Increase in REM Density: A Biological Marker of Bulimia and Depression or an Artifact of Perceived Stress?

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College of William & Mary - Arts & Sciences

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INCREASE IN REM DENSITY: A BIOLOGICAL MARKER
OF BULIMIA AND DEPRESSION OR AN ARTIFACT
OF PERCEIVED STRESS?

A Thesis
Presented to
The Faculty of the Department of Psychology
The College of William & Mary in Virginia

In Partial Fulfillment
Of the Requirements for the Degree of
Master of Arts

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Jeannie Koo
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APPROVAL SHEET

This thesis is submitted in partial fulfillment of the requirements for the degree of

Master of Arts

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Abstract

This study investigated the possibility that REM density may not be a biological marker of bulimia and/or depression, but rather, a reflection of perceived stress. Fourteen college women in an introductory psychology course were asked to volunteer for sleep recordings. Subjects were also asked to fill out a questionnaire at the time of sleep recording. The measures taken included the Perceived Stress Scale (PSS) (Cohen, 1983), the Bulimia Test (BULIT) (Smith & Thelen, 1984) and the Zung Self-Rating Depression Scale (SRDS) (Zung, 1965) as well as demographic information pertaining to weight, height, and income of family or origin. A multiple regression was done in order to see whether or not scores on the BULIT and/or SRDS account for the variance of REM density above and beyond the REM density variance accounted for by the PSS. In addition, correlational analyses were used to clarify the relationship between perceived stress, bulimia, and depression. It was found that, though perceived stress accounts for more of the variance in REM density than bulimia and depression, bulimia and depression also seem to covary with REM density in a way that perceived stress does not. Before future investigations are undertaken to clarify the relationships among these factors, it is suggested that changes be made in the method of investigation.
INCREASE IN REM DENSITY: A BIOLOGICAL MARKER OF BULIMIA AND DEPRESSION OR AN ARTIFACT OF PERCEIVED STRESS?
Introduction

Bulimia and anorexia nervosa are eating disorders with potentially fatal consequences. Currently these two disorders are on the rise, though researchers disagree about the prevalence rate. Naomi Wolf (1991) states that approximately one million women in the United States alone may be suffering from bulimia and anorexia nervosa. Research also suggests that 3.8% to as high as 18% of college students may be bulimic (Crowther & Chernyk, 1986; Hawkins, McDermott, Seeley, & Hawkins, 1992; Striegal-Moore, Silberstein, Frensch, & Rodin, 1988). Some suggest that the discrepancy in prevalence rates across studies may be due to the fact that bulimics are generally secretive about their disorders and will not readily disclose their condition. Thus, some researchers may have had a more difficult time finding bulimics, depending on where the studies were conducted, etc. Others point out that differences in methodology, such as diagnostic criteria, is what makes it difficult to pinpoint a prevalence rate of bulimia (Striegal-Moore, Silberstein, Frensch, & Rodin, 1988).
Differences in diagnostic criteria reflect the fact that researchers are having a difficult time discovering the variables that may correctly identify those who suffer from eating disorders and those who may be at high risk for developing such a disorder. This is especially due to the fact that eating disorders appear to lie on a continuum of "normal" dieting (Striegel-Moore, Silberstein, Frensch, & Rodin, 1989; Washychyn, 1990), making it difficult to determine when restricting one’s diet becomes a clinical problem.

Thus far, bulimics are characterized by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IIIR) (APA, 1987) as having periods of inconspicuous binge eating, where they rapidly eat large amounts of high caloric foods and have self-deprecating thoughts afterwards. If termination of the binge eating does not occur due to pain, sleep, or social interruption, bulimics may induce vomiting. Bulimics often display patterns of alternate binges and fasts as they repeatedly attempt to lose weight. Some may abuse cathartics as a means of controlling their
weight. In general, with the above symptoms, bulimics also greatly fear that they may lose control of their eating.

Anorexia nervosa, on the other hand, is characterized by adherence to a diet severely limited in variety and content. Many anorexics have a weight loss of at least 15% of their original weight, refusing to maintain even the minimal weight for their age and height. Along with a great disturbance in their body image and overall inability to accurately rate their body size, they greatly fear becoming fat. Therefore, although many anorexics may be intensely preoccupied with food (taking great pains to make a lavish meal), they refuse to eat.

An interesting and crucial difference between anorexics and bulimics is that anorexics seem to be more homogenous as a group than bulimics. For example, while the DSM-IIIR lists "hypothermia, bradycardia, hypotension, edema, lanugo (neonatal-like hair), and amenorrhea" (after weight loss) (p. 65) as common biological markers of anorexia, the DSM-IIIR does not list any such markers for bulimics, simply because
bulimics seem to be a very heterogenous group in many aspects. While many anorexics may weigh less than 85% of the standard weight for their height, for example, a few bulimics are thin, some are of normal weight, and some appear to be overweight.

Furthermore, because bulimics seem to be such a heterogenous group whose symptoms seem also to be present in other disorders, some researchers suggest that bulimia may not be a distinct diagnostic entity at all (Johnson, Stuckey, Lewis, & Harper, 1989). In fact, some researchers go as far as to suggest that bulimia may actually just be a variant of affective disorders (Byrne, Nino-Murcia, Gaddy, Doghramji, & Deenan, 1990; Hawkins, McDermott, Seeley, Hawkins, 1992). In support of this notion, a few studies have shown that many bulimics, as high as 50% in one study, concurrently have major depression (Levy, Dixon, Schmidt, 1987; Weilburg, Stakes, Brotman, & Herzog, 1984). Many of these bulimics, furthermore, were shown to have families with a history of depression, further indicating that there may be a relationship between bulimia and depression (Weilburg, Stakes, Brotman, &
Herzog, 1984). There is even evidence that anorexics and bulimics score higher on a depression scale than a normal population, though perhaps lower than patients diagnosed as clinically depressed (Hawkins, McDermott, Seeley, & Hawkins, 1992). Lastly, Byrne et al. (1990) cite research that provides evidence that some bulimics may be successfully treated with antidepressants, suggesting that the nature of the relationship between bulimia and depression may be biological.

A few studies go so far as to point out that some bulimics exhibit characteristics that are considered reliable biological markers of depression. Reports of possible biological markers for depression include a decreased in Rapid Eye Movement (REM) latency, or the time between the initiation of sleep to the first REM period, (Cowen, 1991; Jones, Kelwala, Bell, Dube, Jackson, & Sitaram, 1985; Katz, Kuperberg, Pollack, Walsh, Zumoff, & Weiner, 1984; Lahmeyer, Poznanski, & Bellur, 1983; Lauer, Krieg, Riemann, Majar-Trendel, Krieg, & Berger, 1987; Levy, Dixon, & Schmidt, 1987; Weilburg, Stakes, Brotman, & Herzog, 1984) and an increase in REM density, or the number of actual eye
rem density


Specific studies have found that bulimics display an abnormally decreased REM latency (Katz, et al., 1984; Waller, et al., 1989) and also exhibit an increase in REM density, especially as compared with a normal population, and even at times, when compared with depressed patients (Hudson, et al., 1987; Katz, et al., 1984; Waller, et al., 1989). The increase in REM density is generally found to occur predominantly in the first REM period (Hefez, Metz, & Lavie, 1987; Hudson, et al., 1987; Jones, et al., 1985; Lahmeyer, et al., 1982; Levy, et al., 1986).

However, there are an equal number of studies that show that bulimics do not exhibit an abnormally decreased REM latency and/or an abnormally increased
REM density (Byrne, et al., 1990; Dippel, et al., 1987; Lauer, et al., 1990; Levy, et al., 1988; Levy, et al., 1987; Waller, et al., 1989; Weilburg, et al., 1985). In Byrne’s study (1990), the bulimics actually displayed an even lower REM density as compared with normal controls. Analysis of the different methodologies employed across studies did not yield any consistent patterns that may help to explain the conflicting results.

Other research specifically refutes the notion that bulimia may possibly be a variant of affective disorder. For example, Lauer’s study (1990) found that bulimics displayed a decrease in REM latency regardless of whether or not they were also diagnosed as having minor or major depressive symptoms. Reiter (1990) supports the idea that bulimia is not a variant of affective disorder. Sleep deprivation, for example, has been found to be a successful short-term treatment for depression. He hypothesized that depriving bulimics of sleep would not only lessen their depression, but, if bulimia was a result of depression, the bulimic symptoms as well. Reiter (1990), however,
found no such effect. Thus, these studies suggest that bulimia and depression may be two distinct entities since they seem to vary independently. In addition, dream content studies show that bulimics and depressed patients differ in the content of their dreams as well as the tone and intensity (Dippel, et al., 1987).

Secondly, there is much research to suggest that the increase in REM density may not be a unique reflection of depression. Though a few studies have found a positive correlation between a depression scale and the density of the first REM period (Levy, et al., 1989; Levy, et al., 1987) and a correlation between the severity of depression and the density of the REM period (Lahmeyer, et al., 1990), REM density did not differentiate between bulimics, a group of depressed patients, and normal controls in some studies. Hudson et al. (1987) showed that, although bulimics exhibited an increase in REM density, "approaching significance" (compared with a normal control group), REM density did not differ within the group, although some were diagnosed as having a major depressive disorder while others were not. If an increased REM density is truly
a unique marker of depression, it should have been apparent in this study.

Another discrepancy is that amitriptyline decreases REM density but does not affect depression (Lahmeyer, et al., 1983). Yet another problem is that although a decrease in REM latency and an increase in REM density are commonly found in depressed patients, these characteristics are not found in all depressed patients (Byrne, et al., 1990; Dippel, et al., 1987; Lauer, et al., 1990). In addition, these same characteristics may also be found in obsessive-compulsive and panic disorder patients, though perhaps not as reliably as in depressed patients (Mendelwicz & Kerkofs, 1991). All of the above studies cast doubt on the "specificity of the EEG sleep patterns allegedly characteristic of major depression" (p. 236) (Lauer, et al., 1990). That is, the above studies suggest that increased REM density may not be something necessarily unique to a depressed or bulimic individual--making the possible biological link between bulimics and depressed patients only an artifact of a third variable.

What might this third variable be? There is
evidence that REM density may reflect some type of information processing, particularly of information that is stressful and emotionally-loaded. For example, ever since the discovery that the REM period of sleep seems to be a very active brain state, there has been considerable interest in the possibility of information processing during sleep (Dujardin, Guerrin, & Leconte, 1989). Research has shown that learning is increased when followed by REM sleep, while REM sleep deprivation seems to result in deficits in the task just learned (Smith & Lapp, 1991). There are at least two studies (Dujardin, et al., 1989; Smith & Lapp, 1991) that have shown an increase (or trend towards an increase) in REM density throughout successive REM periods following intensive learning (exam week) in college students. There is at least one study that has contradicting results, however (Koulack, Prevost, & DeKoninck, 1985). Moreover, the type of task learned also seems to affect which REM period manifests an increase in density (Smith & Lapp, 1991).

In addition, there is research to lend support to the idea that REM periods have some type of
relationship to mood variance and/or processing information that is emotionally-loaded (Hetta, Rimon, & Almqvist, 1985; Jones, et al., 1985; Lahmeyer, et al., 1983). For example, Koulack, et al. (1985) found that subjects who were left to sleep uninterrupted after a stressful exam, exhibited a more positive affect upon waking up (compared with their affect before going to sleep). However, subjects who were interrupted during REM and asked to report their dreams did not exhibit any positive change in affect upon waking up. Koulack, et al. (1985) speculated that the REM period may offer different ways of processing complex information, whereas consciousness offers only one way. Thus, individuals are more efficient and/or better adept in processing information during REM periods. Gabel's study (1987) also supports the notion that REM may have some type of relationship with mood. He found that the right hemisphere is especially active during the REM period. The right hemisphere is thought to be involved with perception and is rich in sensory modalities (thus, a plausible area for emotional processes). Interestingly enough, there also appears to be less
activity in the corpus callosum during REM sleep, indicating an isolation of the hemispheres (Gabel, 1987)—making REM almost an exclusively right hemispheric process. When activities suited for the right hemisphere were done after REM sleep, subjects performed much more successfully on those tasks than if they had been done while the subjects were continuously awake (Gabel, 1987).

In trying to understand the nature of the relationship between mood and REM sleep, Kupfer and Heninger (1972) suggest that REM density may reflect mood state or impending switch in mood. They observed that when a bipolar patient of theirs exhibited an increase in REM density, the person concurrently showed signs of switching from a depressed state to a manic state. Another study suggests that REM density is actually a reflection of the processing of extreme emotionally stressful situations. Hefez, et al. (1987), found that people who suffered through traumatic situations, i.e. Nazi concentration camp or combat, exhibited high REM density during the first REM period.
Analysis of dream content in Dippel et al.'s study (1987) showed that bulimics not only dreamt of food 58% of the time (as compared with anorexics who dreamt of food only 26% of the time; no exact percentage was given for the control group, though it was indicated that the control grouped dreamt of food less), but the dream content of bulimics displayed a very negative tone. Often, the negative tone was attributed to the frequent dreams of hostile interactions between others and themselves. Thus, the relationship between REM density and mood seem to be complex.

Interestingly enough, stress and particularly emotional stress, seems to be characteristic of bulimics. For example, many studies show evidence that bulimics manifest an abnormally high level of corticosterone, a sign of physiological stress (Russell, Hooper, Storlien, & Smythe, 1989; Russell, Storlien, & Beaumont, 1987). Furthermore, bulimics manifest signs of perceiving more psychological stress than the normal population (Striegal-Moore, Silberstein, Frensch, & Rodin, 1988). The inability to use successful coping skills, characteristic of many
bulimics, further compounds the stress perceived (Cattanach & Rodin, 1988). As it turns out, bulimics seem to be more emotion-focused in dealing with problems, rather than focusing on problem-solving, which seems to be more effective in resolving conflicts (Cattanach & Rodin, 1988).

Stress and negative affect appear to precede many binges (Crowther & Chernyk, 1986; Lingswiler, Crowther, & Stephens, 1989; McCormack & Carman, 1989). Negative affect also seems to be involved in maintaining the bulimic cycle (Cattanach & Rodin, 1988). For example, "hunger" may be learned with other stimuli besides a lack of food. Negative affect or stress may be stimuli of hunger as it has been found that eating does seem to lower the level of corticosterone in some bulimics, for example, presumably reducing stress temporarily (Russell, et al., 1989; Russell, et al., 1987). As bulimics come in contact with negative affective situations—and bulimics seem to perceive more stress compared with the normal population as stated earlier—this "hunger" may provoke bingeing (McCormack & Carman, 1989). Thus, the relationship between mood and bulimia
also seems to be complex.

This paper proposes that an increase in REM density, suggested to be a possible biological marker of depression and possibly the link that connects depression with bulimia, is just an artifact of some third variable; a variable not unique to depression and/or bulimia. Based on the review of literature available, it is proposed that the third variable may be the processing of information that is stressful and/or emotionally-loaded. Therefore, it is predicted that there will be large positive correlations between scores on a measure of bulimia and REM density or depression and REM density, only if the measure of perceived stress is high. In other words, if stress levels are controlled, there should be little or no correlations of bulimia and REM density or depression and REM density.

Method

Subjects. In this study, fourteen volunteer college women who needed to participate in research in order to receive credit in an introductory psychology course, were asked to participate in sleep recordings.
Only women were included in this study, since it is well known that the incidence of bulimia is predominantly among women.

The data of three women were thrown out due to complications during sleep recordings, leaving an N of eleven. The mean age of participants was 18.82 years ± 1 year with a range from 18 years to 20 years. The mean current weight of participants was 62.65 kg ± 9.08 kg with a range from 46.76 kg to 81.72 kg. The mean height in the sample was 1.69 m ± .09 m with a range of 1.52 m to 1.83 m. Highest past adult weight mean was 66.28 kg ± 10.44 kg with a range from 50.84 kg to 90.80 kg. Lowest past adult weight mean was 57.66 kg ± 8.17 kg with a range from 44.49 kg to 77.18 kg. Five women were caucasian, two were black, two were asian, and two denoted "other." Two subjects did not denote family income level; one subject was of the lowest income level (0-28,000), five were of the middle income level (28,000-56,000), and three were of the highest income level (56,000 or above). Three denoted that they were experiencing an acutely stressful event within the past
Materials. Sleep recordings were done in two laboratory rooms at a university. One room was set up with a bed, phone, videocamera, and small lamp with a 15 watt bulb. The videocamera was set up at a corner of the room, focused on the participant’s face. The small lamp was adjacent to the participant’s bed, focused on the participant’s face. Wires for the videocamera and lamp ran from this room, through a hole near the floor, into the adjacent room. The adjacent room was set up with a monitor, control panel for the videocamera, switch for the small lamp, and also a polygraph instrument.

Sleep polysomnograms were obtained using a four channel Model 7 Grass polygraph instrument. Two EOG electrodes were used (Smith & Lapp, 1991). Though one EEG (C3/A2) and one EMG (neck muscle) (Smith & Lapp, 1991) were also attempted to be utilized, due to equipment failure, these measures were not able to be analyzed.

The scales used were assembled into a stapled booklet. The booklet asked for demographic information
regarding age, weight and height, income of family of origin, presence of acute emotional event(s), and included the Perceived Stress Scale (Cohen, 1983) assessing level of perceived stress, the Bulimia Test (Smith & Thelen, 1984) assessing possible abnormal eating patterns, and the Self-Rating Depression Scale (Zung, 1965). In addition, subjects were also asked to fill out a short questionnaire asking about their dreams in order to try and replicate the findings of Dippel, et al. (1987). The booklet is reproduced as Appendix E.

Scales. The Perceived Stress Scale (PSS) (Cohen, 1983) is a 14-item self-report scale designed to assess global perceived stress. Reliability coefficients for college samples ranged from .84 to .86 (Cohen, 1983). Correlations of the PSS with Life Events scores (Holmes and Rahes, 1967) ranged from .24 to .49 (p < .01) for a sample of smoking college students (Cohen, 1983).

The Bulimia Test (BULIT) (Smith & Thelen, 1984) is a 32-item, self-report scale, designed to assess degree of bulimic symptomology. Using a college population, a reliability score of .87 (p < .0001) was obtained. The
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BULIT total score correlates with membership either in the bulimia group or control group of a college population at .82 (p < .0001) (Smith & Thelen, 1984).

The Self-Rating Depression Scale (SRDS) (Zung, 1964) is a 20-item, self-report scale, designed to assess degree of depressive symptomology. Though reliability scores do not seem available, the SRDS was significantly correlated with global ratings of depression by psychiatrists (r = .65) and with the depression scale of the MMPI (r = .59 to .75) (Goldstein, 1972).

**Design and procedure.** Subjects were contacted by telephone (see Appendix A). Upon agreeing to participate in this study, a time (the usual time the participant went to bed) and a date were set up for one sleep recording session. Although it would have been ideal for sleep recordings to have been taken on several consecutive nights in order to control for a possible "night effect," limited resources restricted this option. Furthermore, though most past studies used several sleep recordings on several nights, at least two studies indicate that there was no
significant night effect from the first night of recording to subsequent nights of recording (Koulack, Prevost, & Koninck, 1985; Levy, Dixon, & Schmidt, 1987).

Participants were asked to abstain from alcohol at least 24 hours before the sleep recording night, and preferably for a week before the sleep recording night, since it is well known that alcohol may change sleep patterns. Participants were also asked to abstain from any drug intake for at least two weeks, unless on prescription, in which case it was noted.

Participants were offered transportation to and from the lab in order to insure safety as well as convenience. Upon arriving for sleep recording, the participant was asked to sign a consent form (see Appendix B) and fill out the questionnaire (see Appendix C). After the questionnaire was completed, the electrodes were placed on the participant. Thereafter, the lights were turned off, the sleep room locked, and the recording was begun.

Forty-five minutes after the recording began, the videocamera, monitor, and small lamp were turned on so
that the researcher could watch the participants' eyes in order to serve as an extra "check" for the REM period.

Five minutes after the first REM period, the subject was awakened in order to fill out a short questionnaire containing questions about dream content. Upon completion, the subject was informed that the results of the study were to be available during mid-May (see Appendix D). Thereafter, the subject was allowed to ask any questions she might have had and then was taken home.

Results

After all data were gathered, all rating scales were scored. Three subjects' data were "thrown out" due to the subjects' turning to one side and/or pulling the covers over the face, making it impossible for the researcher to check EOG measures with the videocamera views of the subjects' faces. REM density was calculated by dividing the total number of eye movements by the total number of minutes of the REM sleep period (Smith & Lapp, 1991). A deflection of at least 30 mV was required in order to be considered an
eye movement; this is comparable to Smith and Lapp's (1991) criteria of at least 25 mV.

The means, standard deviations, and ranges of age, PSS score, BULIT score, SRDS score, REM density, and number of minutes in REM (REM time) are summarized in Table 1.

Insert Table 1 about here

**Dream Assessment.** Dreams could not be assessed because no participants could remember their dreams upon being woken up. Though several participants remembered dreaming, they could not remember the specifics of their dreams.

**Bulimia.** Correlational analyses of bulimia with REM density, perceived stress, and depression found no significant relationships with any of these factors. Power was calculated ($N = 11$) and found to be extremely low ($p < .05 = .95$, Power < .17). The following reported correlations are of non-significant: bulimia with REM density ($r(10) = .33$, $p = .315$), with perceived stress ($r(10) = -.36$, $p = .28$), and with depression
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(\(r(10) = .24, p = .47\)). These non-significant correlations suggest that, had there been a larger sample size, one might have found a relationship between bulimia and the above mentioned factors.

A partial correlation technique was employed to control for the effects of perceived stress. When stress was partialled out, bulimia was correlated slightly less with REM density (\(r(8) = .23, p = .52\)), and slightly more with depression (\(r(8) = .62, p = .06\)). Fisher's statistic shows that neither of these changes in correlation after partialing out stress are significant (\(z = - .21, p = .42\) and \(z = .97, p = .17\), respectively). Using income as the controlled variable, bulimia had a stronger correlation with perceived stress (\(r(6) = -.47, p = .24\)) and no correlation with depression (\(r(6) = .07, p = .87\)). Again, however, Fisher's statistic shows that neither change in correlation is significant (\(z = .17, p = .43\) and \(z = .42, p = .34\), respectively). When income, depression, and stress were all three partialled out, bulimia had a stronger correlation with REM density but the correlation was negative (\(r(4) = -.42, p = .40\)).
Fisher's statistic shows that the difference is not significant ($z=.71$, $p=.24$) (see Table 2).

A multiple regression with bulimia, depression, perceived stress, and income showed that bulimia did not really load onto REM density (Beta = -.39, $p=.40$). However, this should be viewed with caution, as bulimia is correlated with stress and depression. Multiple R was .81 and the adjusted R square was .32 with a standard error of 1.46 (see Table 5).

Depression. Depression significantly correlated with perceived stress ($r(10)=.60$, $p=.049$). In addition, depression was slightly, though non-significantly, correlated with level of income ($r(10)=.23$, $p=.55$) and bulimia ($r(10)=.24$, $p=.47$), and not at all with REM density ($r(10)= -.02$, $p=.96$).

When level of income is partialed out, depression
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was not correlated with bulimia ($r(6) = .07, p=.87$) as mentioned above, but is correlated (non-significantly) even more strongly with perceived stress ($r(6) = .69, p=.06$). Fisher's statistic, however, shows that this change in correlation is not significant ($z= -.22, p=.41$). In addition, when income, bulimia, and stress were partialed out, depression was correlated, though non-significantly, with REM density ($r(4) = .66, p=.15$). Again, Fisher's statistic shows that this change is non-significant ($z= -.60, p=.27$). Finally, it seems that when stress is partialed out, depression is slightly positively correlated (non-significantly) with REM density ($r(8) = .26, p=.48$). Fisher's statistic shows that this change, too, is non-significant ($z= -.42, p=.34$) (see Table 3).

Insert Table 3 about here
REM Density

The multiple regression shows that depression has the second highest Beta weight (Beta=.94, p=.15) (see Table 5).

Insert Table 5 about here

Perceived Stress. Again, as mentioned above, perceived stress was negatively correlated (non-significantly) with bulimia (r(10) = -.36, p=.28) and REM density (r(10) = -.38, p=.25), though significantly correlated with depression (r(10) = .60, p=.049).

When income was partialled out, perceived stress was non-significantly, but positively, correlated with REM density (r(6) = .59, p=.124), slightly more (though still non-significantly) negatively correlated with bulimia (r(6) = -.47, p=.24) as mentioned above, and slightly more but now not quite significantly correlated with depression (r(6) = .69, p=.057). However, Fisher's statistic shows that none of these differences are statistically significant (z= 1.43, p=.08; z=.17, p=.43; and z= -.22, p=.41, respectively). In addition, when income, depression, and bulimia were
partialed out, perceived stress had a stronger (though non-significant because of loss of degrees of freedom) negative correlation with REM density ($r(4) = -.77$, $p=.075$). Fisher's statistic, however, shows that this difference is not statistically significant ($z= .42$, $p=.34$) (see Table 4).

The multiple regression shows that perceived stress is the highest loading factor onto REM density with a Beta weight of $-1.38$ ($p=.07$) (see Table 5).

Discussion

It was predicted earlier in this study that bulimia and depression do not account significantly for the variance of REM density, above and beyond that accounted for by perceived stress. However, though the results are a bit unclear, what is clear is that perceived stress does not covary as expected with REM
density. In fact, the largest, significant, correlation found was with perceived stress and depression.

It is important to first note that the power calculation yielded a very, very small power. Thus, it is very possible and likely that the non-significance of many of the correlations found are mainly due to the small number of subjects, which is contributing to the low power of this study.

The mean PSS score in this study of 25.45 ± 6.19 is similar to the means found in Cohen's study (1983). Cohen found means of 23.57 ± 7.55 and 25.71 ± 6.20 for two female college samples. The mean BULIT score of 78.82 ± 8.72, though slightly high, is also comparable to the mean of 60.3 (no standard deviations were given) in Smith and Thelen's study (1984), which employed a college population. The mean BULIT score of a bulimic population was found to be 124.00 (Smith & Thelen, 1984). The mean SRDS score of .42 ± .07, furthermore, is also within the range of scores found in a normal sample in Zung's study (1964). Zung found a range of scores from .25 to .43 (no standard deviations were
The mean SRDS score found in a population of depressed patients was .74, while in a population of patients with other psychiatric disorders was .53 (no standard deviations were given) (Zung, 1964). The mean REM density (X = 1.33 ± 1.64) is significantly different from the mean REM density of 3.5 ± 1 (N = 11) found in Smith and Lapp's study (1991) (t' (3)=3.78, p<.05). However, the mean number of minutes of the first REM period in this study (X = 10.36 ± 7.38) is comparable to the mean duration found in Levy, et al.'s 1988 study (X = 9 ± 5.1). Differences in variances of REM density may be due to differences in the number of eye movements obtained. Thus, the discrepancy found between the results of this study and other studies may be due to the discrepancy in obtained REM densities.

It is not very surprising to find that bulimia positively (though non-significantly) correlates with REM density, that is, as bulimic symptoms increase, REM density also increases. This supports the literature review mentioned in the introduction, which suggests, therefore, that an increase in REM density may be a biological marker of bulimia. However, what is
surprising is that bulimia negatively correlates with perceived stress. Thus, data seems to show that as bulimic symptoms increase, level of perceived stress decreases. This is the opposite of what would have been expected from the literature review (Cattanach & Rodin, 1988; Crowther & Chernyk, 1986; Lingswiler, et al., 1989; McCormack & Carman, 1989; Striegel-Moore, et al., 1988) which suggests that bulimics may be under more stress than the normal population, at least in part, just due to differences in perception.

One may suggest that this negative relationship between bulimia and perceived stress may be because bulimic activity relieves stress. However, upon further analyzing the questions in the Perceived Stress Scale (Cohen, 1983), it is found that the questions pertain to a fairly long time frame (e.g., month). Though a bulimic may feel relieved of stress directly after a bingeing and/or purging episode, it is unlikely that the feeling of relief extends over a long period of time. In fact, by the very definition of bulimia (APA, 1987), bulimics are particularly afraid of losing control over their eating, which presumably may be
stressful. Thus, the negative relationship between bulimia and perceived stress is puzzling.

It is not surprising, however, that bulimia positively (though non-significantly) correlates with depression. Data seems to show that as bulimic symptoms increase, depressive symptoms also increase. There is much research showing that bulimia and depression are very similar in many aspects, leading some to suggest that bulimia may not be a distinct diagnostic entity (Byrne, et al., 1990; Hawkins, et al., 1992, Johnson, et al., 1989; Levy, et al., 1987; Weilburg, et al., 1984). Thus, the literature suggests, that at the very least, bulimia and depression are expected to covary in the same direction. In this study, we see further support for this idea.

When perceived stress is partialed out, it seems that bulimia is slightly less correlated with REM density, suggesting that perceived stress may somehow contribute to the relationship between bulimia and REM density. However, perceived stress may not be the main contributor of the relationship between bulimia and REM
density, as was hypothesized earlier in this study. In addition, when perceived stress is partialed out, bulimia more strongly correlates (though still non-significantly) with depression. This seems to suggest that some factor of perceived stress may be cancelling out, or in the very least, masking, a part of the relationship between bulimia and depression. What factor or factors may be involved is unknown. Confusingly enough, it seems that when income is partialed out, bulimia correlates more strongly (though still non-significantly) with perceived stress. The relationship, however, is still negative. Some factors of income level, then, may mask or cancel out a part of the relationship between bulimia and perceived stress. When income level is partialed out, however, bulimia is no longer even slightly correlated with depression. The data seem to suggest that income has some factors which contribute or establish the relationship between bulimia and depression; unfortunately, these factors are also unknown. To add to the confusion, it is also found that when depression, perceived stress, and income level are partialed out, bulimia has a stronger
correlation with REM density, but the relationship is a negative one. Thus, the relationship between bulimia and REM density may not only be mediated in part by factor(s) of perceived stress, but also factors which are shared with depression and income level. However, it should be noted that Fisher’s statistic shows that partialing out factors mentioned above does not produce statistically significant changes, if any changes are exhibited at all. Thus, the changes due to partialing out factors may be occurring, but, in this study, the data does not prove that those changes are actually occurring.

The multiple regression, furthermore, suggests that bulimia is not a major contributor to the variances in REM density. However, this should be viewed with caution due to the fact that bulimia is correlated with perceived stress and depression. That is, SPSS arbitrarily decides which factor, for example, bulimia or perceived stress, is to be given credit for the variance that they share (Howell, 1992). That is, both may contribute to the variance in REM density. However, bulimia and perceived stress are (though non-
significantly) somewhat correlated, thus, part of the contribution of variance to REM density is probably shared. Instead of giving credit of the shared variance to both, SPSS randomly gives the credit to one of the two variables.

The fact that depression is significantly correlated with perceived stress is not surprising. After all, it seems to make common sense to expect that an increase in depressive symptoms may covary with an increase in perceived stress. However, it seems to be a bit puzzling that depression is slightly correlated with income level. That is, the data seem to suggest that an increase in depressive symptoms is also correlated with an increase in income level. Lastly, the finding that depressive symptoms are not correlated with REM density is also confusing, as this is not what the literature review suggests. In fact, there is much literature suggesting that depression and REM density should be positively correlated (Dippel, et al., 1987; Hudson, et al., 1987; Jones, et al., 1985; Lahmeyer, et al., 1983; Lauer, et al., 1990; Levy, et al., 1988; Levy, et al., 1987; Mendelwicz & Kerkhofs, 1991;
Waller, et al., 1989). Analysis of the different methodologies used in these different studies show that the main differences between these cited studies and the current investigation are: 1) better equipment; though all used polygraph instruments, some equipments were more advanced than others, 2) experienced polysomnogram raters, 3) several consecutive nights of measurement, and 4) the employment of clinical populations such as bulimics and depressed patients. All of these factors may have contributed to the discrepancy found between the cited studies and this investigation in terms of the correlations of bulimia with REM density and depression with REM density.

Interestingly enough, when level of income, bulimia, and perceived stress are partialed out, depression is positively (though still non-significantly) correlated with REM density. This is in agreement with the literature. What this suggests is that, again, income may have factors which mask or cancel out the relationship between depression and REM density. Again, these income factors seem to be factors other than what was investigated in this study.
When level of income is partialed out, the significant positive correlation between depression and perceived stress is also slightly increased, though the significance level changes because of losses in the degrees of freedom. Again, this suggests that some factors of income are masking or canceling a part of the relationship between depression and perceived stress. When perceived stress is partialed out, a positive relationship between depression and REM density may also be seen. That is, with an increase in depressive symptoms, there also seems to be an increase in REM density, which is as the literature review suggests. This relationship, however, is not as strong without partialing out level of income also. Still, this suggests, then, that some factor(s) of perceived stress mask and/or cancel the relationship between depression and REM density. Again, however, one must keep in mind that Fisher’s statistic shows that differences due to partialing out factors are not significant.

The multiple regression shows that depression has the second highest Beta weight, loading onto REM
density. This, again, seems to support what the current literature suggests, but again, these results should be viewed with caution as depression is correlated with perceived stress, bulimia, and income level.

Completely in opposition of what was hypothesized, perceived stress is negatively correlated (non-significantly) with REM density in this study. That is, with an increase in perceived stress, REM density seems to decrease. The literature, however, suggests that with an increase in perceived stress REM density should increase (Kujardkin, et al., 1990; Smith & Lapp, 1991).

However, when income level is partialied out, perceived stress is then positively correlated, though non-significantly, with REM density. This is in agreement with what the literature review suggests. In addition, what this finding also suggests is that, again, income has factors which seem to mask and/or cancel the relationship between perceived stress and REM density. Again, what these factors may be is unknown. Lastly, when income, depression, and bulimia
are partialed out, perceived stress has a stronger, (though still non-significant) but negative correlation with REM density. Thus, it seems that with an increase in perceives stress, there still seems to be a decrease in REM density. Again, this is in opposition to what the literature seems to suggest.

The multiple regression, interestingly enough, however, shows that perceived stress has the highest beta weight loading onto the variance of REM density. This seems to suggest that perceived stress is really the critical factor which may account for more of the variance of REM density (relative to the other mentioned factors). However, this finding should again be viewed with caution as perceived stress is correlated significantly with depression and non-significantly with bulimia.

Thus, the data suggest that, though the multiple regression seems to indicate that perceived stress is the critical factor that accounts most for the variance in REM density, the correlational analyses seem to suggest that bulimia and depression also covary with some part of REM density with which perceived stress
REM Density

40

does not vary. In fact, in the case of depression, perceived stress seems to somehow mask and/or cancel out the positive relationship between depression and REM density. Still, no definite conclusions can be made due to the low power in this study.

Lastly, dreams were not assessed because no participants could remember the specifics of their dreams, though several participants remembered dreaming. Participants might have forgotten their dreams because the researcher allowed five minutes to pass after the cessation of the first REM period before waking participants up. The researcher allowed five minutes to pass in order to insure that the first REM period was fully recorded.

Before further investigation into these somewhat surprising and perplexing findings, however, several changes need to be incorporated into this type of study. Firstly, the most obvious lack in this study is the sample size. In order for this type of study to have adequate power, which is defined as the probability that a true difference in a population will be detected (Howell, 1992), a sample size of at least
40 participants is necessary. However, it should also be noted that many sleep studies do not use a very large sample; Smith and Lapp's sleep study (1991), for example, only used eleven subjects as well.

In addition, though EEG recordings were attempted, adequate EEG recordings were not measured due to difficulty in securing the EEG electrodes in place. Thus, the researcher in this study relied solely upon two EOG measurements and the videocamera view of the subject's face to determine the duration of the first REM period and the number of eye movements in that first REM period. In the future, however, EEG should be measured. Then, other measurements such as REM latency may also be analyzed.

Furthermore, it is probably necessary to have at least one very experienced polysomnogram scorer or at least two fairly trained polysomnogram scorers. Though the researcher in this study could see eye movements clearly with the polygraph instrument (EOG measurements) and using the videocamera to guard against movement artifacts, extra checks on measurement of dependent variables seemed necessary. Extra checks
may include EEG measures, which may indicate which stage of sleep a subject is in, and also EMG measures, which may be used to detect the onset and duration of a REM period, since during REM, a person experiences atonia.

In addition, room temperature needs to be adequately controlled. The laboratory room used in this study did not have a local temperature regulator. Unfortunately, temperatures were a bit in the extreme at times (i.e., very warm), making sleeping conditions a bit uncomfortable for some participants. This not only might have lengthened sleep latency, but might have also affected other non-obvious factors as well.

Finally, though there is research to suggest that a first night effect does not always occur (Koulack, et al., 1985; Levy, et al., 1987), several adaptation nights seem advisable. The researcher in this study asked each subject whether or not they felt they had taken "a little longer" to fall asleep, the majority of participants replied that it did. Not only sleep latency, but, again, other non-obvious factors may have also been affected.
References


REM Density

44


REM Density

45


REM Density

47


REM Density

48


### Table 1

**Means of Age, PSS, BULIT, SRDS, REM Density, and Time of REM**

*(N = 11)*

<table>
<thead>
<tr>
<th>Factor</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Range</th>
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<tr>
<td>Age</td>
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<td>1</td>
<td>18 to 20</td>
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<tr>
<td>PSS score</td>
<td>25.45</td>
<td>6.19</td>
<td>16.00 to 36.00</td>
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<td>78.82</td>
<td>8.27</td>
<td>67.00 to 99.00</td>
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<td>SRDS score</td>
<td>.42</td>
<td>.07</td>
<td>.31 to .51</td>
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<tr>
<td>REM Density</td>
<td>1.33</td>
<td>1.64</td>
<td>.08 to 5.25</td>
</tr>
<tr>
<td>REM Time</td>
<td>10.36</td>
<td>7.38</td>
<td>3 to 24</td>
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Table 2

**Bulimia: Correlations and Partial Correlations**

<table>
<thead>
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<th>Out...</th>
<th>$r$, p-value, df</th>
<th>Fisher $z$, p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>REM Density</td>
<td>-</td>
<td>.33, .32, 10</td>
<td>-</td>
</tr>
<tr>
<td>REM Density</td>
<td>PSS</td>
<td>.23, .52, 8</td>
<td>$z = .42$, p = .17</td>
</tr>
<tr>
<td>REM Density</td>
<td>Income, SRDS, &amp; PSS</td>
<td>-.42, .40, 4</td>
<td>$z = .71$, p = .24</td>
</tr>
<tr>
<td>PSS</td>
<td>-</td>
<td>-.36, .28, 10</td>
<td>-</td>
</tr>
<tr>
<td>PSS</td>
<td>Income</td>
<td>-.47, .24, 6</td>
<td>$z = .17$, p = .43</td>
</tr>
<tr>
<td>SRDS</td>
<td>-</td>
<td>.24, .47, 10</td>
<td>-</td>
</tr>
<tr>
<td>SRDS</td>
<td>Income</td>
<td>.07, .87, 6</td>
<td>$z = .42$, p = .34</td>
</tr>
<tr>
<td>SRDS</td>
<td>PSS</td>
<td>.62, .06, 8</td>
<td>$z = -.21$, p = .97</td>
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### Table 3

Depression: Correlations and Partial Correlations

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<th>Fisher</th>
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<tr>
<td>PSS</td>
<td>-</td>
<td>.60*, .05, 10</td>
<td>-</td>
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<tr>
<td>PSS</td>
<td>Income</td>
<td>.69, .06, 6</td>
<td>$z=-.22$, $p=.41$</td>
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<tr>
<td>REM Density</td>
<td>-</td>
<td>-.02, .96, 10</td>
<td>-</td>
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<td>PSS</td>
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<td>.66, .15, 4</td>
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<tr>
<td>BULIT</td>
<td>-</td>
<td>.24, .47, 10</td>
<td>-</td>
</tr>
<tr>
<td>BULIT</td>
<td>Income</td>
<td>.07, .87, 6</td>
<td>$z=.42$, $p=.34$</td>
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<tr>
<td>Income</td>
<td>-</td>
<td>.23, .55, 10</td>
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Table 4

Perceived Stress: Correlations and Partial Correlations

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<th>Fisher</th>
</tr>
</thead>
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<tr>
<td>BULIT</td>
<td>-</td>
<td>-.36, .28, 10</td>
<td>-</td>
</tr>
<tr>
<td>BULIT Income</td>
<td>-.47, 24, 6</td>
<td>z=.17, p=.43</td>
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<tr>
<td>REM Density</td>
<td>-</td>
<td>-.38, .25, 10</td>
<td>-</td>
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<tr>
<td>REM Density Income</td>
<td>.59, .12, 6</td>
<td>z=-.24, p=.41</td>
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<tr>
<td>REM Density Income, SRDS, &amp; BULIT</td>
<td>-.77, .08, 4</td>
<td>z=.37, p=.36</td>
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<tr>
<td>SRDS</td>
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<td>.60*, .05, 10</td>
<td>-</td>
</tr>
<tr>
<td>SRDS Income</td>
<td>.69, .06, 6</td>
<td>z=-.22, p=.41</td>
<td></td>
</tr>
</tbody>
</table>
### Table 5

**Multiple Regression Results for Income, Perceived Stress, Bulimia, and Depression**

| Multiple R | .81323 |
| R Square   | .66134 |
| Adjusted R Square | .32268 |
| Standard Error | 1.46263 |

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>DF</th>
<th>F Ratio</th>
<th>F Prob</th>
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<tr>
<td>Regression</td>
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<td>1.95283</td>
<td>.2664</td>
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<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
<th>T Value</th>
<th>T Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSS</td>
<td>-1.382788</td>
<td>-2.395</td>
<td>.0748</td>
</tr>
<tr>
<td>BULIT</td>
<td>- .390043</td>
<td>- .934</td>
<td>.4033</td>
</tr>
<tr>
<td>SRDS</td>
<td>.942050</td>
<td>1.777</td>
<td>.1502</td>
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<tr>
<td>INCOME</td>
<td>- .071240</td>
<td>- .214</td>
<td>.8408</td>
</tr>
</tbody>
</table>
Appendix A

Model of Telephone Conversation
in Seeking Subjects

Hello, my name is Jeannie Koo and I am a Master's student in Psychology. I see that you have signed up to participate in my sleep study. I'd like to give you some more information about my study to see if you would still be interested in participating. This study investigates sleep parameters among the college population. The sleep recording will not last the whole night, but only about 1 1/2 hours from the time you fall asleep. There will also be a short questionnaire for you to fill out; it should only take about ten minutes. Furthermore, if you like, I can pick you up and take you to the lab and back home after the study. I ask only that you bring your own pillow and blanket. In the end, you will receive two credits to fulfill for your introductory psychology course in one night.

Of course, results will be confidential and you may stop participation at any time.
REM Density

Do you have any questions about the study? Would you like to participate?
Appendix B

Sample of Consent Form

COLLEGE OF WILLIAM AND MARY

PSYCHOLOGY DEPARTMENT CONSENT FORM

The general nature of this study of sleep conducted by Jeannie Koo has been explained to me. I understand that I will be asked to fill out a questionnaire and sleep for 1 1/2 hours to 2 hours. I further understand that my anonymity will be preserved and that my name will not be associated with my responses or with any of the results of this study. I know that I may refuse to answer any question asked and that I may discontinue participation at any time. I also understand that any grade, payment, or credit for participation will not be affected by my responses or by my exercising any of my rights. I am also aware that I may report dissatisfactions with any aspect of this experiment to the Psychology Department Chair. I am aware that I must be at least 18 years of age to participate. My signature below signifies my voluntary participation in this experiment.

_____ (Date)   ______________________ (Signature)
Appendix C

Script for Experimental Instructions

I'd like to thank you for your participation and cooperation. At this time, I'd like to give you a quick synopsis of what will happen tonight.

First, I'll give you a questionnaire to fill out. Next, you can get ready for bed. Then I'll take about forty-five minutes to an hour to apply some electrodes to areas of your head. The electrodes will be placed with a bit of gel-like substance. Once the electrodes are set, you can just lay down and go to sleep as always. Please try not to worry about the electrodes--pretend like they are not there. After about an hour and half of sleeping, I'll wake you up and ask you to fill out a very brief questionnaire pertaining to dream content. Upon completion of the questionnaire, when you are ready, I will take you home.

Are there any questions I can answer for you at this time?
First of all, I’d like to thank you for your participation and cooperation. Before you leave, I’d like to give you some more details about the study.

Basically, this study investigates whether there are any differences in REM density—the number of eye movements per REM period—between women who may perceive an unusually high amount of stress, women who may display symptoms of bulimia, women who may display symptoms of depression, and women who do not display any of the above symptoms.

Are there any questions or concerns you may have at this time?

If you like, I can give you the results of the first questionnaire at this time. Otherwise, the results of the study may be available to you about mid-May in the Psychology office.

Again, thank-you very much for your participation.
Appendix E

PLEASE NOTE THAT THERE ARE NO RIGHT OR WRONG ANSWERS AND THAT YOUR ANONYMITY WILL BE PRESERVED.

1. ______ Age  2. ______ (lbs) Weight
3. ______ (Ft’In") Height  4. ______ Highest Past Weight.
5. ______ Lowest Adult Weight  6. ______ Race/Ethnicity
7. ______ What do you consider to be your ideal weight?
8. Please circle level of family income:
   0-28,000  28,000-56,000  56,000 or above
9. Is any stress within the past month due to an acute event (i.e. death of a loved one, career decisions, etc.)? YES NO
   If so, please indicate event:
   ________________________________________________________________

The questions on the following scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you
felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don’t try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

For each question choose from the following alternatives:

0. never
1. almost never
2. sometimes
3. fairly often
4. very often

_____1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?

3. In the last month, how often have you felt nervous and "stressed?"

4. In the last month, how often have you dealt successfully with irritating life hassles?

5. In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?

6. In the last month, how often have you felt confident about your ability to handle your personal problems?

7. In the last month, how often have you felt that things were going your way?

8. In the last month, how often have you found that you could not cope with all the things that you had to do?

9. In the last month, how often have you been able to control irritations in your life?
10. In the last month, how often have you felt that you were on top of things?

11. In the last month, how often have you been angered because of things that happened that were outside of your control?

12. In the last month, how often have you found yourself thinking about things that you have to accomplish?

13. In the last month, how often have you been able to control the way you spend your time?

14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?
Answer each question by circling the appropriate letter. Please respond to each item as honestly as possible; remember, all of the information you provide will be kept strictly confidential.

1. Do you ever eat uncontrollably to the point of stuffing yourself (i.e. going on eating binges)?
   (a) once a month or less (or never)
   (b) 2-3 times a month
   (c) once or twice a week
   (d) 3-6 times a week
   (e) once a day or more

2. I am satisfied with my eating patterns.
   (a) agree
   (b) neutral
   (c) disagree a little
   (d) disagree strongly
3. Have you ever kept eating until you thought you’d explode?
   (a) practically every time I eat
   (b) very frequently
   (c) often
   (d) sometimes
   (e) seldom or never

4. Would you presently call yourself a "binge eater?"
   (a) yes, absolutely
   (b) yes
   (c) yes, probably
   (d) yes, possibly
   (e) no, probably not

5. I prefer to eat:
   (a) at home alone
   (b) at home with others
   (c) in a public restaurant
   (d) at a friend’s house
   (e) doesn’t matter
6. Do you feel you have control over amount of food you consume?
   (a) most or all of the time
   (b) a lot of the time
   (c) occasionally
   (d) rarely
   (e) never

7. I use laxatives or suppositories to help control my weight.
   (a) once a day or more
   (b) 3-6 times a week
   (c) once or twice a week
   (d) 2-3 times a month
   (e) once a month or less (or never)

8. I eat until I feel too tired to continue.
   (a) at least once a day
   (b) 3-6 times a week
   (c) once or twice a week
   (d) 2-3 times a month
   (e) once a month or less (or never)
9. How often do you prefer eating ice cream, milk shakes, or puddings during a binge?
   (a) always  
   (b) frequently  
   (c) sometimes  
   (d) seldom or never  
   (e) I don’t binge.

10. How much are you concerned about your eating binges?
    (a) I don’t binge.  
    (b) bothers me a little  
    (c) moderate concern  
    (d) major concern  
    (e) probably the biggest concern in my life

11. Compared to most people, my ability to control my eating behavior seems to be:
    (a) greater than others’ ability  
    (b) about the same  
    (c) less  
    (d) much less  
    (e) I have absolutely no control.
12. One of your best friends suddenly suggests that you both eat at a new restaurant buffet that night. Although you’d planned on eating something light at home, you go ahead and eat out, eating quite a lot and feeling uncomfortably full. How would you feel about yourself on the ride home?
(a) fine, glad that I’d tried a new restaurant
(b) a little regretful that I’d eaten so much
(c) somewhat disappointed in myself
(d) upset with myself
(e) totally disgusted with myself

13. I would presently label myself a “compulsive eater” (one who engages in episodes of uncontrolled eating).
(a) absolutely
(b) yes
(c) yes, probably
(d) yes, possibly
(e) no, probably not
14. What is the most weight you’ve ever lost in 1 month?
   (a) over 20 pounds
   (b) 12-20 pounds
   (c) 8-11 pounds
   (d) 4-7 pounds
   (e) less than 4 pounds

15. If I eat too much at night I feel depressed the next morning.
   (a) always
   (b) frequently
   (c) sometimes
   (d) seldom or never
   (e) I don’t eat too much at night.

16. Do you believe that it is easier for you to vomit than it is for most people?
   (a) Yes, it’s no problem at all for me.
   (b) Yes, it’s easier.
   (c) Yes, it’s a little easier.
   (d) about the same
   (e) No, it’s less easy.
17. I feel that food controls my life.
   (a) always
   (b) almost always
   (c) frequently
   (d) sometimes
   (e) seldom or never

18. I feel depressed immediately after I eat too much.
   (a) always
   (b) frequently
   (c) sometimes
   (d) seldom or never
   (e) I don’t eat too much.

19. How often do you vomit after eating in order to lose weight?
   (a) less than once a month (or never)
   (b) once a month
   (c) 2-3 times a month
   (d) once a week
   (e) 2 or more times a week
20. When consuming a large quantity of food, at what rate of speed do you usually eat?
   (a) more rapidly than most people have ever eaten in their lives
   (b) a lot more rapidly than most people
   (c) a little more rapidly than most people
   (d) about the same rate as most people
   (e) more slowly than most people (or not applicable)

21. Most people I know would be amazed if they knew how much food I can eat at one sitting.
   (a) without a doubt
   (b) very probably
   (c) probably
   (d) possibly
   (e) no

22. Do you ever eat to the point of feeling sick?
   (a) very frequently
   (b) frequently
   (c) fairly often
   (d) occasionally
   (e) rarely or never
23. I am afraid to eat anything for fear that I won’t be able to stop.
   (a) always
   (b) almost always
   (c) frequently
   (d) sometimes
   (e) seldom or never

24. I don’t like myself after I eat too much.
   (a) always
   (b) frequently
   (c) sometimes
   (d) seldom or never
   (e) I don’t eat too much.

25. How often do you intentionally vomit after eating?
   (a) 2 or more times a week
   (b) once a week
   (c) 2-3 times a month
   (d) once a month
   (e) less than once a month (or never)
26. Which of the following describes your feelings after binge eating?
   (a) I don’t binge eat.
   (b) I feel O.K.
   (c) I feel mildly upset with myself
   (d) I feel quite upset with myself
   (e) I hate myself.

27. I eat a lot of food when I’m not hungry.
   (a) very frequently
   (b) frequently
   (c) occasionally
   (d) sometimes
   (e) seldom or never

28. My eating patterns are different from eating patterns of most people.
   (a) always
   (b) almost always
   (c) frequently
   (d) sometimes
   (e) seldom or never
29. I have tried to lose weight by fasting or going on "crash" diets.
   (a) not in the past year
   (b) once in the past year
   (c) 2-3 times in the past year
   (d) 4-5 times in the past year
   (e) more than 5 times in the past year

30. I feel sad or blue after eating more than I'd planned to eat.
   (a) always
   (b) almost always
   (c) frequently
   (d) sometimes
   (e) seldom, never, or not applicable

31. When engaged in an eating binge, I tend to eat foods that are high in carbohydrates (sweets and starches).
   (a) always
   (b) almost always
   (c) frequently
   (d) sometimes
   (e) seldom, or I don't binge.
32. What is the most weight you’ve ever gained in one month?
   (a) over 20 pounds
   (b) 12-20 pounds
   (c) 8-11 pounds
   (d) 4-7 pounds
   (e) less than 4 pounds

33. My last menstrual period was
   (a) within the past month
   (b) within the past 2 months
   (c) within the past 4 months
   (d) within the past 6 months
   (e) not within the past 6 months

34. I use diuretics (water pills) to help control my weight.
   (a) once a day or more
   (b) 3-6 times a week
   (c) once or twice a week
   (d) 2-3 times a month
   (e) once a month or less (or never)
35. How do you think your appetite compares with that of most people you know?
   (a) many times larger than most
   (b) much larger
   (c) a little larger
   (d) about the same
   (e) smaller than most

36. My menstrual cycle occurs once a month:
   (a) always
   (b) usually
   (c) sometimes
   (d) seldom
   (e) never
REM Density

For each question, choose from the following alternatives:

0. A little of the time
1. Some of the time
2. Good part of the time
3. Most of the time

_____1. I feel down-hearted and blue.
_____2. Morning is when I feel the best.
_____3. I have crying spells or feel like it.
_____4. I have trouble sleeping at night.
_____5. I eat as much as I used to.
_____6. I still enjoy sex.
_____7. I notice that I am losing weight.
_____8. I have trouble with constipation.
_____9. My heart beats faster than usual.
_____10. I get tired for no reason.
_____11. My mind is as clear as it used to be.
_____12. I find it easy to do the things I used to.
_____13. I am restless and can’t keep still.
15. I am more irritable than usual.
16. I find it easy to make decisions.
17. I feel that I am useful and needed.
18. My life is pretty full.
19. I feel that others would be better off if I were dead.
20. I still enjoy the things I used to do.

PART II OF THE QUESTIONNAIRE

Please answer the questions as best as you can.

1. Did the content of your dream include food?
   Yes  No
2. Was your dream focused on food?
   Yes  No
3. Did the content of your dream include a person/people?
   Yes  No
4. Was the person/people focused on you?
   Yes  No
5. If the person/people were focused on you, were they:
   a. friendly
   b. neutral
   c. hostile

   towards you?

6. Was the over-all feeling of your dream:
   a. positive
   b. negative?

Please give a brief summary of what your dream was like.
VITA

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The author was born in Seoul, Korea, December 13, 1969. She graduated from Thomas Jefferson High School for Science and Technology in Alexandria, Virginia, in June of 1988. She obtained a Bachelor of Arts from the University of Virginia in Charlottesville, Virginia, in May, 1992, double majoring in Philosophy and Psychology. She pursued a Master of Arts degree in Psychology from The College of William and Mary in Williamsburg, Virginia, completing in May, 1994. Beginning August, 1994, she will be pursuing a Ph.D. in Experimental Biological Psychology at the University of North Carolina at Chapel Hill.