Eur Arch Psychiatry Clin Neurosci (2003) 253 : 241–247 DOI 10.1007/s00406-003-0438-1

ORIGINAL PAPER

Michael Schredl

Effects of state and trait factors on nightmare frequency

Received: 7 April 2003 / Accepted: 11 June 2003

Abstract In a new approach, this study compared the effects of trait and state factors on nightmare frequency in a non-clinical sample. Although neuroticism and boundary thinness were related to nightmare frequency, regression analyses indicated that the trait measures did not add to the variance explained by the state measures. This finding supports the so-called continuity hypothesis of dreaming, i. e., nightmares reflect negative waking-life experiences. Second, the moderate relationship between nightmare frequency and poor sleep quality was partly explained by the day-time measures of neuroticism and stress, but it can be assumed that nightmares are an independent factor contributing to complaints of insomnia. Longitudinal studies measuring nightmare frequency and stress on a daily basis will shed light on the temporal relationship between daytime measures and the occurrence of nightmares. It will be also very interesting to study the relationship between stress and nightmare frequency in a sample who have undergone cognitive-behavioral treatment for nightmares.

Key words nightmares · stress · personality · sleep disorders

Introduction

Nightmares are defined as easily recalled dreams with strong negative emotions which awaken the sleeper (Hartmann 1984; American Psychiatric Association 1994). In previous studies, however, other descriptions have been: "very disturbing dreams involving any unpleasant emotion" (Belicki 1992) or "a dream that frightens the dreamer" (Wood & Bootzin 1990). Whether these different definitions affect the relationship between nightmare frequency and influencing factors was hitherto studied in a systematic way solely by Zadra and Donderi (2000). Their results suggest that there is a continuum between bad dreams (without awakening) and nightmares (with awakening) with nightmares exhibiting the strongest correlations to psychopathology measures.

Most persons have experienced nightmares at least once in their lifetime (Englehart & Hale 1990; Levin 1994; Schredl, Morlock & Bozzer 1996). In student samples, mean nightmare frequency is about one nightmare per month (Belicki 1992; Belicki, Chambers & Ogilvie 1997). Wood and Bootzin (1990), Chivers and Blagrove (1999) and Zadra and Donderi (2000), however, pointed out that nightmare frequency is considerably higher when measured by dream diaries. Whether this finding is explained by underestimation concerning the retrospective method (questionnaire scales) or due to an increase of nightmare frequency as an effect of deliberately focusing on nightmares (comparable to the increase in dream recall frequency by keeping a diary, especially in low dream recallers, Schredl 2002a) is a question open to future research. Zadra and Donderi (2000) have shown that the correlations between daytime measures and nightmare frequency were not affected by the measurement method.

If adults were asked whether they suffer from nightmares, about 4 to 5 % of representative samples gave an affirmative answer (Bixler et al. 1979; Cirignotta et al. 1983; Janson et al. 1995; Stepansky et al. 1998). Whereas a considerably large area of research (e. g., Kales et al. 1980; Hartmann et al. 1987; Berquier & Asthon 1992) has focused on studying persons with frequent nightmares (nightmare sufferers), the present study investigated factors which might affect nightmare frequency in a non-clinical sample.

If nightmares are conceptualized as very intense dreams (cf. Hunt 1989), the continuity hypothesis of

M. Schredl, Ph. D. (✉)
Sleep laboratory
Central Institute of Mental Health
PO Box 12 21 20
68072 Mannheim, Germany
Tel.: +49-621/1703-787
Fax: +49-621/23429
E-Mail: Schredl@as200.zi-mannheim.de

dreaming (e. g., Domhoff 1996; Schredl 1999) states that nightmares as negatively toned dreams reflect actual negative waking-life experiences. In addition to this effect of state factors, the etiological model of nightmares stresses also the role of trait factors (e. g., Hartmann 1984; Bearden 1994; Schredl & Pallmer 1997). In the following, research regarding the effects of trait and state factors, respectively, on nightmare frequency will be reviewed briefly.

The results of a large-scale twin study (Hublin et al. 1999) indicate that genetic factors partly explain the occurrence of nightmares in adults. The finding that women tend to report nightmares more often than men (Bixler et al. 1979; Levin 1994; Schredl & Pallmer 1998; Hublin et al. 1999) might also be interpreted as a trait effect. The findings, however, are contradictory (e. g., Stepansky et al. 1998) and it can be hypothesized that factors such as stress (e. g., higher prevalence of depression in women; American Psychiatric Association 1994) might explain the gender difference in nightmare frequency. Additional support for the importance of trait factors is yielded by the stability of nightmare frequency from childhood and adulthood ($r = 0.70$; retrospective measure of childhood nightmares) reported by Hublin et al. (1999). The majority of adult nightmare sufferers reported an onset during childhood (Kales et al. 1980; Cirignotta et al. 1983; Hartmann 1984).

Regarding the relationship between personality dimensions and nightmare frequency, the empirical data are heterogeneous. Although Hartmann (1984, 1991) has demonstrated that nightmare sufferers tend to score thinner on the boundary dimension; boundary thinness was not related to nightmare frequency in his large mixed sample ($r = 0.06$; Hartmann 1989). Persons with thin boundaries tend to be sensitive, vulnerable and creative, experience more often mental in-between states and involve themselves more quickly in relationships; i. e., the boundary dimension is very broad (Hartmann 1991). Subsequent studies (Carskadon et al. 1992; Cowen & Lewin 1995; Schredl et al. 1999; Hicks, Bautista & Hicks 1999), however, were able to detect a significant correlation in non-clinical samples.

Regarding neuroticism, positive findings (Berquier & Ashton 1992; Zadra & Donderi 2000) are opposed by a negative finding (Chivers & Blagrove 1999). Similarly, the results for trait anxiety are contradictory; marked relationships were reported by Cook, Caplan and Wolowitz (1990), Schredl, Pallmer and Montasser (1996), Zadra and Donderi (2000) and Levin and Fireman (2002) but not by Wood and Bootzin (1990) and Belicki (1992). This heterogeneity might be explained by the findings of Köthe and Piotrowsky (2001) who reported that state anxiety was elevated on days after experiencing a nightmare in comparison to days after undisturbed nights, i. e., state anxiety might be a mediator variable in the relationship between trait anxiety and nightmare frequency.

Concurrent stress did affect nightmare frequency in several studies (Cirignotta et al. 1983; Cernovsky 1984; Cook, Caplan & Wolowitz 1990; Chivers & Blagrove 1999). Similarly, state anxiety and depressive mood as well as indices of general distress (e. g., measured by the Symptom Checklist 90-R) was related to heightened nightmare frequency (Cook, Caplan & Wolowitz 1990; Stepansky et al. 1998; Zadra & Donderi 2000; Zadra et al. 2000; Levin & Fireman 2002); with the exception of one study (Belicki 1992) which did not find a substantial relationship between actual psychopathology and nightmare frequency.

Within these studies, the intercorrelations between trait and state measures were not taken into consideration systematically and the magnitude of the correlation coefficients to nightmare frequency have not been directly compared. Zadra and Donderi (2000), for example, obtained a higher correlation coefficient for neuroticism ($r = 0.42$, $p < 0.001$) than for the general symptom index (Symptom Checklist 90-R; $r = 0.23$, $p < 0.05$). The correlations between state or trait anxiety, however, were comparable in this study ($r = 0.35$, $p < 0.01$ and $r = 0.36$, $p < 0.01$; respectively).

This brief review of the literature suggests that state as well as trait factors affect nightmare frequency. Within the present study, the hypothesis that state factors explain the relationship between trait factors and nightmare frequency has been tested. As mentioned above, the continuity hypothesis of dreaming (cf. Schredl 1999) predicts that state factors play a more important role in explaining the variability in nightmare frequency than trait factors. Since nightmare frequency is moderately related to dream recall frequency (Belicki 1992; Chivers & Blagrove 1999), correlation coefficients of the two variables with the investigated factors were contrasted in order to rule out the possibility that dream recall frequency moderates the relationship between nightmare frequency and possible influencing factors.

A second goal of the study was the investigation of the relationship between nightmares and sleep quality. On the one hand, nightmares affect sleep directly by awakening the sleeper and are often followed by prolonged periods of wakefulness, thereby reducing sleep quality on those nights (e. g., Cellucci & Lawrence 1978; Köthe & Pietrowsky 2001). On the other hand, worries related to sleep (re-occurrence of nightmares; cf. Schredl & Pallmer 1998) might affect sleep quality even in nights without the actual occurrence of a nightmare. A marked association between nightmare frequency and poor sleep quality has indeed been demonstrated (Cirignotta et al. 1983; Levin 1994; Krakow et al. 1995a; Ohayon, Morselli & Guilleminault 1997; Stepansky et al. 1998). These studies, however, did not investigate whether nightmares are the main factor in explaining poor sleep quality or whether day-time stress affects sleep quality (cf. Schredl et al. 1998) and aggravates nightmare frequency. It was hypothesized that the correlation coefficient between nightmare frequency and sleep quality is significantly reduced when controlled for the effects of waking-life state and trait factors.

Method

Measurement instruments

Dream recall frequency (DRF) and nightmare frequency measures

Several scales measuring dream recall frequency were applied. The DRF scale was a seven-point rating scale (0 = never, 1 = less than once a month, 2 = about once a month, 3 = twice or three times a month, 4 = about once a week, 5 = several times a week and 6 = almost every morning) measuring dream recall frequency of the last months. The retest reliability of this scale for an average interval of 70 days is r = 0.83 (n = 39; Schredl 2002b). Nightmare frequency was measured twice. First, an eight-point rating scale was presented within a self-developed dream questionnaire ("How often do you experience nightmares?" 0 = never, 1 = less then once a year, 2 = about once a year, 3 = about 2 to 4 times a year, 4 = about once a month, 5 = about 2 to 3 times a month, 6 = about once a week, 7 = several times a week). The second scale was part of a sleep questionnaire (LISST; see below). The format was a Likert-type scale ranging from 1 = never to 6 = always.

Dream diary

Each participant kept a structured dream diary over a two-week period. In addition to a checklist measuring dream recall, participants were instructed to record their dream(s) as completely as possible. In addition, two four-point scales were given measuring positive or negative emotions (0 = none, 1 = mild, 2 = moderate, 3 = strong emotions). Up to five dreams were to be recorded. For each diary the medians of negative and positive emotions were determined.

Personality measures

The German version of the NEO-PI-R (Ostendorf & Angleitner 1994) comprises 240 five-point items (coded: 0 to 4) measuring the Big Five personality measures (neuroticism, extraversion, openness to experience, agreeableness and conscientiousness). The sum scores (48 items) can range from 0 to 192. The internal consistencies of the scales are high (r = 0.89 to 92) and confirmatory Multitrait-Multimethod analyses replicated the findings of the English version (Ostendorf & Angleitner 1994).

The Absorption scale (Subscale of Tellegen and Atkinson's personality inventory; Tellegen & Atkinson 1974) consists of 34 yes/no items which measure the capacity to become absorptively involved in imaginative and aesthetic experience, e. g., "I can be greatly moved by eloquent or poetic language." Sum scores were computed. Since all absorption items were scored in one direction (yes answers), 32 unrelated items measuring other personality dimensions were included in the questionnaire (as done in previous studies: e. g., Belicki & Bowers 1981). The internal consistency of the German version amounted to r = 0.854 (N = 51; Schredl, Jochum & Souguenet 1997).

The Boundary Questionnaire (Hartmann 1991) which was translated into German by the Institute of Psychology, University of Zürich, Switzerland, includes 145 five-point scales covering 12 areas (e. g., sleep/dreams, unusual experiences, thought/feeling/mood, interpersonal relationships). The total score, reflective of boundary thinness, was derived by summing the ratings (ranging from 0 to 4) of 138 items, with item reversals when appropriate. The internal consistency of the German scale was r = 0.93 (N = 152), the same as reported by Hartmann (1991) for the English version (r = 0.93, N = 966).

Sleep behavior

Two sleep questionnaires (Schlaffragebogen B; SF-B; Görtelmeyer 1986 and Landecker Inventar zur Erfassung von Schlafstörungen; LISST; Weeß, Schürmann & Steinberg 1997) were administered. The SF-B sleep questionnaire comprises 28 items measuring composite scores such as sleep quality (11 items), feeling of being refreshed in the morning (7 items) and sleep-related somatic symptoms such as jerks in legs and arms at sleep onset, nocturnal sweating and headaches in the morning. The estimates refer to the previous two weeks. The composite scores (averages) ranged from 1 to 5, since most scales of the sleep questionnaire are constructed as five-point Likert scales. The interitem consistency for the composite scores range from r = 0.77 to r = 0.87 and the retest reliability (4 weeks) was about r = 0.70 (Görtelmeyer 1986). Construct validity was shown in several factor analyses, and comparisons with expert ratings were satisfactory, for example, r = –0.67 between sleep quality and the degree of insomnia (Görtelmeyer 1986).

The LISST sleep questionnaire comprises 75 items and was constructed as a screening instrument to detect various sleep disorders. Sum scores were computed for insomnia (6 items), nocturnal breathing disorders (4 items), restless legs syndrome (5 items) and parasomnias (6 items). The single scales followed a six-point Likert scale format (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often, 6 = always). Sufficient internal consistencies as well as accurate discrimination of patients with sleep disorders (diagnosed in a sleep medicine center including two polysomnographic nights) have been demonstrated (Weeß, Schürmann & Steinberg 1997).

The sleep quality score of the SF-B and the insomnia scale of the LISST have been included in the analyses.

Stress measures

Three instruments have been applied to measure the actual stressors experienced by the subjects. The ATE-36 (Schmidt-Atzert 1989) assesses the occurrence of 19 negative events which are part of daily hassles, e. g., forgetting an important date, during the last seven days. The second instrument (EBF-72/3; Kallus 1995) comprises 42 seven-point items measuring stress present in several areas such as social interactions, emotional stress etc. during the last three days. The global stress score was derived as mean of the items. The Symptom Checklist (SCL-90-R; Derogatis 1986) with a retrospective interval of seven days was the third instrument of the present study. The general severity index (mean for all 90 four-point items) was included in the analyses. Sufficient reliability and validity for these measures have been demonstrated by the test authors (Derogatis 1986; Schmidt-Atzert 1989; Kallus 1995).

Procedure and participants

Participants were recruited at the Universities of Mannheim, Heidelberg and Landau for a study entitled "Sleep, dreams, and personality". The questionnaires and the dream diary were given to the participants who completed the questionnaires and the diary over a two-week period and returned them to one of the experimenters. Of 457 participants, 444 persons returned their materials.

Statistical analyses were carried out with the SAS 6.12 software package for Windows. Spearman rank correlations were computed for the DRF scale and the nightmare scale of the dream questionnaire because of their ordinal measurement level. The statistical tests have been carried out one-tailed since the directions of the correlations were predicted by the hypotheses.

The sample included 444 persons whose mean age was 23.5 ± 5.7 years. There were 376 women and 68 men who were mainly psychology students.

Results

Correlations

In Table 1, the results of the nightmare frequency scale (Dream Questionnaire) are presented. Of the sample, 52.2 % experienced nightmares once a month or more often, whereas 12.1 % of the participants reported that nightmares occur at least once a week. The mean of the nightmare scale (LISST) was 2.30 ± 1.10. The intercorrelation between the two nightmare frequency scales amounted to r = 0.662 (p < 0.0001). The correlation coef-

Table 1 Results of the nightmare frequency scale (Dream questionnaire)

Categories	Frequency
Never	25
Less than once a year	34
About once a year	39
About 2 to 4 times a year	113
About once a month	96
About 2 to 3 times a month	80
About once a week	41
Several times a week	12

ficients to dream recall frequency (DRF) were of small to moderate size (DRF – Nightmare frequency (DQ): $r = 0.335$, $p < 0.0001$; DRF – Nightmare frequency (LISST): $r = 0.196$, $p < 0.0001$). As expected, nightmare frequency was related to the intensity of negative emotions measured by the dream diary; positive emotions were inversely correlated with nightmare frequency, but the magnitude of the relationship was small (see Table 2). A total of 423 participants reported at least one dream during the study period.

The correlation coefficients between the nightmare frequency scales and neuroticism, general symptom index (SCL-90-R), number of negative events (ATE-36) and global stress index (EBF-72/3) factors were of medium effect size (see Table 2). All these measures did not correlate with DRF. Similar coefficients regarding DRF and nightmare frequency were found for boundary thinness and absorption, whereas openness to experience was related to DRF but not to nightmare frequency. Women tend to report nightmares more often than men (see Table 2).

Regression analyses

Five regression analyses were carried out in order to determine the effects of state and trait variables on nightmare frequency (LISST scale). Since a gender difference was detected in the present sample, this variable was included in all analyses. A total of 10 % of the variance was explained by gender and neuroticism (see Table 3). Although openness to experience, boundary thinness and absorption (in addition to gender) explained about 6 % of the variance, the most pronounced effect regarding

Table 2 Means, standard deviations (SD) and correlations for trait and state factors

Variables	Mean ± SD	DRF scale (DQ)		Nightmare freq. (DQ)		Nightmare freq. (LISST)	
		r	p	r	p	r	p
Gender (1 = female, 0 = male)	84.7 %	0.091	0.0281	0.148	0.0010	0.146	0.0010
Neuroticism	99.53 ± 23.69	0.039	0.4412[1]	0.313	0.0001	0.301	0.0001
Openness to experience	129.83 ± 15.73	0.133	0.0027	0.055	0.1244	0.064	0.0915
Boundary thinness	289.69 ± 43.19	0.141	0.0016	0.200	0.0001	0.224	0.0001
Absorption	21.64 ± 5.69	0.126	0.0040	0.132	0.0028	0.143	0.0013
General symptom index (SCL-90-R)	0.59 ± 0.44	–0.028	0.5550[1]	0.287	0.0001	0.340	0.0001
General stress index (EBF-72/3)	1.84 ± 0.85	–0.018	0.7043[1]	0.274	0.0001	0.372	0.0001
Number of negative events (ATE-36)	5.56 ± 2.80	0.040	0.4017[1]	0.215	0.0001	0.274	0.0001
Median of positive dream emotions	1.27 ± 0.85	0.150	0.0021[1]	–0.093	0.0285	–0.115	0.0089
Median of negative dream emotions	1.54 ± 0.86	0.022	0.6589[1]	0.326	0.0001	0.253	0.0001

[1] probabilities two-tailed, all other values are one-tailed

Table 3 Regression analyses of factors affecting nightmare frequency (statistical test of the coefficients)

Variables	Trait 1		Trait 2		Trait 3		State		State/Trait	
	t	p	t	p	t	p	t	p	t	p
Gender (1 = female, 0 = male)	1.5	0.0719	2.5	0.0059	1.4	0.0747	2.5	0.0057	2.1	0.0207
Neuroticism	6.3	0.0001			4.9	0.0001			1.1	0.1295
Openness to experience			–1.8	0.9620	–0.8	0.7898			0.1	0.4696
Boundary thinness			3.5	0.0003	1.8	0.0358			1.0	0.1497
Absorption			1.2	0.1240	1.1	0.1284			0.3	0.3714
General symptom index (SCL-90-R)							2.8	0.0026	2.0	0.0230
General stress index (EBF-72/3)							3.1	0.0012	2.9	0.0021
Number of negative events (ATE-36)							1.1	0.1271	0.6	0.3734
R^2 adjusted		0.0980		0.0619		0.1093		0.1752		0.1749
Test (F = , p =)	24.9	0.0001	8.2	0.0001	11.7	0.0001	24.1	0.0001	12.4	0.0001

the trait measures was that of the neuroticism dimension (see Table 3: analysis Trait 3). Gender and the three stress measures accounted for 17.5 % of the total variance (see Table 3). Including the trait measures did not increase the portion of explained variance (see Table 3).

Nightmare frequency and sleep quality

For measuring sleep quality, two indices have been selected: the eleven-item sleep quality scale of the SF-B (Görtelmeyer 1986) and the six-item insomnia scale of the LISST (Weeß, Schürmann & Steinberg 1997). Both indices correlated significantly with the two nightmare frequency scales (see Table 4). Partial correlations were computed where 1) neuroticism, 2) the stress measures, general symptom index (SCL-90-R), general stress index (EBF-72/3), number of negative events (ATE-36) and 3) all four measures were partialled out. The differences between the original correlation and the partial correlations were tested by the formula given by Olkin and Finn (1995). All twelve comparisons were significant at the $p < 0.0001$ level with z-values ranging from 5.5 to –6.1. For example, the introduced partial variable(s) significantly reduced the original correlation coefficient. Two out of four coefficients are no longer significant if the three stress measures and neuroticism have been partialled out.

Discussion

The findings of the present study indicate that state factors as well as trait factors affect nightmare frequency; the effect of current stress, however, seems to be most effective.

The two items measuring nightmare frequency did not include an explicit definition of the term "nightmare" (e. g., awakening criterion). Thus, the high prevalence rates (12 % of the sample reported nightmares occurring at least once a week) should be interpreted with caution. It might be possible that the participants also included bad dreams (without awakening) in their estimates (cf. Zadra & Donderi 2000). The correlation coefficients with the influencing factors, however, were comparable to those reported by Zadra and Donderi (2000) for nightmare frequency. Within their study, the correlation between influencing factors and frequency of bad dreams was much smaller. Thus, the question whether the awakening criteria are useful and how the awakening criteria are applied by the particular dreamer is still open to future research. Sleep laboratory studies or studies using ambulatory EEG recording units may shed light on this topic. The correlation between the nightmare scales and the intensity of negative dream emotion (diary) supports the validity of the scales, although the dream diary did not explicitly elicit whether a specific dream was a nightmare or not. The findings of Zadra and Donderi (2000) indicate that the measurement method (diary vs. questionnaire scale) did not affect the correlational pattern between nightmare frequency and influencing factors.

Another methodological issue that should be discussed is the characteristics of the present sample which consisted mainly of psychology students. On the one hand, the findings might not be valid in the same way as for the general population. But, on the other hand, studying correlations in a homogeneous sample also has its advantages: the effect of possibly mediating variables such as general attitude towards psychological questionnaires should play a minor role in explaining the obtained correlational patterns. Nevertheless, a replication study in a representative sample will be of interest.

Regarding the trait measures, the neuroticism dimension showed the largest correlation coefficient with nightmare frequency and, thus, the findings of Berquier and Ashton (1992) and Zadra and Donderi (2000) have been replicated. In addition, evidence for a relationship between thin boundaries and nightmare frequency (cf. Cowen & Levin 1995; Schredl et al. 1999) was provided. Regression analyses, however, indicate that this relationship is markedly reduced if neuroticism is included in the analysis, i. e., the effect of the boundary dimension is considerably smaller than the effect of the neuroticism trait factor.

Marked correlations have been found for all three stress measures and the findings are thus consistent with previous research (e. g., Cook, Caplan & Wolowitz 1990; Stepansky et al. 1998; Zadra & Donderi 2000; Levin & Fireman 2002). The magnitude of the correlations for neuroticism and the stress factors were comparable. The portion of variance explained by the stress measures

Table 4 Correlations and partial correlations between nightmare frequency and sleep quality

Variables	Original correlation		Partial correlation (neuroticism)		Partial correlation (stress[1])		Partial correlation (neuroticism + stress[1])	
	r	p	r	p	t	p	t	p
Nightmare frequency (DQ) – Sleep quality (SF-B)	–0.264	0.0001	–0.159	0.0005	–0.155	0.0007	–0.127	0.0043
Nightmare frequency (LISST) – Sleep quality (SF-B)	–0.222	0.0001	–0.117	0.0075	–0.062	0.1020	–0.040	0.2057
Nightmare frequency (DQ) – Insomnia scale (LISST)	0.246	0.0001	0.102	0.0168	0.099	0.0193	0.060	0.1067
Nightmare frequency (LISST) – Insomnia scale (LISST)	0.401	0.0001	0.299	0.0001	0.238	0.0001	0.218	0.0001

[1] stress measures: general symptom index (SCL-90-R), general stress index (EBF-72/3), number of negative events (ATE-36)

was considerably higher than that explained by the trait measures. In addition, the regression analysis including all variables revealed that the trait factors did not increase the amount of explained variance in comparison to the regression analysis including the stress measures only. This finding supports the hypothesis that the effects of trait factors are mediated by state factors, i. e., persons with high neuroticism scores experience stress more often and their nightmare frequency is therefore elevated. On the other hand, the strong influence of current stressors supports the general continuity hypothesis of dreaming; nightmares reflect negative waking-life experiences. This underlines the notion of Zadra and Donderi (2000) of a continuum between bad dreams and nightmares. Despite the correlational design of the study, it can be assumed that stress increases nightmare frequency (although there might be interaction effects; see below) since a large variety of studies investigating the effect of experimental stress (e. g., Lauer et al. 1987; De Koninck & Brunette 1991), "real" stress (e. g., Breger, Hunter & Lane 1971), negative life events (e. g., Cartwright et al. 1984; Wood et al. 1992) or trauma (e. g., Krakow et al. 1995a) clearly indicate that stress is followed by more negatively toned dreams and nightmares.

The comparison of the correlation coefficients regarding nightmare frequency and dream recall frequency clearly showed that the relationship between neuroticism, stress measures and nightmare frequency is not mediated by dream recall frequency, although dream recall frequency was moderately associated with nightmare frequency. Solely, the coefficients for the absorption scale and thin boundaries were of similar size.

Concerning the exact temporal relationship between stress and the occurrence of nightmares, the data of the present study did not permit any interpretation since both nightmare frequency and current stress were measured retrospectively. Longitudinal studies which elicit the occurrence of nightmares and stressors on a daily basis are necessary to shed light on this topic. The conflicting results (high interindividual variability) of Cellucci and Lawrence (1978) suggest that simple relationships, e. g., actual stressors increase the probability of nightmare occurrence in the subsequent night, can not be expected. One might hypothesize a cumulative effect of day-time stressors (see the correlation of the number of daily hassles in the present study) and/or the occurrence of delayed effects, e. g., nightmares occurring some time after the stressor. The very high variability of dream content (from dream to dream) also has to be taken into account (Schredl 1998). In addition, the findings of Köthe and Pietrowsky (2001) showed that nightmares themselves can act as stressors and, thus, an interaction between waking-life stress and stress due to the occurrence of nightmares may take place.

As previously reported (e. g., Levin 1994; Ohayon, Morselli & Guilleminault 1997), the present findings also confirm that the occurrence of nightmares is associated with poor sleep quality. Whether this is a direct effect of the nightmares (sleep interruption, prolonged periods of wakefulness) or an indirect effect (fear of re-experience a nightmare) can not be answered by the present data. In order to look at this relationship more closely, longitudinal studies comparing sleep quality of nights with and without nightmares with those of controls with very low nightmare frequency are necessary. The statistical tests of the partial correlations indicate that the relationship between nightmare frequency and poor sleep quality is partly explained by neuroticism and current stress, i. e., stress decreases sleep quality and increases nightmare frequency. A portion of the shared variance, however, was not explained by the waking-life measures, especially for the insomnia scale, and, thus, it seems plausible that nightmares are an independent factor contributing to insomnia complaints. The intervention of Krakow et al. (1995b) has shown that a specific treatment technique for nightmares also improved sleep quality in this patient group.

To summarize, the findings indicate that state factors play a more important role in explaining interindividual variance of nightmare frequency in a non-clinical sample than trait factors. The results thus support the general continuity hypothesis of dreaming. The investigated relationships may contribute to an etiological model of the nightmare disorder (American Psychiatric Association 1994). It will be interesting to study the effects of cognitive-behavioral therapy (Krakow et al. 1995b) on the relationship between stress and nightmares. Keeping the benefit of this short-term intervention in mind, it seems plausible to assume that stress did not affect trained persons as strongly as untrained persons with regard to the occurrence of nightmares.

Acknowledgments This study was supported by a grant (SCHR 637/2–1) given to the author by the Deutsche Forschungsgemeinschaft (DFG).

References

1. American Psychiatric Association (1994) Diagnostic and Statistical Manual of Mental Disorders (DSM IV). American Psychiatric Association, Washington, DC
2. Bearden C (1994) The nightmare: biological and psychological origins. Dreaming 4:139–152
3. Belicki K (1992) Nightmare frequency versus nightmare distress: relation to psychopathology and cognitive style. J Abnorm Psychol 101:592–597
4. Belicki K, Bowers P (1981) The role of hypnotic ability in dream recall. Sleep Res 10:155
5. Belicki K, Chambers E, Ogilvie RD (1997) Sleep quality and nightmares. Sleep Res 26:637
6. Berquier A, Ashton R (1992) Characteristics of the frequent nightmare sufferer. J Abnorm Psychol 101:246–250
7. Bixler EO, Kales A, Soldatos CR, Kales JD, Healey S (1979) Prevalence of sleep disorders in the Los Angeles metropolitan area. Am J Psychiatry 136:1257–1262
8. Breger L, Hunter I, Lane RW (1971) The effect of stress on dreams. International Universities Press, New York
9. Carskadon MA, Wicks J, Sharkey K, Acebo C (1992) Nightmares, sleep-onset imagery, dream emotions, and ego boundaries in college students. Sleep Res 21:135

10. Cartwright RD, Lloyd S, Knight S, Trenholm I (1984) Broken dreams: a study of the effects of divorce and depression on dream content. Psychiatry 47:251–259
11. Cellucci AJ, Lawrence PS (1978) Individual differences in self-reported sleep variable correlation among nightmare sufferers. J Clin Psychol 34:721–725
12. Cernovsky ZZ (1984) Content of waking life events and of nightmare themes. Percept Mot Skills 58:899–902
13. Chivers L, Blagrove M (1999) Nightmare frequency, personality and acute psychopathology. Pers Individ Diff 27:843–851
14. Cirignotta F, Zucconi M, Mondini S, Lenzi PL, Lugaresi E (1983) Enuresis, sleepwalking and nightmares: an epidemiological survey in the Republic of San Marino. In: Guilleminault C, Lugaresi E (eds) Sleep–Wake disorders: natural history, epidemiology and long-term evolution. Raven Press, New York, pp 237–241
15. Cook CA, Caplan RD, Wolowitz H (1990) Nonwaking responses to waking stressors: dreams and nightmares. J Appl Soc Psychol 20:199–226
16. Cowen D, Levin R (1995) The use of the Hartmann boundary questionnaire with an adolescent population. Dreaming 5: 105–114
17. De Koninck J, Brunette R (1991) Presleep suggestion related to a phobic object: successful manipulation of reported dream affect. J Gen Psychol 118:185–200
18. Derogatis LR (1986) Symptom-Check-Liste (SCL-90-R). In: Collegium Internationale Psychiatriae Scalarum (ed) Internationale Skalen für Psychiatrie. Beltz, Weinheim
19. Domhoff GW (1996) Finding meaning in dreams: a quantitative approach. Plenum, New York
20. Englehart RJ, Hale DB (1990) Punishment, nail-biting and nightmares: a cross-cultural study. J Multicult Counsel Develop 18: 126–132
21. Görtelmeyer R (1986) Schlaf-Fragebogen A und B (Sf-A, Sf-B). In: Collegium Internationale Psychiatriae Scalarum (ed) Internationale Skalen für Psychiatrie. Beltz, Weinheim
22. Hartmann E (1984) The nightmare: the psychology and biology of terrifying dreams. Basic Books. New York
23. Hartmann E (1989) Boundaries of dreams, boundaries of dreamers: thin and thick boundaries as a new personality measure. Psychiatr J Univ Ott 14:557–560
24. Hartmann E (1991) Boundaries in the mind. Basic Books, New York
25. Hartmann E, Russ D, Oldfield M, Sivan I, Cooper S (1987) Who has nightmares? Arch Gen Psychiatry 44:49–56
26. Hicks RA, Bautista J, Hicks GJ (1999) Boundaries and the level of experience with six types of dreams. Percept Mot Skills 89: 760–762
27. Hublin C, Kaprio J, Partinen M, Koskenvuo M (1999) Nightmares: familial aggregation and association with psychiatric disorders in a nationwide twin cohort. Am J Med Genet 88:329–336
28. Hunt HT (1989) The multiplicity of dreams: memory, imagination and consciousness. Yale University Press, New Haven
29. Janson C, Gislason T, De Backer W, Plaschke P, Björnsson E, Hetta J, Kristbjarnason H (1995) Prevalence of sleep disturbances among young adults in three European countries. Sleep 18: 589–597
30. Kales A, Soldatos CR, Caldwell A, Charney D, Kales JD, Markel D, Cadieux R (1980) Nightmares: clinical characteristics and personality pattern. Am J Psychiatry 137:1197–1201
31. Kallus KW (1995) Erholungs-Belastungs-Fragebogen (EBF). Swets & Zeitlinger, Frankfurt
32. Köthe M, Pietrowsky R (2001) Behavioral effects of nightmares and their correlations to personality patterns. Dreaming 11: 43–52
33. Krakow B, Tandberg D, Barey M, Scriggins L (1995a) Nightmares and sleep disturbance in sexually assaulted women. Dreaming 5:199–206
34. Krakow B, Kellner R, Pathak D, Lambert L (1995b) Imagery rehearsal treatment for chronic nightmares. Beh Res Ther 33: 837–843
35. Lauer C, Riemann D, Lund R, Berger M (1987) Shortened REM latency: a consequence of psychological strain? Psychophysiology 24:263–271
36. Levin R (1994) Sleep and dream characteristics of frequent nightmare subjects in a university population. Dreaming 4: 127–137
37. Levin R, Fireman G (2002) Nightmare prevalence, nightmare distress, and self-reported psychological disturbance. Sleep 25: 205–212
38. Ohayon MM, Morselli PL, Guilleminault C (1997) Prevalence of nightmares and their relationship to psychopathology and daytime functioning in insomnia subjects. Sleep 20:340–348
39. Olkin I, Finn JD (1995) Correlations redux. Psychol Bull 118: 155–164
40. Ostendorf F, Angleitner A (1994) A comparison of different instruments proposed to measure the Big Five. Eur Rev Appl Psychol 44:45–53
41. Schmidt-Atzert L (1989) Ein Fragebogen zur Erfassung emotional relevanter Alltagsereignisse (ATE 36). Diagnostica 35: 354–358
42. Schredl M (1998) The stability and variability of dream content. Percept Mot Skills 86:733–734
43. Schredl M (1999) Die nächtliche Traumwelt: Eine Einführung in die psychologische Traumforschung. Kohlhammer, Stuttgart
44. Schredl M (2002a) Questionnaire and diaries as research instruments in dream research: methodological issues. Dreaming 12: 17–15
45. Schredl M (2002b) Messung der Traumerinnerung: siebenstufige Skala und Daten gesunder Personen. Somnologie 6:34–38
46. Schredl M, Jochum S, Souguenet S (1997) Dream recall, visual memory, and absorption in imaginings. Pers Individ Diff 22: 291–292
47. Schredl M, Morlock M, Bozzer A (1996) Kindheitserinnerungen und Träume Erwachsener. Z Psychosom Med Psychoanal 42: 25–33
48. Schredl M, Pallmer R (1997) Alpträume bei Kindern. Prax Kinderpsychol Kinderpsychiatr 46:36–56
49. Schredl M, Pallmer R (1998) Geschlechtsspezifische Unterschiede in Angstträumen von Schülerinnen und Schülern. Prax Kinderpsychol Kinderpsychiatr 47:463–476
50. Schredl M, Pallmer R, Montasser A (1996) Anxiety dreams in school-aged children. Dreaming 6:265–270
51. Schredl M, Schäfer G, Hofmann F, Jacob S (1999) Dream content and personality: thick vs. thin boundaries. Dreaming 9:257–263
52. Schredl M, Schenck W, Görtelmeyer R, Heuser I (1998) Einflußfaktoren auf die Schlafqualität bei Gesunden. Somnologie 2:99–103
53. Stepansky R, Holzinger B, Schmeiser-Rieder A, Saletu B, Kunze M, Zeitlhofer J (1998) Austrian dream behavior: results of a representative population survey. Dreaming 8:23–30
54. Tellegen A, Atkinson G (1974) Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. J Abnorm Psychol 83:268–277
55. Weeß HG, Schürmann T, Steinberg R (1997) Landecker Inventar zur Erfassung von Schlafstörungen (LISST). Unveröffentlichter Fragebogen des Schlafmedizinischen Zentrums Klingenmünster
56. Wood JM, Bootzin RR (1990) The prevalence of nightmares and their independence from anxiety. J Abnorm Psychol 99:64–68
57. Wood JM, Bootzin RR, Rosenhan D, Nolen-Hoeksma S, Jourden F (1992) Effects of the 1989 San Francisco earthquake on frequency and content of nightmares. J Abnorm Psychol 101: 219–224
58. Zadra A, Donderi DC (2000) Nightmares and bad dreams: their prevalence and relationship to well-being. J Abnorm Psychol 109:273–281
59. Zadra A, Germain A, Fleury F, Raymond I, Nielsen T (2000) Nightmare frequency versus nightmare distress among people with frequent nightmares. Sleep (Suppl) 23(2):A170