J. Sleep Res. (2004) **13,** 129–136

The relationship of nightmare frequency and nightmare distress to well-being

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Accepted in revised form 10 March 2004; received 19 November 2003

SUMMARY Nightmares can be defined as very disturbing dreams, the events or emotions of which cause the dreamer to wake up. In contrast, unpleasant dreams can be defined in terms of a negative emotional rating of a dream, irrespective of whether or not the emotions or events of the dream woke the dreamer. This study addresses whether frequency of unpleasant dreams is a better index of low well-being than is frequency of nightmares. A total of 147 participants reported their nightmare frequency retrospectively and then kept a log of all dreams, including nightmares, for 2 weeks, and rated each dream for pleasantness/unpleasantness. Anxiety, depression, neuroticism, and acute stress were found to be associated with nightmare distress (ND) (the trait-like general level of distress in waking-life caused by having nightmares) and prospective frequency of unpleasant dreams, and less so with the mean emotional tone of all dreams, or retrospective or prospective nightmare frequency. Correlations between low well-being and retrospective nightmare frequency became insignificant when trait ND was controlled for, but correlations with prospective unpleasant dream frequency were maintained. The reporting of nightmares may thus be confounded and modulated by trait ND: such confounding does not occur for the reporting of unpleasant dreams in general. Thus there may be attributional components to deciding that one has been awoken by a dream, which can affect estimated nightmare frequency and its relationship with well-being. Underestimation of nightmare frequency by the retrospective questionnaire compared with logs was found to be a function of mean dream unpleasantness and ND.

KEYWORDS definition of nightmares, nightmare distress, nightmare frequency, psychopathology, well-being

INTRODUCTION

It has often been suggested that nightmares may be indicative of an underlying psychopathology or current lack of emotional well-being, but there is considerable conflict on this in the literature. Frequency of nightmares has been related to high scores on the neurotic and psychotic scales of the Minnesota Multiphasic Personality Inventory (MMPI) (Kales *et al*., 1980), and with global, mainly neurotic psychopathology (Berquier and Ashton, 1992). Lang and O'Connor (1984) found neuroticism correlated significantly with nightmare frequency ($r = 0.26$) and intensity ($r = 0.23$), such low correlations being typical in this field. However, Hartmann *et al.* (1981, 1987) found no association between frequent nightmares and MMPI neuroticism, and Chivers and Blagrove (1999) found no significant correlation between neuroticism on the Eysenck Personality Questionnaire (EPQ) and prospective nightmare frequency as assessed by a log.

Nightmare frequency has also been associated with state anxiety (Köthe and Pietrowsky, 2001), mood and anxiety disorders (Ohayon *et al*., 1997) and incidence of suicide, anxiety, depressed mood and symptoms of life stress (Tanskanen *et al*., 2001). However, whereas Levin (1998) found that subjects having at least one nightmare per week had significantly greater trait anxiety and schizotypy than controls, there were only trends for higher state anxiety and depression. In addition, in a longitudinal study, Cellucci and Lawrence (1978) found state anxiety correlated significantly within subjects with

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the frequency of nightmares for only four of 29 subjects, and with nightmare intensity for two of the subjects, although this does indicate some support for a relationship between anxiety and nightmares.

Frequency of nightmares has also been associated with acute stress (Cernovsky, 1984a; Chivers and Blagrove, 1999; Hartmann, 1984, 1998; Pagel *et al*., 1995; Wood *et al*., 1992). Koulack and Nesca (1992) found that type A individuals had more nightmares than type B, the former being characterized in the paper as experiencing more stress: the two groups did not differ in dream recall frequency. However, Belicki (1992a) and Cernovsky (1984b) found no relationship between recent life stress and incidence of nightmares.

Some of the studies reviewed above assessed nightmare frequency retrospectively by questionnaire, some prospectively by logs, and some by both methods, and results can differ according to the method of measurement used (Schredl, 2002). For example, neuroticism correlates with level of negative emotions in dreams, as assessed by retrospective questionnaire (Bernstein & Belicki, 1995–6), and with many negatively toned dream content measures, such as worry, fear, hatred, anger and loneliness (Lang and O'Connor, 1984). However, the latter study only used a retrospective questionnaire, and the Bernstein and Belicki study did not find the neuroticism/negative dream emotions relationship when assessment was by prospective logs. A further difference between the retrospective and prospective methods is that the use of contemporaneous logs usually yields a higher nightmare frequency than estimates based on a retrospective questionnaire (Wood and Bootzin, 1990). Zadra and Donderi (2000) suggested that the underestimation of nightmare frequency by retrospective questionnaire may be due to a motivated forgetting caused by the negative emotions of nightmares, as they found such levels of underestimation do not occur for retrospective estimates of frequency of lucid and flying dreams, which do not have such negative emotional tone. However, that lucid and flying dreams are also rarer than nightmares may provide a simpler explanation for the smaller difference between their retrospective and prospective estimates of frequency. This simpler explanation would be expected from effects of more ordinary forgetting over time or simple focusing of attention caused by keeping the log, as described by Schredl (2002).

The studies reviewed above also differed in the definitions used for nightmares. For example, Belicki (1992a) defined them as 'very disturbing dreams, involving any unpleasant emotion, which are usually vividly recalled', and Cernovsky (1984a,b) used 'any frightening dream'. Some researchers have defined nightmares as highly disturbing dreams, where the negative emotion awakens the dreamer, and using this definition Zadra and Donderi (2000) found that nightmare frequency has higher correlations with psychopathology and well-being measures than does the frequency of distressing dreams where the emotion does not wake the dreamer (termed bad dream frequency). They state that this supports the inclusion of this cause of waking criterion in the definition of nightmares, which are then a rarer and possibly more intense type of distressing dream. However, this raises the question of whether frequency of all distressing dreams, whether or not the negative emotion or events of the dream woke the dreamer, may be an even better index of low well-being than is nightmare frequency that uses the awakening criterion. It is possible that the results of Zadra and Donderi (2000) were confounded by nightmares and bad dreams having different levels of distressing emotions or imagery, with nightmares that wake people up possibly being more negatively toned, and it being this negative emotional tone that is really associated with low well-being. Indeed, Levin and Fireman (2002a) found that nightmare frequency correlations with psychopathology are greatly reduced by partialling out the mean emotional tone of the nightmares, with this emotional tone being a better predictor of low well-being than is nightmare frequency.

There is further evidence for emotional tone of dreams being related to low well-being: Zadra *et al*. (1995) found trait anxiety correlated negatively with the ratio of positive to negative dream affect. However, Blagrove and Price (2000) found only a marginally significant small correlation between emotional tone of dreams and waking happiness-depression, and whereas Levin and Fireman (2001–2) found propensity for guilty fear-of-failure daydreams was significantly correlated with nightmare frequency and with emotional tone of nightmares, after regression there was only a significant correlation with nightmare frequency.

In addition to differing in method of measuring frequency and in definition of nightmares, many of the papers reviewed earlier did not take account of the trait of nightmare distress (ND). This trait was first measured by Wood and Bootzin (1990) with a single question of whether subjects have a problem with nightmares, 19.5% of their respondents reported that they do, there being no significant sex difference. ND correlated $r = 0.38$ with nightmare frequency as measured by a 2-week log, and $r = 0.59$ with nightmare frequency from 12-month retrospective reports. There was no relationship between ND and trait anxiety, and the authors ask whether ND is related to state anxiety and is more a function of personality than of nightmare content.

Nightmare distress refers to the extent to which nightmares have a negative waking effect, and in the Belicki (1992b) scale it is measured by items such as whether the individual is frightened of going to sleep, avoids people who have been in their nightmares, or would seek a therapy that will stop the nightmares. It has only a low correlation ($r = 0.26$) with nightmare frequency (Belicki, 1992a). ND is greater in individuals high in neuroticism (Claridge *et al*., 1997; Lang and O'Connor, 1984), and in those with high scores on the Stress-Related Problems Scale, which assesses various bodily, anxiety and pain symptoms (Madrid *et al*., 1999). ND, but not nightmare frequency, correlates significantly with psychological adjustment (Belicki, 1992a), stress-related symptoms (Zadra *et al*., 2000) and neuroticism and physical complaints (Köthe and Pietrowsky, 2001). Levin and Fireman (2002b) found that nightmare frequency was correlated with trait ND ($r = 0.47$) but not with state ND ($r = 0.21$), the latter being

akin to the dream emotional tone measure used in the present study. They conclude that nightmare frequency is related more to how individuals view their dreams in general (e.g. their ND score) than with the characteristics of the actual dream or nightmare itself. However, their measurement of state dream distress was performed only on nightmares, which may have resulted in a lack of variance in that variable; the present study will assess emotional tone for all dreams.

Given the conflicts in the literature we aimed to investigate in one study the relationship of low well-being with retrospective and prospective nightmare frequency, frequency of unpleasant dreams, and with the mean emotional tone of all dreams, including nightmares. Importantly, the participants' judgement of dream emotional tone was made on a rating scale separately from any decision about whether they were woken by the dream, which thus may reduce attributional and halo effects in the making of these two judgements. This method allowed us to compare nightmare frequency (using the cause of waking criterion) with the frequency of all disturbing dreams (here termed unpleasant dream frequency, UPDF), as indices of low well-being, the latter definition not using the cause of waking criterion. Well-being was assessed by self-report measures of anxiety, depression, neuroticism and acute stress.

There were four hypotheses:

Hypothesis 1: The underestimation of nightmare frequency by retrospective questionnaires is related to the mean emotional tone of the participants' dreams, and to trait ND.

Hypothesis 2: Low well-being is related to frequency of nightmares, frequency of unpleasant dreams, and to mean emotional tone of dreams.

Hypothesis 3: There is an association between low well-being and ND.

Hypothesis 4: Nightmare distress is a modulator of correlations between nightmare frequency and low well-being.

METHOD

Participants

We recruited 147 participants (females = 124, males = 23, mean age = 23.76 years, SD = 11.39, range = 17–83) from members and associates of the university population. They were not paid for participation. To be included in the study they had to report remembering at least one dream (which could be a nightmare) per month.

Materials

Participants were assessed for neuroticism by the Eysenck Personality Questionnaire-RS (EPQ-RS, 12 items, scores range from 0 to 12; Eysenck and Eysenck, 1991), anxiety and depression during the past week by the bipolar Profile of Mood States (POMS-BI, 12 items each, scores range from 0 to 36; Lorr and McNair, 1980), and acute stress/psychopathology by the General Health Questionnaire (GHQ, 12 items, scores range from 0 to 12; Goldberg and Williams, 1988). The GHQ is a global measure of acute psychological distress, assessing 'inability to carry out one's normal 'healthy' functions, and the appearance of new phenomena of a distressing nature' (Goldberg and Williams, 1988). Scores are associated with general and work stress and social competence (Cook *et al.*, 1996). Goldberg *et al.* (1976) found that the GHQ correlates highly with the SCL-36, and that both tests have very similar correlations with various other psychopathology ratings, both scales covering psychophysiological symptoms and minor affective disorders, with the GHQ also having items covering role satisfaction and outwardly observable behaviour. ND was measured by the Belicki (1992b) questionnaire (13 items, scores range 0–52).

The dream log consisted of 14 sections, one to be completed each consecutive morning for 2 weeks. Each section had a first question 'Did you have a nightmare?' and a second question 'Did you have a dream that wasn't a nightmare?' If the response was yes the participant rated 'how pleasant or unpleasant the dream felt to you during the dream' on a 7-point scale of very pleasant (1) to very unpleasant (7) (Hedonic Tone scale, Foulkes *et al.*, 1966). Unpleasantness was used rather than other more specific terms such as frightening so as to be inclusive of the many types of possible negative emotions.

Procedure

All participants first completed the EPQ-RS, POMS-BI and GHQ. Participants were then told that a nightmare is a 'very disturbing dream in which the unpleasant visual imagery and/or emotions wake the person up' (definition from Zadra and Donderi, 2000), and the difference between nightmares and night terrors was explained, so that the latter were excluded. Participants completed a retrospective questionnaire on their frequency of recalling dreams and frequency of nightmares. If they reported having nightmares, they completed Belicki's (1992b) ND questionnaire. Participants then completed the log each morning for 2 weeks, recording their incidence of dreams and nightmares and rating the emotional tone of each. From this log the frequency of nightmares, and the frequency of all dreams rated very or moderately unpleasant (termed unpleasant dreams), could be assessed, as well as the mean emotional tone of all dreams.

RESULTS

On the retrospective questionnaire participants reported having a mean of 1.62 nightmares per month (SD = 2.19, range = 0–10 per month): 29% reported not having nightmares, or having less than one per year, 37% had from one per year up to one per month, and 34% more than one per month. Over the 2 weeks of the log 42% had at least one nightmare, nightmares were recalled on a mean of 0.91 nights (SD = 1.48, range = 0–9), equivalent to 1.98 (SD = 3.22) nightmares per month.

Of the 43 participants who reported retrospectively that they do not have nightmares, 37 had none during the 2-week log period, four had one nightmare, and two had two nightmares. For those 104 participants who reported retrospectively having at least one nightmare per year, logs produced a mean estimate of nightmare frequency 25% higher than the questionnaires. Individual differences in the ratio of estimates of nightmare frequency made by logs to estimates made by retrospective questionnaires did not correlate significantly with well-being variables, but did correlate with ND ($r = 0.21$, df = 100, $P = 0.037$) and with mean emotional tone of dreams ($r = 0.21$, df = 99, $P = 0.032$, sex and age partialled out in these correlations). However, as these latter variables are correlated with retrospective nightmare frequency, we reran the correlations with retrospective nightmare frequency partialled out, ratio of frequencies on logs to retrospective frequency on questionnaires then correlated significantly with ND ($r = 0.25$, df = 99, $P = 0.013$) and mean tone of dreams ($r = 0.23$, df = 98, $P = 0.021$). These correlations indicate that underestimation of nightmare frequency by retrospective questionnaires is a function of trait and state ND, supporting hypothesis 1.

Unpleasant dreams were defined as any dream (including nightmares) rated 6 or 7 on the Hedonic Tone scale, that is, as moderately or very unpleasant. Mean UPDF was 1.54 (SD = 1.79) over the 2 weeks, and 65% of participants had at least one unpleasant dream.

Females reported significantly more unpleasant dreams on the log than did males [$F = 1.69$ (SD = 1.85); $M = 0.70$ (SD = 1.06), Mann–Whitney $U = 917.0$, $z = 2.81$, $P = 0.005$] and significantly more nightmares on the retrospective questionnaire than males [$F = 1.79$ (SD = 2.29), $M = 0.71$ (SD = 1.17), Mann–Whitney $U = 965.5$, $z = 2.50$, $P = 0.012$]. There were no significant sex differences on log-assessed nightmare frequency, mean emotional tone of dreams, neuroticism, depression, anxiety, acute stress or ND. Age did not correlate significantly with log or questionnaire nightmare frequency (QNF), nor with UPDF, but it had significant negative correlations with neuroticism, depression and stress. Frequency of non-nightmare dreams, and of non-unpleasant dreams, had very small insignificant correlations with low well-being variables.

Table 1 shows the summary statistics for dream and low well-being variables. Sample mean for neuroticism accorded with means reported by Eysenck and Eysenck (1991, p. 23, Table 6) for males and females (aged 16–70 years) of 4.95 (SD = 3.44) and 5.90 (SD = 3.14), respectively, and POMS means were comparable with normative means in a sample of undergraduate students with a higher proportion of women than men of anxiety = 11.74 and depression = 12.24 (derived from Lorr and McNair, 1980, p. 5, Table 2). Table 2 shows that individuals who report nightmares, either on the retrospective questionnaire or the logs, in general have lower well-being scores than those who do not report nightmares. For the retrospective questionnaire there is a decrease in well-being with increasing nightmare frequency, as there is on the logs for the groups defined by UPDF. These results support hypothesis 2. However, although those recording no nightmares on the logs have lower well-being scores than those with nightmares, there is no clear difference between those with one, and those with more than one nightmare on the logs. Sex was used as a factor and age as a covariate in the inferential statistics, but in most cases had no significant effect.

Table 3 shows that low well-being has highest Pearson correlations with trait ND, supporting hypothesis 3, and UPDF; next in magnitude are correlations with mean emotional tone of dreams, and correlations with QNF and log nightmare frequency (LNF) are smallest. There were no systematic differences between males and females, between participants high and low in neuroticism, or between participants high and low in trait ND, in size of these correlation coefficients. These Pearson correlations were checked against Spearman correlations due to the nightmare and unpleasant dream distributions being non-normal. In general, Pearson correlations were close to Spearman correlations.

Table 4 shows that when ND is partialled out the correlations between nightmare frequency and the low well-being variables become very small, whereas when either of the nightmare frequency measures is partialled out of the ND/low well-being correlations, only small decrements occurred. These results support hypothesis 4.

Table 5 shows the correlations of mean dream emotional tone with low well-being variables when ND, retrospective QNF, prospective LNF and UPDF are partialled out, and correlations of UPDF with low well-being variables when dream emotional tone is partialled out. Tables 4 and 5 show that UPDF and ND were the main correlates of the low well-being measures. This conclusion was confirmed when multiple

Table 1 Descriptive statistics of low well-being and nightmare and dream variables

	n	*Mean*	*SD*	*Minimum*	*Maximum*
Neuroticism	147	7.07	3.25	0	12
Depression	147	16.76	7.73	1	32
Anxiety	147	16.95	6.68	1	33
Stress	147	3.94	3.47	0	12
Retrospective nightmare frequency per month	147	1.62	2.19	0	10
Log nightmare frequency per 2 weeks	147	0.91	1.48	0	9
Diary unpleasant dream frequency per 2 weeks	147	1.54	1.80	0	10
Mean emotional tone all dreams	140	4.00	0.77	2.43	6.00
Nightmare suffering	104	17.70	8.94	0	50

Table 2 Well-being scores for conditions defined by number of nightmares (NM) on retrospective questionnaires and by number of nightmares and unpleasant dreams (UPD) on prospective logs

	NM frequency on retrospective questionnaire				
	Never (n = 43)	*At least once per month, n = 54*	*More than once per month, n = 50*	*F(2,140)*	*P*
Neuroticism	5.63[ab] (3.70)	7.46[b] (2.68)	7.90[a] (3.03)	5.141	0.007
Depression	14.02[a] (7.99)	16.37[b] (6.95)	19.52[ab] (7.52)	4.316	0.015
Anxiety	14.56[a] (6.66)	16.96[b] (6.35)	18.98[ab] (6.50)	4.201	0.017
GHQ-Stress	3.02[a] (3.63)	3.74 (3.21)	4.94[a] (3.43)	1.929	0.149
	NM recorded on 2-week log				
	None, $n = 86$	1 NM, $n = 27$	>1 NM, $n = 34$	*F*(2,140)	*P*
Neuroticism	6.67 (3.28)	6.81 (3.35)	8.29 (2.83)	1.320	0.271
Depression	15.73[a] (7.55)	19.74[a] (8.55)	16.97 (7.07)	3.402	0.036
Anxiety	15.92[a] (6.70)	19.11[a] (6.59)	17.82 (6.35)	2.675	0.072
GHQ-Stress	3.55[a] (3.34)	4.81[a] (3.82)	4.24 (3.47)	3.016	0.052
	NM recorded on 2-week log				
	None, $n = 86$	1 or >1 NM, $n = 61$		*F*(1,142)	*P*
Neuroticism	6.67 (3.28)	7.64 (3.14)		3.306	0.071
Depression	15.73[a] (7.55)	18.20[a] (7.81)		5.171	0.024
Anxiety	15.92[a] (6.70)	18.39[a] (6.44)		5.04	0.026
GHQ-Stress	3.55[a] (3.34)	4.49[a] (3.61)		5.83	0.017
	UPD recorded on 2-week log				
	None, $n = 51$	1 UPD, $n = 39$	>1 UPD, $n = 57$	*F*(2,140)	*P*
Neuroticism	5.96[a] (3.32)	7.21 (2.96)	7.98[a] (3.12)	4.231	0.016
Depression	14.24[a] (7.50)	16.26 (7.91)	19.35[a] (7.09)	2.704	0.070
Anxiety	15.20[a] (6.43)	15.69[b] (6.61)	19.37[ab] (6.33)	7.283	0.001
GHQ-Stress	3.04 (3.66)	4.13 (3.50)	4.61 (3.16)	0.650	0.524

Values are given as mean (SD). Sex is used as a factor in the ANOVAS, and age as a covariate, these had significant affects only in the following instances: age for all GHQ analyses, and for the NM log depression analyses, sex on the questionnaire and log UPDs anxiety analyses. Paired comparisons: numbers with same superscript (aa or bb) differ significantly ($P < 0.05$) on that variable.

Table 3 Correlations between low well-being variables and nightmare and unpleasant dream variables [retrospective questionnaire nightmare frequency (QNF), prospective log nightmare frequency, trait nightmare distress (ND), mean emotional tone of all dreams including nightmares, and unpleasant dream frequency (UPDF)], and correlations between nightmare and unpleasant dream variables

	QNF (df = 143)	*Log NF (df = 143)*	*ND (df = 100)*	*Mean tone (df = 136)*	*UPDF (df = 143)*
Anxiety	0.16*	0.12	0.29**	0.26**	0.35***
Depression	0.19*	0.10	0.30**	0.22**	0.32***
Neuroticism	0.19*	0.20*	0.20*	0.22**	0.26***
GHQ-Stress	0.14	0.17*	0.28**	0.12	0.25**
QNF		0.64***	0.45***	0.28***	0.41***
Log NF	0.64***		0.36***	0.34***	0.46***
ND	0.45***	0.36***		0.17	0.25**
Mean tone	0.28***	0.34***	0.17		0.63***

Correlations between well-being and dream or nightmare variables have age and sex partialled out, and correlations between dream and nightmare variables have sex partialled out. *$P < 0.05$, **$P \leq 0.01$, ***$P \leq 0.001$.

regression was run for each well-being variable, using all nightmare and unpleasant dream variables as predictors.

DISCUSSION

We have replicated the previous findings that low well-being correlates with trait ND with medium-sized correlation coefficients, and correlates with nightmare/UPDF with low to medium-sized correlation coefficients. Our retrospective nightmare frequency/low well-being correlation coefficients are comparable with those of retrospective nightmare frequency with neuroticism, anxiety, and Symptom Check List score found by Zadra and Donderi (2000). However, whereas the view of Zadra and Donderi is that nightmares, as defined with the cause of waking criterion, are an extreme type of bad dream, with a better diagnostic value for low well-being than would be obtained from bad dream frequency, we have found that frequency of all unpleasant dreams, irrespective of

Table 4 Correlations between nightmare and unpleasant dream frequency variables and low well-being variables with nightmare distress partialled out, and between nightmare distress and low well-being variables with nightmare or unpleasant dream frequency partialled out

	QNF (ND partialled out)	*ND (QNF partialled out)*	*Log NF (ND partialled out)*	*ND (log NF partialled out)*	*UPDF (ND partialled out)*	*ND (UPDF partialled out)*
Anxiety	0.04	0.24*	0.01	0.27**	0.29**	0.22*
Depression	0.06	0.25*	−0.01	0.29**	0.26**	0.24*
Neuroticism	0.11	0.13	0.14	0.14	0.22*	0.14
GHQ-Stress	0.02	0.25*	0.08	0.24*	0.19	0.23*

All dfs = 99. Sex and age are partialled out. QNF, questionnaire nightmare frequency; ND, nightmare distress; UPDF, unpleasant dream frequency. $*P < 0.05$, $**P \leq 0.01$.

Table 5 Correlations between dream emotional tone and low well-being variables with nightmare frequency (NF) and nightmare distress (ND) partialled out, and between unpleasant dream frequency (UPDF) and low well-being variables with dream tone partialled out

	Dream tone (QNF partialled out, df = 135)	*Dream tone (log NF partialled out, df = 135)*	*Dream tone (ND partialled out, df = 98)*	*Dream tone (UPDF partialled out, df = 135)*	*UPDF (dream tone partialled out, df = 135)*
Anxiety	0.22**	0.23**	0.22*	0.05	0.25**
Depression	0.18*	0.20*	0.17	0.02	0.24**
Neuroticism	0.18*	0.17	0.19	0.08	0.16
GHQ-Stress	0.09	0.07	0.08	−0.05	0.23**

Sex and age are partialled out. QNF, questionnaire nightmare frequency; ND, nightmare distress; UPDF, unpleasant dream frequency. $*P < 0.05$, $**P \leq 0.01$.

whether the individual thinks the events or emotions of the dream woke them, is an even better index of low well-being than is nightmare frequency. This is important for deciding what definition of nightmares clinicians should be advised to use.

There are various possible explanations for this result, which goes against Zadra and Donderi's view that categorizing bad dreams with nightmares weakens the distinction between individuals of high and low well-being. A first explanation is that individuals are not able to assess accurately whether the emotions or events of a dream woke them up. This would mean that, in studies where a large correlation between nightmare frequency and low well-being is found, participants may have attributed their being woken to the events of the dream because of their assessment of how unpleasant the whole dream was, or this attribution may be a function of their low well-being. A second explanation is that individuals may be able to judge accurately whether they were awoken by the events or emotions of the dream, but that such awakenings, once emotional tone of dreams is controlled for, are not related to waking well-being or psychopathology. A final somewhat counterintuitive explanation is that for the emotions of a dream to wake one up may require a shift in the dream from positive to negative emotions, thus eliciting surprise and awakening, and that nightmares that awaken the sleeper may thus have some more positive emotional content than the bad dreams which do not cause awakening. The latter two explanations accord with Zadra *et al.*'s (1995) finding of a significant correlation between trait anxiety and bad dream frequency, but not with nightmare frequency.

There is a possibility that the differences of these results from Zadra and Donderi (2000) are due to different frequencies of nightmares and unpleasant dreams in the studies, or in the samples having different levels of well-being. Our results of mean UPDF are roughly comparable with theirs, but our sample had higher mean retrospective and LNFs than theirs, and so we do not consider the difference in findings as due to any restricted range of nightmare frequencies, or general higher well-being, in our sample.

Our second finding is the greater correlation of well-being with ND than with nightmare frequency, and the reduction in correlations using nightmare frequency when ND is partialled out. Small correlations between retrospective nightmare or UPDF and well-being have often been found in the literature, such as in the retrospective studies of Belicki (1992a) and Cernovsky (1984b), which defined nightmares without the waking criterion. The latter proposed that the use of a daily or weekly log to measure nightmares (not using the awakening criterion) may produce positive correlations with waking stress, a suggestion that we have tested in this study with our unpleasant dream measure, and we confirm this suggestion.

Partialling out ND reduced the nightmare frequency/low well-being correlations, but the UPDF/low well-being correlations were maintained. This indicates that there may be attributional or confounding effects of ND on nightmare frequency and its correlations, indeed Levin and Fireman (2002a) found that whether a person reports a nightmare (their study used the awakening criterion for nightmares) is more determined by trait ND and waking attributions than by the phenomenal qualities of that specific nightmare. On this,

however, we also found that nightmare frequency is positively related to mean emotional tone of dreams as well as to ND.

The data here result in the following model of nightmare and UPDF that combines attributional and wake–sleep continuity theories (Domhoff, 2003; Schredl and Hofmann, 2003). Low well-being results in negative emotions in dreams and thus more frequent unpleasant dreams, and also correlates with trait ND. As some emotions in dreams are still positive even for low well-being individuals the frequency of unpleasant dreams has a greater association with low well-being than does mean dream emotion. Retrospective and prospective nightmare frequency, however, are partly a function of trait ND, in addition to low well-being, indeed most studies of nightmare frequency have failed to control for ND. This influence of trait ND, and the variance involved in introspection about whether the emotions of the dream woke the person up, results in nightmares being a worse predictor of well-being than are unpleasant dreams in general. It is a prediction of this model that ND correlates more highly with prospective nightmare frequency than with prospective UPDF, which accords with the data from this study, and that ND will correlate more highly with retrospective nightmare frequency than with retrospective UPDF, a prediction that should now be tested. Furthermore, people distressed by nightmares should be interviewed to compare the contributions to waking distress caused by the events and emotions that occur during the nightmare versus those events and emotions involved in causing them to awaken.

The present data do not allow us to determine directions of causality for the correlations between nightmare or unpleasant dream frequencies, ND, and waking well-being, and each correlation may be modulated by personality factors, such as thinness of personal boundaries (Hartmann, 1998). There may be a degree of tautology in the correlation between ND and low waking well-being (in that the latter may be termed general distress). However, some items on the ND scale do refer to behavioural consequences of having nightmares, rather than just affective states caused by the nightmare, which indicates that low waking well-being and trait ND are distinguishable. Indeed, Pietrowsky and Köthe (2003) find that correlations of thinness of personal boundaries with various behavioural effects of nightmares differ across a series of nightmares, and that there are cognitive components to ND, such as believing the nightmare contains a message.

We conclude that low well-being is associated with a greater frequency of unpleasant dreams, and a more negative reaction to nightmares, but less so with mean emotional tone of dreams or with the frequency of nightmares using the cause of waking criterion. We recommend that future studies utilize a range of nightmare and unpleasant dream measures, and enable participants to decide on the emotional tone of dreams separately from deciding whether the distressing emotion or dream events woke them up. Further investigation of individuals' postulated ability to judge why they were awoken from an unpleasant dream is also needed, so as to justify the inclusion of a cause of waking criterion in the definition of nightmares. Mean dream emotional tone and trait ND were associated with differences in estimation of nightmare frequency by logs and retrospective questionnaires, and hence may be confounds of retrospective frequency measures. ND also confounds correlations between nightmare frequency and well-being, which suggests an attributional component to the estimation of nightmare frequency. This indicates that treatment for alleviating nightmares in non-patient groups such as investigated here should involve treatment for the waking reaction to nightmares in addition to any method for reducing their frequency, but whether this generalizes to patient samples [e.g. post-traumatic stress disorder (PTSD) or narcoleptic patients] with a different or greater range of pathology still has to be investigated.

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