Nightmares and Bad Dreams: Their Prevalence and Relationship to Well-Being

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This study, for the first time, distinguishes between nightmares and bad dreams, measures the frequency of each using dream logs, and separately assesses the relation between nightmares, bad dreams, and well-being. Eighty-nine participants completed 7 measures of well-being and recorded their dreams for 4 consecutive weeks. The dream logs yielded estimated mean annual nightmare and bad-dream frequencies that were significantly (ps < .01) greater than the mean 12-month and 1-month retrospective estimates. Nightmare frequency had more significant correlations than bad-dream frequency with well-being, suggesting that nightmares are a more severe expression of the same basic phenomenon. The findings confirm and extend evidence that nightmares are more prevalent than was previously believed and underscore the need to differentiate nightmares from bad dreams.

Both the prevalence of nightmares and the relation between nightmares and measures of psychopathology have been extensively studied. However, research on nightmares has been hampered by inconsistent definitions. Hartmann (1984) defined a nightmare as a long, frightening dream that awakens the sleeper, and awakening from a frightening dream has been used as an operational definition of nightmares by others (e.g., Coalson, 1995; Feldman & Hersen, 1967; Hersen, 1971; Levin, 1994; Levin & Hurvich, 1995; Miller & DiPilato, 1983). However, some researchers do not use the waking criterion (e.g., Belicki, 1992a; Bixler, Kales, Soldatos, Kales, & Healy, 1979; Chivers & Blagrove, 1999; Kales et al., 1980; Klink & Quan, 1987; Salvio, Wood, Schwartz, & Eichling, 1992; Wood & Bootzin, 1990). Furthermore, some investigators have not defined nightmares or have left nightmares to be defined by participants themselves (e.g., Belicki & Belicki, 1986; Cernovsky, 1983; Dunn & Barrett, 1988; Haynes & Mooney, 1975; Hearne, 1991; Stepansky et al., 1998).

The assumption underlying the use of the waking criterion is that sleepers awaken from a nightmare because of the extreme intensity of the emotions experienced. Thus, awakening is viewed as an indirect measure of nightmare intensity. This may not be so. First, even the most unpleasant dreams do not necessarily awaken the sleeper (Levitan, 1976, 1978, 1980; Van Bork, 1982). Second, less than one fourth of chronic nightmare patients report always awakening from their nightmares (Krakow, Kellner, Pathak, & Lambert, 1995). Third, when the waking criterion is used to distinguish nightmares from bad dreams among participants who experience both bad dreams and nightmares, approximately 45% of bad dreams are found to have emotional intensities equal to or exceeding those of the average nightmare (Zadra, 1996; Zadra & Donderi, 1993).

Irrespective of the waking criterion, nightmares have almost always been defined as *frightening dreams* (e.g., Bixler et al., 1979; Brimacombe & Macfie, 1993; Feldman & Hersen, 1967; Hartmann, 1984; Hersen, 1971; Kales et al., 1980; Levin, 1998; Levin & Hurvich, 1995; Miller & DiPilato, 1983; Salvio et al., 1992; Wood & Bootzin, 1990). Although this fear component is widely accepted in nightmare research, data from three studies challenge this assumption. Dunn and Barrett (1988) and Zadra and Donderi (1993) found that 17% to 30% of the nightmares reported by their participants contained emotions other than fear, such as anger and grief. Similarly, Belicki, Altay, and Hill (1985) reported that a significant proportion of individuals cite primary emotions other than fear in their nightmares.

In order to compare nightmare studies, it is important that the term *nightmare* be consistently defined. Halliday (1987, 1991) suggested that disturbing dreams that awaken the sleeper should be called nightmares, whereas disturbing dreams that do not awaken the sleeper should be called bad dreams. This is how we distinguish nightmares from bad dreams in this study. A nightmare is defined as a very disturbing dream that awakens the sleeper. A bad dream is a very disturbing dream that does not awaken the sleeper.

Prevalence of Nightmares

Among college and university students, 76% to 86% of students report having had at least one nightmare in the previous year, whereas 8% to 29% of them report having had one or more nightmares a month (Belicki, 1985; Belicki & Belicki, 1982, 1986; Feldman & Hersen, 1967; Haynes & Mooney, 1975; Lester, 1968; Levin, 1994; Wood & Bootzin, 1990). In addition, between 2% and 6% of undergraduate students report one or more nightmares per week (Belicki & Cuddy, 1991; Feldman & Hersen, 1967; Haynes & Mooney, 1975; Levin, 1994), which is consistent with

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the rate of 4% found in a random population of adults (Janson et al., 1995).

Two surveys have assessed the incidence of complaints of nightmares, rather than the general rate of nightmare occurrence, in the general public (Bixler et al., 1979; Klink & Quan, 1987). Together, these two surveys indicate that 5% to 8% of the general population report a current problem with nightmares, with about 6% reporting a previous complaint.

In the previously cited studies, nightmare frequency was almost always assessed by retrospective self-report (e.g., asking participants how many nightmares they had in the previous month or year). But retrospective reports can be affected by factors like poor memory as well as by how the question is formulated. To overcome these limitations, Wood and Bootzin (1990) assessed nightmare frequency from daily dream logs. Undergraduates recorded the number of nightmares experienced over a period of 2 weeks and estimated the number of nightmares experienced during the past year and during the past month. The results indicated that when compared with an extrapolation from the daily logs, retrospective self-reports underestimated nightmare frequency by a factor of 2.5. Salvio et al. (1992), using the same protocol as Wood and Bootzin (1990), found that nightmares in the elderly were 10 times more prevalent than had been previously estimated, thus supporting the conclusion that nightmares are more prevalent than indicated by retrospective self-reports.

Wood and Bootzin (1990) were the first to use daily dream logs to study nightmare prevalence. Their study, however, had two methodological shortcomings. First, their reporting period was only 2 weeks, which was prorated to 52 weeks for comparison to the 12-month retrospective reports. Small variations over 2 weeks would magnify the variability of a prorated 52-week estimate. Second, their students were instructed to record only nightmares. It is possible that the focus on nightmares influenced the participants' reports.

One goal of the present study was to clarify and extend the evidence that retrospective reports underestimate the frequency of nightmares as recorded in daily dream logs. We addressed short-comings of the Wood and Bootzin study by (a) using a 1-month dream log, (b) asking participants to record all of their remembered dreams, and (c) collecting both retrospective and dream log information on pleasant dreams (e.g., flying dreams) as well as disturbing ones. In addition, nightmare and bad-dream-frequency data were tabulated separately.

A 1-month log has never previously been used to assess nightmare frequency and research on the prevalence of nightmares has not distinguished between nightmares and bad dreams. Consequently, no predictions were made as to whether retrospective reports underestimate the nightmare and bad-dream frequency obtained from daily logs. This part of the study was therefore exploratory.

Nightmares and Psychopathology

Much of the previous nightmare research has been dedicated to investigating the association between nightmare frequency and various measures of psychopathology. Although most studies have found a relationship (Berquier & Ashton, 1992; Chivers & Blagrove, 1999; Feldman & Hersen, 1967; Hartmann & Russ, 1979; Hartmann, Russ, van der Kolk, Falke, & Oldfield, 1981; Haynes &

Mooney, 1975; Hersen, 1971; Kales et al., 1980; Levin, 1989, 1998; Levin & Hurvich, 1995), others have not (Hearne, 1991; Lester, 1968, 1969; Belicki, 1992a; Wood & Bootzin, 1990; Zadra, Assaad, Nielsen, & Donderi, 1995). Several factors may account for these inconsistent findings. First, different studies have focused on different populations, including undergraduate students (Cellucci & Lawrence, 1978; Dunn & Barrett, 1988; Feldman & Hersen, 1967; Haynes & Mooney, 1975; Lester, 1968, 1969; Levin, 1989, 1998; Levin & Hurvich, 1995; Wood & Bootzin, 1990), nonstudent adults (Hearne, 1991; Kales et al., 1980; Miller & DiPilato, 1983), psychiatric inpatients (Hersen, 1971), and people with a lifelong history of frequent nightmares (Berquier & Ashton, 1992; Hartmann & Russ, 1979; Hartmann et al., 1981). It is possible that the nature and magnitude of relationships between nightmares and psychopathology vary across some of these populations.

Another source of variability is the criterion used to classify participants into a frequent nightmare group. In some studies, people were classified into a frequent nightmare group if they reported having had 12 or more nightmares over the previous year (i.e., one or more nightmares per month) (Belicki & Belicki, 1986; Berquier & Ashton, 1992; Hersen, 1971; Kales et al., 1980; Levin, 1989), whereas in other studies the inclusion criteria consisted of reporting one or more nightmares per week (Dunn & Barrett, 1988; Feldman & Hersen, 1967; Hartmann et al., 1981; Levin, 1998). In addition, almost all of these studies used retrospective estimates of nightmare frequency to determine group membership, and the group inclusion cutoffs used (e.g., 12 or more nightmares per year) were arbitrary and of unknown validity. Finally, as previously discussed, definitions of what constitutes a nightmare have been inconsistent.

A set of interrelated personality measures define a single psychometric dimension relating scores on paper-and-pencil tests of neuroticism, anxiety, depression, life-events stress, personal adjustment, and general symptomatology. This dimension was called *psychological well-being* by Brown and Donderi (1986), who found that adults with recurrent dreams scored lower on well-being than did past-recurrent dreamers and nonrecurrent dreamers.

The second goal of the present study was to learn whether psychological well-being is related to nightmares and bad dreams. Data from two studies (Zadra, 1996; Zadra & Donderi, 1993) indicated that nightmares are more emotionally intense than bad dreams. In addition, the people who report nightmares also tend to report bad dreams, whereas there are some people who report only bad dreams but no nightmares. One study (Zadra, 1996) found that people with both frequent nightmares and bad dreams had a low level of psychological well-being, people with frequent bad dreams only had a higher level of well-being that the nightmare and bad dreams group, and controls who seldom experienced nightmares or bad dreams had the highest psychological wellbeing. On the basis of these results, we hypothesized that nightmare frequency would correlate more strongly with measures of well-being than would bad-dream frequency.

Method

Participants

Participants were undergraduate students who were recruited as nonpaid volunteers through class announcements in the faculties of arts, science,

Procedure

Participants were given definitions of a flying dream, a lucid dream, a bad dream, a nightmare, and a sleep terror, and questions on these types of dreams were answered by the experimenter. Nightmares were defined as very disturbing dreams in which the unpleasant visual imagery and/or emotions wake you up (i.e., the dream's unpleasant content woke you up while the dream was still ongoing). Bad dreams were defined as very disturbing dreams that, though being unpleasant, do not cause you to awaken (e.g., you feel that the dream occurred earlier in the night prior to your awakening, you remembered it only after being awakened by external factors such as your alarm clock, or you only remembered the dream later during the day). Participants also received instruction sheets detailing all of the pertinent definitions and the procedures to follow for completing the dream logs. It was stressed to the students at the group meetings that we were equally interested in people with high and low dream recall and that all types of dreams were of interest to the experimenters.

dreams, sexual dreams, lucid dreams, and nightmares.

Participants then completed two research protocols. The first contained the McGill Sleep & Dream Questionnaire and the six measures of psychological well-being used by Brown and Donderi (1986). Specifically, the measures were neuroticism, trait anxiety, depression, general psychopathology symptomatology, life-events stress, and personal adjustment. These variables were measured by the Neuroticism scale of the Eysenck Personality Inventory (Eysenck & Eysenck, 1968), the State–Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970), the Beck Depression Inventory (BDI; Beck & Beamesderfer, 1974), the General Symptom Index of the Symptom Checklist-90—Revised (SCL-90-R; Derogatis, 1977), the Life Events Inventory (LEI; Paykel & Uhlenluth, 1972), and the Adjective Checklist (Gough & Heilbrun, 1965), respectively. In addition, Spielberger's STAI-S was also included as a measure of state anxiety. These measures are fully described, with reliability and validity data, in Brown and Donderi (1986).

The second research protocol required the participants to record their dream experiences each morning in the daily dream log provided for a period of one calendar month. Participants were instructed to report, for each remembered dream, the main emotions present (if any), the intensities of these emotions on a 9-point scale, and to note whether the dream was a lucid dream, a nightmare, a bad dream, or a flying dream. Both phases of the study were completed by the participants at home. They were instructed to complete and return the first protocol before beginning the dream recording set. The dream logs were returned at the end of the 1-month recording period.

The research protocols contained three measures of nightmare and bad-dream frequency. Four questions on the Sleep & Dream Questionnaire required the participants to estimate the number of nightmares and bad dreams they had experienced over the past year and over the past month. These questions served as the 12-month and 1-month retrospective selfreport measures of incidence. The daily dream log served as the nonretrospective, ongoing measure of both nightmare and bad-dream frequency.

Results

One hundred and forty-eight students attended group information meetings, and 103 students completed the study. Fourteen participants were excluded for failing to follow the research protocol instructions because they gave nonquantitative responses on either the 1-month or 12-month retrospective estimates (e.g., answering "many" or "over 20"). This reduced the total number of participants for which nightmare and bad-dream frequency data were analyzed from 103 to 89 (68 women, 21 men, M age = 20.5 years). On each one of our nightmare and bad-dream frequency measures (i.e., 12-month, 1-month, daily log), there were one or two people whose nightmare scores, bad dream scores, or both were more than three standard deviations above the mean. We carried out our analyses both with and without data from these participants and found no major changes in the correlations or levels of significance attributed to them in this study. We validated all significant product-moment correlations by using nonparametric Spearman rank-order correlations. The results presented are based on data from all 89 participants. Because no significant differences in either nightmare or bad-dream frequency were found between men and women on retrospective or dream log measures, their data were combined for all analyses.

Prevalence of Nightmares and Bad Dreams

Nightmare and bad-dream data from the 1-year and 1-month retrospective measures and from the dream logs were analyzed for all participants. On the 12-month retrospective measure, the mean number of nightmares reported per year was 4.21 (SD = 7.34). Twenty-nine participants (33%) reported one or more nightmares on the 1-month retrospective report, and the mean number of nightmares reported for the previous month was .48 (SD = .88). Multiplying by 12 gives an estimated annual mean nightmare frequency of 5.76, an estimate 37% higher than the estimate obtained by the 12-month retrospective report.

Forty-two of the 89 participants (47%) reported having had at least one nightmare over the 4 weeks covered by the dream log. The mean number of nightmares reported during this period was .92 (SD = 1.27). This converts to a prorated annual mean nightmare frequency of 11.04, which is 162% higher than the 1-year retrospective mean estimate of 4.21 and 92% higher than the 1-month retrospective mean nightmare estimate of 5.76.

On the 12-month retrospective measure, the mean number of bad dreams reported per year was 17.35 (SD = 19.03). Sixty-one participants (69%) reported at least one bad dream in the previous month, and the mean number of bad dreams reported on the 1-month retrospective measure was 1.60 (SD = 1.76). Multiplying by 12 gives a prorated estimated annual mean bad-dream frequency of 19.20, which is 11% higher than the estimate obtained by the 12-month retrospective report.

Seventy-two participants (81%) reported having had at least one bad dream over the 4 weeks covered by the dream log. The mean number of bad dreams reported during this period was 2.45 (SD = 2.35). This converts to a prorated annual mean bad-dream frequency of 29.40, which is 69% higher than the 1-year retrospective mean estimate of 17.35 and 53% higher than the 1-month retrospective mean bad dream estimate of 19.20.

Adding the nightmare and bad-dream frequencies gives an estimated annual mean nightmare and bad-dream frequency of 21.56 and 24.96 for the 12-month and 1-month retrospective methods, respectively. Seventy-four participants (83%) reported at least one nightmare or bad dream during the 4-week period covered by the dream logs. Combining the mean number of nightmares and bad dreams reported on the logs gives an estimated mean annual frequency of 40.44, an estimate 88% and 62% higher, respectively, than the 12-month and 1-month retrospective estimates.



Figure 1. Estimated mean number of nightmares and bad dreams per year as related to reporting method.

Figure 1 shows a comparison of the results obtained in this study on the estimated mean number of nightmares and bad dreams per year for the three reporting methods with the results reported by Wood and Bootzin (1990). As can be seen from this graph, the degree of underestimation for nightmares and bad dreams in this study is consistent with the underestimation pattern found by Wood and Bootzin.

The distribution of retrospective nightmare and bad-dream frequency estimates, as well as the dream log data, were all positively skewed. To normalize the distribution, we added a constant of .5 to all data points and performed a square-root transformation on the retrospective and dream log data. A one-way analysis of variance (ANOVA) showed that the transformed means of the three reporting methods for nightmare frequency were significantly different, F(2, 176) = 12.75, p < .001. Student Newman-Keuls post hoc comparisons showed that significantly fewer nightmares were reported by the two retrospective methods than by the daily dream log (ps < .01). There were no significant differences between the two retrospective measures.

A one-way ANOVA showed that the transformed means of three reporting methods for mean frequency of bad dreams were significantly different, F(2, 176) = 12.64, p < .001. Student Newman-Keuls post hoc comparisons showed that significantly fewer bad dreams were reported by the two retrospective methods than by the daily dream logs (ps < .01). There were no significant differences between the two retrospective measures.

To examine whether retrospective measures also led to an underestimation of pleasant dreams, we also analyzed frequency data for lucid dreams and flying dreams. Seventy-one of the 89 participants (80%) provided quantitative responses on both the 1-month and 12-month retrospective estimates for lucid and flying dreams and had frequency scores that were within three standard deviations from the mean. The estimated annual mean ($\pm SD$) lucid-dream frequencies based on the 12-month retrospective measure, the 1-month retrospective measure, and the 4-week log were 8.41 (± 15.42), 11.07 (± 19.76), and 11.32 (± 19.65), respectively. The daily log frequency was thus 35% higher than the 12-month retrospective estimate and virtually equivalent to the

1-month retrospective estimate. The estimated annual mean $(\pm SD)$ flying-dream frequencies based on the 12-month retrospective measure, the 1-month retrospective measure, and the 4-week log were 1.44 (\pm 3.45), 1.51 (\pm 4.50), and 1.85 (\pm 4.37), respectively. The dream log estimate for flying dreams is approximately 25% higher than the retrospective measures. The distribution of retrospective and log estimates were all positively skewed. To normalize the distribution, we added a constant of .5 to all data points and performed a square-root transformation on the retrospective and dream log data. A one-way ANOVA on the transformed data showed that the three reporting methods for mean lucid-dream frequency and mean flying-dream frequency were not significantly different (ps < .05).

Table 1 presents the results of correlational analyses performed to assess the interrelations among the three measures of nightmare and bad-dream frequency. The intercorrelations among the three indices of nightmare frequency were all significant, as were those among the three measures of bad-dream frequency. However, only two of the nine correlations among the nightmare and bad-dream indices were significant. The three frequency indices were combined to form a single composite measure of nightmare frequency and one of bad-dream frequency for use in subsequent analyses. We obtained composite scores by standardizing the component variables and summing them.

Psychological Well-Being

The intercorrelations among all seven measures of well-being are presented in Table 2. Several of the well-being measures were highly intercorrelated. To avoid redundancy in the analyses, we combined strongly related measures into a small number of composites. A factor analysis showed that five measures (i.e., state anxiety, trait anxiety, neuroticism, depression, and general symptom index) had factor loadings > .65 on Factor 1. These five scales were thus combined into a composite variable. We obtained composite scores by standardizing the component variables and summing them. The correlation between the two remaining variables, life events stress and personal adjustment, was only .03, and therefore they were not combined.

Table 3 presents the correlations between the indices of nightmare and bad-dream frequency and measures of well-being, including all composite variables. At least 3 of the 4 indices of nightmare frequency were significantly correlated with measures of neuroticism, trait anxiety, state anxiety, depression, symptom

 Table 1

 Zero-Order Correlations Among Nightmare and

 Bad-Dream Frequency Variables

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	Variable	1	2	3	4	5	6
1.	NM/year	_					
2.	NM/month	.71***	—				
3.	NM/log	.48***	.59***				
4.	BD/year	.17	.18	.13	—		
5.	BD/month	.03	.18	.11	.72***		
6.	BD/log	.15	.29**	.25*	.45***	.47***	-
						A STREET LINE AND A STREET	

Note. NM = nightmare; BD = bad dream.

* p < .05. ** p < .01. *** p < .001. All p values are two-tailed.

Intercorrelations Among Well-Being Variables								
Well-being measure	1	2	3	4	5	6	7	
1. Neuroticism: EPI	_							
2. Trait anxiety: STAI-T	.75***							
3. State anxiety: STAI-S	.48***	.58***						
4. Depression: BDI	.51***	.50***	.37***					
5. Symptom index: SCL	.66***	.68***	.47***	.63***				
6. Personal adjustment: ACL	52***	40***	28**	34***-	.43***			
7. Life events: LEI	05	.07	.03	.14	.15	.03		

Table 2

Note. EPI = Eysenck Personality Inventory; STAI-T = State-Trait Anxiety Inventory-Trait; STAI-S = State-Trait Anxiety Inventory-State; BDI = Beck Depression Inventory; SCL = Symptom Checklist 90-Revised; ACL = Adjective Checklist; LEI = Life Events Inventory. ** p < .01 *** $p \le .001$. All p values are two-tailed.

index, and the well-being composite. By contrast, in no case was more than one measure of bad-dream frequency significantly correlated with a given measure of well-being. In addition, in 27 of the 32 possible comparisons, the magnitude of the correlations between well-being variables and nightmare frequency was greater than with the corresponding measure of bad-dream frequency. However, as shown in Table 3, only two of these differences were significant, and another six approached significance.

Two hierarchical regressions were calculated to examine the separate and unique contributions of nightmares versus bad dreams in relation to well-being. In the first regression, the composite measure of nightmare frequency was the dependent variable, and we entered bad-dream frequency in the first step to partial out any shared variance. We entered scores on the composite measure of well-being and LEI in the second step to permit examination of the incremental effect of well-being on nightmare frequency. In the second regression, the composite measure of bad-dream frequency was the dependent variable, and we entered nightmare frequency in the first step to partial out any shared variance. We entered scores on the composite measure of well-being and LEI in the second step to permit examination of the incremental effect of

well-being on bad-dream frequency. As seen in Table 4, the first step of the regression analyses indicates that bad-dream frequency and nightmare frequency had 5% of shared variance (p < .05). In the first regression, the measures of well-being accounted for a significant portion of the variance in nightmare frequency beyond that accounted for by the bad-dream frequency covariate (incremental $R^2 = .13$, p < .001), with the well-being composite making a significant unique contribution. In the second regression, wellbeing incremented a statistically significant (p < .05) 4% of the variance in bad-dream frequency beyond that accounted for by the nightmare frequency covariate.

Discussion

To summarize the main findings of the present study: (a) The estimated yearly frequency of nightmares and of bad dreams depended on the reporting method, with the daily dream log extrapolations resulting in the highest estimates and the 12-month retrospective report estimating the fewest number of nightmares and bad dreams; (b) nightmare frequency had more significant

Table 3

Correlations Between Nightmare and Bad-Dream Frequency and Well-Being

Variable	EPI	STAI-T	STAI-S	BDI	SCL	ACL	LEI	WBcomp
NM/year	.33**	.27**	.28**	.10	.15	11	01	.28**
NM/month	.35***	.37 ^a ***	.35 ^b ***	.25*	.21*	10	.25*	.38 ^b ***
NM/log	.41 ^a ***	.28**	.27**	.23*	.25*	19†	.02	.36***
NM composite	.42 ^b ***	.36 ^b ***	.35 ^b ***	.22*	.23*	15	.10	.39 ^b ***
BD/year	.21*	.16	.09	.19†	.23*	02	.08	.22*
BD/month	.14	.05	.09	.12	.18†	.04	.18†	.14
BD/log	.13	.09	.08	.14	.11	02	.22*	.14
BD composite	.19†	.12	.10	.18†	.20†	01	.19†	.20†

Note. NM = nightmare; BD = bad dream; EPI = Eysenck Personality Inventory; STAI-T = State-Trait Anxiety Inventory—Trait; STAI-S = State-Trait Anxiety Inventory—State; BDI = Beck Depression Inventory; SCL = Symptom Checklist 90—Revised; ACL = Adjective Checklist; LEI = Life Events Inventory; WBcomp = well-being composite.

^a Correlation coefficients for corresponding measures of nightmare and bad-dream frequency are significantly different at p < .05.

^b Correlation coefficients for corresponding measures of nightmare and bad-dream frequency are marginally significant at p < .10.

† Marginally significant at p < .10.

* $p \le .05$. ** p < .01. *** p < .001. All p values are two-tailed.

Table 4	
Hierarchical Regressions on Nightmare	and
Bad-Dream Frequency Variables	

Dependent variable and step	β	R^2	ΔR^2	ΔF
NM frequency composite				
Step 1		.05	.05	4.85*
BD frequency composite	.15			
Step 2		.18	.13	6.36**
Well-being composite	.38**			
Life Events Inventory	.04			
BD frequency composite				
Step 1		.05	.05	4.85*
NM frequency composite	.17			
Step 2		.09	.04	2.89*
Well-being composite	.12			
Life Events Inventory	.16			

Note. N = 89. Reported β s are those with all variables in the equation at Step 2. NM = nightmare; BD = bad dream. * p < .05. ** p < .001.

correlations with the measures of psychological well-being than did bad-dream frequency. These findings are discussed in turn.

Prevalence

The results from the 4-week daily dream logs indicate clearly that retrospective measures underestimate both nightmares and bad dreams. This supports and extends Wood and Bootzin's (1990) conclusion that nightmares are more prevalent than was previously believed. Our results also suggest that bad dreams are even more prevalent than nightmares.

When the nightmare frequency data from our 4-week log were prorated over 52 weeks, they were found to give an annual frequency 162% higher than the mean 12-month retrospective estimate and 92% higher than the prorated mean 1-month retrospective estimate. The prorated annual bad-dream frequency estimated from the logs was 69% and 53% higher than the mean 12-month and the prorated 1-month retrospective estimates, respectively. By comparison, Wood and Bootzin's (1990) participants reported a 150% higher mean nightmare frequency using a prorated 2-week log than they reported on a 12-month retrospective estimate and a 91% increase over the prorated mean 1-month retrospective estimates. Although the frequency of both nightmares and bad dreams is underestimated by retrospective measures, our data indicate that the underestimation is greater for nightmares.

Wood and Bootzin (1990) defined a nightmare as "a dream that frightens the dreamer." Because their nightmare criterion included dreams that did or did not waken the sleeper, their nightmares were a combination of nightmares and bad dreams, as defined in our study. Although confirming the general trend toward underestimation of nightmares established in Wood and Bootzin, there was a greater overall prevalence of bad dreams than of nightmares in the present study (see Figure 1). This finding may be the result of several factors. First, Wood and Bootzin's students kept only a 2-week dream log, and consequently there was greater uncertainty in the extrapolation needed to obtain an annual frequency estimate. As a result, data may have been affected by the variability of dream patterns over this short interval. Second, it is possible that by defining nightmares as a frightening dream, participants did not report disturbing dreams in which the main emotion was one other than fear. Third, Wood and Bootzin's students took part in their study as part of an undergraduate course requirement. The students in the present study were recruited as volunteers from a variety of classes and presumably represent individuals particularly interested in dreams. Our participants may have had especially good recall of vivid nightmares and bad dreams. Finally, the home dream logs were collected at the end of the 30-day recording period and not every few days as was the case in Wood and Bootzin's study. Thus, we cannot be sure that that our students' recordings were actually made on a daily basis.

A larger number of dreams were reported in the dream logs than were reported in estimates of dream-recall frequency. A question on the McGill Sleep & Dream Questionnaire asks for an estimate of the number of dreams recalled per week. The mean frequency of estimated dream recall per week was 5.82 (SD = 3.06). The mean number of dreams reported in the 4-week logs was 27.13 (SD = 14.24), or 6.78 dreams per week. This suggests either that retrospective reports underestimate the total number of dreams or that keeping a dream log increases dream recall, or both. Could the underestimation of nightmare and bad-dream frequencies simply have been the result of an increase in recalled dreams caused by keeping a dream log? Several observations suggest that this was not the case. Dream-recall frequency from the 4-week log was about 15% higher than the retrospective estimates, but the dreamlog frequency of nightmares and bad dreams was considerably higher (between 53% and 162%) than the retrospective estimates. Although the dream logs used in this study covered a period that was twice as long as the logs studied by Wood and Bootzin (1990), the underestimation for nightmares and bad dreams was about 45% less than in the Wood and Bootzin logs. Furthermore, analyses of the retrospective estimates of two types of pleasant dreams (i.e., lucid and flying dreams) indicate that these estimates were closer to dream-log frequency data than were retrospective estimates for nightmares and bad dreams. The comparison is clearest for lucid dreams. The 12-month retrospective estimate resulted in an underestimation of 35% for lucid dreams versus 162% for nightmares, whereas the 1-month retrospective estimate gave an underestimation of only 2% for lucid dreams versus 92% for nightmares. Thus, although people tend to underestimate their recall of everyday dreams and pleasant dreams, the underestimation is considerably greater for unpleasant dreams. Moreover, the fact that underestimation is greater for nightmare frequency than for bad-dream frequency suggests that the stronger the negative dream content, the greater the underestimation. Why underestimation is primarily confined to unpleasant dreams and why it is apparently a function of the amount of unpleasantness remains to be determined.

Only 2 of the 9 correlations among the nightmare and baddream frequency measures were significant, indicating only a weak to moderate relation between nightmare frequency and baddream frequency. These results thus support the contention that the distinction between nightmares and bad dreams is an important one. Although our definitions of nightmares and bad dreams require participants to judge whether or not the dream caused them to awaken, we found no evidence to suggest that this is difficult. To verify the clarity of our definitions, we asked participants to make written comments on the use of the various definitions. Of the original 103 participants who completed the study, two noted that they were unsure if a particular dream was or was not a flying dream, three were not sure if they had really been lucid in some of their dreams, and only one reported difficulties in distinguishing between awakenings caused by the dream's negative content (i.e., nightmares) and unpleasant dreams recalled later, following spontaneous or externally caused awakenings. Similarly, the fact that less than 25% of nightmare patients report always awakening from their nightmares (Krakow et al., 1995) suggests that nightmare sufferers also make such distinctions.

Well-Being

It was hypothesized that nightmare frequency would correlate more strongly with psychological well-being than would baddream frequency. The data provided suggestive evidence in support of this prediction. A greater number of well-being measures were significantly related to nightmare frequency than to baddream frequency. Higher correlations were found for nightmares than for bad dreams with 6 of the 7 measures of well-being, but most of the corresponding correlations were not significantly different from one another (see Table 3). Finally, a direct examination of the unique relationships between measures of well-being and nightmare frequency versus bad-dream frequency showed that well-being accounted for approximately 13% of the variance in nightmare frequency versus 4% of the variance in bad-dream frequency.

Zadra (1996) proposed that people with frequent nightmares are at one end of a dimension of negative dream affect and that people reporting frequent bad dreams occupy a middle place on this dimension. The results from this study support the idea that a dimension of negative dream affect is associated with scores on self-reported measures of well-being. The data indicate that people who experience bad dreams are low on self-reported measures of well-being, but not to the extent exhibited by those with nightmares. These results form a pattern that suggests that scores on measures of well-being are inversely related to the position of a dreaming experience on the dimension of negative dream affect.

Many studies have investigated relationships between nightmare frequency and various measures of anxiety (Cellucci & Lawrence, 1978; Dunn & Barrett, 1988; Feldman & Hersen, 1967; Haynes & Mooney, 1975; Hersen, 1971; Lester, 1968, 1969; Levin, 1989; Levin & Hurvich, 1995; Wood & Bootzin, 1990; Zadra et al., 1995). Taken together, these studies indicate a weak to moderate relationship between anxiety and retrospective estimates of nightmare frequency. Consistent with past studies, we found a small but statistically significant correlation between our four measures of nightmare frequency-but not of bad-dream frequency-and scores on the measures of trait and state anxiety (see Table 3). Wood and Bootzin (1990) found that the magnitude of the association between trait anxiety and nightmare frequency decreased from .13 to .04 when daily logs were used to measure nightmare frequency instead of 12-month retrospective self-reports. Our data provide mixed support for this finding. For nightmare frequency, the correlations between the 12-month retrospective estimates and measures of trait and state anxiety were .27 and .28, respectively, but these correlations remained virtually unchanged (.28 and .27) when the daily logs were used. The 12-month retrospective estimates of bad-dream frequency correlated .16 and .09 with trait and

state anxiety, respectively. The first correlation decreased to .09, and the second remained virtually the same (.08) when logfrequency data were used. As for the other five measures of well-being, Table 3 shows that the nightmare-log frequency data had stronger associations than did retrospective frequency estimates with four of the five measures (i.e., neuroticism, depression, general symptomatology, and personal adjustment), whereas the opposite was true for bad-dream log frequency (i.e., only higher for life-events). Taken together, these results provide only partial support for Wood and Bootzin's suggestion that anxious individuals do not necessarily have more nightmares but rather that they are more likely to remember and report nightmares retrospectively.

In the present study, it was noted that almost all of the people reporting frequent nightmares also report having frequent bad dreams, whereas there are individuals who report having frequent bad dreams who do not experience nightmares. Consequently, had we collapsed the range of nightmare and bad-dream frequency into dichotomous scales of high versus low frequency, we would have obtained the following three groups: (a) high nightmares/high bad dreams, (b) low nightmares/high bad dreams, and (c) low nightmares/low bad dreams. In other words, there is no high nightmares/low bad dreams group. This suggests that nightmares represent a somewhat rarer-and more severe-expression of the same basic phenomenon. This observation, together with data presented, has important implications for research on the relation between nightmares and psychopathology. Group-based studies that define nightmares by using a waking criterion would classify bad-dream-only participants as control participants, whereas those that do not use a waking criterion could place these very same individuals in the nightmare (experimental) group. The former situation could result in an increase of the control group's mean scores on dependent measures of psychopathology, whereas the latter could decrease the experimental group's scores on such measures. This possibility may account for some of the inconsistent findings reported on the relation between nightmare frequency and measures of psychopathology.

The length of time during which people have had frequent nightmares or bad dreams may also be related to well-being. Our study did not assess the history of either nightmare or bad-dream experiences. The possible relationship between the length of time during which people have had frequent nightmares or frequent bad dreams and measures of well-being remains unknown.

Studies have shown that nightmare frequency is only moderately related to the waking suffering or distress associated with nightmares (Belicki, 1985, 1992b; Belicki, Chambers, & Ogilvie, 1997; Wood & Bootzin, 1990). Moreover, Belicki (1992a) reported that ratings of nightmare distress, but not of nightmare frequency, were significantly related to scores on both the SCL-90-R and the BDI. Thus, waking level of nightmare distress is an important variable that influences or mediates the relation between nightmare frequency and psychopathology. The distinction between nightmare distress and nightmare frequency has only been studied in recent years. Similarly, this study was the first to separately assess the relation between nightmares, bad dreams, and measures of well-being. An understanding of the interaction effects of nightmare frequency and nightmare distress on measures of psychopathology requires further study.

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