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Proposed Cut Scores for the Nightmare Experience Scale (NExS) Among Nonclinical Samples: An Analog Study

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ABSTRACT – This study employed an analog design to evaluate optimal cut scores for the Nightmare Experience Scale (NExS) to identify individuals with possible clinically salient nightmares (CSNs) in a nonclinical sample. Undergraduate participants (N = 480) completed the NExS, the Disturbing Dream and Nightmare Severity Index (DDNSI), and the SLEEP-50 Nightmare Scale (S50-N). Using established DDNSI and S50-N thresholds, participants were classified into possible CSN and control groups. Receiver operating characteristic analyses were conducted to evaluate NExS accuracy. The NExS demonstrated strong discriminative ability (AUC = .941) in distinguishing between positive and negative cases of possible CSNs. Sensitivity and specificity indices indicated that a cut score of ≥9 is suitable for identifying potential CSNs in nonclinical populations. Future studies incorporating clinical interviews are warranted to determine the scale's utility for detecting clinically meaningful nightmare presentations in clinical settings.

Keywords: Nightmare Experience Scale (NExS); Clinically salient nightmares; Nightmare assessment; Receiver operating characteristics; Cut-score validation; Sleep disturbance; Nonclinical sample

Introduction

Nightmares are described as dysphoric, vivid, and easily remembered dreams that often result in awakening (Hartmann, 1999). Among large community samples, about 4.0% of adults report having nightmares "often" and 40.0% as "sometimes" (Sandman et al., 2013). However, frequency of occurrences only partly describes nightmare phenomena. Belicki (Belicki, 1992) asserts that another important aspect of the nightmare experience is nightmare distress – the degree to which

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individuals are perturbed by their nightmares. Taken together, frequent nightmares with related distress have been referred to as indicating clinically salient nightmares (CSNs): that is, nightmares that might benefit from treatment (Krakow, 2006).

Though CSNs do not indicate a particular diagnostic nosology, they are similar to a diagnosis of nightmare disorder, which includes both frequent nightmares and related distress or psychosocial impairment (American Psychiatric Association [APA], 2022; American Academy of Sleep Medicine [AASM], 2014). While bona fide diagnoses of nightmare disorder require a clinical interview, screening to identify possible CSNs does not (Krakow, 2006; Levin & Nielsen, 2007). When studying large samples, it is usually more resource efficient to screen possible cases of CSNs using self-report scales rather than interviews. Indeed, analog methodology of creating CSN and non-CSN analog groups based on self-report has been used extensively among nonclinical samples (Lee et al., 2024; Nadorff et al., 2011; Yassin et al., 2020).

It would be possible for investigators to assess nightmare frequency and distress separately using measures such as the Mannheim Dream Questionnaire (Schredl et al., 2014) and attempt to extrapolate CSNs. Indeed, this would allow for precise measurement of nightmare frequency and distress. Nevertheless, a more common approach to identifying CSNs appears to be using cut scores yielded from a composite of items tapping nightmare frequency and distress. Cut scores can be described as a threshold score to screen possible (though not verified) cases of a phenomenon. Cut scores are commonly used when trying to identify individuals with experiences which might indicate clinical significance (Murphy et al., 1987). For example, cut scores on the short form of the Depression, Anxiety, and Stress Scales (Henry et al., 2005) have been employed in clinical and nonclinical research settings to create analog groups of individuals with depression and anxiety (Evans et al., 2021).

Two validated multi-item self-report measures with recommended cut scores to identify possible CSNs are the SLEEP-50 Nightmare Scale (S50-N) (Spoormaker et al., 2005) and the Disturbing Dream and Nightmare Severity Index (DDNSI) (Krakow et al., 2002). The S50-N is part of a larger self-report questionnaire assessing various sleep complaints – Spoormaker et al.'s SLEEP-50 Questionnaire (2005). S50-N items inquire about subjective experiences of nightmares over the past month. Cut scores were established by comparing a sample of nightmare disorder patients and controls (Spoormaker et al., 2005). Several studies have applied the S50-N cut scores among clinical and nonclinical samples (Yassin et al., 2020; Gaultney, 2010; Swart et al., 2013; van Schagen et al., 2017).

Krakow et al.'s (2002) DDNSI is a stand-alone measure to assess the frequency (past week) and subjective intensity of nightmares and bad dreams. Use and scoring of the DDNSI is straightforward and the measure has been relatively popular. To wit, the supplemental materials of Bolstad et al.'s (2021) report identifies 47 published research articles utilizing the DDNSI. The DDNSI has a recommended cut score described as "consistent with" CSNs (Krakow et al., 2002). However, its derivation and verification were not clearly articulated. Nevertheless, several researchers have used recommended DDNSI cut scores to identify possible CSNs (Krakow, 2006; Lee et al., 2024; Nadorff et al., 2011, 2015).

Another recently developed measure that could be useful for screening CSNs is the Nightmare Experience Scale (Kelly & Mathe, 2019). The NExS assesses nightmare frequency and related distress as a single factor. Recently developed, use of the NExS has been limited to a few published studies, e.g., (Floyd et al., 2025; Kelly, 2020a, 2020b; Kelly & Mathe, 2019; Prakash et al., 2023; Yount et al., 2024). One possible benefit of the NExS, compared to the S50-N and DDNSI, is a clear description of nightmares using the waking criterion (Zadra & Donderi, 2000). As such, it might be a useful instrument for researchers wanting to identify CSNs using a more rigorous definition of nightmares. However, to date, no cut scores were located for the NExS.

The measures discussed above have strengths and limitations. For instance, the NExS has been validated and shows some promise as a measure of CSNs in both its original form (Kelly & Mathe, 2019) and a Spanish translation (Baños-Chaparro et al., 2024). However, it is limited by the lack of cut scores to identify possible CSNs. Also, it has not been used extensively among clinical samples. The DDNSI has been validated in both clinical and nonclinical samples (Bolstad et al., 2021; Rufino et al., 2024), but empirical examinations of its cut score have not been reported. Further, the DDNSI purposefully does not differentiate bad dreams and nightmares, i.e., no operational definition or waking criteria (Krakow, 2006). Similarly, the S50-N does not directly differentiate bad dreams and nightmares though it's items reflect this distinction (Spoormaker et al., 2005). The S50-N also does not include distress associated with nightmares making measurement of CSNs, as defined herein, less clear. Regardless of limitations, the recommended cut scores of the S50-N and DDNSI seem to have been generally accepted and seemingly successfully utilized by previous researchers to operationally define CSNs.

The purpose of the current study is to identify possible cut-scores for the NExS in a nonclinical sample. Such findings could inform researchers wishing to use the NExS to create CSN analog groups using a single measure with a clear definition of nightmares. Further, if cut scores can adequately be established this would also provide additional evidence of the criterion validity of the NExS. Because previous findings indicated that the S50-N, DDNSI, and NExS were strongly correlated (Kelly & Mathe, 2019), it was expected that the NExS would be able to identify possible CSNs as classified by the S50-N and DDNSI.

Method

Participants and Procedures

Participants included 480 (271 females, 187 males, 22 missing values) individuals enrolled in undergraduate psychology courses at a university in the United States. The average age of the sample was 19.49 (*SD* = 2.30) years. Most participants (275; 57.3%) identified themselves as White/Caucasians. Other ethnicities identified included Latinx (134; 27.9%), African American or Black (29; 6.0%), Asian (4 (0.8%), Native American (2; 0.4%), and "other" (8; 1.7%). The remaining 28 (5.8%) did not report race/ethnicity.

The study was approved by the Institutional Review Board where data was collected and conducted in accordance with the Helsinki Declaration. Participants were recruited before undergraduate psychology class meetings to answer a questionnaire on "Measuring Bad Dreams." After obtaining informed consent, participants completed "paper and pencil" questionnaires in small group settings before regular lectures. Data was not collected during exam weeks. Nominal course credit was offered for participation. No time limits or exclusionary criteria were used for participation.

Measures

SLEEP-50 Nightmare Scale (S50-N). The S50-N (Spoormaker et al., 2005) includes 5 items measuring different aspects of nightmares experiences over the past month. Participants respond using a 4-point scale from 1 (*not at all*) to 4 (*very much*). Responses are summed to produce a total score that can range from 5–20. As per scale author instructions, higher scores indicate more nightmares. CSN cases are identified by a score of ≥ 3.0 on the nightmare frequency item and ≥ 9.0 on the sum of three of the four additional items regarding particulars about respondent's nightmares. Responses to the final item assessing physical arousal during nightmares is not included in the categorical scoring of CSNs but is included in the continuous scale score (Spoormaker et al., 2005). Spoormaker et al. (2005) report support for criterion validity and a retest reliability coefficient of .89 across 3 weeks.

Disturbing Dream and Nightmare Severity Index (DDNSI). The DDNSI (Krakow et al., 2002) includes 5 items examining frequency and intensity of nightmares. Response formats vary across items from indicating specific numbers of nightmares over the past week to a 6-point scale ranging from 0 (*not at all*) to 6 (*extremely*) for distress and intensity items. Summed responses can range from 0–37 with higher scores indicating more intense disturbing dreams and nightmares. Krakow et al. (2002) assert that a score of 10 or more indicates the likely presence of CSNs. Previous research has reported evidence for factorial, convergent, and discriminant validity (Bolstad et al., 2021; Rufino et al., 2024) and a retest reliability coefficient of .71 across 3 months (Lee et al., 2021).

Nightmare Experience Scale (NExS). The NExS (Kelly & Mathe, 2019) includes 4 items assessing nightmare frequency and related distress. Participants respond using a 5-point scale from 0 (*strongly disagree*) to 4 (*strongly agree*). Responses are summed to produce a total score that can range from 0–16. Higher scores indicate more frequent distressing nightmares. Following standard instructions for the NExS, nightmares were defined for respondents as "disturbing, clearly remembered dreams that awaken the sleeper." Previous research reported evidence of factorial, convergent, and discriminant validity (Baños-Chaparro et al., 2024; Kelly & Mathe , 2019) and a retest reliability coefficient of .86 across 2 weeks (Kelly & Mathe, 2019).

Statistical Analyses

Coefficient alpha was calculated as a measure of internal consistency reliability of instruments. Pearson correlations were calculated between measures. Given the intent was not to determine actual nightmare diagnoses, it was deemed sufficient for the aims of this study to create an analog CSN group. This was done by identifying individuals exceeding recommended cut-scores on both the S50-N and DDNSI. Using both the S50-N and DDNSI was intended to provide a conservative estimate of possible CSNs in this sample given that each includes slightly different aspects of the nightmare experience. The remainder of the sample was included as controls.

Using these defined groups, sensitivity (the percentage of correctly identified, or true positive, cases of classified CSNs) and specificity (the percentage of correctly identified cases without identified CSNs, or true negative cases) were calculated as receiver operating characteristics (ROC). The area under the curve (AUC) was calculated to determine efficacy of the NExS in distinguishing positive and negative cases of CSNs. Recommendations for interpretation suggest that optimal sensitivity and specificity should both be at least 0.80 (Plante & Vance, 1994). Area under the curve is considered "good" if it is at least 0.8 and "excellent" if it exceeds 0.9 (Nahm, 2022). To partly validate the use of this methodology to identifying CSNs in the current nonclinical sample, AUC and ROC analyses were also calculated for DDNSI scores comparing a CSN group and controls identified using the S50-N, which has clearly described derivation of cut scores. Analyses were calculated using SPSS 29.0 for Windows.

Results

As presented in Table 1, all measures possessed good internal consistency, and as would be expected, were strongly correlated. Measures had an average intercorrelation of .73. The strongest relationship was between the NExS and DDNSI, which was near the upper limit of reliabilities for those scales.

Established cut scores for the S50-N identified 69 (14.4%) participants with possible CSNs. For the DDNSI, 111 (23.1%) participants were identified with possible CSNs. An inspection of the raw data indicated that 52 participants exceeded the cutoff on the DDNSI but were not identified with CSNs using the S50-N. Whereas, 11 participants exceeded the cutoff on the S50-N but were not identified with CSNs using the DDNSI. A total of 58 participants (12.1%) exceeded the cutoff

on both the S50-N and DDNSI. The latter grouping participants were categorized as a CSN group to examine ROCs of the NExS. The remaining 422 (87.9%) participants were categorized as controls.

Table 1: Pearson correlations between scales and descriptive statistics

	S50-N	DDNSI	*M* ± *SD*	α
S50-N			10.31 ± 3.79	.808
DDNSI	.731		6.41 ± 5.70	.859
NExS	.681	.776	4.96 ± 4.27	.847

Note: $N = 480$. All correlations significant at $p < .001$. S50-N = Sleep-50 Nightmare Scale; DDNSI = Disturbing Dreams and Nightmare Severity Index; NExS = Nightmare Experience Scale.

The ROC analysis found the AUC for identifying CSNs using the NExS was .941 (95% CI: .914–.967). Sensitivity and specificity exceeding .60 for NExS scores are presented in Table 2. Using the previously noted criteria of both sensitivity and specificity being least 0.80, the optimal cut score for the NExS could be 8 or 9. Choosing one or the other may depend on intentions of the assessor, i.e., identifying more or fewer positive cases. In the interests of a slightly higher specificity, we recommend using a score of 9 or higher on the NExS for classifying possible CSNs among nonclinical samples.

Table 2: Sensitivity and specificity of selected Nightmare Experience Scale total scores to identify potentially clinically salient nightmares

Score	Sensitivity	Specificity
5	.983	.614
6	.966	.704
7	.966	.763
8	.897	.815
9	.828	.877
10	.724	.936
11	.638	.964

In the current sample, using a NExS score of 9 or more identified 100 (20.8%) participants as having possible CSNs. This was 31 more cases than the S50-N, which was statistically significant ($\chi^2 = 5.69$, $p = .017$). The NExS identified 11 fewer cases than the DDNSI, which was not significant ($\chi^2 = 0.57$, $p = .449$). From another angle, the DDNSI and NExS agreed on 85.2% of cases, whereas the S50-N and NExS agreed on 86.9% of cases as indicating possible CSNs or not.

The analyses to partly validate the current methodology among this sample found that using S50-N cut scores as the criterion, the AUC for the DDNSI identifying CSNs was .927 (95% CI: .894–.959). Using .80 as optimal sensitivity and specificity, the cut score for the DDNSI could be either 9 or 10, with 10 having slightly higher specificity (See Table 3).

Table 3: Sensitivity and specificity of selected DDNSI scores using the S50-N as the criterion

Score	Sensitivity	Specificity
6	.957	.606
7	.957	.691
8	.928	.759
9	.899	.813
10	.841	.871
11	.754	.898
12	.667	.934
13	.609	.961
14	.536	.976

Note: NExS = Nightmare Experience Scale; DDNSI = Disturbing Dreams and Nightmare Severity Index; S50-N = Sleep-50 Nightmare Scale.

Discussion

As predicted, the NExS was able to identify individuals in this nonclinical sample classified as having possible CSNs using the S50-N and DDNSI as criterions. The NExS had an "excellent" AUC suggesting it was able to differentiate positive and negative cases of possible CSNs determined by other validated measures. This methodology was supported by the finding that when using cases identified by the S50-N, the cut score of 10 for the DDNSI was equivalent to that recommended by previously (Krakow et al., 2002).

Given their strong intercorrelations, it might be noted that the NExS, DDNSI, and S50-N possess good convergent validity, assumedly tapping CSNs. This finding was consistent with previous research that found the three measures were strongly correlated (Kelly & Mathe, 2019). These strong intercorrelations are also reasonable considering that all three measures have face validity of measuring intense experiences of nightmares. Nevertheless, given limitations of the study it is not known the extent to which reporting bias, psychopathology, traumatic nightmare content, or other features of the sample may have influenced the results. As such, it cannot be known the extent to which these measures were consistent because they reflected CSNs or other influences.

It is noteworthy that the prevalence rate of CSNs in the current sample was approximately twice that found in a previous sample of university students using the S50-N (Al Salmani et al., 2020) and DDNSI (Nadorff et al., 2011), but on par with an online sample from Amazon's Mechanical Turk using the DDNSI (Nadorff et al., 2015). This discrepancy between the current and previous student findings may reflect a higher-than-expected presence of psychopathology or trauma among the current sample which were not assessed. However, it is noteworthy that recent samples of university students have identified elevations of psychopathology among university students which could extend to nightmares (Auerbach et al., 2018). Indeed, the current findings may indicate that the incidence of CSNs among university students is higher than previously estimated. This would be consistent with Bolstad et al.'s (2025) findings of increases in retrospective nightmare reports before and after the COVID-19 pandemic. Moreover, it is possible

that given the study was advertised to participants as focusing on bad dreams may have "pulled" for endorsing more distressing nightmares. Additional research is needed to clarify these issues.

The current findings characterize the S50-N as being the most conservative of the three measures used in this study for identifying CSNs. The DDNSI and NExS appear more sensitive to the presence of possible CSNs or, alternatively, might overestimate CSNs relative to the S50-N. Under or overestimation cannot be determined from the current data. The relative differences between the scales in identifying CSNs also may be because the DDNSI and NExS include items reflecting intensity of, or distress about, nightmares, which is not included on the S50-N. Schredl et al.'s (2021) findings suggest that nightmare distress may be associated with other personality variables that could influence endorsement of it, potentially increasing scores on measures including this element of nightmare experiences.

Several limitations of the current study should be noted. For instance, the sample included only university undergraduate students. As such, these findings may not represent the population. Also, it should be clearly stated that the use of university student sample and self-report measures severely limits generalization of the current findings to clinical samples or use in a diagnostic setting. Additionally, other possibly influencing variables such as trauma and affective distress were not accounted for (Gieselmann et al., 2019). It is also possible that the use of only self-report indices of the same domain (i.e., nightmares) created a criterion–predictor contamination. This might inflate AUC and sensitivity estimates. Moreover, given the methodology, it should be stressed that until further validation with interviews is reported, the purposes of the identified cut scores for the NExS should conservatively be used for screening/analog grouping in research only, not for clinical diagnosis.

The above limitations highlight areas needed for future research. For instance, research is needed to replicate the current findings among clinical samples. Even among nonclinical samples, future research should include measures which examine possible psychopathology and trauma given they are often associated with nightmares and may influence their prevalence (Levin & Nielsen, 2007; Sheaves et al., 2023). Future work should validate the NExS cutoff against structured clinical interviews to remove shared-content effects. Also, using dream diary measures (Zadra & Donderi, 2000), stand-alone measures of nightmare distress (Belicki, 1992), and measures of negative effects of nightmares (Krakow et al., 2000) could be useful additions to future research attempting to validate measures of CSNs, in general. Finally, comparison with self-report measures that purport to identify nightmare disorder might be of interest. For instance, the 5-item Nightmare Disorder Index (Dietch et al., 2021) was recently introduced to purportedly identify cases of nightmare disorder.

In conclusion, the NExS appears to be a relatively effective and efficient self-report measure for identifying possible CSNs among nonclinical university student samples relative to other brief self-report measures. The AUC indicates that the NExS was able to differentiate identified positive and negative cases of CSNs. The NExS demonstrated adequate sensitivity and specificity and may be useful to researchers wishing to use these instruments to identify individuals with possible CSNs. Replication using interviews and clinical samples is warranted.

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