranging from 45 to 59, and 60 plus designated severe through extremes levels of anxiety. Cronbach’s alpha is an acceptable .82 (Tanaka-Matsumi & Kameoka, 1986).

2.2.4. Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) consists of a retrospective questionnaire containing 19 items. The index includes measures in seven domains:

subjective sleep quality, sleep latency, sleep disturbances, use of sleep medications, and daytime dysfunction (Buysse et al., 1989). The PSQI consists of four written and 15 multiple-choice items, with responses scored from 0 (no difficulty) to 3 (severe difficulty) across the seven domains. A global score is also derived, ranging from 0 to 21, with scores greater than five indicative of a significant sleep disturbance (Buysse et al., 1989). The reported psychometric properties of the PSQI include test-retest reliability of $r = .85$ and Cronbach's $\alpha = .83$ (see Germain et al., 2005). Different versions exist (e.g., symptom assessment over the past 12 months); However, the present study used the one-month version.

2.2.5. Beliefs About Dreams Questionnaire (BADQ)

Initially developed by Li et al. (2019), the Beliefs About Dreams Questionnaire (BADQ) was developed to examine the beliefs individuals hold about their dreams, originally describing the dream beliefs of Chinese college students. However, given the stated goals elucidated by Li et al., which included a recognized need to consider personal beliefs about dreams and nightmare distress, the BADQ was chosen. The final version of the BADQ consists of 26 items, resulting in a five-factor structure that is as follows. The first factor, Dream omen and health, concerns items that deal with the personal belief that dreams can provide insights that act as prophecies of the future and can reflect upon one's health. Higher scores on the Dream superstitions factor reflect personal beliefs that dreams could reflect their previous lives and the activity of their soul. Individuals scoring high on the third factor, Dream meaninglessness, consider dreams inconsequential, not impacting their life, and not worth attention. The fourth factor, Dream reality, assesses beliefs that dream content is associated with daily experiences in the world while awake. Such views include the belief that dreams are reflective of conscious and unconscious desires (see, Schredl & Hofmann, 2003; Domhoff, 2003). Finally, a fifth factor, Dream attitude, included items that include a willingness to recall, share, and personally like or dislike dreams. The Cronbach's α of all subscales exceeded .80, with good reliability and construct validity (Li et al., 2019).

2.2.6. Mannheim Dream Questionnaire (MADRE)

Briefly, the MADRE instrument (Dyck et al., 2017a, 2017b) includes measures of the frequency of dream recall, including recall of lucid dreams measured on a 7-point scale and items designed to ascertain participant experiences with many attributes of the contents of their dreams. Dream frequency was determined on a 7-point scale ranging from never through almost every morning. The emotional intensity of dream content was rated on a 5-point scale from not intense at all to very intense. Similarly, the emotional tone of dreams was rated on a 5-point scale ranging from neutral to very negative or positive. Lucid dreaming was defined using the criteria elucidated in work reported elsewhere (Schredl & Erlacher, 2004). Nightmares were defined using the International Classification of Sleep Disorders (ICSD-3; American Academy of Sleep Medicine, 2014). Distress associated with the experience of nightmares was scored on a five-point scale, from

not at all distressing to very distressing. The recurrence of nightmares related to events in daily life was also queried, as were nightmare experiences associated with childhood. A free response item was included for descriptions concerned with nightmare topics and personal attitudes toward dreams in general, and beliefs about dreams were included (see Dyck et al., 2017a).

3. Results

3.1. Bivariate Analyses

The results of the correlations among the MADRE scales and the BADQ scales are presented in **Table 3** and **Table 4**, respectively. Nightmare frequency in childhood was positively related to nightmares in adulthood ($r = .413$). Among the MADRE scales, nightmare frequency was inversely related to dream emotional intensity ($r = -.437$), level of distress during nightmares ($r = -.421$), and the frequency that recurrent nightmares reflect events while awake ($r = -.428$). Other results of note include the results that the level of distress during nightmares and the frequency of nightmares were associated with events in the waking world ($r = .215$). Last, perhaps unsurprisingly, dream intensity and dream recall were inversely correlated but not dream emotional tone ($p > .05$).

Table 3. Spearman bivariate correlations among the MADRE measures.

Variable	1	2	3	4	5	6	7
1	---	.413**	.436**	-.437**	.460**	-.421**	-.428**
2		---	.164*	-.242**	.102	-.229**	-.165*
3			---	-.356**	.110	-.246**	-.259**
4				---	-.288**	.287**	.228**
5					---	-.195**	-.338**
6						---	.215**
7							---

Note: ** $p < .001$. * $p = .05$. $N = 359$. (1) Nightmare Frequency; (2) Nightmare Frequency during Childhood; (3) Frequency of Dream Recall; (4) Dream Emotional Intensity; (5) Emotional Tone of Dreams; (6) Level of Distress During Nightmares; and (7) How often do you experience Recurrent Nightmares Related to Waking Life.

Table 4. Spearman bivariate correlations among the BADQ scales.

Variable	1	2	3	4	5
1	---	.584**	-.471**	.488**	.396**
2		---	-.347**	.240**	.253**
3			---	-.326**	-.450**
4				---	.274**
5					---

Note: ** $p < .001$. $N = 359$. (1) Dream Omen & Health; (2) Dream Superstition; (3) Dream Meaninglessness; (4) Dream Reality; (5) Dream Attitude.

Turning to consideration of the BADQ, the Dream Omen & Health and Dream Superstition scales were positively related ($r = .584$), reflecting the stock such individuals put into the experience of dream states. Similarly, Dream Reality and Dream Attitude were correlated ($r = .274$). Thoughts on the meaningless nature of dreams were inversely related to the Dream Omen & Health ($r = -.471$) and Superstition ($r = -.347$) scales.

Following bivariate consideration of the relevant dependent and independent variables, we examined whether any demographic differences existed in nightmare frequency, dream intensity, and dream emotion. Given the ordinal nature of these dependent variables, the data were analyzed using Kruskal-Wallis tests, followed by Mann-Whitney U tests as needed.

3.2. Preliminary Demographic Comparisons

A Mann-Whitney U test was performed to evaluate where nightmare frequency differed by gender. The results revealed no significant difference in the frequency of nightmares between male ($M_{\text{Male}} = 7.69$, $SD = 3.25$) and female vs. $M_{\text{Female}} = 8.15$, $SD = 2.76$) respondents, $z = -1.49$, $p = .136$. Conversely, nonscience majors (mean rank = 202.52) reported significantly higher nightmare frequencies than science majors (mean rank = 163.65), $z = -3.56$, $p < .001$. Last, group differences in nightmare frequency as a function of academic rank were examined using a Kruskal-Wallis test, which revealed no significant differences among the three groups.

A Chi-Square Test of Independence assessed the relationship between a dichotomized version of sleep quality (good, bad) and the frequency of nightmares (high, moderate, low). The analysis revealed a significant relationship between sleep quality and nightmare frequency, $X^2(2, N = 359) = 19.37$, $p < .001$, $V = .232$. Overall, 59.1% of the participants reported experiencing good sleep. Examination of column proportions indicated that among individuals who reported high levels of nightmares, only 43.5% rated their sleep as good. As the reported frequency declined, the proportion of individuals reporting good sleep rose to 60.4%, with 72.9% of individuals who experienced few or no nightmares reporting their sleep quality as good.

When the relationship between quality of sleep and nightmare distress was considered, the analysis revealed a significant relationship between the two, $X^2(2, N = 359) = 7.12$, $p = .028$, $V = .141$. Examination of column proportions indicated that among individuals who rated their sleep as good, the proportion of individuals with low nightmare distress was higher (67.6%) than those rating nightmares as causing moderate (53.1%) or severe (53.8%) distress. For those individuals experiencing moderate or high distress, the proportions of individuals rating their sleep as good or bad were similar.

3.3. Multivariate Analyses

Based on the goals associated with the present research and the preliminary analyses, a series of multivariate analyses were conducted using key demographic

variables as independent variables. Preliminary analyses did not yield any interactions among these. Therefore, all analyses were conducted as one-way MANOVAs.

3.3.1. Gender

1) Personality Factors

Given the reported differences between males and females in investigations examining nightmares (e.g., Schredl, 2014; Schredl et al., 2014), gender differences in the relevant dependent measures are considered here. Turning to the five measures of personality that comprise the TIPI, the resulting multivariate ANOVA was significant, Wilks' $\Lambda = .918$, $F(5, 353) = 6.34$, $p < .001$, $\eta_p^2 = .082$. A follow-up review of the univariate analyses revealed only an effect of gender associated with the Emotional Stability factor, $F(1, 357) = 21.59$, $p < .001$, $\eta_p^2 = .057$. Male participants ($M = 9.96$, $SD = 2.58$) scored higher than female participants ($M = 7.96$, $SD = 2.80$).

2) Psychological Measures

Next, the level of psychological pressures experienced by the participants. The dependent variables of stress (PSS) and anxiety (Zung SAS) were treated as dependent variables in the model. Analysis of the data using a one-way MANOVA revealed a significant effect of gender, Wilks' $\Lambda = .920$, $F(2, 356) = 15.58$, $p < .001$, $\eta_p^2 = .080$. In the subsequent examination of the univariate analyses a significant effect of gender on both dependent measures, perceived stress, $F(1, 357) = 13.02$, $p < .001$, $\eta_p^2 = .035$, and self-rated anxiety, $F(1, 357) = 24.40$, $p = .031$, $\eta_p^2 = .064$, was found. Post hoc examination of these effects revealed the following. When stress was considered, female participants reported significantly higher stress levels ($M = 21.30$, $SD = 6.16$) than male participants ($M = 17.77$, $SD = 7.24$). Similarly, self-reported anxiety among female students was significantly higher ($M = 39.19$, $SD = 7.14$) than their male peers ($M = 33.88$, $SD = 5.43$).

3) Beliefs About Dreams

When stress and anxiety were explored through the lens of gender, a significant multivariate effect was found, Wilks' $\Lambda = .920$, $F(2, 356) = 15.58$, $p < .001$, $\eta_p^2 = .080$. Univariate analyses revealed a significant effect of gender in perceived stress as measured by the PSS, $F(1, 357) = 13.02$, $p < .001$, $\eta_p^2 = .035$, and anxiety as measured by the Zung SAS, $F(1, 357) = 24.40$, $p < .001$, $\eta_p^2 = .064$. Female participants ($M_s = 21.30$ & 39.19) had significantly higher scores than their male counterparts ($M_s = 17.77$ & 33.88 ; PSS & Zung SAS, respectively).

4) Sleep Hygiene

A primary goal of the present research was to examine the interrelationships among sleep behaviors, with dreaming and nightmares in particular, participant sleep hygiene and sleep-related experiences were considered. There, the analysis included total sleep time, the estimated proportion of the time in sleep, the global score of the PSQI, and nightmare frequency. The results of this analysis follow. First, the MANOVA was significant, Wilks' $\Lambda = .934$, $F(4, 354) = 65.28$, $p < .001$, $\eta_p^2 = .066$. Turning to the univariate analyses, male ($M = 322.50$, $SD = 69.60$) and female ($M = 374.08$, $SD = 88.98$) participants differed in total sleep, $F(1, 357) = 14.73$, $p < .001$, $\eta_p^2 = .040$. revealed no differences in total sleep or nightmare

recurrent frequency between the two groups. The estimated percent of time sleeping (versus in bed but awake) was significant, $F(1, 357) = 4.27$, $p = .040$, $\eta_p^2 = .012$. Last, no gender differences on the Global PSQI measure or the frequency of recurrent nightmares was found.

3.3.2. Academic Rank

1) Personality Factors

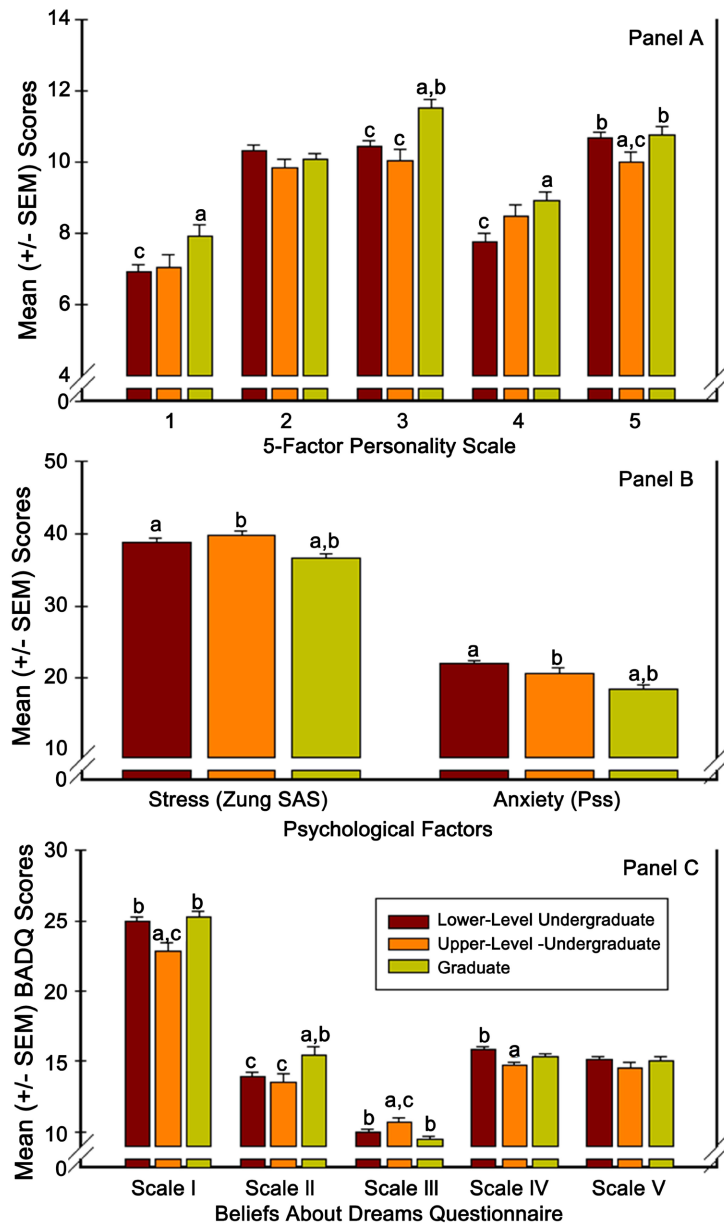


Figure 1. Comparison of students of different academic ranks on the big-five personality traits, psychological stress and anxiety, and beliefs about dreams (see text for scale descriptions). TIPI scales = 1 (Extraversion), 2 (Agreeableness), 3 (Conscientiousness), 4 (Emotional Stability), 5 (Openness to Experience). Letters a, b, and c represent a significant difference from those of a different academic rank. a = freshman & sophomore undergraduates. b = junior & senior undergraduates. c = graduate students.

As noted earlier, to simplify the variables in the multinomial logistic regressions analyses (see below), student academic ranks were categorized as lower-level and upper-level undergraduate students, and graduate students. The relevant results are presented in **Figure 1**, panel A. First, the five factors of personality measured by the TIPI were collectively considered. The resulting MANOVA results showed a significant effect of academic rank, Wilks' $\Lambda = .894$, $F(10, 706) = 4.04$, $p < .001$, $\eta_p^2 = .054$. Subsequent univariate ANOVAs revealed modest differences associated with academic rank on the Extraversion, $F(2, 356) = 3.43$, $p = .033$, $\eta_p^2 = .019$, Conscientiousness, $F(2, 356) = 8.65$, $p < .001$, $\eta_p^2 = .046$, Emotional Stability, $F(2, 356) = 5.22$, $p = .006$, $\eta_p^2 = .029$ and the Openness to Experience, $F(2, 356) = 3.53$, $p = .030$, $\eta_p^2 = .019$, measures of personality. Post hoc examination of the means revealed the following. Differences were observed between lower-level undergraduates and graduate students on the Extraversion and Emotional Stability factors, with upper-level undergraduates intermediate but not significantly different from the other groups of students. In addition, all three academic ranks differed on the Conscientiousness and Openness to Experience measures of personality.

2) Psychological Measures

Turning to the level of psychological pressures experienced by the participants, the dependent variables of stress (PSS) and anxiety (Zung SAS) were treated as dependent variables in the model. Analysis of the data using a one-way MANOVA revealed a significant effect of academic rank, Wilks' $\Lambda = .894$, $F(4, 710) = 5.32$, $p < .001$, $\eta_p^2 = .029$. Subsequent consideration of the univariate analyses revealed a significant effect of Academic rank on both dependent measures, perceived stress, $F(2, 356) = 8.91$, $p < .001$, $\eta_p^2 = .048$, and self-rated anxiety, $F(2, 356) = 3.50$, $p = .031$, $\eta_p^2 = .019$. As seen in **Figure 1**, panel B, post hoc examination of these effects revealed the following. When stress was considered, upper-level undergraduates reported significantly higher stress levels than graduate students but not lower-level undergraduates. Graduate students reported significantly lower stress than upper-level undergraduates as well. Reported anxiety among graduate students was significantly lower than that of upper-level and lower-level undergraduate students. Lower- and upper-level undergraduate stress levels were comparable.

3) Beliefs About Dreams (BADQ)

Consideration about participant beliefs concerning dreams revealed the following. Inspection of the resulting MANOVA indicated a significant multivariate effect, Wilks' $\Lambda = .908$, $F(10, 704) = 3.49$, $p < .001$, $\eta_p^2 = .047$. Given this result, follow-up univariate analyses revealed the following. Student academic ranks differed significantly on the Dream Omen and Health and Dream Superstition scales, $F(2, 356) = 8.06$, $p < .001$, $\eta_p^2 = .047$, and $F(2, 356) = 4.17$, $p = .016$, $\eta_p^2 = .023$, respectively. Group differences were detected on the Dream Meaninglessness, $F(2, 356) = 5.84$, $p = .003$, $\eta_p^2 = .032$, and Dream Reality, $F(2, 356) = 6.61$, $p = .002$, $\eta_p^2 = .036$, scales, respectively.

Post hoc examination of the means revealed the following. As seen in **Figure 1**,

panel C, the mean score on the Dream Omen and Health scale for the upper-level participants was significantly lower than that of the other two groups, which had comparable means. When Dream Superstition was considered, graduate participants had significantly higher scores than both undergraduate groups, with the latter two groups similar. Turning to Dream Meaninglessness, scores for upper-level undergraduates were significantly higher than the other two groups. Once again, these two groups did not differ significantly. Last, only the means for the lower-level and upper-level participants differed significantly, with the mean for the graduate participants intermediate but not significantly different from either extreme.

4) Sleep Hygiene

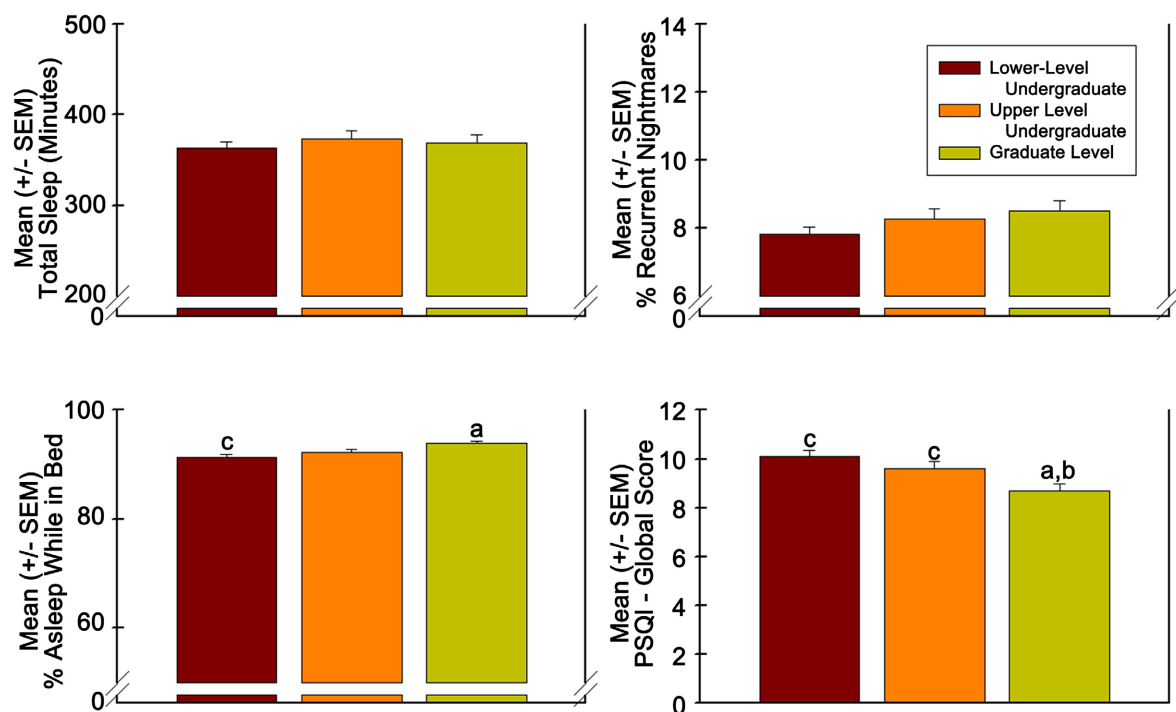


Figure 2. Comparison of participant sleep hygiene and sleep-related experiences, including the frequency of recurrent nightmares among lower- and upper-level undergraduates and graduate students. Letters a, b, and c represent a significant difference from those of a different academic rank. a = freshman & sophomore undergraduates. b = junior & senior undergraduates. c = graduate students.

Since the main thrust of the present research was examining the interrelationships associated with dreaming and nightmares in particular, participant sleep hygiene and experiences were considered an important part of the current research. The relevant results are presented in **Figure 2**. This analysis included total sleep time, the estimated proportion of the time in sleep, the global score of the PSQI, and nightmare frequency. The MANOVA was significant, Wilks' $\Lambda = .908$, $F(8, 706) = 2.53$, $p < .010$, $\eta_p^2 = .028$. Subsequent univariate analyses revealed no total sleep or nightmare frequency differences among the three groups. The estimated percentage of time sleeping (versus in bed but awake) was significant, $F(2, 356) =$

5.03, $p = .007$, $\eta_p^2 = .027$. Subsequent post hoc comparison of the three means revealed that graduate participants spent slightly longer sleeping than lower-level undergraduates, with upper-level undergraduates not significantly different from either of the other two groups. More importantly, the participants differed significantly on the Global PSQI score, $F(2, 356) = 6.82$, $p = .001$, $\eta_p^2 = .037$. Here, graduate students had significantly lower scores than the two undergraduate groups, with the latter two not significantly different.

3.3.3. Academic Discipline (Science vs. Nonscience Majors)

1) Personality Factors

As noted earlier, academic majors were assigned to two categories, nonscience majors or science majors, to simplify the variables in the multinomial logistic regression analyses that follow. Turning first to the TIPI measures, analysis of the relevant data revealed that MANOVA results showed a significant effect of academic discipline, Wilks' $\Lambda = .919$, $F(5, 353) = 6.21$, $p < .001$, $\eta_p^2 = .0081$. Examination of the univariate ANOVAs revealed differences associated with academic major on the Emotional Stability, $F(5, 353) = 20.21$, $p < .001$, $\eta_p^2 = .054$. Nonscience majors scored higher than science majors ($M = 9.00$, $SD = 2.88$ vs. $M = 7.66$, $SD = 2.70$). The Openness to Experience dimension of personality was also significant, with nonscience majors ($M = 10.94$, $SD = 2.01$) scoring higher on this measure of personality than science majors ($M = 10.27$, $SD = 2.32$).

2) Psychological Measures

Consideration of the psychological pressures experienced by the participants, variables of stress (PSS) and anxiety (Zung SAS) as dependent variables in the model revealed a nonsignificant outcome, Wilks' $\Lambda = .985$, $F(2, 356) = 2.80$, $p = .062$.

3) Beliefs About Dreams

Like the psychological measures of stress and anxiety, the multivariate outcome with the BADQ scales as dependent measures was nonsignificant ($p > .40$).

4) Sleep Hygiene

When the effect of academic major associated with different aspects of sleep behavior, including recurring nightmares, were considered, no differences between nonscience and science majors were detected (all $ps > .37$).

3.4. Multinomial Logistic Regression Analyses

For all stepwise multinomial logistic regression analyses, the dependent variable, nightmare frequency, was recoded into high, moderate, and low or absent levels numbers of nightmares. Individuals with few or no reported nightmares served as the reference group. Because variables such as academic rank and major are relevant in the prediction of a number of behavioral and physiological measures, the demographic descriptors of the participants were included in all analyses. For gender, male served as the reference category. The science major served as the reference category as well. Last, the graduate student category served in this capacity. Next, instead of considering all variables in the modeling process, we examined

chose, different groups of factors that may be predictive of nightmare frequencies in adulthood.

3.4.1. Links Between Demographic and Personality Characteristics Variables and Nightmare Frequency

For the first regression analysis, the demographic variables and the Big-Five factors as measured by the TIPI were examined to determine if any associations existed between these factors and nightmare frequency. The result of this analysis is presented in **Table 5** (TIPI). The final model included four of five of the TIPI measures, the freshman, sophomore academic category, and nonscience majors. A Wald likelihood ratio test revealed that the final model was statistically significant, $X^2(12) = 90.28$, $p < .001$, Nagelkerke (1991) pseudo- $R^2 = .251$.

Table 5. Multinomial logistic regression results associated with the demographic and personality characteristics of the participants.

	<i>B</i> (Std. Error)	Wald(<i>df</i>)	Exp(<i>B</i>)
High ^{a,b}			
Intercept	1.058 (1.072)	7.897 (1)* ^c	
Academic Major—Nonscience	−.719 (.309)	5.40 (1)*	.487
Academic Rank = Freshman, Soph.	−.312 (.307)	1.03 (1)	.732
Extraversion (TIPI) ^d	−.104 (.052)	3.94 (1)*	.902
Agreeableness (TIPI)	−.034 (.078)	.19 (1)	.967
Conscientiousness (TIPI)	.113 (.059)	3.60 (1)	1.119
Emotional Stability (TIPI)	−.314 (.063)	24.91 (1)***	.731
Medium			
Intercept	−1.364 (1.106)	1.802 (1)	
Academic Major—Nonscience	−.746 (.281)	7.05 (1)**	.474
Academic Rank = Freshman., Soph.	.806 (.281)	8.22 (1)**	2.240
Extraversion (TIPI)	.007 (.047)	.03 (1)	1.007
Agreeableness (TIPI)	.135 (.072)	3.52 (1)	1.145
Conscientiousness (TIPI)	.178 (.060)	8.72 (1)**	1.195
Emotional Stability (TIPI)	−.204 (.058)	12.39 (1)***	.816

Note: ^aReference category was few or no nightmares. ^bDependent variable is frequency of nightmares. ^c* $p < .05$; ** $p < .01$; *** $p < .001$. ^dTen-Item Personality Inventory (TIPI).

Among those reporting frequent nightmares, the odds of being a nonscience major increased as nightmare frequency decreased ($OR = .487$). Similarly, higher Extraversion ($OR = .902$), Emotional Stability (.731) scores were associated with lower levels of nightmares.

For those participants reporting a moderate number of nightmares, the odds of being a nonscience major decreased as nightmare frequency increased ($OR = .487$). Among this group, lower-level undergraduates were significantly more likely to experience higher nightmare frequencies ($OR = 2.24$). Higher Emotional Stability

scores were associated with lower levels of nightmares (OR = .816). Last, Conscientiousness was significant, with the odds of number of nightmares increasing as the values of this predictor increased (OR = 1.195).

3.4.2. Link between Sleep Quality Measures and Nightmare Frequency

For the next regression analysis, the demographic variables and the six components of the PSQI—subjective sleep quality, sleep latency, sleep disturbances, use of sleep medications—were considered. The relevant results are presented in **Table 6**. The final model included sleep disturbances, the use of sleep medications, and habitual sleep efficiency measures and the freshman, sophomore academic category and nonscience majors. A Wald likelihood ratio test revealed that the final model was statistically significant, $X^2(10) = 86.99$, $p < .001$, Nagelkerke pseudo- $R^2 = .243$.

Table 6. Multinomial logistic regression results associated with the demographic and sleep quality measures of the participants.

	<i>B</i> (Std. Error)	Wald(<i>df</i>)	Exp(<i>B</i>)
High ^a			
Intercept	−1.991 (.513)	15.08 (1)*** ^c	
Academic Major—Nonscience	−.960 (.308)	9.70 (1)**	.383
Academic Rank = Freshman, Soph.	−.169 (.316)	.29 (1)	.844
Habitual Sleep Efficiency (PSQI) ^d	−1.090 (.472)	5.34 (1)*	2.974
Sleep Disturbances (PSQI) ^d	1.099 (.312)	12.45 (1)***	3.002
Sleep Medications (PSQI) ^d	.583 (.195)	8.90 (1)**	1.792
Medium			
Intercept	−.665 (.457)	0.211 (1)	
Academic Major—Nonscience	−.876 (.274)	10.23 (1)***	.417
Academic Rank = Freshman., Soph.	.928 (.282)	10.87 (1)***	2.530
Habitual Sleep Efficiency (PSQI) ^b	.528 (.470)	1.26 (1)	1.695
Sleep Disturbances (PSQI) ^b	.607 (.292)	4.31 (1)*	1.835
Sleep Medications (PSQI) ^b	.066 (.191)	0.12 (1)	1.068

Note. ^aReference category was few or no nightmares. ^bDependent variable is frequency of nightmares. ^c* $p < .05$; ** $p < .01$; *** $p < .001$. ^dPittsburg Sleep Quality Index (PSQI).

For individuals reporting high frequencies of nightmares, habitual sleep efficiency (OR = 2.974), sleep disturbances (OR = 3.002, and the use of sleep medications (OR = 1.792) were significant, with the odds of number of nightmares increasing as the values of these three predictors increased. On the other hand, the odds of being a nonscience major increased as nightmare frequency decreased (OR = .383); In fact, a $1/.383 = 2.61$ -fold decrease.

When the group comprising participants reporting moderate number of nightmares is considered, sleep disturbances were once again significant and in the expected direction (OR = 1.835). None of the remaining sleep measures were

significant. Once again, the odds of being a nonscience major increased as nightmare frequency decreased ($OR = .417$). Last, lower-level undergraduates were more likely to experience a moderate number of nightmares ($OR = 2.53$) relative to their graduate student counterparts.

3.4.3. Links among Demographic, Dream- & Nightmare-Related Emotionality and Intensity Variables

Turning to consideration of the associations between nightmare frequency and measures of the characteristics of dreams generally and nightmares specifically, the following results emerged. The final model included dream emotional tone, dream intensity, level of distress accompanying nightmares, and childhood frequency of nightmares as well as the freshman, sophomore academic rank category and nonscience majors. A Wald likelihood ratio test revealed that the final model was statistically significant, $X^2(12) = 175.43$, $p < .001$, Nagelkerke pseudo- $R^2 = .436$. The results are presented in **Table 7**. Among individuals who reported frequent nightmare experiences, the odds of the number of nightmares increased as the emotional tone increased (i.e., more negative; $OR = 1.874$). The odds of being a nonscience major decreased as nightmare frequency increased ($OR = .416$), dream intensity was associated with nightmare frequency ($OR = .127$), higher levels of nightmare distress are associated with low or absent nightmare frequencies ($OR = .466$), and higher levels of childhood nightmare frequency were associated lower levels of nightmare experiences in adulthood ($OR = .274$).

Table 7. Multinomial logistic regression results associated with the demographic and dream- and nightmare-related emotionality intensity measures.

	<i>B</i> (Std. Error)	Wald(<i>df</i> ^c)	Exp(<i>B</i>)
High ^{a,b}			
Intercept	7.324 (.929)	62.23 (1)***	
Academic Major—Nonscience	−.877 (.347)	6.39 (1)*	.416
Academic Rank = Fresh., Soph.	−.608 (.357)	2.90 (1)	.545
Dream Emotional Tone (MADRE) ^d	.628 (.265)	5.62 (1)*	1.874
Dream Intensity (MADRE) ^d	−2.066 (.353)	34.43 (1)***	.127
How Distressing Nightmares (MADRE) ^d	−.763 (.235)	10.50 (1)**	.466
Frequency of Nightmares as a Child	−1.293 (.245)	27.87 (1)***	.274
Medium			
Intercept	4.578 (.868)	27.83 (1)***	
Academic Major—Nonscience	−.904 (.294)	9.44 (1)**	.405
Academic Rank = Fresh., Soph.	.664 (.295)	5.08 (1)*	1.943
Dream Emotional Tone (MADRE) ^d	−.084 (.210)	.16 (1)	.920
Dream Intensity (MADRE) ^d	−.396 (.209)	3.58 (1)	.673
How Distressing Nightmares (MADRE) ^d	−1.007 (.201)	25.21 (1)***	.365
Frequency of Nightmares as a Child	−.445 (.192)	5.36 (1)*	.641

Note: ^aReference category was few or no nightmares. ^bDependent variable is frequency of nightmares. ^c* $p < .05$; ** $p < .01$; *** $p < .001$. ^dMannheim Dream Questionnaire (MADRE).

When nightmare frequencies were more moderate, as nightmare frequency decreased, the odds of being a nonscience major increased ($OR = .405$). Once again, lower-level undergraduates were more likely to experience a moderate number of nightmares ($OR = 1.943$) relative to their graduate student counterparts. For moderate nightmare frequencies, higher levels of nightmare distress were associated with lower nightmare frequencies ($OR = .365$) and the frequency of childhood nightmares ($OR = .641$).

3.4.4. Links Among Stress and Anxiety and Nightmare Frequency

Since Stress and Anxiety both affect sleep quality (Kalmbach et al., 2018; Schredl et al., 2019; Sheaves et al., 2023) Turning to consideration of the associations between nightmare frequency, anxiety, stress, and the demographic characteristics the following results emerged. The final model included consideration of stress (PSS) and anxiety (Zung SAS) as well as the freshman, sophomore academic rank category and nonscience majors (see Table 8). A Wald likelihood ratio test revealed that the final model was statistically significant, $X^2(8) = 78.34$, $p < .001$, Nagelkerke pseudo- $R^2 = .221$. The odds of being a nonscience major decreased as nightmare frequency increased ($OR = .405$). Academic rank was nonsignificant. As expected, the odds of the number of nightmares increased as perceived stress ($OR = 1.065$) and anxiety increased ($OR = 1.075$).

Table 8. Multinomial logistic regression results associated with the demographic, academic, stress, and anxiety measures.

	<i>B</i> (Std. Error)	Wald(<i>df</i>) ^c	Exp(<i>B</i>)
High ^{a,b}			
Intercept	−3.559 (.921)	14.92 (1)***	
Academic Major—Nonscience	−.903 (.293)	9.49 (1)**	.405
Academic Rank = Fresh., Soph.	−.173 (.299)	.37 (1)	.841
Perceived Stress (PSS) ^d	.063 (.024)	6.67 (1)**	1.065
Perceived Anxiety (Zung SAS) ^e	.072 (.022)	10.23 (1)***	1.075
Medium			
Intercept	−2.058 (.851)	5.84 (1)*	
Academic Major—Nonscience	−.845 (.275)	9.43 (1)**	.430
Academic Rank = Fresh., Soph.	1.033 (.285)	13.78 (1)***	2.810
Perceived Stress (PSS) ^d	−.048 (.023)	4.29 (1)*	.953
Perceived Anxiety (Zung SAS) ^e	.084 (.022)	14.95 (1)***	1.087

Note: ^aReference category was few or no nightmares. ^bDependent variable is frequency of nightmares. ^c* $p < .05$; ** $p < .01$; *** $p < .001$. ^dPerceived Stress Scale. ^eZung Self-Rating Anxiety Scale.

Turning to individuals reporting moderate nightmare frequencies, as nightmare frequency decreased, the odds of being a nonscience major increased ($OR = .405$). Once again, lower-level undergraduates were more likely to experience a

moderate number of nightmares (OR = 2.810) relative to graduate students who experienced moderate nightmare activity. However, among participants with moderate levels of nightmare activity, higher levels of stress were associated with lower levels of nightmare activity (OR = .953), while higher stress levels were associated with higher nightmare activity (OR = 1.087) among this group.

3.4.5. Links between Beliefs about Dreams and Nightmare Frequency

For the final regression analysis, the demographic variables and the beliefs and uses of dreams as measured by the BADQ and elements of MADRE were examined to determine if any associations existed between these factors and participant nightmare frequency. The result of this analysis is presented in **Table 9**. The final model included one of five BADQ factors, the MADRE scale concerned with participant thoughts on Interactions and Uses of Dreams, freshman, sophomore academic category, and nonscience majors. A Wald likelihood ratio test revealed that the final model was statistically significant, $X^2(8) = 85.66$, $p < .001$, Nagelkerke pseudo- $R^2 = .239$.

Table 9. Multinomial logistic regression results associated with the demographic variables and attitudes about dreaming of the participants.

	<i>B</i> (Std. Error)	Wald(<i>df</i>) ^c	Exp(<i>B</i>)
High ^{a,b}			
Intercept	5.669 (.968)	34.26 (1)***	
Academic Major—Nonscience	−1.406 (.312)	20.31 (1)***	.245
Academic Rank = Fresh., Soph.	−.316 (.304)	1.08 (1)	.729
Dream Superstition (BADQ) ^d	−.082 (.030)	7.53 (1)**	.921
Interactions with & Uses of Dreams (MADRE) ^e	−.712 (.128)	31.13 (1)***	.491
Medium			
Intercept	−2.794 (.931)	9.01 (1)**	
Academic Major—Nonscience	−1.070 (.283)	14.31 (1)***	.343
Academic Rank = Fresh., Soph.	.838 (.276)	9.23 (1)**	2.311
Dream Superstition (BADQ) ^d	−.097 (.029)	11.32 (1)***	.908
Interactions with & Uses of Dreams (MADRE) ^e	−.196 (.118)	2.73 (1)	.822

Note: ^aReference category was few or no nightmares. ^bDependent variable is frequency of nightmares. ^c* $p < .05$; ** $p < .01$; *** $p < .001$. ^dBeliefs About Dreams Questionnaire (BADQ). ^eMannheim Dream Questionnaire (MADRE).

Examining those who experience high numbers of nightmares, once again the odds of being a nonscience major decreased as nightmare frequency increased (OR = .245) but the lower-level academic rank category was nonsignificant. Of particular interest in the present study, the odds of the number of nightmares increased as Dream Superstitions (OR = .921) and Interactions and Uses of Dreams

decreased (OR = .491). When individuals reporting experiencing a moderate number of nightmares was considered the results were similar to that of those who had quite frequent nightmares (see **Table 9**). However, lower-level undergraduates were more likely to experience a moderate number of nightmares (OR = 2.311) relative to their graduate student counterparts.

Last, a summary of the multinomial logistic regression analyses is provided in **Table 10**. As seen in the table, a variety of variables were associated with nightmare frequency. These included personality characteristics, academic rank and major, sleep quality, anxiety and stress, and personal beliefs about dreams.

Table 10. Summary of the multinomial logistic regression analyses.

Model & Nightmare Frequency Categories ^a	Predictor Variables	Association (+/-) ^b
Demographic Variables & TIPI		
High Frequency of Nightmares	Nonscience Majors	-
	Extraversion	-
	Emotional Stability	-
Moderate Frequency of Nightmares	Nonscience Majors	-
	Freshman, Sophomore	+
	Emotional Stability	-
	Conscientiousness	+
Demographic Variables & Sleep Quality Measures		
High Frequency of Nightmares	Nonscience Majors	-
	Habitual Sleep Efficiency	+
	Sleep Disturbances	+
	Use of Sleep Medications	+
Moderate Frequency of Nightmares	Nonscience Majors	+
	Freshman, Sophomore	-
	Sleep Disturbances	+
Demographic Variables & Sleep Emotionality and Intensity		
High Frequency of Nightmares	Nonscience Majors	-
	Childhood Frequency	-
	Emotional Tone	+
	Dream Intensity	-
Moderate Frequency of Nightmares	Nonscience Majors	-
	Freshman, Sophomore	+
	Frequency of Childhood Nightmares	-
	Nightmare Distress	-
Demographic Variables & Anxiety & Stress		
High Frequency of Nightmares	Nonscience Majors	-
	Anxiety	+
	Stress	+

Continued

Moderate Frequency of Nightmares	Freshman, Sophomore	+
	Anxiety	+
	Stress	–
Demographic Variables & Beliefs About Dreams		
High Frequency of Nightmares	Nonscience Majors	–
	Dream superstitions	–
	Interactions & Uses of Dreams	–
Moderate Frequency of Nightmares	Nonscience Majors	–
	Freshman, Sophomore	+
	Dream Superstitions	–
	Interactions & Uses of Dreams	–

Note: ^aReference category is few or no nightmares. ^bOdds ratio.

4. Discussion

In the present study, I considered potential factors that influence dream frequency and content and the typical emotional tone of dreams. One primary goal of the present research was to examine the personality characteristics and academic background of participants on the frequency of nightmares among a cohort of college students of different academic ranks, undergraduate and graduate, and the impact of majoring in an area of science versus nonscience majors. For example, differences in major may well drive reported sleep differences among different majors (e.g., Ruiz, 2011; Shukman, 2018). In addition, the potential role of stress and anxiety on nightmare frequency was examined. Finally, but central to the goals of the present research, various measures of sleep quality, beliefs about the experience of dreaming, the meaning ascribed to personal dreams, and the MADRE Interactions and Uses of Dreams subscale were considered as drivers impacting the frequency, severity, and distress individuals experience when confronted with nightmares.

Of interest here, nightmare frequency and nightmare distress are inversely related ($r_s = -.407, p < .001$). The same applies to emotional intensity ($r_s = -.438, p < .001$). Of note, the proportion of recurrent nightmares is inversely related to both distress ($r_s = -.340, p < .001$) and intensity ($r_s = -.192, p < .001$). While speculative, this could reflect differences in personal experience with nightmares. Simply put, the experience could ameliorate the severity of adverse effects associated with nightmares. However, this supposition must be tempered with caution. Past research has been reported linking an increased risk of attempts at suicide with recurrent nightmares (Sjöström et al., 2009). The reported link holds after controlling for many participant variables, including (e.g., sex, age, relationship status), employment status, putative confounding behaviors (e.g., smoking, use of alcohol, amount of exercise) as well as sleep, and psychological variables (e.g., insomnia, depression et al., traumatic experiences, the use of psychotropic medica-

tions) (Nadorff et al., 2011; Sandman et al., 2017).

On the other hand, the emotional tone of more general dream content and emotional tone is positive ($r_s = .427, p < .001$). This could simply reflect the proportion of dreams that reflect more pleasant experiences relative to the number nightmares. Information in the form of books or articles about dreaming was not correlated with nightmare frequency or as an aid in gaining a greater understanding of personal dreams.

Distress during a nightmare appears to be associated with psychological disorders, including depression and neuroticism (Blagrove et al., 2004; Köthe & Pietrowsky, 2001; Miró & Martinez, 2005; Roberts & Lennings, 2006; Schredl et al., 2003). However, these reported associations are complicated by reports of associations with psychopathology, neuroticism, and nightmare frequency (Schredl, 2003; Schredl & Goeritz, 2019). Interestingly, the link between the amount of distress associated with nightmares and psychopathy appears to be more pronounced than the relationship between nightmare frequency and psychopathy. However, in one recent report, the frequency of nightmares was associated with increased emotional reactivity, at least as indexed neuroticism (Schredl & Goeritz, 2019).

Contrary to the present study, gender has been considered a reliable predictor of nightmare frequency (Schredl & Goeritz, 2019; Schredl & Reinhard, 2011). In fact, consideration of the personality factors as part of the multivariate analyses revealed only a significant difference on the emotional stability factor, with males scoring higher than females. In the context of correlations, a bivariate correlation may be nonsignificant, while the same variable becomes significant in a multiple regression analysis due to several reasons. These include suppression effects, collinearity and share variance, and, possibly, a confound (Tabachnick & Fidell, 2019). Since gender differences have been reported elsewhere, I plan to examine the issue further in a planned investigation.

Emotional stability was also a significant predictor variable in the stepwise regression analyses. In addition, extraversion and conscientiousness made significant contributions to the equations as well. Currently, an explanation that can account for the role of these two aspects of personality has yet to be proffered. Of interest, in the course of the MANOVA analyses, differences in extraversion, openness to experience emotional stability, and conscientiousness were observed among students of different academic ranks. Both are but, oddly, neuroticism was not. Given that differences in scores of neuroticism account for some of the observed gender differences in nightmare frequency (Schredl, 2014), this was somewhat surprising.

4.1. The Role of Stress, Worry, & Anxiety

The college experience can be one marked with a multitude of challenges. Many of these challenges can adversely affect their quality of life and mental health. Not limited to one factor, the choices and the demands associated with different academic disciplines, the personal experiences, and a host of contextual factors can

all adversely impact the mental well-being of the student (Arnett et al., 2014; Brenneisen Mayer et al., 2016; January et al., 2018). Anxiety, common among college students, was exacerbated by the COVID pandemic (Lee et al., 2021; Wang et al., 2020). Last, mental health remains an issue among college students as levels of anxiety, depression, and persisting symptoms of PTSD symptoms have remained relatively high even as society moved into the post-pandemic era (Wang et al., 2022).

In the present study, an additional surprising result was the levels of stress and anxiety experienced by students of different academic ranks. For example, upper-level undergraduates reported significantly higher stress levels than graduate students but not lower-level students. Graduate students reported significantly lower stress than upper-level undergraduates as well. Further, reported anxiety levels among graduate students were significantly lower than among upper-level and lower-level undergraduate students. Lower- and upper-level undergraduate stress levels were comparable. Given this, both were predictive nightmare frequency in the stepwise logistic regression analyses.

Worry is often defined as a cognitive process involving repetitive and uncontrollable thoughts about potential future threats or problems (Borkovec et al., 1983). It is characterized by a predominance of negative, future-oriented thinking, where individuals focus on the uncertainty of future events and their potentially adverse outcomes (Freeman, 2016; Startup & Davey, 2001). Predominantly verbal in form, worry involves an internal dialogue that focuses on the possibility of undesirable events that lie in the future (Borkovec et al., 1983). This future-oriented thinking can lead to a cycle of rumination and problem-solving attempts, often without reaching a satisfactory resolution. Worry is often seen as a central feature of generalized anxiety disorder (GAD), but it can occur in a variety of other contexts as well.

Borkovec et al. (1983) described worry as a predominantly verbal-linguistic activity, suggesting the involvement of more words and less imagery. This cognitive activity primarily focuses on problem-solving and anticipating future difficulties, which can lead to prolonged periods of mental engagement with perceived threats. Importantly, worry can be adaptive when it leads to productive problem-solving; however, excessive worry can become maladaptive, leading to heightened anxiety and stress without resolving the underlying issues (Davey, 1994).

Anxiety, on the other hand, is a broader construct encompassing emotional, cognitive, physiological, and behavioral components in response to perceived threats (Barlow, 2002). It is a normal and often adaptive response to danger or stress, preparing individuals to deal with threats by activating the body's fight-or-flight response. However, when anxiety becomes chronic or disproportionate to the actual threat, it can lead to significant distress and impairment.

Clearly, worry is associated with a negative affect (Rek et al., 2017; Segerstrom et al., 2000). Although nightmares are by nature considered negative and often highly emotional, they are not completely driven by affect. Often, repetitive and

negatively oriented cognition processes drive negative dream content, increasing the probability of nightmares (Rek et al., 2017). A series of priming thoughts preceding sleep would enhance the propensity for developing a nightmare.

According to Rek et al. (2017), among the variables they tested, the association between worry and nightmare occurrence was the largest found. Further, worry was also associated with the severity of the nightmare. Rek et al. found that after controlling for negative affect, these associations still were detected. They concluded that as a cognitive thought process, negative thoughts and associated content are amplified. In turn, this increases the likelihood of nightmares and as well as also the ensuing levels of nightmare distress. Last, they posit that worrying before sleep increases the chances of experiencing a distressing nightmare. The following day, it is possible that nightmares may prime the individual to engage in higher levels of worry and, in doing so, create a recurring cycle.

According to the theoretical framework of different scholars (Nielsen & Levin, 2007; Samson et al., 2023), nightmares are a form of dreaming where the context contains high threat levels but lacks an affective resolution (Samson et al., 2023). Threats as part of the experience of nightmares are not resolved effectively and as a result, the emotional experiences of anxiety and fear undermine successful regulation of emotion and a sense of catharsis. For example, nightmares in their more extreme form and frequency as part of a nightmare disorder include dreams that are recurrent, emotionally intense and include highly threatening content. Such experiences create substantial distress in the individual, and their life is characterized by diminished function in personal, social, educational, or occupational spheres of life (American Psychiatric Association, 2022).

In the affective network dysfunction (AND) model, Nielsen and Levin (2007) proposed framework that accounts for nightmares, distinguishing between affect distress and affective load and their contributions to the etiology of nightmares. Affective load reflects the incidence rate of current stressors in the individual's life, while affective distress, conceptualized as a trait factor, amplifies emotional reactivity levels. Nielsen & Levin's model incorporated many elements of existing models addressing nightmare psychopathology, including mood regulation (Kramer, 1991, 1993), boundary permeability (Hartmann et al., 1991), threat simulation (Revonsuo, 2000), and REM sleep somatization (Fisher et al., 1970). According to Nielsen and Levin, nightmares may simply be a manifestation of malfunctioning networks of affective processes involving the hippocampus, the amygdala, the medial prefrontal cortex, and the anterior cingulate cortex. In their view, these brain structures are central during dreaming, and are engaged in fear memory extinction.

Nightmares are often linked to traumatic events (Hasler & Germain, 2009; Rek et al., 2017), including events related to the development of PTSD (Harb et al., 2012; Nielsen & Levin, 2007; Spoormaker, 2008). Nightmares are considered one of the characteristic clinical symptoms of the diagnosis of PTSD (American Psychiatric Association, 2022). However, stressors considered milder and part of

waking life have been linked to nightmare occurrences (Loveland Cook et al., 1990). Thus, stressful events, whether more often considered a common part of life experiences (e.g., exam stress) or a more profound but rarer event (e.g., a category five hurricane such as Katrina), can be a cause of more frequent nightmares (Delmore et al., 2002; Loveland Cook et al., 1990; Wood et al., 1992). Last, a negative affect, more broadly is considered an important factor in initiating nightmares (Rek et al., 2017). Among nightmare sufferers, even non-nightmare dreams contain greater negative emotions compared to a non-nightmare control group (Paul et al., 2021).

At any rate, for individuals who suffer from nightmares, gaps in our knowledge remain. Where of interest, nightmares have been associated with a number of psychiatric disorders; however, with the exception of cases of PTSD, nightmares are not considered a priority during treatment (Sheaves et al., 2023). Nonetheless, as noted by Schredl and Goeritz (2019), in reports utilizing clinical samples, individuals suffering from nightmares as adults commonly report that their experiences with nightmares began before adulthood (see Kales et al., 1980).

4.2. Cultural and Spiritual Influences on the Impact of Dreams and Nightmares

As noted earlier, dream beliefs are deeply embedded in cultural contexts, with different cultures attributing varying levels of significance to dreams and nightmares. Often, dreams and nightmares are integrated into broader spiritual or religious frameworks. Eastern cultures, particularly those influenced by Hinduism, Buddhism, and traditional Chinese thought, often view dreams as significant spiritual experiences or messages from higher realms (Bulkeley, 2008; Thurman, 1995). For example, Buddhism views dreams as part of the *samsara* (cycle of rebirth) and as reflections of the mind's state. Traditional Chinese thought, influenced by Confucianism, Taoism, and traditional Chinese medicine, regard dreams as significant indicators of health and spiritual balance. Dreams were often interpreted as reflections of one's inner harmony or disharmony with the natural order (Ong, 1981). In Japan, Shinto beliefs have historically attributed sacred meanings to dreams, considering them as a conduit to the divine. Dreams were often seen as messages from the *kami* (spirits) and were taken seriously in guiding personal and communal decisions (Katu, 2010).

Thus, dreams are often interpreted in the context of the dreamer's spiritual journey towards enlightenment (Thurman, 1995; Wallace, 2003). In contrast, Western perspectives, shaped by Judeo-Christian beliefs and later by psychoanalytic theories, tend to interpret dreams as reflections of the individual's inner psyche and subconscious mind (Freud, 1900; Jung, 1964).

Exploring dream beliefs in Eastern and Western cultures, finding that Eastern cultures often incorporate spiritual and moral interpretations of dreams, whereas Western cultures tend to adopt psychological explanations. This cultural divergence underscores the importance of considering cultural context when studying

dream beliefs and their impact on nightmares.

In many Indigenous and non-Western cultures, dreams are seen as integral to spiritual practices and community life. For example, the Senoi people of Malaysia traditionally practice dream-sharing, where community members discuss their dreams to gain insights and resolve conflicts (Stewart, 1951). This practice often reduces the frequency of nightmares, as dreams are collectively interpreted and integrated into waking life.

The participants in my investigation are all enrolled in a Evangelical Christian university. Most, but not all profess to being at least nominally Christian. In the Christian Bible, both Old and New Testaments are rich with references to dreams and nightmares, often portraying them as instruments of divine communication. In the Old Testament, dreams are significant as channels of divine revelation. Jacob's dream at Bethel, where he sees a ladder reaching heaven, is one such instance (Genesis 28:12). This dream signifies God's covenant with Jacob and His assurance of divine protection and guidance. Daniel's ability to interpret King Nebuchadnezzar's dreams (Daniel 2, 4) also highlights the divine origin and significance of dreams. Daniel's interpretations reveal God's sovereignty over human kingdoms and His ability to communicate future events through dreams.

Nonetheless, even within Biblical Scripture, attitudes concerning the nature of dreams are present (Neil, 2015). For example, the book of Ecclesiastes suggests a dim view of the role of dreams, with messaging suggesting that dreams often are the tool of false prophets (Noegel, 2007). Conversely, In the New Testament canon, dreams and dream interpretation are considered in a more positive light.

Of relevance to the current research, in many cultures, dreams are believed to contain messages from ancestors or deities and are treated with great reverence and attention (Hong, 2022; Samson et al., 2023). This cultural framework provides a supportive context for interpreting and managing nightmares, often reducing their emotional impact and frequency.

4.3. Nightmares, Transliminality, and Thin Boundaries

First described and defined by Thalbourne, transliminality has been explored to further a putative hypersensitivity to various aspects of psychological experience such as ideation, imagery, and perception origins in either the external environment or in the unconscious (e.g., see Thalbourne & Houran, 2000; Thalbourne & Maltby, 2008). Following their original transliminality thesis, Thalbourne et al. investigated the transfer of unconscious thought and external stimulation into conscious awareness finding support for individual differences in the degree of transference in and out of conscious awareness (Thalbourne & Houran, 2000). Accordingly, transliminality has been defined as “susceptibility to, and awareness of, large volumes of imagery, ideation, and affect—these phenomena being generated by subliminal, supraliminal, and/or external input” (Thalbourne et al., 1997: p. 327) including the “tendency for psychological material to cross thresholds into or out of consciousness” (Thalbourne & Houran, 2000: p. 853). Of

importance to the present discussion, individuals rated higher in transliminality tend to possess beliefs in paranormal phenomena and may report mystical experiences (Thalbourne & Delin, 1999).

Relating the general idea to dreaming and the consideration of personality, Hartmann (1991) suggested that individual differences in the degree to which personality characteristics are compartmentalized are related (see Thalbourne, 2000). Arguing in terms of the idea of compartmental boundaries, for example, Hartmann et al. (2001) suggested individuals differ as a thick or thin personality type, with the latter individuals predisposed to have overlapping thoughts, and merging ideas. This contrasts with thick boundary personalities prone to more distinct and precise ideas. Thus, thick boundaries refer to the separation between and among areas of our thoughts, memories, and feelings, while thin boundaries reflect the amount of connectedness among the same. Hartmann found that the majority of individuals experiencing nightmares could be characterized as having thin boundaries. Further, dream recall was higher among such individuals as it was more vivid and emotionally laden with dream content (Hartmann et al., 1991; Schredl et al., 1996). Last, Schredl et al. (1999) replicated these findings using dream diaries, finding higher levels of negative dream content and a greater emphasis on the meaningful nature of the dreams among those with thin boundaries.

4.4. Limitations and Conclusion

The current cross-sectional design, without the ability to randomly assign subjects to groups, does not allow for the determination of causal relationships among the variables of interest. This is especially true when sleep-associated problems, current beliefs about dreams and nightmares, and nightmare frequency and distress were considered. The possibility of such important considerations as bidirectional relationships and the temporal order of various experiences were not fully considered in this study. In addition, the sample was drawn from a single university. Given this, selection biases are quite possible. Finally, the overwhelming majority of the participants were at least nominally practicing Christians. While denomination and belief systems varied, the sample did not permit proper consideration of individuals from different religious backgrounds, including those who defined themselves as spiritual but not religious (Shimron, 2023).

The present study used standard retrospective measures to determine metrics such as the frequency of nightmares among the participants. As noted elsewhere (Schred & Goeritz, 2019), there is concern that, compared to prospective methods such as journaling and logs, retrospective reports may lead to an underestimation of nightmare frequency (Robert & Zadra, 2008). Encouragingly, such estimation, if it exists, is small (Zadra & Donderi, 2000), and there is evidence that estimates of nightmare frequency are often higher using retrospective methods, at least in clinical samples (Lancee et al., 2010; Pietrowsky & Köthe, 2003).

Another issue that remains is concerned with how the operational definition of nightmares markedly differs across different investigations, with different metrics

included, such as the frequency of nightmares, the amount of distress or other emotions typically experienced with nightmares, whether the participant reported waking from nightmares, and nightmare recall (Gauchat et al., 2014). For example, nightmares have been operationalized at least one bad dream per month that awakened the participant (Langston et al., 2010) versus nightmares defined as “emotionally intense, frightening, and vivid dreams” (Liu et al., 2021). Additional examples, including those used in the present study, exist. Given these (and other) differences in operationalizing nightmares, often comparison across investigations is problematic. Last, often the investigators did not provide a definition to the participants, leaving them open to multiple definitions of what they consider a nightmare (El Sabbaugh et al., 2023).

Last, no data about psychological disorders among the participants was collected as part of the present report. As noted earlier, psychological disorders are often associated with nightmare frequency (Swart et al., 2013). In addition nightmares and nightmare frequency have been linked to a number of medications—albeit at different rates—including beta blockers (e.g., Lopressor), selective serotonin reuptake inhibitors (Zoloft) and atypical antidepressants (e.g., Wellbutrin), antibiotics (e.g., Cipro), antihistamines (e.g., Benadryl), Alzheimer’s medications (e.g., Donepezil), antipsychotics (e.g., Zyprexa), stimulants (e.g., Ritalin) (Agboton et al., 2014; Bilwise, 2004; Cojocariu et al., 2021; Fares, 2011; Kay & Eisenstein, 2017; Kierlin & Littner, 2011; Nicolas & Ruby, 2020).

In closing, future research is required to examine whether the nightmare experiences, frequency, and emotional tone remain fixed for the individual, or change as a function of academic experiences, stress levels and anxiety, and other factors. Here, the use of prospective measures and, ideally, longitudinal designs may prove quite valuable. Given individual differences in sleep-wake cycles and the associated neurophysiological processes involving such brain areas as suprachiasmatic nucleus, additional insight may yield greater understanding to the associations among sleep disruptions, proneness to recurrent nightmares, and nightmare frequency (Roenneberg et al., 2007).

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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