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Nightmare distress revisited: Cognitive appraisal of nightmares according to Lazarus' transactional model of stress

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ABSTRACT

Aim of the current research was to newly conceptualize nightmare distress. The special focus was on the appraisal of nightmare distress while applying a theory-driven approach based on Lazarus' transactional model of stress. It was argued that individuals feel the more distressed the more they feel threatened and harmed by their nightmares (primary appraisal according to Lazarus) and the more they lack of adequate coping skills to deal with the stressor (secondary appraisal). Based on these assumptions, the questionnaire of Cognitive Appraisal of Nightmares (CAN) was challenged empirically in two studies of patients who have experienced distressing nightmares using explorative and confirmative factor analyses ($N = 504$ and $N = 402$). Items and scales showed good psychometric properties and plausible correlations. The CAN sum score was more distinct from nightmare frequency than the frequently used Nightmare Distress Questionnaire (NDQ), underpinning that frequency and distress are both different approaches to what patients suffer from. The NDQ was particularly associated with acted out behaviors after a nightmare, while the CAN was particularly associated with physiological and emotional consequences of a nightmare. In order to obtain a multifactorial and theory-driven picture about how individuals appraise their nightmares, the CAN may be convenient.

1. Introduction

Recurrent nightmares that cause significant psychological strain are diagnosed as nightmare disorder with a prevalence of between 3% and 8% in the general public (Gieselmann et al., in press). Nightmares cause distress, anxiety, arousal, and worsened mood the subsequent day (Köthe & Pietrowsky, 2001). They are associated with disturbances in sleep quality (Krakow, 2006; Lancee, Spoormaker, & van den Bout, 2010b), daytime distress, depression (Blagrove, Farmer, & Williams, 2004; Lancee & Schrijnemaekers, 2013; Levin & Fireman, 2002), up to suicidal thoughts and attempts (Nadorff, Nazem, & Fiske, 2013).

According to Belicki (1992), "The amount of waking distress associated with nightmares" is referred to as nightmare distress. Nightmare distress is more strongly associated with general psychopathology than with the number of nightmares the individual has had (i.e., nightmare frequency; Belicki, 1992; Levin & Fireman, 2002). According to Levin and Nielsen (2007), distress occurs, if affect load, i.e. a stressor together with the individual's capacity for emotion regulation, impinges on affect distress, i.e., on a disposition to experience heightened distress. A mixture of adverse life history and genetic predispositions causes this disposition. Thus, individuals differ regarding their appraisal of nightmare distress according to individual differences in affect load and affect distress.

Empirically, nightmare distress mediated whether the nightmares caused decreases in well-being (Blagrove et al., 2004) and non-specific nightmare treatment reduced nightmare frequency only, while nightmare-specific treatment reduced both nightmare frequency and nightmare distress (Gieselmann, Böckermann, Sorbi, & Pietrowsky, 2017; van Schagen, Lancee, de Groot, Spoormaker, & van den Bout, 2015).

Despite its central role, nightmare distress is hardly defined. Past research defined it according to the distress in general (Wood & Bootzin, 1990) or to the distress during and immediately after a nightmare (Lancee & Schrijnemaekers, 2013; Lancee, Spoormaker, & van den Bout, 2010a; Spoormaker, Verbeek, Jan van den Bout, & Klip, 2005). Others point to the consequences the nightmares have on cognitions, emotions, and behaviors (Agargün et al., 1999; Davis & Wright, 2007; Pietrowsky & Köthe, 2003) or to their effects on social functioning (Krakow, 2006; Krakow et al., 2000; Schlarb, Zschoche, & Schredl, 2016; Schmid, Kröner-Borowik, Hansen, Weßlau, & Steil, 2017). The first and most frequently utilized instrument to assess nightmare distress is the Nightmare Distress Questionnaire (NDQ; Belicki, 1992), which is assumed to assess (1) general concerns about

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nightmares, (2) their impact on sleep quality, and (3) on daytime beliefs and perceptions (Böckermann, Gieselmann, & Pietrowsky, 2014). Despite its frequent utilization, methodological limitations of the NDQ have been addressed. Given that nightmare distress can vary from low to high intensity levels, it should be assessed on intensity scales (Schredl, Landgraf, & Zeiler, 2003). Thus, it is not plausible why 10 of 13 items of the NDQ have to be rated on frequency scales ranging from 1 (*always*) to 5 (*never*) rather than on intensity scales. Consequently, the association between nightmare distress and nightmare frequency decreased when frequency scales were avoided (Schredl et al., 2003).

The transactional model of stress proposed by Lazarus (1966) attempts to explain why individuals experience the same stressor differently. According to Lazarus (1966), the amount of distress the individual experiences depends on his/her primary and secondary appraisal of the stimulus. A stimulus is perceived as distressing if it threatens the individual's well-being. This primary appraisal is necessary, but it is not sufficient, given that the stimulus is perceived as distressing only if the individual lacks of adequate coping skills to deal with the stressor. This is referred to as secondary appraisal (Lazarus, 1966).

Former research applied the transactional model of stress to other stressors and demonstrated that the perceived life threat in cancer patients was more important to quality of life than the objective disease stage (Laubmeier & Zakowski, 2004) and that optimists differed from pessimists regarding secondary, but not regarding primary appraisal (Chang, 1998).

Many instruments do not account for secondary appraisal (e.g., Endler & Parker, 1990; Nolen-Hoeksema, 1991; c.f., Chang, 1998) or they measured secondary appraisal with only one single item (e.g., Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986).

Following Lazarus (1966), we attempted to assess primary and secondary appraisal of nightmare distress in a multifactorial way. These factors shall enable theory-driven manipulations of different aspects of nightmare distress and allow for experimental variations. These considerations provided the basis for the two empirical studies.

2. Study 1

Study 1 was conducted to set up factors constituting nightmare distress according to the transactional model of stress. In this vein, we wanted to extract factors representing (1) the evaluation whether the nightmares are perceived as threatening to one's well-being (*nightmare threat*), and (2) the appraisal of the consequences after one has had a nightmare (*nightmare harm*) both constituting primary appraisal. Secondly, the process of secondary appraisal is aimed at the evaluation of one's resources to cope with the stressor, the individual may (3) try to find reasons that caused the nightmares (*blame/credit*). He/she may (4) estimate, develop and rely on coping strategies to deal with the nightmares (*coping potential*), and, he/she may (5) evaluate to what degree his/her strategies may help to cope with future nightmares (*future expectancies*).

After expert ratings (see Table 1), items were handed out to individuals concerned and analyzed using exploratory factor analyses. Because nightmare frequency and nightmare distress measure different concepts (e.g., Belicki, 1992; Gieselmann et al., in press), the present measure of nightmare distress should be more distinct from nightmare frequency than the NDQ is distinct from nightmare frequency.

2.1. Methods

2.1.1. Participants

Participants were included if they were 18 years or older and if they have “experienced distressing nightmares” (there were no additional inclusion/exclusion criteria). The survey was advertised via the homepage of the university, our outpatient clinic, social networks, websites addressing sleep and nightmares, flyers on the campus, an oral presentation on nightmares addressed to the general public, local newspapers, and magazine reports. Participation was either computer administered or via paper and pencil forms. Before their participation, they gave written informed consent and they could win 50 € or 25 € (awarded twice) as incentive to participate. Access to nightmare treatment was available upon request, thus data collection was in line with the declaration of Helsinki.

Six hundred twenty-four participants filled out the questionnaire. Fifty-three of them were excluded as they did not finish the questionnaire, $n = 7$ were underage, and $n = 60$ were excluded as they reported that they were not distressed by nightmares at all. Thus, a final sample of $N = 504$ ($n = 363$ female; 72%) remained. Their age ranged between 18 and 84 years ($M = 33.29$, $SD = 12.82$), $n = 244$ (48%) held a university degree, $n = 158$ (31%) were studying or otherwise in training, $n = 185$ (37%) were working full-time and $n = 83$ (17%) were working part-time. The other $n = 78$ (15%) were at home, unemployed, or unable to work. Overall, participants reported that they have had $M = 4.20$ ($SD = 6.26$; range, 0–80) nightmares the previous month. Regarding nightmare distress (NDQ; range, 13–65, see below), they scored with $M = 43.32$ ($SD = 7.79$; range, 22–60).

Men and women did not differ in nightmare frequency, $t(497) = .79$, *n.s.*, though men indicated higher distress than women (NDQ; $M_{men} = 45.68$, $SD = 7.80$ vs. $M_{women} = 42.44$, $SD = 7.66$), $t(497) = -4.19$, $p < .001$. Furthermore, the younger the participant, the lower nightmare frequency, $r(504) = -0.22$, $p < .001$, but the higher nightmare distress, $r(504) = .12$, $p = .009$.

2.1.2. Material

2.1.2.1. Test construction. Forty-eight items were formulated to characterize the five subscales as derived from the transactional model of stress. These items were handed out to 10 clinical psychologists with comprehensive experience in nightmare treatment. They were asked to assign each item to the scale it may most likely belong to. Items were included if at least 80% of the experts classified them to the intended subscale, which accounted for 20 items. From the remaining items, nine items were rephrased and one item was moved from *coping potential* to *future expectancy* because of the expert rating. Participants were asked how much they would agree on the following statements on a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*absolutely*). Before, they read a short definition of nightmares.

2.1.2.2. Nightmare frequency. To assess nightmare frequency, participants were asked to indicate the number of nightmares they had the previous month.

2.1.2.3. Nightmare distress. The Nightmare Distress Questionnaire (NDQ; Belicki, 1992) consisted of 13 items to be rated on a 5-point Likert scale. For 10 items, the scale ranged from 1 (*always*) to 5 (*never*), for two items, the scales ranged from 1 (*not at all*) to 5 (*a great deal*), and for the remaining item, the scale ranged from 1 (*not at all interested*) to 5 (*extremely interested*). Higher values indicated higher levels of nightmare distress. Relliability was Cronbach's $\alpha = .81$.

2.1.3. Statistical analysis

An exploratory factor analysis (EFA), a principle component analysis was performed using SPSS Statistics 23 software package in order to check how these items load on the extracted factors. Because of the fact that all items were assumed to correspond to a general factor assessing nightmare distress, an oblique promax rotation (K = 4) was chosen. Factor extraction was done by a parallel analysis and confirmed by Velicer's minimum average partial (MAP) test (O'Connor, 2000) as both procedures were found to produce the most accurate results (Zwick & Velicer, 1986). Items were assigned to a factor if the corresponding factor explained more than 50% of the variance of the item, thus if a_{ij}^2(squared factor loading)/h_j^2(squared explainable item loading; commonality) > 0.50 (Fürntratt, 1969). Aim was to extract

Table 1
Initially formulated items according to Lazarus' (1966) transactional model of stress after expert rating.

	Primary appraisal
Nightmare threat	Evaluation whether the nightmares are perceived as threatening to one's well-being. 03. I feel threatened by my nightmares. 07. I am scared to go to sleep, as I could have a nightmare again. **11. My nightmares indicate that something bad could happen to me.** **16. I am prepared that my nightmares could eventually become reality.** **20. I am scared that my nightmares could come true.** 28. I think that my nightmares are threatening.
Nightmare harm	Assesses the cognitive and emotional consequences directly after one has had a nightmare. 01. After a nightmare, old memories come back. **05. When I have a nightmare and wake up, I have problems going to sleep again.** **13. After a night with a nightmare, I am more tired than usual.** 17. After a nightmare, I am aware of how vulnerable I am. 24. When I have had a nightmare, I am more nervous than usual. **30. After a nightmare, I am drenched in sweat.**
	Secondary appraisal
Blame/credit	Individuals concerned try to find reasons that may have caused the nightmares. **08. I know the reason for my nightmares.** 09. My nightmares arise from experienced negative events. **18. I have an explanation for my nightmares.** **14. I know whom/what is responsible for my nightmares.** 22.$^{+}$ I do not know why I have nightmares. 27. I know how my nightmares come about.
Coping potential	Individuals with high coping potential know how to deal with their nightmares. They have developed strategies to lower nightmare distress. If not, feelings of helplessness and panic may be the consequence. **02.$^{+}$ When I have a nightmare, I know what I have to do to overcome it.** 10. Sometimes it is not clear to me, how I should react to nightmares. 12.$^{+}$ I have developed strategies, which take away my anxiety about nightmares. 19. I do not know what I can do about my nightmares. **23.$^{+}$ I have a solution, which provides an escape from nightmares.** **26.$^{+}$ After a nightmare, I know how to cope with the stress.**
Future expectancy	Based on the evaluation of tested coping strategies, the individual appraised how and to what degree he/she is able to cope with nightmares in the future. 04.$^{+}$ I am less and less anxious about my next nightmare. 06. I will never get rid of my nightmares. 15. I do not think there is a way, which would take away my anxiety about having nightmares. 21.$^{+}$ I will be able to get to grips with my nightmares. 25. I have lost hope that there is a solution for my nightmares. 29.$^{+}$ I am confident that the phase of my nightmares will pass.

Note. Items that remained after expert estimation; items included to the final version of the questionnaire are highlighted in bold; $^{+}$: Inversed item; Introduction: "How much would you agree on the following statements?" Please code 1 (*not at all*), 2 (*a little*), 3 (*moderately*), 4 (*predominately*), 5 (*totally*).

the items for each scale that displayed the highest factor loadings together with the lowest cross-loadings. Spearman rank correlations between these factors, nightmare frequency, and the NDQ were calculated and compared according to Bortz (2006).

2.2. Results

2.2.1. Exploratory factor analysis (EFA)

Both, the parallel analysis and MAP test suggest a four-factor solution. These four factors explained 23%, 17%, 7%, and 5% of the variance, respectively, resulting in 52% of the total variance explained. They had eigenvalues of 6.99, 5.06, 1.95, and 1.59, respectively.

As shown in Table 2, all items that were ought to assess aspects of *blame/credit* loaded on the first factor. Item 1 was omitted given its high cross-loadings with the second factor ($a_{1,2}$ = .47). Though all other items appeared as adequate, items 14, 08, and 18 were used as they provided the highest factor loadings ($a_{x,1} \geq 0.85$) and acceptable cross-loadings ($a_{x,y} \leq 0.28$). Ten items displayed the highest loadings on the second factor, but items 03, 06, 07, 10, 17, 24, and 28 displayed higher cross-loadings on the third and fourth factor ($a_{x,y} \geq 0.46$). Thus, items 05, 13, and 30 remained because they provided the highest factor loadings ($a_{x,1} \geq 0.58$) and acceptable cross-loadings ($a_{x,y} \leq 0.26$). Nine items displayed the highest loadings on a third factor. According the expert ratings, these items represented both items on future expectancies and items on coping potentials. Because items on coping potential loaded more clearly on the third factor with fewer cross-loadings, those items were retained, so that items 02, 23, and 26 remained (factor loadings: $a_{x,3} \geq 0.57$; cross-loadings: $a_{x,y} \leq 0.27$). The fourth factor contained four items. Because item 15, also loaded highly on the second factor ($a_{14,2}$ = .54) and items 20, 16, and 11 remained (factor loadings: $a_{x,4} \geq 0.77$; cross-loadings: $a_{x,y} \leq 0.41$).

A second EFA that was conducted with the 12 remaining items, yielded a four-factorial structure; factor loadings were as expected (see Table 3). The factors were referred to as *blame/credit* (α = .90), *nightmare harm* (α = .67), *nightmare threat* (α = .79), and *coping potential* (α = .64). Overall reliability was α = .61.

Nightmare harm held the highest association with the NDQ, while *blame/credit* and *coping potential* were the most distinct. Surprisingly, *blame/credit* was negatively associated with nightmare frequency and the NDQ, which indicated that knowing the cause of the nightmares was associated with a higher nightmare frequency and more distress (see Table 4). To account for this and contrary to first assumptions, items of this scale were not inversed before they were integrated into the sum score. All scales of the present questionnaire correlated significantly with the total score, and correlation between the sum score and the NDQ was medium to high. The sum score was more distinct

Table 2
Factor loadings after promax rotation and explained variance of the initially formulated 30 items (Study 1, $N = 504$).

		Descriptives		Factors				
Item no.	Intended scale	*M*	*SD*	Factor 1	Factor 2	Factor 3	Factor 4	h^2
14.	3. blame/credit	2.97	1.24	**.87**	.04	.20	.12	.78
08.	3. blame/credit	2.88	1.17	**.87**	.08	.18	.09	.76
18.	3. blame/credit	3.22	1.17	**.85**	–.03	.28	.03	.75
27.	3. blame/credit	2.91	1.21	**.82**	.02	.25	.03	.69
22.	3. blame/credit	2.59	1.26	**–.80**	.04	–.22	.04	.68
09.	3. blame/credit	3.26	1.06	**.72**	.20	–.02	.16	.53
01.	2. nightmare harm	3.08	1.08	**.50**	.43	–.21	.29	.39
13.	2. nightmare harm	3.25	1.25	.17	**.72**	–.19	.17	.59
24.	2. nightmare harm	2.83	1.17	.15	**.71**	–.27	.48	.53
03.	1. nightmare threat	2.51	1.10	.13	**.71**	–.40	.46	.52
28.	1. nightmare threat	2.22	1.12	.20	**.70**	–.39	**.55**	.55
05.	2. nightmare harm	3.37	1.18	–.04	**.67**	–.26	.22	.49
07.	1. nightmare threat	1.81	1.09	.05	**.65**	–.35	.46	.45
06.	5. future expectancy	2.58	1.24	.25	**.61**	**–.57**	.40	.54
30.	2. nightmare harm	2.83	1.21	–.08	**.58**	–.18	.23	.39
10.	4. coping potential	2.99	1.13	–.15	**.57**	**–.53**	.32	.44
17.	2. nightmare harm	3.05	1.21	.31	**.50**	–.29	**.49**	.37
21.	5. future expectancy	3.28	1.13	–.04	–.42	**.73**	–.39	.56
23.	4. coping potential	2.30	1.08	.27	–.06	**.68**	–.13	.56
19.	4. coping potential	3.09	1.26	–.13	.38	**–.63**	.40	.43
29.	5. future expectancy	3.14	1.27	.00	–.26	**.63**	–.24	.41
25.	5. future expectancy	2.34	1.21	.01	.41	**–.63**	.39	.43
26.	4. coping potential	2.48	1.10	.19	–.22	**.60**	–.10	.40
02.	4. coping potential	2.67	1.19	.19	–.27	**.57**	–.11	.36
12.	4. coping potential	2.01	1.19	.31	.11	**.49**	–.08	.40
04.	5. future expectancy	2.78	1.32	**.03**	–.38	**.44**	–.17	.24
20.	1. nightmare threat	2.38	1.31	.08	.35	–.32	**.84**	.72
16.	1. nightmare threat	1.64	0.92	.14	.34	–.25	.84	.71
11.	1. nightmare threat	1.98	1.13	.06	.41	–.25	**.77**	.60
15.	5. future expectancy	2.38	1.19	.01	**.41**	**–.45**	**.47**	.31
Eigenvalues				6.99	5.06	1.95	1.59	
% variance explained				23	17	7	7	52

Note. Numbering according to the first version of the questionnaire; h^2: communalities after factor extraction; factor extraction after parallel analysis and MAP-test; factor loading of a_{ij}^2(squared factor loading)/h_j^2(squared explainable factor loading; commonality) > 0.50 and items included to the final version of the questionnaire are highlighted in bold.

Table 3
Factor loadings after promax rotation and explained variance of the 12 remaining items (Study 1, $N = 504$).

		Descriptives		Factors				
Item no.	Intended Scale	*M*	*SD*	Factor 1	Factor 2	Factor 3	Factor 4	h^2
14	3. blame/credit	2.97	1.24	**.92**	.08	–.04	.29	.60
18	3. blame/credit	3.22	1.17	**.91**	–.01	–.08	.31	.67
08	3. blame/credit	2.88	1.18	**.90**	.05	.02	.27	.80
16	2. nightmare harm	1.64	0.92	.10	**.86**	.18	–.10	.69
20	2. nightmare harm	2.38	1.31	.03	**.85**	.17	–.19	.68
11	2. nightmare harm	1.98	1.13	–.01	**.82**	.32	–.12	.85
05	1. nightmare threat	3.37	1.18	–.10	.22	**.82**	–.21	.75
13	1. nightmare threat	3.25	1.25	.13	.14	**.81**	–.10	.73
30	1. nightmare threat	2.83	1.21	–.13	.24	**.69**	–.09	.56
26	4. coping potential	2.48	1.10	.21	–.11	–.13	**.78**	.61
02	4. coping potential	2.67	1.19	.22	–.14	–.22	**.77**	.82
23	4. coping potential	2.30	1.08	.31	–.13	–.03	**.73**	.51
Eigenvalues				3.02	2.58	1.44	1.24	
% variance explained				25	21	12	10	68

Note. Numbering according to the first version of the questionnaire; h^2: communalities after factor extraction; factor extraction after parallel analysis and MAP-test; factor loading of a_{ij}^2(squared factor loading)/h_j^2(squared explainable factor loading; commonality) > 0.50 and items included to the final version of the questionnaire are highlighted in bold.

Table 4
Relevant Spearman rank correlations of the questionnaire on Cognitive Appraisal of Nightmares (CAN) and its factors with nightmare frequency and nightmare distress (NDQ; Study 1, $N = 504$).

	CAN^{+}	NDQ	Nightmare frequency
CAN nightmare threat	.56***	.50***	.20***
CAN nightmare harm	.59***	.61***	.23***
CAN blame/credit	–.57***	–.06	–.08
CAN coping potential	.67***	.31***	.12**
CAN^{+}	1	.54***	.18***
NDQ		1	.43***

Note. Nightmare frequency (previous month); CAN: Cognitive Appraisal of Nightmares; $^{+}$contrary to first hypotheses, *blame/credit* items were not inversed before they were added to the sum score; NDQ: Nightmare Distress Questionnaire. *$p < .05$ **$p < .01$ ***$p < .001$ (two-tailed).

from nightmare frequency than the NDQ was distinct from nightmare frequency, $Z = -4.40$, $p < .001$.

2.3. Discussion

With the aim to set up factors with clear and distinct factor loadings, we attempted to conceptualize nightmare distress according to Lazarus' (1966) transactional model of stress with the factors *blame/credit*, *nightmare harm*, *nightmare threat*, and *coping potential* that were extracted. Contrary to our expectations, both parallel analysis and MAP-test suggested an extraction of four instead of five factors, so that expectancies on one may deal with future nightmare was not mapped within the factorial structure. Besides, *blame/credit* was negatively associated with the other distress parameters, i.e., the more participants knew the cause of their nightmares, the higher the nightmare distress. This contradicts Lazarus (1966), who proposed that knowing the cause of a stressor lowers distress because it increases the coping options to react to the stressor. Thus, we reversed the items of *blame/credit* before we integrated them into the sum score. In addition, items of the factor *nightmare threat* that addressed the anticipatory fear that nightmares will return were not extracted and the factor only includes items that map the concern that participants' nightmares predict future events.

These scales built the questionnaire on Cognitive Appraisal of Nightmares (CAN). Internal consistency was satisfying for each scale as well as for the sum score. As suggested by Spoormaker, Schredl, and van den Bout (2006) and Schredl (2010), it was possible to create items that were more distinct from nightmare frequency than the NDQ was distinct from nightmare frequency. Primary appraisal mechanisms, i.e., *nightmare harm*, and *nightmare threat*, were the most in accordance with the NDQ. Secondary appraisal, i.e., *blame/credit* and *coping potential*, was the least represented within the NDQ.

3. Study 2

To replicate and confirm the results of Study 1 and to further account for the validity of the questionnaire on Cognitive Appraisal of Nightmares (CAN), the questionnaire was administered together with other measures of nightmare distress, sleep quality, and neuroticism. We expected to confirm its factorial structure and its associations with nightmare frequency and with the NDQ. Furthermore, we expected medium sized associations between both NDQ, CAN, and nightmare frequency, behaviors after a nightmare, neuroticism, as well as with sleep quality given that they measure different, but related constructs. In order to explore the additional value of the CAN beyond the NDQ, we tested whether the newly developed instrument was able to predict physiological and emotional effects as well as behaviors after a nightmare over and above the NDQ.

3.1. Methods

3.1.1. Participants

As in Study 1, participants who have "experienced distressing nightmares" were informed about the survey using online and offline strategies. $N = 434$ declared interest to fill out the questionnaire and procedures regarding informed consent and incentives for participation were the same as in Study 1. Nine participants were excluded from the data set as they dropped out before they finished the questionnaire; $n = 4$ were excluded as they were underage; and $n = 19$ were excluded because they indicated that they did not suffer from any nightmare distress at all. A total sample of N = 402 remained, $n = 378$ were female (87%), and they were between 18 and 77 years old ($M = 28.38$, $SD = 10.23$). One hundred and seventy-eight (41%) held a university degree, $n = 203$ (47%) were studying or otherwise in training, and $n = 169$ (39%) were working full-time or part-time. The $n = 58$ (14%) others were either on maternal leave, unemployed, or unable to work.

3.1.2. Further material

3.1.2.1. Nightmare distress. See Study 1 for details on the Nightmare Distress Questionnaire (NDQ; Belicki, 1992). Unfortunately, the internal consistency within the current sample was poor ($\alpha = .33$). Only after three items were omitted (items 5, 8, and 13), internal consistency increased to $\alpha = .85$. Item 13 that assess for interest in nightmare treatment was introduced as optional by Belicki (1992). The further omission of Items 5 and 8 surely limited the interpretability of the questionnaire.

3.1.2.2. Nightmare frequency. To assess nightmare frequency, participants indicated the number of nightmares they had the previous month.

3.1.2.3. Nightmare consequences. The Nightmare Behavior Questionnaire (NBQ; Pietrowsky & Köthe, 2003) asked for behavioral strategies participants may apply after they have had a nightmare. In the applied version, all items had to be rated on a 4-point Likert scale ranging from 1 (*I fully agree*) to 4 (*I fully disagree*). We utilized the two scales assessing physiological and emotional effects (13 items, e.g., "The nightmare induced an accelerated heart rate") and de facto acted out behaviors (8 items, e.g., "I had to talk with somebody about the nightmare"). In former work, nights with nightmares were followed by increased psychological and emotional distress and elicited behavioral coping strategies (Köthe & Pietrowsky, 2001; Pietrowsky & Köthe, 2003), indicating that both dimensions were highly relevant to nightmare disorder. Internal consistency of both scales in the current sample was $\alpha = .89$ and $\alpha = .71$, respectively.

3.1.2.4. Sleep quality. Sleep quality was assessed by the Pittsburgh Sleep Quality Inventory (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989), which was designed to retrospectively assess sleep quality over a four-week interval. The sum score was constituted by the components sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, the use of sleeping medication, and daytime functioning which were composed of time estimations and questions had to be rated on a 4-point Likert scale. Higher values indicated lower sleep quality. Internal consistency of the current sample was $\alpha = .76$.

3.1.2.5. Neuroticism. Neuroticism was assessed by the neuroticism subscale of the widely used NEO-FFI Five-Factor Inventory (Costa & McCrae, 1985) have to be rated on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). In past research, neuroticism was highly associated with nightmare distress (Blagrove et al., 2004; Köthe & Pietrowsky, 2001). Internal consistency of the current sample was $\alpha = .87$.

3.1.3. Statistical analysis

A confirmatory factor analysis (CFA) using the maximum likelihood (ML)-based method with 1000 Bollen Stine bootstrap samples (due to a failed normality assumption) was performed using AMOS 25 software package. As proposed by Beauducel and Wittmann (2005), we depicted the X^2 value, the comparative-fit-index (CFI), the standardized root mean residual (SRMR), and the root mean square error of approximation (RMSEA). According to Hu and Bentler (1999), CFI ≥ 0.95, SRMR ≤ 0.08, and RMSEA ≤ 0.06 indicated a "relatively good fit between the hypothesized model and the observed data". We tested (1) model, that consisted of one single factor assessing appraisal, (2) a model, that consisted of two factors assessing primary and secondary appraisal, and (3) a model, that consisted of four factors as suggested in Study 1, and a model that (4) again tested appraisal, but with primary and secondary appraisal as superordinate latent factors. Furthermore, we calculated correlations, compared correlations, and conducted hierarchical regression analyses to explore the additional explanatory value of the CAN.

3.2. Results

3.2.1. Descriptive statistics

Participants reported that they had $M = 6.31$ ($SD = 7.22$; range, 0–50) nightmares the previous month. Men and women did not differ in their nightmare frequency, $t(430) = .89$, *n.s.*, but women ($M = 34.87$, $SD = 5.13$) reported higher nightmare distress than men (NDQ; $M = 33.31$, $SD = 4.83$), $t(431) = 2.12$, $p = .035$. There were no associations between nightmare frequency neither between nightmare distress nor age, $r(432) \leq 0.08$, $p \geq .11$.

3.2.2. Confirmatory factor analysis (CFA)

When testing the model, in which all items represented one single factor, fit indices were $X^2(54) = 1162.090$, $p < .001$, CFI = .335; SRMR = .190, RMSEA = .218. When testing the second model, in which the items represented two factors assessing primary and secondary appraisal, fit indices were $X^2(53) = 380.55$, $p < .001$, CFI = .803; SRMR = .118, RMSEA = .120. When testing a third model, in which the items represented four factors, we obtained the best fit: $X^2(48) = 61.613$, $p = .090$, CFI = .992; SRMR = .031, RMSEA = .026 (see Fig. 1). When adding primary and secondary appraisal as superordinate latent factors, the overall model fit decreased, $X^2(54) = 183.013$, $p < .001$, CFI = .923; SRMR = .121, RMSEA = .074.

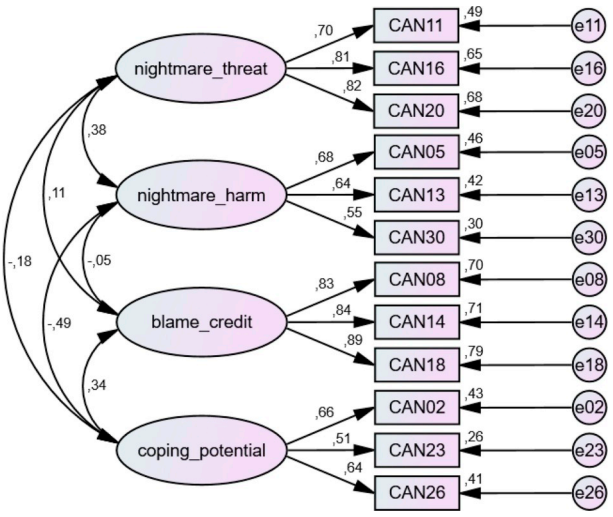

Fig. 1. Path diagram (standardized estimates) of the questionnaire on Cognitive Appraisal of Nightmares (Study 2; $N = 433$).

3.2.3. Reliability and correlates with other measures

All items explained 66% of the total variance of the second sample. Internal consistency was α = .81 for *nightmare threat*, α = .65 for *nightmare harm*, α = .89 for *blame/credit*, and α = .63 for *coping potential*. Reliability of the total score was α = .66.

Correlations of the CAN factors, the CAN sum score, and its factors with the NDQ, nightmare frequency, physiological and emotional effects (NBQ), behaviors (NBQ), sleep quality (PSQI), and neuroticism (NEO-FFI) are presented in Table 5. There were medium-sized associations between the CAN sum score and nightmare frequency, behaviors after a nightmare, neuroticism, and sleep quality, $0.40 \leq r(433) \geq 0.52$, and higher associations with the physiological effects after a nightmare. These associations were somewhat lower, but similar to the associations between the NDQ and these measures. As in Study 1, *nightmare harm* had the highest association with the NDQ, while *blame/credit* was neither associated with the NDQ nor with nightmare frequency, $r \leq 0.09$. As in Study 1, positive association between the CAN sum score and nightmare frequency was lower than the association between the NDQ and nightmare frequency, $Z = -1.84$, $p = .033$. Regarding the other measures, both CAN and NDQ were positively associated with physiological and emotional effects after a nightmare (NBQ physiol.), the enactment of behavioral coping strategies (NBQ behaviors), a worsened sleep quality, as well as with neuroticism. Among the distinct scales of the CAN questionnaire, *nightmare harm* held the highest associations with all other measures, while *nightmare harm* was still weaker associated with nightmare frequency, than the NDQ was associated with nightmare frequency, Z = −2.69, p = .040.

Applying a hierarchical regression approach to predict physiological and emotional effects after one has had a nightmare (NBQ), nightmare frequency, neuroticism (NEO-FFI), and sleep quality (PSQI) were all entered together into a first block, the NDQ was entered into a second block, and all CAN scales were entered into a third block. After the NDQ was added to the model, it made a significant contribution and increased variance by $\Delta R^2 = .20$, $F(1,414) = 266.01$, $p < .001$, so that the explanatory value of nightmare distress was over and above that of neuroticism (NEO-FFI) and sleep quality (PSQI). Furthermore, the CAN items made a significant contribution beyond nightmare frequency, neuroticism (NEO-FFI), sleep quality (PSQI), and the NDQ, $\Delta R^2 = .05$, $F(4,410) = 18.30$, $p < .001$ (see Table 6).

To predict behaviors after a nightmare (NBQ), nightmare frequency, neuroticism (NEO-FFI), and sleep quality (PSQI) were entered into a first block, the NDQ was entered into a second block, and all CAN scales were entered into a third block. After adding the NDQ, explained variance increased by $\Delta R^2 = .23$, $F(1,414) = 179.18$, $p < .001$. After the CAN items were added, incremental variance was $\Delta R^2 = .01$, which was only marginally significant $F(4,410) = 2.23$, $p = .066$. In the final model, the NDQ, *nightmare harm*, and *coping potential* contributed to the model and predicted behaviors after one has had a nightmare (NBQ), while the NDQ made the largest contribution, β = .61, $p < .001$, compared to $\beta \leq 0.11$, $p \geq .039$.

3.3. Discussion

With the use of a second sample, the selected items forming the CAN showed a good model fit and confirmed the factorial structure of the scales. As in Study 1, internal consistency was satisfactory and scales were more distinct from nightmare frequency, than the NDQ was distinct from nightmare frequency. As expected, there were medium-sized associations with nightmare frequency, behaviors after a nightmare (NBQ), neuroticism (NEO-FFI), and sleep quality (PSQI). Both CAN and NDQ correlated similarly with these measures. Among the CAN scales, *nightmare harm* held the highest associations with all other measures and the scale *blame/credit* was not associated with any other measure.

There are two limitations that need to be addressed. First, the confirmatory factor analysis was conducted contrary to Marsh, Hau, Balla, and Grayson (1998), who suggested to group at least four items

Table 5
Relevant Spearman rank correlations of the questionnaire on Cognitive Appraisal of Nightmares (CAN) and its factors with nightmare distress (NDQ), nightmare frequency, physiological and emotional effects (NBQ), behaviors (NBQ), sleep quality (PSQI), and neuroticism (NEO-FFI; Study 2, $N = 433$).

	CAN	NDQ nightmare distress	Nightmare frequency	NBQ physiol.	NBQ behaviors	PSQI sleep quality	NEO-FFI neuro-ticism
CAN nightmare threat	.64***	.50***	.25***	.53***	.35***	.30***	.35***
CAN nightmare harm	.66***	.63***	.35***	.65***	.51***	.51***	.37***
CAN blame/credit	.42***	.09	.06	.07	.09	.05	.06
CAN coping potential	.42***	.33***	.28***	.35***	.15**	.37***	.32***
CAN	1	.68***	.40***	.70***	.48***	.52***	.48***
NDQ nightmare distress	.68***	1	.50***	.80***	.69***	.57***	.48***

Note. CAN: Cognitive Appraisal of Nightmares; NDQ: Nightmare Distress Questionnaire; nightmare frequency (previous month); NBQ: Nightmare Behavior Questionnaire; PSQI: Pittsburgh Sleep Quality Index; NEO-FFI: NEO Five-Factor Inventory. *$p < .05$ **$p < .01$ ***$p < .001$ (two-tailed).

to one factor because fewer items decrease identifiability of the presented models and possible shortcomings are not represented in the overall fit indices. Second, the NDQ displayed satisfactory internal consistency only after three items were removed.

Yet, the CAN scales showed an explanatory value in the prediction of physiological and emotional effects that was beyond the explanatory value of the NDQ. When predicting de facto acted out behaviors, the additional exploratory value of the CAN items are comparably low, to the extent that the NDQ may be the better instrument to cover the assessment of de facto acted out behaviors.

4. General discussion

Aim of the current study was to newly conceptualize nightmare distress. The special focus was on the experienced intensity of distress while applying a theory-driven approach based on Lazarus' (1966) transactional model of stress.

This model explained individual reactions towards a stimulus according to the degree the individual experiences it as threatening to one's well-being (primary appraisal) and according to the appraisal of an individual's coping skills (secondary appraisal). Based on these assumptions, the scales (1) *nightmare threat* and (2) *nightmare harm* covered primary appraisal. The scales (3) *blame/credit* and (4) *coping potential* were extracted and covered secondary appraisal (see Table 7 for the final version). All of them conceptualized cognitive appraisal of nightmares in a multifactorial way. Instead of utilizing frequency scales such as most of the items of the NDQ, ratings were assessed using intensity scales and appropriate items were subsumed into the Questionnaire of Cognitive Appraisal of Nightmares (CAN).

In both studies, the four scales still showed acceptable fit indices, even though each scale consists of three items only. In both studies, the CAN sum score was more distinct from nightmare frequency than the NDQ score was distinct from nightmare frequency. This is in line with Belicki (1992) who claimed to treat nightmare distress and nightmare frequency as distinct constructs and with Schredl et al. (2003) who argued that nightmare distress is a concept based on an intensity instead of a frequency function. When predicting acted out behaviors following a nightmare, the explanatory value of the CAN items was

Table 6
Hierarchical linear regression analysis to predict physiological and emotional effects (NBQ) and behavioral coping strategies (NBQ; Study 2, $N = 433$).

	NBQ physiological and emotional effects				NBQ behaviors			
	B	*BE*	ß	ΔR^2	*B*	*BE*	ß	ΔR^2
First block				.48***				.23***
Absolute term	6.89	1.20			10.42	.82		
Nightmare frequency	.30	.04	.27***		.16	.03	.25***	
PSQI sleep	.68	.09	.31***		.25	.06	.21***	
NEO-FFI neuroticism	.30	.04	.34***		.09	.02	.17***	
Second block				.20***				.23***
Absolute term	–.33	1.04			6.11	.76		
Nightmare frequency	.10	.04	.09**		.04	.03	.06	
PSQI sleep quality	.23	.08	.11**		–.02	.06	–.01	
NEO-FFI neuroticism	.16	.03	.18***		< .01	.02	< .01	
NDQ nightmare distress	.68	.04	.61***		.40	.03	.66***	
Third block				.05***				.01
Absolute term	−3.80	1.44			6.90	1.13		
Nightmare frequency	.09	.03	.08**		.04	.03	.06	
PSQI sleep quality	.13	.07	.06		–.03	.06	–.02	
NEO-FFI neuroticism	.12	.03	.14***		.01	.02	.01	
NDQ nightmare distress	.47	.05	.42***		.38	.04	.61***	
CAN nightmare threat	.50	.08	.19***		< .01	.06	< .01	
CAN nightmare harm	.59	.10	.21***		.18	.08	.11*	
CAN blame/credit	.06	.07	.03		–.01	.05	< .01	
CAN coping potential	.12	.10	.04		–.16	.08	–.09*	

Note. B: unstandardized regression coefficient; *BE*: unstandardized error of *B*; ß: standardized regression coefficient; ΔR^2: increases in variance explained by adding predictors; NDQ: Nightmare Distress Questionnaire; CAN: Cognitive Appraisal of Nightmares; NBQ: Nightmare Behavior Questionnaire. *$p < .05$ **$p < .01$ ***$p < .001$ (two-tailed).

Table 7
The Cognitive Appraisal of Nightmares (CAN) questionnaire according to Lazarus' (1996) transactional model of stress.

The following questions deal with nightmares. Nightmares are extremely dysphoric and well-remembered dreams that usually involve efforts to avoid threats to survival, security, or physical integrity. On awakening, the individual rapidly becomes oriented and alert. Nightmares are accompanied by physiological symptoms such as sweating and shortness of breath.How much would you agree on the following statements?		Not at all	A little	Moderately	Predominately	Totally
01.$^{+}$	When I have a nightmare, I know what I have to do.	1	2	3	4	5
02.	When I have a nightmare and wake up, I have problems going to sleep again.	1	2	3	4	5
03.	I know the reason for my nightmares.	1	2	3	4	5
04.	My nightmares indicate that something bad could happen to me.	1	2	3	4	5
05.	After a night with a nightmare, I am more tired than usual.	1	2	3	4	5
06.	I know whom or what is responsible for my nightmares.	1	2	3	4	5
07.	I prepare myself that my nightmare could eventually become reality.	1	2	3	4	5
08.	I have an explanation for my nightmares.	1	2	3	4	5
09.	I am scared that my nightmares could come true.	1	2	3	4	5
10.$^{+}$	I have a solution, which provides an escape from nightmares.	1	2	3	4	5
11.$^{+}$	After a nightmare, I know how to cope with the stress.	1	2	3	4	5
12.	After a nightmare, I am drenched in sweat.	1	2	3	4	5

Note. Nightmare threat: items 04, 07, 09; *nightmare harm*: items 02, 05, 12; *blame/credit*: items 03, 06, 08; *coping potential*: 01^{+}, 10^{+}, 11^{+}. $^{+}$: inversed item.

lower than that of the NDQ, suggesting that the NDQ may be the better instrument to cover de facto acted out behaviors.

Unexpectedly, distress was higher the more evident the cause of the nightmare was. Lazarus (1966) argued that uncertainty about what has caused the distress goes, thus, not knowing the cause of a stressor should be associated with higher distress. The fact that knowing the cause of a nightmare was associated with higher nightmare distress in both studies may be due to the fact that causes often have its seeds in traumatic experiences and those who suffer from posttraumatic nightmares are more impaired than those who suffer from idiopathic nightmares (Germain & Nielsen, 2003).

4.1. Limitations and suggestions for future research

There a number of limitations that have to be named. First, both studies recruited individuals who have "experienced distressing nightmares". This should provide a low-threshold offer in order to obtain large sample sizes, but future research is needed to replicate findings in individuals diagnosed with nightmare disorder. Second, given that the CAN assesses distress and does not include an assessment of impairments in daytime functioning, it should not solely be used to screen nightmare disorder. Third, the high number of female participants should be taken into account when applying the results to a male sample because women differ from men according to their dream characteristics (Schredl, 2010), and fourth, questions on changes over time could not be answered with the reported cross-sectional design.

At the same time, the multifactorial structure of nightmare distress is beneficial, especially when studying processes during nightmare therapy in order to find out which dimensions are mostly affected by the treatment. According to the transactional model of stress (Lazarus, 1966), nightmare treatment would particularly improve secondary appraisal, rather than primary appraisal (c.f., Laubmeier & Zakowski, 2004). This may correspond to the notion that many nightmare sufferers still report to have nightmares after treatment, but that they did not suffer any more from these nightmares. Further, it corresponds to findings, that treatment is more effective the more it induces feelings of mastery in the patients (Germain et al., 2004; Kunze, Lancee, Morina, Kindt, & Arntz, 2019; Rousseau & Belleville, 2018). Within an experimental approach, the four factors that constitute nightmare distress may be manipulated by offering to the patient different information on nightmares, nightmare treatment, nightmare harm, or on the ability to cope with their nightmares. Different manipulations should result in different and predictable changes in nightmare distress. Taken together, the NDQ is a widely used and valid measurement to address nightmare distress and may be particularly associated with de facto acted out behaviors after a nightmare. In order to obtain a multifactorial and theory-driven instrument about how individuals appraise their nightmares and thus perceive their nightmare distress, the CAN may be better suited. These scales were particularly associated with the physiological and emotional effects the nightmares may cause.

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References

Agargün, M. Y., Kara, H., Bilici, M., Sava, A., Telci, M., Semiz, B., et al. (1999). The Van Dream Anxiety Scale: A subjective measure of dream anxiety in nightmare sufferers. *Sleep and Hypnosis, 1*, 204–211.

Beauducel, A., & Wittmann, W. W. (2005). Simulation study on fit indices in confirmatory factor analyses based on data with slightly distorted simple structure. *Structural Equation Modeling, 12*, 41–75. https://doi.org/10.1207/s15328007sem1201_3.

Belicki, K. (1992). Nightmare frequency versus nightmare distress: Relations to psychopathology and cognitive style. *Journal of Abnormal Psychology, 101*, 592–597. https://doi.org/10.1037/0021-843X.101.3.592.

Blagrove, M., Farmer, L., & Williams, E. (2004). The relationship of nightmare frequency and nightmare distress to well-being. *Journal of Sleep Research, 13*, 129–136. https://doi.org/10.1111/j.1365-2869.2004.00394.x.

Böckermann, M., Gieselmann, A., & Pietrowsky, R. (2014). What does nightmare distress mean? Factorial structure and psychometric properties of the nightmare distress questionnaire (NDQ). *Dreaming, 24*, 279–289. https://doi.org/10.1037/a0037749.

Bortz, J. (2006). *Statistik für Human- und Sozialwissenschaftler [Statistics for human and social sciences]*. Berlin, Germany: Springer.

Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*, 193–213. https://doi.org/10.1016/0165-1781(89)90047-4.

Chang, E. C. (1998). Dispositional optimism and primary and secondary appraisal of a atressor. *Journal of Personality and Social Psychology, 74*, 1109–1120.

Costa, P. T., Jr., & McCrae, R. R. (1985). *The NEO personality inventory manual*. Odessa, FL: Psychological Assessment Resources.

Davis, J. L., & Wright, D. C. (2007). Randomized clinical trial of chronic nightmares in trauma-exposed adults. *Journal of Traumatic Stress, 20*, 123–133. https://doi.org/10.1002/jts.20199.

Endler, N. S., & Parker, J. D. (1990). Multidimensional assessment of coping. *Journal of Personality and Social Psychology, 58*, 844–854. https://doi.org/10.1037/0022-3514.58.5.844.

Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology, 50*, 992–1003.

Fürntratt, E. (1969). Zur Bestimmung der Anzahl interpretierbarer gemeinsamer Faktoren in Faktorenanalysen gemeinsamer Daten [Determining the number of interpretable common factors in factor analyses of psychological data]. *Diagnostica, 15*, 62–75.

Germain, A., Krakow, B., Faucher, B., Zadra, A., Nielsen, T., Hollifield, M., ... Koss, M. (2004). Increased mastery elements associated with imagery rehearsal treatment for nightmares in sexual assault survivors with PTSD. *Dreaming, 14*, 195–206. https://doi.org/10.1037/1053-0797.14.4.195.

Germain, A., & Nielsen, T. (2003). Sleep pathophysiology in posttraumatic stress disorder and idiopathic nightmare sufferers. *Biological Psychiatry, 54*, 1092–1098. https://doi.org/10.1016/S0006-3223(03)00071-4.

Gieselmann, A., Ait Aoudia, M., Carr, M., Germain, A., Gorzka, R., Holzinger, B., et al. (in press). Etiology and treatment of nightmare disorder: State of the art and future perspectives. Journal of Sleep Research. doi:10.1111/jsr.12820.

Gieselmann, A., Böckermann, M., Sorbi, M., & Pietrowsky, R. (2017). The effects of an internet-based imagery rehearsal intervention: A randomized controlled trial. *Psychotherapy and Psychosomatics, 86*, 231–240. https://doi.org/10.1159/000470846.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55. https://doi.org/10.1080/10705519909540118.

Köthe, M., & Pietrowsky, R. (2001). Behavioral effects of nightmares and their correlations to personality patterns. *Dreaming, 11*, 43–52. https://doi.org/10.1023/A:1009468517557.

Krakow, B. (2006). Nightmare complaints in treatment-seeking patients in clinical sleep medicine settings: Diagnostic and treatment implications. *Sleep, 29*, 1313–1319. https://doi.org/10.1093/sleep/29.10.1313.

Krakow, B., Lowry, C., Germain, A., Gaddy, L., Hollifield, M., Koss, M., et al. (2000). A retrospective study on improvements in nightmares and post-traumatic stress disorder following treatment for co-morbid sleep-disordered breathing. *Journal of Psychosomatic Research, 49*, 291–298. https://doi.org/10.1016/S0022-3999(00)00147-1.

Kunze, A. E., Lancee, J., Morina, N., Kindt, M., & Arntz, A. (2019). Mediators of change in imagery rescripting and imaginal exposure for nightmares: Evidence from a randomized wait-list controlled trial. *Behavior Therapy, 50*, 978–993. https://doi.org/10.1016/j.beth.2019.03.003.

Lancee, J., & Schrijnemaekers, N. C. M. L. (2013). The association between nightmares and daily distress. *Sleep and Biological Rhythms, 11*, 14–19. https://doi.org/10.1111/j.1479-8425.2012.00586.x.

Lancee, J., Spoormaker, V. I., & van den Bout, J. (2010a). Cognitive behavioral self-help treatment for nightmares: A randomized controlled trial. *Psychotherapy and Psychosomatics, 79*, 371–377. https://doi.org/10.1159/000320894.

Lancee, J., Spoormaker, V. I., & van den Bout, J. (2010b). Nightmare frequency is associated with subjective sleep quality but not with psychopathology. *Sleep and Biological Rhythms, 8*, 187–193. https://doi.org/10.1111/j.1479-8425.2010.00447.x.

Laubmeier, K. K., & Zakowski, S. G. (2004). The role of objective versus perceived life threat in the psychological adjustment to cancer. *Psychology and Health, 4*, 425–437. https://doi.org/10.1080/0887044042000196719.

Lazarus, R. S. (1966). *Psychological stress and the coping process.* New York: McGrawHill.

Levin, R., & Fireman, G. (2002). Nightmare prevalence, nightmare distress, and self-reported psychological disturbance. *Sleep, 25*, 205–212. https://doi.org/10.1093/sleep/25.2.205.

Levin, R., & Nielsen, T. (2007). Disturbed dreaming, posttraumatic stress disorder, and affect distress: A review and neurocognitive model. *Psychological Bulletin, 133*, 482–528. https://doi.org/10.1037/0033-2909.133.3.482.

Marsh, H. W., Hau, K. T., Balla, J. R., & Grayson, D. (1998). Is more ever too much? The number of indicators per factor in confirmatory factor analysis. *Multivariate Behavioral Research, 33*, 181–220.

Nadorff, M. R., Nazem, S., & Fiske, A. (2013). Insomnia symptoms, nightmares and suicide risk: Duration of sleep disturbance matters. *Suicide and Life-Threatening Behavior, 43*, 139–149. https://doi.org/10.1111/sltb.12003.

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology, 100*, 569–582.

O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. *Behavior Research Methods, Instruments, & Computers, 32*, 396–402.

Pietrowsky, R., & Köthe, M. (2003). Personal boundaries and nightmare consequences in frequent nightmare sufferers. *Dreaming, 13*, 245–254. https://doi.org/10.1023/B:DREM.0000003146.11946.4c.

Rousseau, A., & Belleville, G. (2018). The mechanisms of action underlying the efficacy of psychological nightmare treatments: A systematic review and thematic analysis of discussed hypotheses. *Sleep Medicine Reviews, 39*, 122–133. https://doi.org/10.1016/j.smrv.2017.08.004.

van Schagen, A. M., Lancee, J., de Groot, I. W., Spoormaker, V. I., & van den Bout, J. (2015). Imagery rehearsal therapy in addition to treatment as usual for patients with diverse psychiatric diagnoses suffering from nightmares: A randomized controlled trial. *Journal of Clinical Psychiatry, 76*, e1105–e1113. https://doi.org/10.4088/jcp.14m09216.

Schlarb, A. A., Zschoche, M., & Schredl, M. (2016). Der Nightmare Effects Questionnaire (NEQ). Pilotstudie zu ersten psychometrischen Kennwerten bei Jugendlichen und jungen Erwachsenen [The Nightmare Effects Questionnaire (NEQ). A pilot study on the first psychometric characteristics among adolescents and young adults]. *Somnologie, 20*, 251–257. https://doi.org/10.1007/s11818-016-0086-0.

Schmid, C., Kröner-Borowik, T., Hansen, K., Weßlau, C., & Steil, R. (2017). German versions of the Nightmare Effects Survey (NES) and the Nightmare Frequency Questionnaire (NFQ): Psychometric properties in a sample of adult chronic nightmare sufferers. *Dreaming, 27*, 232–250. https://doi.org/10.1037/drm0000052.

Schredl, M. (2010). Nightmare frequency and nightmare topics in a representative German sample. *European Archives of Psychiatry and Clinical Neuroscience, 260*, 565–570. https://doi.org/10.1007/s00406-010-0112-3.

Schredl, M., Landgraf, C., & Zeiler, O. (2003). Nightmare frequency, nightmare distress and neuroticism. *North American Journal of Psychology, 5*, 345–350.

Spoormaker, V. I., Schredl, M., & van den Bout, J. (2006). Nightmares: From anxiety symptom to sleep disorder. *Sleep Medicine Reviews, 10*, 19–31. https://doi.org/10.1016/j.smrv.2005.06.001.

Spoormaker, V. I., Verbeek, I., Jan van den Bout, J., & Klip, E. C. (2005). Initial validation of the SLEEP-50 questionnaire. *Behavioral Sleep Medicine, 3*, 227–246.

Wood, J. M., & Bootzin, R. R. (1990). The prevalence of nightmares and their independence from anxiety. *Journal of Abnormal Psychology, 99*, 64–68.

Zwick, W. R., & Velicer, W. F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological Bulletin, 99*, 432–442.