Retest reliabilities for two single items measuring bad dream frequency (Pittsburgh Sleep Quality Index (PSQI)) or nightmare frequency (Mannheim Dream Questionnaire (MADRE))

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Summary. Several measures eliciting nightmare frequency have been developed over the years. Most of the measures show sufficient reliability, but some studies are based on the four-point item of the Pittsburgh Sleep Quality Index (PSQI) measuring bad dream frequency – even though reliability data for this item have not been published. The present study included a sample of N = 277 participants (wait-list control group of a sleep app study) who completed the PSQI and the nightmare frequency scale of the Mannheim Dream Questionnaire (MADRE) at baseline, at Week 6, and Week 12. Whereas the retest reliability coefficients were sufficiently high for the MADRE nightmare scale, reliability for the PSQI bad dream frequency item was not adequate. Despite the high inter-correlations between different nightmare and bad dream frequency measures, the question of validity is still open to future research, e.g., whether nightmares (with awakening at the end) or disturbing dreams (with or without awakening from the dream) should be the focus of research, especially in the context of investigating model of the nightmare disorder.

Keywords: Nightmare frequency, retest reliability, validity

1. Introduction

Nightmares are defined as "extended, extremely dysphoric, and well-remembered dreams that usually involve threats to survival, security, or physical integrity (p. 315; American Academy of Sleep Medicine, 2023)." The differentiation between nightmares and bad dreams are based on the subjective estimate whether the dream caused awakening or not: "Nightmares were defined as very disturbing dreams in which the unpleasant visual imagery and/or emotions wake you up (p. 275)" whereas "bad dreams were defined as very disturbing dreams that, though being unpleasant, do not cause you to awaken (p. 275, Zadra & Donderi, 2000)". However, using the awakening criteria has been criticized (Blagrove & Haywood, 2006) and abandoned by the diagnostic criteria of the nightmares disorders in the ICSD-3 (American Academy of Sleep Medicine, 2014). The focus is on whether frequent nightmares are causing clinically significant distress; this so defined nightmare disorder occur in 2% to 5% of representative samples (Schredl, 2023). Given this clinical significance, research has focused on etiological models of nightmares, typically modelling an interaction between disposition and stress (Gieselmann et al., 2019). This indicates that trait factors like personality dimensions as well as stress factors are associated with nightmare frequency (Levin & Nielsen, 2007). In order to correlate nightmare frequency with trait measures, nightmare mea-

sures that reliably measure inter-individual differences are needed. The next paragraph will briefly review the studies addressing the psychometric properties of nightmare frequency measures.

One debate focused on the differences found using retrospective measures vs. prospective measures to determine nightmares frequency (Wood & Bootzin, 1990). Typically, the prospective measure yielded a slightly higher number of nightmares compared to the retrospective scales; however, the differences are relatively small (d = 0.111; Zunker et al., 2015) or non-significant (d = 0.06; Robert & Zadra, 2008). The correlation coefficients between the retrospective scales and the log measures were relatively large ranging between r = .44 and r = .60 (Krakow et al., 2002; Wood & Bootzin, 1990; Zadra & Donderi, 2000), indicating that the inter-individual differences in nightmare frequency are comparable for the two measurement approaches. However, one has to keep in mind that the internal consistency (Cronbach's alpha) for a two week diary measuring nightmare frequency was relatively low: r = .61 (Wood & Bootzin, 1990) and, thus, measurement errors might have reduced the correlation between diary measure and retrospective measure. In addition, measuring nightmare frequency by keeping logs over a four-week period to obtain sufficient reliability for measuring inter-individual differences are typically not feasible for large-scaled studies; for example, the Osteoporotic Fractures in Men Study (MrOS) with N = 3,818 participants used the bad dream item of the Pittsburgh Sleep Quality Index (PSQI) (Otaiku, 2022). However, retest reliability of this single four-point scale was not published, only coefficients for the total score and the subscales (Buysse et al., 1989).

For four retrospective nightmare frequency measures reliability measures were published and will be listed in the following. The Nightmare Frequency Questionnaire (NFQ) consists of two questions about the number of nights with nightmares respective the number of nightmares on a

yearly, monthly, weekly, nightly basis (Krakow et al., 2000). The retest reliability in a small sample of nightmare sufferers for a two-week period was r = .86 (number of nightmares) and r = .90 (number of nights with nightmares) (Krakow et al., 2002). However, the high reliability might only be found in patients samples as in population-based samples nightmares occur less often and thus yield a limited variance and this can affect the correlation coefficient between the two measurement points. Agargün et al. (1999) used a single item "During the past month, how often have you had a frightening dream and awaking from it? Never, rarely, sometimes, usually, often) und reported a retest reliability of r = .84 in a mixed sample of nightmare sufferers and healthy controls. The retest interval was on average 5.3 days. Again, including patients might have yielded a high reliability coefficient as the variance regarding nightmare frequency in such a sample is very high. Schredl et al. (2014) also developed a single item for measuring nightmares frequency (an eight-point scale) and found a retest reliability of r = .751 in a large population-based sample (N = 2,929) for a two-week period. Subsequent studies using the German version or a translated version of the MADRE questionnaire yielded similar results ranging from r = 0.672 to r = .918 with retest intervals ranging from one to four weeks (Dyck et al., 2017; Kelly & Mathe, 2019; Mediano et al., 2022; Scapin et al., 2018; Stumbrys et al., 2013; Yoshioka, 2025). Even for a three-year interval, the retest reliability was quite high: r = .616 (N = 1,318) (Schredl & Göritz, 2015), indicating high stability of inter-individual differences over this time period. Lastly, Kelly and Mathe (2020) developed the Nightmare Frequency Index (NFI) with four five-point items, e.g., "I have nightmares often." (0 = Strongly disagree to 4 = Strongly agree). For the four-item version, Cronbach's alpha was r = .85 and the correlation of the total score with the MADRE nightmare frequency items was high: r = .77 (Kelly & Mathe, 2020). The internal consistency of a three-item version of the NFI was lower: r = .756 (Kelly, 2024). However, these authors did not publish a retest reliability and, thus, stability over time for the NFI total score is not known. However, the retest reliability of the first item "I have nightmares often" was quite high: r = .80 (two weeks, N = 59) (Kelly & Daughtry, 2021). To summarize, the nightmare frequency measures seems to have adequate psychometric properties, however, retest reliability coefficients in larger population-based samples have only been reported by Schredl et al. (2014). Thus, the question arises how reliably the four-point item measuring bad dream frequency is if applied in large samples (Nakajima et al., 2014; Otaiku, 2022); that is, can this item measure stable inter-individual differences in bad dream frequency.

The aim of the present study is to determine the retest reliability of two single-item scales (MADRE item and PSQI item) measuring nightmare frequency respective bad dream frequency and their intercorrelation. Differences in retest reliability coefficients were statistically tested, we hypothesized that the eight-point scale (MADRE scale) outperforms the four-point scale of the PSQI.

2. Method

2.1. Participants

Overall, 277 participants (217 women, 59 men, 1 non-binary) were included in the analysis. Their mean age was 41.84 ± 13.31 yrs. (range: 18 to 81 yrs.)

2.2. Nightmare frequency measures

The first nightmare frequency measure was taken from the Mannheim Dream Questionnaire (MADRE; Schredl et al., 2014). The eight-point rating scale ("How often did you experience nightmares recently (in the past several months)?") 0 = never, 1 = less than once a year, 2 = about once a year, 3 = about two to four times a year, 4 = about once a month, 5 = two to three times a month, 6 = about once a week, 7 = several times a week) was presented. The item included the following definition: "Nightmares are dreams with strong negative emotions that result in awakening from the dreams. The dream plot can be recalled very vividly upon awakening." The two-week retest reliability of the nightmare frequency scale was: r = .756 (Schredl et al., 2014).

The second nightmare frequency measure was part of the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989). The item 5h was formulated as follows: "During the past month, how often have you had trouble sleeping because you had bad dreams." The answering options were: 0 = Not during the past month, 1 = less than once a week, 2 = once or twice a week, and 3 = three or more times a week. A specific definition for "bad dreams" was not provided. German versions exist for a two-week and a four-week measurement interval (Backhaus et al., 2002); in the present study the original 4-week version was applied. The retest reliability for the global score of the German version (Backhaus et al., 2002) was r = .86 (retest intervals with an average of about 45 days) and comparable to the coefficient of the original version of r = .85 (retest intervals with an average of about 28 days) (Buysse et al., 1989). A specific retest coefficient for the bad dream item 5h has not yet been published.

2.3. Procedure

The sample consisted of the waiting list control group of the study published by Munt et al. (2025). In this pre-registered study, the effect of using a personalized sleep app on sleep quality in poor sleepers was tested. Potential participants completed a pre-screening questionnaire and were enrolled if they met the following inclusion criteria: age ≥ 18 years; Regensburg Insomnia Scale score of 13–24 (indicating the presence of subclinical threshold sleep problems; Crönlein et al., 2013); users of an iOS smartphone; and were not actively engaged in other treatments for sleep problems. Participants were excluded if they had an untreated psychological disorder affecting sleep (e.g. depression, anxiety disorders, bipolar disorder, schizophrenia) or current severe medical conditions (e.g. chronic pain, cancer); were using prescription or over-the-counter medications or substances that had a primary effect on sleep architecture; were using medication for other conditions (e.g. anxiety, attention deficit-hyperactivity disorder [ADHD]) that affected sleep; consumed ≥ 3 units of alcohol on ≥ 4 nights per week; consumed recreational drugs; were pregnant or breastfeeding; performed shift work; had bedtimes of less than 6 hr per night; were travelling across ≥ 2 time zones or sleeping away from home on > 7 nights during the study period; or had been recently diagnosed with a sleep disorder. The participants completed three times (baseline, Week 6, and Week 12) several questionnaires, sleep questionnaire (Görtelmeyer, 2011), the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989), the short-form Health Questionnaire (SF-12) measuring mental and physical health (Ware et al., 1996), the Perceived Stress Scale (PSS; Schneider et al.,

Table 1. Distribution of nightmare frequency (MADRE scale) for the three measurement points (N = 277).

Category	Baseline		Week 6		Week 12	
	N	Percent	N	Percent	N	Percent
Several times a week	12	4.33%	10	3.61%	4	1.44%
About once a week	19	6.86%	26	9.39%	23	8.30%
two or three times a month	42	15.16%	36	13.00%	32	11.55%
About once a month	48	17.33%	48	17.33%	49	17.69%
About two or four times a year	48	17.33%	53	19.13%	46	16.61%
About once a year	31	11.19%	23	8.30%	13	4.69%
Less than once a year	33	11.91%	28	10.11%	33	11.91%
Never	44	15.88%	53	19.13%	77	27.80%

Note. MADRE = Mannheim Dream questionnaire

2020), and the nightmare frequency scale of the Mannheim Dream Questionnaire (MADRE; Schredl et al., 2014). Only participants who completed the nightmare frequency scales at all three measurement points were included.

Statistical analysis were carried out with SAS 9.4 software package for Windows (SAS Institute, Cary, North Carolina, USA). Due to the ordinal level of the nightmare scale, Spearman rank correlations and Wilcoxon tests were computed. Differences between correlation coefficients were tested using the formula given in Warne (2020). Effect sizes were computed based on the algorithms provided by Lenhard and Lenhard (2016).

3. Results

The distributions of the MADRE nightmare scale for the three measurement points are depicted in Table 1. About 10% experienced nightmares once a week or more often. Whereas there was no difference in nightmare frequency between Baseline and Week 6 (Wilcoxon test: $z = -0.3$, $p = .793$, $d = 0.036$), nightmare frequency decreased from Baseline to Week 12 ($z = -3.9$, $p < .0001$, $d = 0.482$) and from Week 6 to Week 12 ($z = -4.0$, $p < .0001$, $d = 0.495$).

The distribution of the PSQI nightmare item for the three measurement points are shown in Table 2. About 20% of the participants reported having bad dreams causing sleep problems once a week or more often. A decrease in bad dream frequency was also found, however only the differences between baseline and Week 12 was statistically significant ($z = -2.9$, $p = .008$, $d = 0.354$), whereas the other comparisons (Baseline vs. Week 6: $z = -1.7$, $p = .089$, $d = 0.205$ and Week 6 vs. Week 12: $z = -1.4$, $p = .173$, $d = 0.169$) did not reach statistical significance.

The inter-correlations between the MADRE scale and the PSQI item were as follows: $r = .607$ (Baseline), $r = .630$ (Week 6), and $r = .694$ (Week 12). The retest reliability coefficients for the MADRE scale ranged between $r = .623$ and $r = .694$, whereas the reliability coefficients of the PSQI item were significantly smaller and ranged between $r = .342$ and $r = .510$ (see Table 3). Interestingly, the correlation coefficients between baseline values and the 12-week period values were smaller compared to the correlations baseline vs. Week 6: $z = -2.1$, $p = .0190$, one-tailed (MADRE scale) and $z = -2.4$, $p = .0087$, one-tailed (PSQI item).

4. Discussion

The findings indicate that the retest reliability indices of the four-point PSQI item measuring bad dream frequency were relatively small – considerably lower compared to the nightmare frequency scale of the MADRE. Thus, findings based on the PSQI item, e.g., Nakajima et al. (2014) or Otaiku (2022) should be viewed with caution as high measurement error variance due to low reliability can reduce correlation coefficients or even produce null correlations between the measured variable and other variables and, thus, affect the interpretation of the findings. The retest correlation coefficients for the MADRE nightmare scale in this study were a little bit lower compared to previous studies (Dyck et al., 2017; Mediano et al., 2022; Scapin et al., 2018; Schredl et al., 2014; Stumbrys et al., 2013; Yoshioka, 2025); this seem plausible as the retest interval of 6 respective 12 weeks was longer compared to periods of one to four weeks in these earlier studies. Indeed, the reliability coefficients for the 12-week interval in the present study were significant smaller compared to the 6-week interval; indicating that nightmare

Table 2. Distribution of bad dream frequency (PSQI item 5h) for the three measurement points (N = 277).

Category	Baseline		Week 6		Week 12	
	N	Percent	N	Percent	N	Percent
Three or more times a week	8	2.89%	8	2.89%	6	2.17%
Once or twice a week	61	22.02%	51	18.41%	43	15.52%
Less than once a week	129	46.57%	126	45.49%	130	46.93%
Not during the past month	79	28.52%	92	33.21%	98	35.38%

Note. PSQI = Pittsburgh Sleep Quality Index

Table 3. Retest reliabilities of the MADRE scale and the PSQI scale

Category	Retest (MADRE)[1]	Retest (PSQI)[1]	Difference between correlation coefficients
Baseline vs. Week 6	.694	.468	z = 4.8 p < .0001[2]
Baseline vs. Week 12	.623	.342	z = 5.5 p < .0001[2]
Week 6 vs. Week 12	.678	.510	z = 2.6 p = .0045[2]

Note. MADRE = Mannheim Dream questionnaire, PSQI = Pittsburgh Sleep Quality Index, [1]Spearman Rank correlations (all p < .0001), [2]one-tailed

frequency varies over time (intra-individual fluctuations) and is not as stable as personality traits. The retest correlation for nightmare frequency over a 3-yr. interval is still high (r = .616; Schredl & Göritz, 2015) but lower compared to retest reliabilities of the Big Five Personality dimensions over a two-year period (r =.798 (neuroticism), r = .747 (extraversion), r = .797 (openness to experience), r = .722 (agreeableness), and r = .724 (conscientiousness) measured in the same panel of participants (Schredl, 2021). Nevertheless, the stability of nightmare frequency supports the notion that trait factors can explain a significant portion of inter-individual differences in nightmares frequency (Levin & Nielsen, 2007).

Interestingly both measures showed that nightmare frequency respective bad dream frequency is declining over the 12-week period with a moderate effect size. Even though, a similar decline in nightmare frequency (effect size of d = 0.374) have been observed for a 3-yr interval (Schredl & Göritz, 2015), it is very likely that the major part of the decrease in the present study is explained by the statistical effect called regression to the mean. The participants were selected for having sleep problems and showed on average more nightmares compared to a representative sample (Schredl, 2025) at baseline; the effect size for this difference was large (d = 0.816). Thus, a second and third measurement would be more likely nearer the population mean. However, it should be noted that the sample did not consist of nightmare sufferers like in previous studies (Agargün et al., 1999; Krakow et al., 2002) and, thus, the smaller retest reliability coefficients found in the present study compared to the coefficients reported for the two clinical samples might reflect the lower variance in nightmare frequency found in samples not selected for having nightmares.

Even though several nightmare frequency measures (Agargün et al., 1999; Kelly & Mathe, 2020; Krakow et al., 2002; Schredl et al., 2014) show adequate reliability, the question regarding the validity of nightmare frequency measures have not been studied systematically. It seems important to provide a specific definition of nightmares like for the MADRE scale (Schredl et al., 2014); the Nightmare Frequency Index (NFI; Kelly & Mathe, 2020) based on the NExS scale (Kelly & Mathe, 2019) used a similar definition "Nightmares are defined as unpleasant and clearly remembered dreams that awaken you; after waking you quickly become alert." The basic idea behind this definition given in the MADRE and the NFI is to differentiate nightmares from night terrors – a NREM parasomnia that is characterized by sudden awakenings from REM sleep accompanied by a pronounced physiologically fear reaction but also with amnesia; therefore, recalling a vivid dream differentiates the

two phenomena quite good (American Academy of Sleep Medicine, 2023). Agargün et al. (1999) provided the definition "frightening dreams with awakening" and the SLEEP-50 questionnaire (Spoormaker et al., 2005) used "I have frightening dreams" without any further definition (the additional items addressing the awakening criterion, recall, and orientation were not included in the psychometric analyses); however, research (Robert & Zadra, 2014; Schredl & Göritz, 2018; Zadra et al., 2006) has shown that even though anxiety and panic is often but not always at the center of a nightmare, other emotions like grief, disgust, anger can also dominate a nightmare. As mentioned in the introduction, there is a distinction between bad dreams and nightmares based on the awakening criterion (Zadra & Donderi, 2000). Regarding the diagnostic criteria of the nightmare disorder, there has been a shift from "nightmares as disturbing mental experiences that generally occur during REM sleep and that often result in awakening (p. 155) in the ICSD-2 (American Academy of Sleep Medicine, 2005) to nightmares as "extended, extremely dysphoric, and well-remembered dreams that usually involve threats to survival, security, or physical integrity (p. 257)" in the ICSD-3 (American Academy of Sleep Medicine, 2014). The distinction seems of importance as bad dreams without awakening are more frequent than nightmares with awakening (Zadra & Donderi, 2000). However, both dream types can affect sleep, waking life and cause clinically significant distress (Zadra et al., 2006). The Nightmare Frequency Questionnaire (NFQ) of Krakow et al. (2002) asks "… how often you experience nightmares and disturbing dreams (p. 187)" and, thus, includes both dream types. Kelly and Mathe (2020) reported inter-correlations between different nightmare measures, their Nightmare Frequency Index (NFI) correlated with a modified version of the NFQ (r = .63), with the MADRE nightmare scale (r = .77), and with the VDAS nightmare item of Agargün et al. (1999) (r = .70). Even though, the correlations are relatively high, the question regarding validity is still open: Which nightmare measure should used, for example, in studying etiological models of nightmare disorder as the diagnostic criteria are nearer to "disturbing dreams" than to "nightmares with awakening". If no definition is provided in the questionnaire, the question what the participant define as a nightmare has also not been studied. The present findings indicate that bad dream frequency (PSQI item) and nightmare frequency (MADRE scale) are also inter-correlated (r = .607), but overall more research regarding the validity of nightmare frequency measures is needed.

To summarize, most (but not all) nightmares frequency or bad dream frequency measures show high reliability, but the question of validity is still open to future research, that is, how nightmares, bad dreams, or disturbing dreams are defined within these measures.

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Conflict of interest statement

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References

Agargün, M. Y., Kara, H., Bilici, M., Cilli, A. S., Telci, M., Semiz, Ü. B., & Basoglu, C. (1999). The Van Dream Anxiety Scale: a subjective measure of dream anxiety in nightmare sufferers. Sleep and Hypnosis, 1, 204-211.

American Academy of Sleep Medicine. (2005). The international classification of sleep disorders. (ICSD-2). AASM.

American Academy of Sleep Medicine. (2014). The international classification of sleep disorders. (ICSD-3). AASM.

American Academy of Sleep Medicine. (2023). The international classification of sleep disorders. (ICSD-3-TR). AASM.

Backhaus, J., Junghanns, K., Broocks, A., Riemann, D., & Hohagen, F. (2002). Test–retest reliability and validity of the Pittsburgh Sleep Quality Index in primary insomnia. Journal of Psychosomatic Research, 53(3), 737-740. https://doi.org/10.1016/S0022-3999(02)00330-6

Blagrove, M., & Haywood, S. (2006). Evaluating the awakening criterion in the definition of nightmares: how certain are people in judging whether a nightmare woke them up? Journal of Sleep Research, 15, 117-124. https://doi.org/10.1111/j.1365-2869.2006.00507.x

Buysse, D., Reynolds III, C., Monk, T., Berman, S., & Kupfer, D. (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

Crönlein, T., Langguth, B., Popp, R., Lukesch, H., Pieh, C., Hajak, G., & Geisler, P. (2013). Regensburg Insomnia Scale (RIS): a new short rating scale for the assessment of psychological symptoms and sleep in insomnia; Study design: development and validation of a new short self-rating scale in a sample of 218 patients suffering from insomnia and 94 healthy controls. Health and Quality of Life Outcomes, 11(1), 65. https://doi.org/10.1186/1477-7525-11-65

Dyck, S., Schredl, M., & Kühnel, A. (2017). Retest reliability study of the Mannheim Dream Questionnaire (MADRE). International Journal of Dream Research, 10(2), 173-176. https://doi.org/10.11588/ijodr.2017.2.38122

Gieselmann, A., Ait Aoudia, M., Carr, M., Germain, A., Gorzka, R., Holzinger, B., Kleim, B., Krakow, B., Kunze, A. E., Lancee, J., Nadorff, M. R., Nielsen, T., Riemann, D., Sandahl, H., Schlarb, A. A., Schmid, C., Schredl, M., Spoormaker, V. I., Steil, R., van Schagen, A. M., Wittmann, L., Zschoche, M., & Pietrowsky, R. (2019). Aetiology and treatment of nightmare disorder: State of the art and future perspectives. Journal of Sleep Research, 28(4), e12820. https://doi.org/10.1111/jsr.12820

Görtelmeyer, R. (2011). Schlaf-Fragebogen A und B - Revidierte Fassung (Sf-A/R, Sf-B/R). Hogrefe.

Kelly, W. E. (2024). Exploring the Role of a Concretizing Style and Its Manifestations in Nightmare Etiology: A Cross-Sectional Study. Psychiatry and Behavioral Sciences, 14(1), 1-10. https://doi.org/10.5455/PBS.20231217074456

Kelly, W. E., & Daughtry, D. (2021). Gender differences in retrospective nightmare frequency among young adults: Effects of nightmare distress and affective distress. International Journal of Dream Research, 14(1), 131-135. https://doi.org/10.11588/ijodr.2021.1.73786

Kelly, W. E., & Mathe, J. R. (2019). A brief self-report measure for frequent distressing nightmares: The Nightmare Experience Scale (NExS). Dreaming, 29(2), 180-195. https://doi.org/10.1037/drm0000106

Kelly, W. E., & Mathe, J. R. (2020). Comparison of single- and multiple-item nightmare frequency measures. International Journal of Dream Research, 13(2), 136-142. https://doi.org/10.11588/ijodr.2020.2.64362

Krakow, B., Hollifield, M., Schrader, R., Koss, M. R., Tandberg, D., Lauriello, J., McBride, L., Warner, T. D., Cheng, D. T., Edmond, T., & Kellner, R. (2000). A controlled study of imagery rehearsal for chronic nightmares in sexual assault survivors with PTSD: a preliminary report. Journal of Traumatic Stress, 13, 589-609. https://doi.org/10.1023/A:1007854015481

Krakow, B., Schrader, R., Tandberg, D., Hillifield, M., Koss, M. P., Yau, C. L., & Cheng, D. T. (2002). Nightmare frequency in sexual assault survivors with PTSD. Journal of Anxiety Disorders, 16, 175-190. https://doi.org/10.1016/s0887-6185(02)00093-2

Lenhard, W., & Lenhard, A. (2016). Berechnung von Effektstärken (Computing effect sizes). http://www.psychometrica.de/effektstaerke.html accessed on Oct 25, 2023. https://doi.org/10.13140/RG.2.2.17823.92329

Levin, R., & Nielsen, T. A. (2007). Disturbed dreaming, posttraumatic stress disorder, and affect distress: a review and neurocognitive model. Psychological Bulletin, 133(3), 482-528. https://doi.org/10.1037/0033-2909.133.3.482

Mediano, M., Montoro, P. R., Contreras, M. J., & Mayas, J. (2022). Assessment of a Spanish version of the Mannheim Dream questionnaire (MADRE) in a young adult Spanish sample. International Journal of Dream Research, 15(2), 184-197. https://doi.org/10.11588/ijodr.2022.2.84172

Munt, O., Schredl, M., Gottlieb, E., Fischer, S., Gautschi, D., Gahan, L., & Schoebel, C. (2025). The effects of a personalized sleep improvement app in subclinical poor sleepers: A randomized controlled trial. Journal of Sleep Research, e14445. https://doi.org/10.1111/jsr.14445

Nakajima, S., Inoue, Y., Sasai, T., Okajima, I., Komada, Y., Nomura, T., & Takahashi, K. (2014). Impact of frequency of nightmares comorbid with insomnia on depression in Japanese rural community residents: a cross-sectional study. Sleep Medicine, 15(3), 371-374. https://doi.org/10.1016/j.sleep.2013.11.785

Otaiku, A. I. (2022). Distressing dreams and risk of Parkinson's disease: A population-based cohort study. eClinicalMedicine, 48, 101474. https://doi.org/10.1016/j.eclinm.2022.101474

Robert, G., & Zadra, A. L. (2008). Measuring nightmare and bad dream frequency: impact of retrosepctive and prospective instruments. Journal of Sleep Research, 17, 132-139. https://doi.org/0.1111/j.1365-2869.2008.00649.x

Robert, G., & Zadra, A. L. (2014). Thematic and content analysis of idiopathic nightmares and bad dreams. Sleep, 37(2), 409-417. https://doi.org/10.5665/sleep.3426

Scapin, F., Dehon, H., & Englebert, J. (2018). Assessment of a French version of the Mannheim Dream questionnaire (MADRE) in a Belgian sample. International Journal of Dream Research, 11(1), 46-53. https://doi.org/10.11588/ijodr.2018.1.42597

Schneider, E. E., Schönfelder, S., Domke-Wolf, M., & Wessa, M. (2020). Measuring stress in clinical and nonclinical subjects using a German adaptation of the Perceived Stress Scale. International Journal of Clinical and Health Psychology, 20(2), 173-181. https://doi.org/10.1016/j.ijchp.2020.03.004

Schredl, M. (2021). Nightmare Distress, Beliefs about Nightmares, and Personality. Imagination, Cognition and Personality, 40(3), 177-188. https://doi.org/10.1177/0276236620934371

Schredl, M. (2023). Nightmare disorder. In C. A. Kushida (Ed.), Encyclopedia of Sleep and Circadian Rhythms (Second Edition) (pp. 110-116). Academic Press. https://doi.org/10.1016/B978-0-12-822963-7.00284-X

Schredl, M. (2025). Nightmare frequency and nightmare distress in poor sleepers: A cross-sectional study. Journal of Sleep Research, online first, e70187. https://doi.org/10.1111/jsr.70187

Schredl, M., Berres, S., Klingauf, A., Schellhaas, S., & Göritz, A. S. (2014). The Mannheim Dream questionnaire (MADRE): Retest reliability, age and gender effects. International Journal of Dream Research, 7(2), 141-147. https://doi.org/10.11588/ijodr.2014.2.16675

Schredl, M., & Göritz, A. S. (2015). Changes in dream recall frequency, nightmare frequency, and lucid dream frequency over a 3-year period. Dreaming, 25(2), 81-87. https://doi.org/10.1037/a0039165

Schredl, M., & Göritz, A. S. (2018). Nightmare themes: An online study of most recent nightmares and childhood nightmares. Journal of Clinical Sleep Medicine, 14(3), 465-471. https://doi.org/10.5664/jcsm.7002

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

Stumbrys, T., Erlacher, D., & Schredl, M. (2013). Reliability and stability of lucid dream and nightmare frequency scales. International Journal of Dream Research, 6(2), 123-126. https://doi.org/10.11588/ijodr.2013.2.11137

Ware, J. E., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: Construction of Scales and Preliminary Tests of Reliability and Validity. Medical Care, 34(3), 220-233. https://doi.org/10.1097/00005650-199603000-00003

Warne, R. T. (2020). Statistics for the Social Sciences: A General Linear Model Approach (Second Edition ed.). Cambridge University Press.

Wood, J. M., & Bootzin, R. R. (1990). The prevalence of nightmares and their independence from anxiety. Journal of Abnormal Psychology, 99, 64-68. https://doi.org/10.1037//0021-843x.99.1.64

Yoshioka, Y. (2025). Evaluating the Japanese version of the Mannheim Dream questionnaire (MADRE) in adults: Age and gender effects. International Journal of Dream Research, 18(2), 179-191. https://doi.org/10.11588/ijodr.2025.2.110477

Zadra, A. L., & Donderi, D. C. (2000). Nightmares and bad dreams: Their prevalence and relationship to well-being. Journal of Abnormal Psychology, 109, 273-281. https://doi.org/10.1037/0021-843X.109.2.273

Zadra, A. L., Pilon, M., & Donderi, D. C. (2006). Variety and intensity of emotions in nightmares and bad dreams. Journal of Nervous and Mental Disease, 194, 249-254.

Zunker, M., Althoff, H. K., Apel, J., Lässig, H. S., Schültke, L., & Schredl, M. (2015). Comparing questionnaire and diary measures for eliciting nightmare frequency. International Journal of Dream Research, 8, 129-134. https://doi.org/10.11588/ijodr.2015.2.23395