2006

Exam stress, depression, social support, and sleep disturbance

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DOI: <https://doi.org/10.31979/etd.6yb4-ub4d>

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EXAM STRESS, DEPRESSION, SOCIAL SUPPORT, AND SLEEP DISTURBANCE

A Thesis

Presented to

The Faculty of the Department of Psychology

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Leticia Mayoral

December 2006

UMI Number: 1441111

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ABSTRACT

EXAM STRESS, DEPRESSION, SOCIAL SUPPORT, AND SLEEP DISTURBANCE

by Leticia Mayoral

Stress and depression are growing problems affecting college students and may result in sleep disorders. Social support has been shown to buffer against stress. The purpose of this study was to investigate exam stress and to determine if social support acts as a buffer. It was hypothesized that stress, depression, and sleep disturbance would be greater during exam stress, and that social support would moderate stress and depression so that less sleep disturbance is experienced. Participants in this study were 334 undergraduate students who completed a survey during exam stress or non-exam stress condition. The results of this study demonstrated that exam stress did not increase stress, depression, or sleep disturbance. Social support did not buffer the effects of stress on sleep disturbance. However, additional analyses demonstrated that females used different types of social support as a buffer between depression and sleep disturbance. Implications and future research are discussed.

Acknowledgements

I would like to thank my thesis advisor, Dr. Cheryl Chancellor-Freeland, for supporting and believing in me throughout the whole thesis process. Her optimism and belief in my abilities is what gave me the perseverance to finish my thesis. I would also like to thank Dr. Megumi Hosoda for her insights and help with my statistics. Also, I would like to thank Dr. Mark Van Selst for being the third reader of my thesis. This thesis could not have been done without the help and support of my family and friends who kept asking, “When are you going to finish your thesis?”

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Introduction

Stress is defined as any condition that disrupts physiological or psychological homeostasis (Kim & Yoon, 1998). Catastrophic stress is the type of stress caused by major life events, such as moving, the death of a loved one, and serious injury or illness; whereas, daily hassles are those most commonly experienced, such as meeting deadlines or goals (Picchioni et al., 2002). The stressors with the greatest impact are those that are viewed negatively and those that accumulate over time. If left untreated, such stressors can lead to negative mental and physical health consequences. The response to a stressful condition leads to biological and behavioral changes. Biologically the stress response involves the activation of the hypothalamus, pituitary and adrenal axis in the brain to produce cortisol (Bear, Connors, & Paradiso, 2001). This physiological response along with its behavioral correlates, increased vigilance and avoidance behavior, define the commonly known “fight-or-flight” response to stress (Bear, Connors, & Paradiso, 2001). And although this description of a stress response may accurately describe stress behavior for males, it may not for females. Taylor et al. (2000) describe the female response to stress to be a “tend-and-befriend” response and not a fight-or-flight response. From an evolutionary perspective, it is believed that the demands of pregnancy, nursing, and infant care leave females unable to fight or flee. Instead, females form protective, affiliatory groups to stave off danger, ensuring that both mother and offspring would more likely survive whatever danger exists (Taylor et al., 2000). From a contemporary view, the advantages of befriending are clear (e.g., protection from threat, help with childcare, instrumental support, and emotional support), and may help explain why

females reportedly elicit more social support from family and friends during stressful situations than do males (Day & Livingstone, 2003). However, while females, may at times, benefit from social support, recent evidence suggests that it may also be a source of interpersonal strain, conflict, misunderstanding, and mistreatment, and may even augment the perception of stress (Bergdahl & Bergdahl, 2002). The role and precise nature of social support as a mitigating factor during stressful events remain in question.

Stress

Stress is a growing problem for, and consequence of, our fast-paced modern society, where the prevalence of moderate to severe stress among adults in North America has reached 35.3% (Rosengren et al, 2004). Indeed, one survey estimates the cost of stress in the workplace to U.S. businesses to be more than \$150 billion each year as a result of ill-health consequences and reduced productivity (Sauter et al., 1999; Spector, 2002). Many illnesses, such as viral infections (Maddock & Pariante, 2001), coronary heart disease (Tennant, 1999), immune function disorders (Maddock & Pariante, 2001), and even cancer (Maddock & Pariante, 2001), have been linked to stress. Stress may also result in psychological disorders such as anxiety and depression (Maddock & Pariante, 2001). Sleep disorders are often reported with high levels of perceived stress (Kalimo, Tenkanen, Harma, Poppius, & Heinsalmi, 2000), and this may serve to increase perceived stress, as well as to augment existing psychological and physiological stress-related disorders. Cognitive dysfunction has also been associated with stress, with chronic stress-induced cortisol levels leading to the degeneration of the brain's learning and memory center, the hippocampus (McEwen & Sapolsky, 1995;

McEwen, 1999). This is particularly relevant to students and those in the workforce whose achievement depends on learning and memory capacity.

College students and stress. Although college life was once viewed as a carefree, liberating stage of life, it is now viewed as a particularly stressful one. This is particularly true for the college freshmen who are still transitioning into college life (Towbes & Cohen, 1996). These students are often away from home for the first time, they often have jobs, and they have a new academic and social environment to adjust to. Unlike the environment in which non-student peers live, the college student life consists of continuous evaluations in the form of weekly tests and papers, and various assignments, with end of the course assignments and exams creating particularly high levels of stress. The stress experienced by students may not be in the form of catastrophic stress, but rather an accumulation of daily hassles that become overwhelming during final exams. Recent studies report that 26.8% of all college students report feeling stressed (Sax, Lindholm, Astm, Korn, & Mahoney, 2002), with particularly high levels of stress and anxiety occurring during exam time (Sprangler, 1997; Deinzer, Kleineidam, Stiller-Winkler, Idel, & Bachg, 2000). Indeed, college exams have been widely reported to exacerbate perceived stress (Jemmott & Magloire, 1988; Steptoe, Wardle, Pollard, Canaan, & Davies, 1996; Vedhara, Hyde, Gilchrist, Tytherleigh, & Plummer, 2000; Macht, Haupt, & Ellgring, 2005). Evidence that college exams are stressful is that they have also been shown to negatively affect health in college students by reducing Immunoglobulin A (Jemmott & Magloire, 1988, Deinzer, Kleineidam, Stiller-Winkler, Idel, & Bachg, 2000) and by dysregulating cytokines

(Marshall, Agarwal, Lloyd, Cohen, Henninger, & Morris, 1998), both of which provide a first line defense against infections. Also, research has found that college exams are related to increases in sleep disturbance (Blankstein, Flett, Watson, & Koldedien, 1990), eating (Macht, Haupt, & Ellgring, 2005), to smoking (Steptoe, Wardle, Pollard, Canaan, & Davies, 1996), and to decreases in physical activity (Steptoe, Wardle, Pollard, Canaan, & Davies, 1996).

Stress and Depression

A particularly serious consequence of stress can be depression, with a significant positive correlation between these two variables having been widely reported (Cohen & Hoberman, 1983; Bergdahl & Bergdahl, 2002; Ravindran, Matheson, Griffiths, Merali, & Anisman, 2002). Stressful life events have also been shown to predict future depression (Swift & Wright, 2000). Depression, like stress, also greatly impacts the college student population, and for college students and campus mental health professionals this has become a matter of mounting urgency (Kitzrow, 2003). The National College Health Assessment in 2000 found that 10% of college students assessed had been diagnosed with depression (Arehart-Treichel, 2002). Also, exam stress has been found to significantly increase depression in college students (Gilbert, Stunkard, Jensen, Detwiler, & Marinko, 1996; Steptoe, Wardle, Pollard, Canaan, & Davies, 1996). Gender differences in depression have been reported, with females showing a higher prevalence rate of depression than males, specifically with females showing more somatic symptoms of depression in college students and the general population (Riolo, Nguyen, Greden, & King, 2005; Moo-Estrella, Perez-Benitez, Soliz-Rodriguez, & Arankowsky-Sandoval,

2005; Kelly, Kelly, Brown, & Kelly, 1999; Wenzel, Steer, & Beck, 2005). It should be noted, however, that the relationship between stress and depression is somewhat murky. Some studies report that depressed people do not necessarily have more stressful life events, but tend to view the stressful life events as more negatively than those without depression, thus suggesting the relationship between stress and depression is one that may be bidirectional in nature (Ravindran, Matheson, Griffiths, Merali, & Anisman, 2002; Swift & Wright, 2000).

Stress, Depression, and Sleep

One of the most documented consequences of both stress and depression is sleep disturbance. Recent research on sleep has shown that people today are sleeping less than previously reported. For instance, Hicks, Fernandez and Pellegrini (2001) reported that from 1969 to 2001 the median sleep duration for college students gradually decreased from 7.75 hours of sleep to 6.65 hours of sleep, findings that have negative implications for health (Roth & Ancoli-Israel, 1999) and academic performance (Kelly, Kelly, & Clanton, 2001). Some of the consequences and correlates of not getting enough sleep include reduced concentration, impaired memory, decreased ability to accomplish daily tasks, diminished enjoyment of interpersonal relationships, and decreased mood and wellness (Roth & Ancoli-Israel, 1999).

Sleep quality is clearly affected by stress, both in terms of self-report and observed sleep. High levels of stress have been shown to be significantly and positively correlated with nightmares (Picchioni et al., 2002) and sleep complaints (Hall et al., 2000). A strong association exists between high levels of perceived stress and fewer

hours of reported sleep (Heslop, Smith, Metcalfe, Macleod, & Hart, 2002). In reference to physiological measures, stress has been shown to produce significantly lower rapid eye movement (REM) counts, increased REM latency and a reduction in the total time spent in REM, indicating that stress reduces this particular form of restorative sleep (Germain, Buysse, Ombao, Kupfer, & Hall, 2003; Williamson et al., 1995).

The relationship between sleep and depression has been well established. Hall et al.'s (2000) research demonstrated depression to be positively related to sleep complaints. Depressed college students report experiencing more somnolence during school, poorer sleep quality, greater latency to initiate sleep, and a greater amount of awakenings than college students with no depressive symptoms (Moo-Estrella, Perez-Benitez, Soliz-Rodriguez, & Arankowsky-Sandoval, 2005; Lindberg et al., 1997). Other research by Chang, Ford, Mead, Cooper-Patrick, and Klag (1997) and Roberts, Shema, Kaplan, and Strawbridge (2000) reveal that sleep disturbance also predicts depression later on in life.

Social Support

Because the deleterious effects of stress are broad reaching and potentially debilitating, researchers and clinicians have been actively searching for ways to ameliorate the effects of stress and depression. Social support has long been thought to serve as an effective coping method, and an effective buffer between stress and illness (Dean & Lin, 1977), although careful empirical research has only recently begun. Cohen and Hoberman (1983) define social support as the various resources provided by one's interpersonal relationships. More recently, social support has been identified across four main dimensions and have been described by Cohen, Mermelstien, Kamarck, and

Hoberman (1985) as 1) tangible social support, which is the perceived availability of material aid, 2) appraisal social support, which is the perceived availability of having someone to talk to about problems, 3) self-esteem social support, which is the perceived availability of a positive comparison when comparing one's self with others, and 4) belonging social support, which is the perceived availability of people one can do things with.

A number of reports support the notion that social support serves as a buffer for stress and depression, but this effect may vary depending on gender. Those studies examining the role of social support with males report that with the experimental stressor, the Tier Social Stress Test, males have a significantly reduced stress response relative to those who had no social support (Kirschaum, Klauer, Filipp, & Hellhammer, 1995; Heinrichs, Baumgartner, Kirschbaum & Ehlert, 2003). This was not true for females, who tended to show a higher stress response with social support than those with no social support with the experimental stressor (Kirschaum et al., 1995). One explanation for this finding is described as the boomerang effect, in which social support creates more stress instead of relieving it. Social support has also been shown to act as a buffer between stress and depression. One example is Cohen and Hoberman's (1983) study, which demonstrated social support to be a significant buffer between stressful negative life events and depressive symptoms. More specifically, it was found that particular types of social support, that is, appraisal, self-esteem, and belonging social support, were significant buffers for depression in a college sample of students. Another study by Swift and Wright (2000) revealed that global, self-esteem, and belonging social support were

negatively associated with depression, and that self esteem social support mitigated the effects of the stress-associated with sexual coercion in female college students. It is noteworthy that this is one of the few studies that investigated the role of social support in stress in females. Clearly, additional studies with gender-matched samples are needed to elucidate whether and to what extent gender plays a role in this issue.

Social support has also been reported to act as a buffer between stress and sleep. One such study by Picchioni et al. (2002) reports that college students with high levels of daily stressors, life stressors, and low social support experienced a significantly greater nightmare intensity than did students with high social support. Others have reported that reduced social support in college students increased perceived stress of an acute stressor and demonstrated reductions in REM sleep (Germain, Buysse, Ombao, Kupfer, & Hall, 2003). Regarding the relationship of social support, depression and sleep, Bazargan (1996) showed that being female and depressed, with low levels of emotional social support are strong predictors of sleep disturbances in elderly African Americans.

To briefly summarize, the rates of stress and depression among college students are on the rise, this could be augmented during examination times. There have also been reports of poorer sleep quality and fewer hours spent sleeping, particularly for those who experience stress and depression, and again, particularly during exam times. Social support may be one mechanism by which to buffer the deleterious effects of stress and depression so that sleep disturbances are reduced. Indeed, recent research suggests that both males and females benefit from social support, but the seminal work by Taylor et al. (2000) suggests that the protective nature of affiliatory social support would be most

beneficial to females. Careful research examining social support as a buffer of stress and depression in males and females is essential in learning more about how social support works and how it buffers against the detrimental effects of stress and depression so that sleep is not negatively affected.

Hypotheses

The purpose of this study is to demonstrate that stress, depression, and sleep disturbance increase in college students during final exam stress relative to non-exam stress. It is predicted that during final exam stress, when stress is suppose to be high, social support will be a particularly strong variable in moderating stress and depression so that less sleep disturbance will be experienced. Based on the work by Taylor et al. (2000), it is also predicted that social support will be particularly beneficial to females.

Method

Participants

Participants in this study were 334 undergraduate students from an ethnically diverse university. One hundred and forty participants completed the survey in the exam stress condition and 119 participants completed the survey in the non-exam stress condition. The mean age of the participants was 22.17 years ($SD = 5.68$). Seventy-one percent of the participants were females and 29% of the participants were males. Thirty-six percent of the participants were Caucasians, 30% of the participants were Asians, 15% of the participants were Hispanics, 13% of the participants were Other, and 6% of the participants were African-Americans (See Table 1).

Procedure

The Institutional Review Board-Human Subjects committee at San Jose State University approved the procedure for this study. Undergraduate students completed a survey packet outside of class for extra credit or research participation credit. The survey packet has four separate measures to assess each of the variables included in this study, stress, depression, social support, and sleep disturbance. In this study, participants were given the survey packet about two months before the final exam week for the non-exam stress condition and were asked to complete the survey packet and return it as soon as possible. Participants in the exam stress condition were handed the survey packet two to five days before finals and collected during finals week. All participants were given informed consent and told that the purpose the study was to examine the relationship between stress, depression, social support, and sleep disturbance.

Table 1

Ethnic Distribution of Participants Grouped According to Gender

	African- American	Asian	Caucasian	Hispanic	Other	Total
Female						
N	12	66	94	37	29	238
%	5	28	40	15	12	100
Male						
N	9	35	24	11	15	94
%	10	37	25	12	16	100
Total						
N	21	101	118	48	44	332
%	6	30	36	15	13	100

Measures

Stress. The Daily Hassles and Uplifts Scale (DeLongis, Folkman, & Lazarus, 1988) was used to measure stress in this study because it measures a more common form of stress, daily hassles, as well as how positive or negative the daily hassles are perceived to be. This measure has 53 items that most people deal with on a daily basis (e.g., your children, the weather, your workload) and the participants are asked to rate from 0, none or low, to 3, a great deal, how much they perceive each item to be a hassle and an uplift. Both the hassles and uplifts are summed and give two separate scores ranging from 0-159. DeLongis (1985) found that this scale has eight factors with Cronbach's alpha ranging from .80 to .93. In this sample of college students Cronbach's alpha was .91. Many studies have used this survey on college students to measure stress (Picchioni et al., 2002; Marshall, Agarwal, Lloyd, Cohen, Henninger, & Morris, 1998).

Sleep. A Sleep Habits Questionnaire was used to measure sleep disturbances. It has ten questions assessing sleep habits, how satisfied the respondent are with their sleep and sleep duration. Some sample questions from the questionnaire are "During the past month, how would you rate your sleep overall?" and "During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?" The response format goes from not during the past month to three or more times a week. This measure has been used in many studies. An example would be Hicks, Marical, and Conti (1991) who used this measure to study the differences between stress and coping in habitual long and short sleepers. The Cronbach's alpha for this sample of college students was .76.

Social Support. The college student version of the Interpersonal Support Evaluation List (ISEL) (Cohen & Hoberman, 1983) was used in this study to measure social support. The measure has 48 items in a true and false format and they are all summed to give a global social support score ranging from 0, no social support, to 48, the highest level of social support. This measure is made up of four factors, with twelve items assessing tangible social support that are summed to give an individual score of tangible social support, twelve items assessing belonging social support that are summed to give an individual score of belonging social support, twelve items assessing appraisal social support that are summed to give an individual score of appraisal social support, and twelve items assessing self-esteem social support that are summed to give an individual score of self-esteem social support. Cohen, Mermelstien, Kamarck, and Hoberman (1985) found the convergent validity for the ISEL measure to range from .30 to .46. Also, Cohen, Mermelstien, Kamarck, and Hoberman (1985) found Cronbach's alpha for this measure to be .86 and this was also true for this sample of college students.

Depression. The Beck Depression Inventory-II (BDI-II) was used to measure depression. This measure has 21 items that assess the severity of depressive symptomatology and scores range from 0-63 with the severity of depression increasing with the score. The response format goes from 0 to 3 with 3 being the most severe form of that symptom of depression. The scores are cutoff from 0-13 indicating none to minimal depression, 14-19 indicating mild depression, 20-28 indicating moderate depression and 29-63 indicating severe depression (Beck, Steer, & Brown, 1996). It has been found to have high internal consistency with Cronbach's alpha ranging from .90

(Grothe, et al., 2005) to .93 (Beck, Steer, & Brown, 1996) and in this sample of college students Cronbach's alpha was .89. The BDI-II also was found to have a convergent validity of .93 (Dozois, Dobson, & Ahnberg, 1998).

Analysis

Group differences were examined between the exam stress condition and non-exam stress condition with one-way analysis of variance (ANOVA) to test the first hypothesis. Regression analyses were used to test the second hypothesis to examine the moderating effect of social support on stress, depression, and sleep disturbance.

Results

Descriptive Statistics

The means and standard deviations for depression, social support, stress, and sleep disturbance are shown in Table 2. Mean stress levels were found to be 45.42 ($SD = 22.13$) in the exam stress condition, and 46.48 ($SD = 21.50$) in the non-exam stress condition. The mean level of depression was established to be 13.25 ($SD = 9.50$) for the exam stress condition, and 12.32 ($SD = 9.51$) for the non-exam stress condition. The prevalence of depression in this college sample was found to be 18.1% with mild depression, and 18.6% with moderate to severe depression. It was demonstrated that the mean level of sleep disturbance was 25.30 ($SD = 5.81$) in the exam stress condition and 24.77 ($SD = 6.62$) in the non-exam stress condition. Global social support, or overall social support, was shown to have a mean of 35.80 ($SD = 6.73$) in the exam stress condition, and a mean of 35.22 ($SD = 7.40$) in the non-exam stress condition.

Correlations

In Table 2 and Table 3, the intercorrelations between the variables are shown for both exam stress and non-exam stress conditions. In the exam stress condition depression was positively correlated with stress, $r(140) = .42, p < .01$, and sleep disturbance, $r(140) = .63, p < .01$. Stress and sleep disturbance were also positively correlated with each other in the exam stress condition, $r(140) = .31, p < .01$. Global social support was negatively correlated with depression, $r(140) = -.47, p < .01$, and sleep disturbance, $r(140) = -.21, p < .05$, in the exam stress condition. Depression was also positively correlated with stress, $r(119) = .27, p < .01$, and sleep disturbance, $r(119) = .52, p < .01$,

Table 2

Intercorrelation Matrix For Exam Stress

	1	2	3	4	5	6	7	8
1. Depression	-	-.47**	-.20*	-.27**	-.42**	-.43**	.42**	.63**
2. Global Social Support		-	.67**	.76**	.75**	.65**	-.10	-.21*
3. Tangible Support			-	.36**	.30**	.29**	-.03	-.09
4. Belonging Support				-	.46**	.32**	.03	-.13
5. Appraisal Support					-	.30**	-.15	-.17*
6. Self-esteem Support.						-	-.14	-.22**
7. Daily Stress							-	.31**
8. Sleep Disturbance								-
Mean	13.25	35.80	10.04	7.39	9.98	8.38	45.43	25.30
SD	9.50	6.73	2.25	2.42	2.56	2.21	22.13	5.81

Note: * = $P < .05$; ** = $P < .01$; n = 140

Table 3

Intercorrelation Matrix For Non-Exam Stress

	1	2	3	4	5	6	7	8
1. Depression	-	-.35*	-.02	-.29**	-.29**	-.42**	.27**	.52*
2. Global Social Support		-	.66**	.76**	.78**	.75**	-.05	.03
3. Tangible Support			-	.39**	.33**	.34*	-.03	.11
4. Belonging Support				-	.46**	.40**	-.05	.02
5. Appraisal Support					-	.48**	.02	.01
6. Self-esteem Support.						-	-.10	-.04
7. Daily Stress							-	.33**
8. Sleep Disturbance								-
Mean	12.33	35.23	9.81	7.74	10.07	7.59	46.49	24.78
SD	9.51	7.41	2.19	2.54	2.69	2.52	21.50	6.62

Note: * = $P < .05$; ** = $P < .01$; n = 119

in the non-exam stress condition. In the non-exam stress condition stress and sleep disturbance were also positively correlated with each other, $r(119) = .33, p < .01$. Global social support was also negatively correlated to depression, $r(119) = -.35, p < .01$, in the non-exam stress condition.

Hypotheses Testing

Hypothesis one, that during exam stress students would have higher levels of stress, depression, and sleep disturbance than during non-exam stress, was tested using one-way ANOVA. The results demonstrated the exam stress condition did not significantly increase stress, $F(1, 318) = .31, p > .05$, depression, $F(1, 322) = .00, p > .05$, and sleep disturbance, $F(1, 322) = .63, p > .05$, when compared to those in the non-exam stress condition. Therefore, the hypothesis that students in the exam stress would have increased levels of stress, depression, and sleep disturbance relative to those in the non-exam stress was not supported.

The second hypothesis, examining social support as a moderator between stress and sleep disturbance and depression and sleep disturbance, was tested with separate regression analyses. The regression analyses indicated that social support was not a significant moderator between stress and sleep disturbance, during non-exam stress, $F(1, 119) = 0.02, p > .05, \Delta R^2 = .00$ (See Table 4), and during exam stress, $F(1, 140) = 2.50, p > .05, \Delta R^2 = .02$ (See Table 5). Also, the results revealed that social support was not a significant moderator between depression and sleep disturbance, during non-exam stress, $F(1, 131) = 2.41, p > .05, \Delta R^2 = .01$ (See Table 6), and during exam stress, $F(1, 161) = 1.37, p > .05, \Delta R^2 = .01$ (See Table 7). The second hypothesis was not supported here.

Table 4

Summary of Hierarchical Regression Analysis for Examining the Effects of Stress and Social Support on Sleep Disturbance in Exam Stress (N = 141)

Variable	β
Step 1	
Stress	.30*
Global Social Support	-.19*
Step 2	
Stress	.98*
Global Social Support	.08
Stress X Global Social Support	-.71

Note: * = $p < .05$; $R^2 = .14$ for Step 1; $\Delta R^2 = .02$, $p > .05$ for Step 2

Table 5

Summary of Hierarchical Regression Analysis for Examining the Effects of Stress and Social Support on Sleep Disturbance in Non-Exam Stress (N = 120)

Variable	β
Step 1	
Stress	.33*
Global Social Support	.05
Step 2	
Stress	.40
Global Social Support	.08
Stress X Global Social Support	-.07

Note: * = $P < .05$; $R^2 = .11$ for Step 1; $\Delta R^2 = .00$, $p > .05$ for Step 2

Table 6

Summary of Hierarchical Regression Analysis for Examining the Effects of Depression and Social Support on Sleep Disturbance in Exam Stress (N = 162)

Variable	β
Step 1	
Depression	.64*
Global Social Support	.09
Step 2	
Depression	.96*
Global Social Support	.19
Depression X Global Social Support	-.30

Note: * = $P < .05$; $R^2 = .37$ for Step 1; $\Delta R^2 = .01$, $p > .05$ for Step 2

Table 7

Summary of Hierarchical Regression Analysis for Examining the Effects of Depression and Social Support on Sleep Disturbance in Non-Exam Stress (N = 132)

Variable	β
Step 1	
Depression	.62*
Global Social Support	.22*
Step 2	
Depression	.01
Global Social Support	.02
Depression X Global Social Support	.58

Note: * = $P < .05$; $R^2 = .32$ for Step 1; $\Delta R^2 = .01$, $p > .05$ for Step 2

The third hypothesis that females would utilize social support more than males was tested by ANOVA. The results demonstrated that females perceived significantly more overall, or global, social support, $F(1, 318) = 6.79, p < .01$.

Additional Analysis

Overall there is no moderating effect due to social support, which is inconsistent with the literature that supports social support acting as a moderator. However, whether there are differences in social support and gender specific effects would be consistent with the findings above, and with the literature, and prompts more detailed analyses. Additional analyses were done to examine the effects of gender and the qualitatively different types of social support in this study. It was questioned whether the different forms of social support would be more beneficial than others to males and females. The different types of social support that make up global social support are tangible social support, belonging social support, appraisal social support, and self-esteem social support. Taylor et al. (2000) proposes that females will benefit more from belonging social support when stress is high than do males. In the initial analysis, the data were collapsed across the two variables, gender and social support, and thus may have obscured important findings. The means, standard deviations, and intercorrelations of depression, stress, sleep disturbance, and social support for males and females can be seen in Table 8, Table 9, Table 10, and Table 11. The data demonstrate that tangible social support, belonging social support, appraisal social support, and self-esteem social support were not significant moderators between stress and sleep disturbance in neither the exam stress condition nor the non-exam stress condition for either males or females.

In males, it was also demonstrated that tangible social support, belonging social support, appraisal social support, and self-esteem social support were not significant moderators between depression and sleep disturbance in both the exam stress and non-exam stress conditions. However, it was revealed that during the non-exam stress condition global social support, $F(1, 92) = 6.82, p < .05, \Delta R^2 = .05$ (See Table 12), self-esteem social support, $F(1, 94) = 3.99, p < .05, \Delta R^2 = .03$ (See Table 13), and appraisal social support, $F(1, 94) = 9.10, p < .05, \Delta R^2 = .06$ (See Table 14), act as significant buffers between depression and sleep disturbance in females. During the exam stress condition only belonging social support acts as a significant buffer between depression and sleep disturbance in females, $F(1, 121) = 6.93, p < .05, \Delta R^2 = .04$ (See Table 15). These regression analyses support the hypothesis that social support can serve as a moderator between depression and sleep disturbance, and that females benefit more from it.

We sought to further explain the discrepancy between our findings and those reported by others. The literature suggests that the results may vary with ethnicity (Taylor et al., 2004). In particular, the literature suggests that there are ethnic differences in the use of social support (Taylor et al., 2004). Given that our sample was from an ethnically diverse university, we further examined the role of ethnicity. Due to the limits of the sample only the differences between Caucasians ($n = 118$) and Asians ($n = 101$) could be examined. Asians reported to have significantly less overall social support ($M = 33.03, SD = 8.31$), $F(4, 312) = 4.21, p < .01$, and more specifically, they utilized less self-esteem social support ($M = 7.27, SD = 2.54$) than Caucasians ($M = 36.52, SD = 6.61$; $M = 8.55, SD = 1.97$), $F(4, 319) = 5.17, p < .01$. This supports the research

demonstrating that Asians do not seek social support because it would disturb the collective community associated with this culture (Taylor et al., 2004).

Table 8

Males Intercorrelation Matrix For Exam Stress

	1	2	3	4	5	6	7	8
1. Depression	-	-.61**	-.38*	-.24	-.48**	-.56**	.50**	.78**
2. Global Social Support		-	.69**	.72**	.67**	.63**	-.01	-.39*
3. Tangible Support			-	.31	.15	.44**	-.06	-.24
4. Belonging Support				-	.50**	.15	.11	-.10
5. Appraisal Support					-	.14	-.09	-.33*
6. Self-esteem Support.						-	-.01	-.39*
7. Daily Stress							-	.63**
8. Sleep Disturbance								-
Mean	11.14	34.78	9.73	7.49	9.27	8.29	47.57	24.3
SD	8.46	7.03	2.58	2.56	2.69	2.54	19.98	6.09*

Note: * = $P < .05$; ** = $P < .01$; $n = 37$

Table 9

Males Intercorrelation Matrix For Non-Exam Stress

	1	2	3	4	5	6	7	8
1. Depression	-	-.39*	.04	-.20	-.47**	-.53**	.22	.39*
2. Global Social Support		-	.65**	.83**	.88**	.81**	.25	.13
3. Tangible Support			-	.45**	.36*	.36*	.21	.30
4. Belonging Support				-	.66**	.50**	.29	.08
5. Appraisal Support					-	.69**	.17	-.01
6. Self-esteem Support.						-	.13	.10
7. Daily Stress							-	.28
8. Sleep Disturbance								-
Mean	10.82	32.65	9.18	7.35	9.15	6.97	47.57	23.38
SD	7.74	9.77	2.61	3.10	3.60	2.91	22.27	5.59

Note: * = $P < .05$; ** = $P < .01$; $n = 34$

Table 10

Females Intercorrelation Matrix For Exam Stress

	1	2	3	4	5	6	7	8
1. Depression	-	-.45**	-.17	-.29**	-.45**	-.40**	.42**	.57**
2. Global Social Support		-	.67**	.79**	.78**	.67**	-.13	-.16
3. Tangible Support			-	.40**	.36**	.21**	-.01	-.04
4. Belonging Support				-	.46**	.40**	-.00	-.14
5. Appraisal Support					-	.38**	-.17	-.13
6. Self-esteem Support.						-	-.20*	-.16
7. Daily Stress							-	.22*
8. Sleep Disturbance								-
Mean	14.01	36.17	10.16	7.36	10.23	8.42	44.66	25.65
SD	9.78	6.62	2.13	2.38	2.48	2.09	22.90	5.70

Note: * = $P < .05$; ** = $P < .01$; n = 103

Table 11

Females Intercorrelation Matrix For Non-Exam Stress

	1	2	3	4	5	6	7	8
1. Depression	-	-.43**	-.08	-.36**	-.28**	-.43**	.30**	.55**
2. Global Social Support		-	.66**	.71**	.66**	.71**	-.25*	-.06
3. Tangible Support			-	.33**	.26*	.30**	-.16	.00
4. Belonging Support				-	.27*	.32**	-.23*	-.03
5. Appraisal Support					-	.30**	-.07	-.02
6. Self-esteem Support.						-	-.22*	-.12
7. Daily Stress							-	.37**
8. Sleep Disturbance								-
Mean	12.92	36.26	10.07	7.89	10.45	7.85	46.06	25.34
SD	10.12	5.98	1.96	2.28	2.14	2.32	21.30	6.94

Note: * = $P < .05$; ** = $P < .01$; $n = 85$

Table 12

Summary of Hierarchical Regression Analysis for Females Examining the Effects of Depression and Social Support on Sleep Disturbance in Non-Exam Stress (N = 93)

Variable	β
Step 1	
Depression	.65*
Global Social Support	.21*
Step 2	
Depression	-.62
Global Social Support	-.08
Depression X Global Social Support	1.19*

Note: * = $P < .05$; $R^2 = .35$ for Step 1; $\Delta R^2 = .05$, $p < .05$ for Step 2

Table 13

Summary of Hierarchical Regression Analysis for Females Examining the Effects of Depression and Self-Esteem Social Support on Sleep Disturbance in Non-Exam Stress (N = 95)

Variable	β
Step 1	
Depression	.61*
Self-esteem Social Support	.13
Step 2	
Depression	.10
Self-esteem Social Support	-.09
Depression X Self-esteem Social Support	.49*

Note: * = $P < .05$; $R^2 = .32$ for Step 1; $\Delta R^2 = .03$, $p < .05$ for Step 2

Table 14

Summary of Hierarchical Regression Analysis for Females Examining the Effects of Depression and Appraisal Social Support on Sleep Disturbance in Non-Exam Stress (N = 95)

Variable	β
Step 1	
Depression	.61*
Appraisal Social Support	.14
Step 2	
Depression	-.45
Appraisal Social Support	-.22
Depression X Appraisal Social Support	1.04*

Note: * = $P < .05$; $R^2 = .32$ for Step 1; $\Delta R^2 = .06$, $p < .05$ for Step 2

Table 15

Summary of Hierarchical Regression Analysis for Females Examining the Effects of Depression and Belonging Social Support on Sleep Disturbance in Exam Stress (N = 122)

Variable	β
Step 1	
Depression	.58*
Belonging Social Support	.07
Step 2	
Depression	1.05*
Belonging Social Support	.34*
Depression X Belonging Social Support	-.52*

Note: * = $P < .05$; $R^2 = .32$ for Step 1; $\Delta R^2 = .04$, $p < .05$ for Step 2

Discussion

The most unexpected result from this study was that we did not find significant increases in stress, depression, or sleep disturbance during final exam time. This is inconsistent with the literature that has reported exam stress to significantly increase perceived stress (Sprangler, 1997; Deinzer, Kleineidam, Stiller-Winkler, Idel, & Bachg, 2000), depression (Gilbert, Stunkard, Jensen, Detwiler, & Marinko, 1996; Steptoe, Wardle, Pollard, Canaan, & Davies, 1996), and sleep disturbance (Blankstein, Flett, Watson, & Koldedin, 1990). However, we did find different responses to exam stress when the data were separated by gender. For example, males were seen to have slightly higher levels of depression and sleep disturbance in the non-exam stress condition, while females were seen to have slightly higher levels of depression and the same level of sleep disturbance in the exam stress condition relative to the non-exam stress condition (See Tables 8, 9, 10, & 11).

Based on the noted gender differences, it seemed to us that exam stress did have some effect, and the question remained, why didn't we find a main effect for exam stress when others had? There are several possible explanations, one being that the surveys for the exam stress condition were distributed about two to five days before the final exams, and perhaps if the surveys were given during final exams we would have found a robust effect of exam stress. Another possible reason for the lack of increase in stress during exam stress is that the measure of stress used in this study, the Daily Hassles and Uplifts scale, may not have been sensitive enough to demonstrate this in our sample. Studies have used a variety of measures to assess stress including self-report measures such as the

college version of the Social Readjustment Rating Scale (Holmes & Rahe, 1967), which measures life event stress, and the Perceived stress scale (Cohen, Kamarck, & Mermelstien, 1983), which measures perception of ongoing stress, and biological measures of stress including measuring levels of cortisol (Kirschbaum, Klauer, Filipp, & Hellhammer, 1995). Even though there are many measures of stress to choose from, the Daily Hassles and Uplifts scale of stress seemed most appropriate for this study because it had been shown to be a valid and reliable measure of stress; moreover, it measures both how positive and how negative participants perceive their daily hassles to be. A final explanation is that the non-exam stress condition just had a higher baseline level of stress to start with. One possible reason for this is that this sample consisted of mostly first year college students who were experiencing stress because they were still adjusting to college life. Nonetheless, the fact that depression and sleep disturbance were slightly, albeit not significantly, higher in the exam stress condition may suggest that the college students were feeling more stressed in the exam stress condition than in the non-exam stress condition.

The hypothesis that when stress is high social support will moderate the effect of stress so that less sleep disturbance is experienced was not supported in this study in males or females. However, when depression and sleep disturbance were examined, regression analyses demonstrated that social support is important in buffering the effects of depression on sleep disturbance in females but not in males. So even though our original hypothesis was not supported, these findings do support the notion that social support can moderate the effect of depression on sleep disturbance, but only in females.

In particular, it was found that during non-exam stress females benefited from global social support, appraisal social support, and self-esteem social support to buffer the effect of depression on sleep disturbance. However, during exam stress, females only benefited from belonging social support to buffer the effect of depression on sleep disturbance. These findings suggest that females use appraisal, self-esteem, and global social support to help decrease the negative effects of depression during daily stress, but use belonging social support during more stressful situations, such as during final exams. These results support Taylor et al.'s (2000) hypothesis that females respond to stress by tending and befriending unlike males. This study supports the hypothesis that females respond to stress by tending and befriending because females benefited in particular from belonging social support, which is the perceived availability of people one can do things with, during exam stress, when stress is supposed to be high. The implication of this finding is that females could potentially benefit from using social support to buffer the effects of depression on sleep disturbance. Another implication is that males and females use social support differently because in this study females reported having significantly more global social support and appraisal social support than males and those two types of social support were significant buffers between depression and sleep disturbance during non-exam stress for females but not for males.

One limitation of this study is that the relatively low number of male participants made it difficult to conclusively determine whether and to what degree social support acts as a buffer between stress and sleep disturbance, and between depression and sleep disturbance in males. The regression analysis revealed that social support did not have a

moderating effect, but it is difficult to discern whether the findings for social support in males was accurate or whether it was due to the lack of power.

Another limitation of this study is that the sample is mostly made up of Caucasians and Asians relatively participants. Although the sample came from an ethnically diverse college in California, the sample collected was not large enough to adequately represent multiple ethnicities. Our additional analyses found ethnic difference between Caucasians and Asians in the use of social support, but the sample size was too small to perform a regression analysis examining ethnicity. It would have been interesting to have fully examined ethnic differences because the literature has reported such differences in regards to stress, depression, sleep disturbance, and social support. Taylor et al. (2004) reported ethnic differences in stress with European Americans reporting more personal stressors than Asians and Asian Americans. Ethnic differences in depression have been noted by Riolo, Nguyen, Greden, and King (2005) who found that the prevalence of major depression was significantly higher in Whites, 10.4%, than in African Americans, 7.5%, and Mexican Americans, 8.0%. Also, it was found that African-American males scored significantly higher on depression than Caucasian males in a college sample (Kelly, Kelly, Brown, & Kelly, 1999). Sleep has also been shown to have ethnic differences, in particular, the literature illustrates that minorities experience more sleep disturbance than Caucasians (Jean-Louis, Kripke, Ancoli-Israel, Klauber, & Sepulveda, 2000; Jean-Louis, et al., 2001; Stepnowsky, Moore, & Dimsdale, 2003). Ethnic differences in social support have also been reported by Taylor et al. (2004) who found that Asians and Asian Americans were less likely to use social support as a coping

mechanism and more likely to report that social support would disrupt group harmony, sharing problems would make the problem worse, it is one's responsibility to solve their own problems, others may not understand the problem, and sharing problems would elicit criticism and lose face than European Americans. In this study ethnicity was not a variable because there was not a large enough representation of the minority groups to adequately represent them.

Future research should address some of the limitations of this study. It can do this by using a within-subjects design to track the effects of exam stress on individuals and reduce variance. Also, future research should use more sensitive measures of stress and even measure stress directly by measuring cortisol, the stress hormone. A larger sample size that includes more males and minorities so that gender and ethnicity can be accurately represented and analyzed is another consideration for future research. Future research should further examine the gender differences found in this study and examine why social support benefited females and not males in this study. It should also investigate what does act as a buffer for males under exam stress. Another topic future research should examine are other variables that have the potential to ameliorate stress, depression, and sleep disturbance such as positive life events, coping strategies, and personality characteristics.

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