Comparison of single- and multiple-item nightmare frequency measures

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Summary. Nightmare frequency research usually relies on single-item measures. The current study compared some single- and multiple-item measures of nightmare frequency. Three single-item measures representing different response formats (binary, ordinal, and nominal) were compared with both an existing and newly devised multiple-item nightmare frequency scale, the Nightmare Frequency Index (NFI). To collect psychometric information on the new scale, 276 university students completed the NFI. A subsample of 146 participants completed additional measures of nightmare frequency and constructs previously related to nightmares. The NFI had adequate psychometric properties. Generally, nightmare frequency measures demonstrated convergent and discriminant validity. A higher-order nightmare frequency factor was found with all nightmare frequency measures contributing. Multiple-item measures had slightly higher average correlations than a binary single-item measure, but not ordinal or nominal single-item measures. The results are discussed in the context of choosing frequency measures for research.

Keywords: Nightmares, Nightmare Frequency, Nightmare Distress, Measurement

1. Introduction

Measurement of the frequency of nightmares, easily recalled and unpleasant dreams that usually produce anxiety, fear, or other unpleasant emotions (American Psychiatric Association [APA], 2013) has remained largely unstandardized over several decades (Levin & Nielsen, 2007). Most questionnaire-based studies on nightmare frequency have relied on single-item interval or ordinal scales that assessed numbers of nightmares recalled over a specified time-period, i.e., 1, 2, 3… (Nielsen, Stenstrom, & Levin, 2006; Schredl, 2003) or nominal estimates of perceived nightmare frequency, i.e., "occasionally" and "often" (Nguyen, Madrid, Marquez, & Hicks, 2002; Sandman et al., 2013). Both single-item approaches have yielded similar correlations with other measures (Kelly, Mathe, & Yu, 2018).

Few researchers have attempted to measure nightmare frequency using multiple-item measures. This is interesting given that the use of single-item versus multiple-item scales has remained controversial. It has been argued that single-item scales generally are more susceptible to measurement error, have lower reliability, less measurement sensitivity, and fail to capture nuances in constructs compared to multiple-item scales (Bowling, 2005; Kamakura, 2015). On the other hand, empirical findings suggest that in many instances only a single item may suffice (Bergkvist & Rossiter, 2007), especially when assessing concrete, hypothetically unidimensional constructs (Fuchs & Diamantopoulos, 2009) such as nightmare frequency. Given previous conjecture of the differences between multiple- and single-item measures, in the current research, the authors explore if using multiple items to asses nightmare frequency could better encapsulate the wide range with which participants might experience, and thus report, nightmares.

Perhaps the lack of multiple-item nightmare frequency scales available to researchers is one reason for the paucity of studies comparing multiple- and single-item measures in this domain. Several multiple-item nightmare related scales have been developed. However, many do not specifically inquire about nightmare frequency (i.e., Belicki, 1992; Chen et al., 2014; Gorzka et al., 2019; Köthe & Pietrowsky, 2001). Those that do assess frequency in some form, such as the Van Dream Anxiety Scale (Agargün et al., 1999), the Disturbing Dream and Nightmare Severity Index (Krakow et al., 2002a), the Nightmare Intervention and Treatment Evaluation Scale (Donovan, Padin-Rivera, Chapman, Strauss, & Murray, 2004), the SLEEP50 Nightmare Disorder Subscale (Spoormaker, Verbeek, van den Bout, & Klip, 2005), and the Nightmare Experience Scale (Kelly & Mathe, 2019), include items representing distress, intensity, and/or effects associated with nightmares. Inclusion of these additional aspects of nightmares might be useful when examining nightmare disorder (APA, 2013) or combined concepts such as frequent distressing nightmares (Kelly & Mathe, 2019) or nightmare severity (Krakow et al., 2002a). However, their inclusion could confound nightmare frequency estimates due to their relationships with general psychological distress (i.e., Levin & Fireman, 2002).

The only multiple-item scale specifically measuring nightmare frequency that was identified at the time of this writing was the Nightmare Frequency Questionnaire (NFQ; Krakow et al., 2000). The NFQ prompts respondents to report the number of nights with nightmares and the number of recalled nightmares over the last year, month, and week. The NFQ possesses adequate to good reliability and validity, es-

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pecially in clinical research (Krakow et al., 2002b). However, the format and large number of possible responses could be confusing for respondents. Also, attempts to recall exact numbers of nightmares over longer periods such as the past year could be difficult.

The purpose of the current study was to compare some multiple- and single-item measures of nightmare frequency. To accomplish this, first an attempt was made to develop an additional multiple-item scale that was brief, unidimensional, and had an easily understood nominal response format. This experimental instrument was then compared with a modified version of the NFQ with an interval response scale, and single-item measures chosen to represent different response formats, i.e., nominal, ordinal, and binary, as described by Levin and Nielsen (2007). Given the likelihood of increased measurement sensitivity relative to single-item measures (Kamakura, 2015), it was expected that the multiple-item scales would demonstrate relatively higher average correlations with "criterion" measures than single-item scales. Criterion measures were defined for this study as hypothetically related measures not assessing nightmare frequency. These included measures of constructs previously found to be previously found to be related to nightmare frequency including nightmare distress, general psychological distress, neuroticism, posttraumatic stress reactions, and sleep quality (Levin & Nielsen, 2007), as well as one construct theoretically related to nightmares -- self-fragmentation (Kohut, 1977).

2. Method

2.1. Participants and Procedure

The full sample consisted of 276 (136 females, 134 males, 6 unidentified) who completed the experimental multiple-item nightmare frequency scale. A subsample of 146 completed additional nightmare and criterion measures described below. The average age of the full sample was 19.20 (*SD*=2.41). Most of the sample, 80%, identified themselves as White/Caucasian. Other ethnicities included African American (9%), Hispanic (3%), Asian (1%), Arabian (5%), and "other" (2%). The subsample included 76 females and 70 males with an average age of 18.76 (*SD*=1.75). Subsample ethnic demographics were similar to the full sample.

2.2. Measures

Nightmare Frequency Index (NFI). An experimental nightmare frequency scale was constructed by selecting the two positively phrased items from the Nightmare Experience Scale (Kelly & Mathe, 2019), assessing the frequent occurrence of nightmares. The positively phrased items are "I have nightmares often" and "I have nightmares several nights a month." Also, two negatively phrased items were included creating a four-item scale. The negatively phrased items are "In most years I have few, or no, nightmares" and "Weeks can pass without me having a nightmare." For ease of reference, this scale is hereafter referred to as the Nightmare Frequency Index (NFI). Items are presented in Table 1. Participants responded using a 5-point scale (0= "Strongly disagree" to 4= "Strongly agree"). Given this was a newly developed measure, reliability and validity have not been examined.

Other Nightmare Frequency Measures. In addition to the NFI, another multiple-item, nightmare frequency scale, a modified version of Krakow et al.'s (2000) N*ightmare Frequency Questionnaire* (NFQ-M; Kelly & Yu, 2019) was included. Using an interval response format, respondents estimated the number of nights with nightmares (0-7) and the number of nightmares experienced (0-14+) over the past week. Summed responses to both items provided a continuous measure of nightmare frequency. An internal consistency reliability of .83 (Kelly & Yu) and an average test-retest reliability of .88 (2 weeks; Krakow, 2002b) have been reported. Additionally, three single-item nightmare frequency measures were included representing different response formats. As an ordinal measure the single-item *Mannheim Dream Questionnaire - Nightmare Scale* (MADRE-N; Schredl, Berres, Klingauf, Schellhaas, & Göritz, 2014) was also included. Because possible responses include yearly nightmares, the original phrasing of "in the past several months" was omitted. For this scale, participants were provided Schredl et al.'s (2014) definition of nightmares and asked to respond to the prompt "How often do you experience nightmares?" using a scale from 0="Never" to 7="Several times a week" creating a general measure without a specified time-frame. A test-retest reliability of .75 (four weeks) has been reported (Strumbrys, Erlacher, & Schredl, 2013). Additionally, a binary measure was included by asking participants to respond "True" or "False" to the item "I have nightmares frequently" from the *Iowa Sleep Disturbances Inventory - Nightmare Scale* (ISDI-NF; Koffel & Watson, 2010). Reliability information for this item has not been reported. Finally, participants were asked to respond to a nominal item within the past month from the *Van Dream Anxiety Scale* (VDAS-NF; Agargün et al., 1999): "Over the past month, how often have you had a frightening dream and awaken completely from it?" A five-point scale, 0="Never" to 4= "Often" was used. A test-retest reliability of .83 (five days) has been reported (Agargün et al., 1999).

Criterion Measures. Participants completed several criterion measures to compare performance of the nightmare frequency measures described above. The 13-item *Nightmare Distress Questionnaire* (NDQ; Belicki, 1992) was used as a measure of nightmare distress, waking suffering associated with nightmares. Participants responded using a 5-point scale (1="Strongly Disagree" to 5="Strongly Agree"). Summed responses indicted more nightmare distress. As a measure of general psychological distress, the 10-item *Symptom Checklist-10-Revised* (SCL-10R; Rosen et al., 2000), was included. Participants responded using a 5-point scale (0="Not at all" to 4="Extremely"). Higher summed scores reflected more state distress. Neuroticism was assessed using the 8-item *Big Five Inventory-Neuroticism Scale* (BFI-N; John & Srivastava, 1999) to which participants responded using 5-point scale: 1="Strongly disagree" to 5="Strongly agree". Higher summed responses indicated more trait neuroticism. The 6-item *PTSD Checklist-Civilian Short Form* (PCL-SF; Lang & Stein, 2005) was included to measure posttraumatic stress symptoms. Participants responded using 5-point scale (1="Not at all" to 5="Extremely"). Summed responses indicated more posttraumatic stress symptoms.

Participants also responded to three single-item criterion measures. Dream recall frequency was assessed with the *Mannheim Dream Questionnaire-Dream Recall Frequency Scale* (DRF; Schredl et al., 2014): "How often have you recalled your dreams recently (over the past several months)?" Participants responded using a 7-point scale ranging from

0="Never" to 6="Almost every morning". *General sleep quality* was assessed with the item "Generally, I slept badly over the past month." Responses ranged from 1="Not at all" to 4="Very much". *Self-fragmentation* was assessed with the item "At times I have felt as if I were coming apart" using a 5-point scale ranging from 0="Not at all" to 4="Very true".

2.3. Procedure

Participants were recruited before undergraduate psychology courses to complete a "paper and pencil" questionnaire on "nightmares and personal characteristics." After obtaining informed consent, participants completed questionnaires anonymously during regular class times. Before beginning, participants were given written instruction that "In this study nightmares are defined as unpleasant and clearly remembered dreams that awaken you; after waking you quickly become alert." Participants received no incentive to complete questionnaires. There was no time limit and no exclusionary criteria used to screen participants.

2.4. Statistical Analysis

Coefficient alpha was used to determine the reliability of all multiple-item scales. Given its usefulness in identifying latent factor structures (Costello & Osborne, 2005), a maximum likelihood factor analysis was calculated to determine the structure of NFI items using data from the full sample. In addition to Eigenvalues, a Scree plot was used to confirm the number of factors to be extracted. Because some measures were ordinal, Spearman's Rho correlations were calculated to examine convergent validity for nightmare frequency measures. A maximum likelihood factor analysis was also calculated to determine if nightmare frequency measures were assessing the same latent variable. Spearman correlations were used to examine relationships between nightmare frequency scales and criterion measures. Finally, ordinal regressions were calculated to examine unique relationships of nightmare frequency scales to criterion measures. Because of meta-analysis findings that females tend to report more nightmares than males (Schredl & Reinhard, 2011), gender was included as a predictor in regressions. All analyses were conducted using SPSS for Windows.

3. Results

3.1. NFI Factorial Validity and Scale Properties

Before using the NFI as an assumedly unidimensional multiple-item measure in the current, study, its factor structure and basic psychometric properties were explored. NFI item responses for the full sample were examined using a maximum likelihood factor analysis. One factor emerged (Eigenvalue=2.40) that accounted for 60.09% of the variance in responses. The chi-square test indicated adequacy of the model was significant, χ^2 (2) = 16.58, p<.001. Gorsuch (1983) noted that scales accounting for at least 50% of the variance can be considered unidimensional. A Scree plot supported a unidimensional factor structure. The residual of only one item (Item 3; residual=.16) slightly exceeded McDonald's (1985) criteria of .10, further supporting the unidimensional nature of the scale. Factor loadings are presented in Table 1. NFI responses were summed for subsequent analyses with higher scores indicating more nightmare frequency.

The NFI coefficient alpha reliability for the full sample was .85. The average and standard deviation of total scale scores are presented in Table 2. The median NFI score was 4.00. There was no appreciable difference in *M* and *SD* between the full sample and the subsample. Data from the full sample suggested that skewness was within acceptable limits (.76). NFI scores were not significantly correlated with age, r_s=.07, p=.28. The gender difference for NFI scores did not reach significance, t(268)=1.80, p=.07, d=.22, though females (M=5.23, SD=4.50) scored slightly higher than males (M=4.28, SD=4.12).

3.2. Relationships Between Nightmare Frequency Measures

In the subsample, coefficient alphas of the NFI and NFQ-M were .86 and .88, respectively. No significant gender differences were found for any nightmare frequency measures, t's<1.11, p's<.27, d's<.18. Spearman's Rho correlations between nightmare frequency measures, as well as their means and standard deviations, are presented in Table 2. All variables were significantly correlated. On average, the MADRE-N had the highest average correlation (average R^2=44%) with other nightmare frequency measures. It was followed closely by the NFI (average R^2=42%) and the VDAS-NF (average R^2=40%). Therefore, these three measures had the strongest convergent validity. Though significant, the NFQ-M (average R^2=35%) and especially the ISDI-NF (average R^2=23%) validity coefficients were somewhat low for measures of the same phenomenon.

To examine if nightmare frequency measures were tapping the same latent variable, and their relative contribution to it, a maximum likelihood factor analysis was calculated on total scores of the two multiple-item measures and responses to the three single-item measures. One factor emerged accounting for 63.70% of the variance (Eigenvalue=3.19). Factor loadings were as follows: NFI (.89), VDAS-NF (.82), MADRE-N (.82), NFQ-M (.76), and ISDI-NF (.69).

Table 1. Factor Loadings and Item-Total Correlations of NFI Items

Item	FL	r_t	M	SD
1. I have nightmares often.	.80	.71	0.94	1.07
2. In most years I have few, or no, nightmares. (r)	.74	.68	1.82	1.53
3. I have nightmares several nights a month.	.89	.78	1.11	1.35
4. Weeks can pass without me having a nightmare. (r)	.65	.62	0.89	1.21

Note: N=276. FL=factor loading; r_t=corrected item-total scale correlation. NFI= Nightmare Frequency Index. (r) = Reverse coded item.

Table 2. Correlations Between Nightmare Frequency Measures

Scale	NFQ-M	MADRE-N	VDAS-NF	ISDI-NF	M	SD	Mr_s	Skew
1. NFI	.63	.77	.70	.50	4.76	4.32	.65	.76
2. NFQ-M		.62	.58	.51	1.77	2.72	.59	2.55
3. MADRE-N			.79	.47	3.42	1.92	.66	-.24
4. VDAS-NF				.43	1.14	1.21	.63	.91
5. ISDI-NF					0.12	0.32	.48	2.42

Note: NFI M, SD, and skew N=276. For all other calculations N=146. All correlations are Spearman's Rho and significant at p<.001. NFI=Nightmare Frequency Index; NFQ-M=Nightmare Frequency Questionnaire-Modified; MADRE-N= Mannheim Dream Questionnaire-Nightmare Scale; VDAS-NF=Van Dream Anxiety Scale-Nightmare frequency item; ISDI-NF=Iowa Sleep Disturbances Inventory-Nightmare frequency item; Mr_s=Average correlation with other measures.

3.3. Correlations Between Nightmare Frequency and Criterion Measures

Internal consistencies for multiple-item criterion measures were good (Table 3). Only self-fragmentation (Female M=2.17, SD=1.45; Male M=1.37, SD=1.37), $t(144)$=3.42, p<.01, d=.57, and neuroticism (Female M= 23.49, SD=6.60; Male M=19.24, SD=5.84), $t(144)$=4.10, p<.01, d=.68, had significant gender differences.

Spearman's Rho correlations were calculated between the five nightmare frequency measures and the seven criterions. These results are presented in Table 3. The strongest correlates for all nightmare frequency measures were nightmare distress and dream recall frequency. Correlations with general distress (SCL-10R), neuroticism (BFI-N), and trauma symptoms (PCL-SF) were comparatively low, and in several instances, particularly for neuroticism and trauma, were nonsignificant. Self-fragmentation was correlated significantly with the VDAS-NF, NFI, and MADRE-N, while sleep quality was correlated significantly with only the NFI and ISDI-NF.

The only nightmare frequency measure that correlated significantly with all seven criterions was the NFI, followed by the VDAS-NF, which correlated significantly with six criterions. The NFQ-M and MADRE-N each correlated significantly with four criterions, while the ISDI-NF correlated with three. The VDAS-NF had the highest average correlation with criterion measures (average R^2=9%), followed by the NFI (average R^2=7%) and the MADRE-N (average R^2=6%). The NFQ-M (average R^2=5%) and ISDI-NF (average R^2=3%) had the lowest average correlations with criterion measures.

3.4. Regressions Predicting Nightmare Frequency Measures

To determine if the nightmare frequency measures had statistically unique relationships with criterion measures, ordinal regressions were calculated for each nightmare frequency measure. The seven criterion variables and gender were entered as predictors for each nightmare frequency measure. Regressions yielded similar results. All nightmare frequency scales were uniquely predicted by nightmare distress and dream recall frequency. Most of the remaining predictors were nonsignificant. Neuroticism results were the most inconsistent regarding significance. Neuroticism was a unique predictor of the NFI, NFQ-M, and ISDI-NF but not MADRE-N or VDAS-NF measures. The VDAS-NF model had the best fit (X^2) followed by the MADRE-N and NFI. The NFQ-M and ISDI-NF models were weakest. In terms of variance accounted for in nightmare frequency measures, results ranged from 36% for the NFQ-M to 53% for the ISDI-NF. These results were consistent with the convergent correlations and criterion correlations presented above.

4. Discussion

The purpose of the current study was to compare some single- and multiple-item measures of nightmare frequency. A multiple-item scale with a relatively simple scaled response format was developed to allow comparisons with single-item scales in addition to the NFQ-M. The results were partly consistent with expected results. Inconsistent with expectations, taken together, multiple-item measures did not "outperform" most single-item measures, in respect to validity

Table 3. Correlations Between Nightmare Frequency Measures and Criterion Variables

Scale	NFI	NFQ-M	MADRE-N	VDAS-NF	ISDI-NF	M(SD)	α
NDQ	.49**	.47**	.52**	.58**	.38**	21.95(9.38)	.89
SCL-10R	.23**	.24**	.23**	.30**	.09	09.96(7.68)	.85
BFI-N	.21**	.18*	.12	.21*	.11	21.45(6.58)	.84
PCL-SF	.17*	.11	.13	.22**	.03	13.52(5.59)	.84
DRF	.37**	.35**	.40**	.31**	.33**	03.91(1.44)	--
SQ	.17*	.06	.12	.15	.17*	02.01(1.10)	--
SF	.27**	.13	.25**	.32**	.09	01.79(1.46)	--
Mr_s	.27	.22	.25	.30	.17		

Note: N=146. *p<.05 **p<.01. All correlations Spearman's Rho. NFI=Nightmare Frequency Index; NFQ-M=Nightmare Frequency Questionnaire-Modified; MADRE-N= Mannheim Dream Questionnaire-Nightmare Scale; VDAS-NF=Van Dream Anxiety Scale-Nightmare frequency item; ISDI-NF=Iowa Sleep Disturbances Inventory-Nightmare frequency item; SCL-10R= Symptom Checklist-10-Revised; BFI-N= Big Five Inventory-Neuroticism Scale; PCL-SF= PTSD Checklist-Civilian Short Form; DRF= Manheim Dream Questionnaire-Dream Recall Frequency Scale; SQ=Sleep Quality; SF=Self-Fragmentation; Mr_s=Average correlation with other measures.

Table 4. Ordinal Regressions Predicting Nightmare Frequency Measures

	NFI			NFQ-M			MADRE-N			VDAS-NF			ISDI-NF		
Scale	*SE*	χ^2	*p*	*SE*	χ^2	*p*	*SE*	χ^2	*p*	*SE*	χ^2	*p*	*SE*	χ^2	*p*
NDQ	.02	29.50	.01	.03	27.89	.01	.02	34.54	.01	.03	38.02	.01	.05	12.62	.01
SCL-10R	.03	00.15	.70	.04	00.02	.90	.03	01.21	.27	.04	02.13	.14	.08	00.81	.37
BFI-N	.03	05.58	.02	.04	05.37	.02	.03	00.96	.33	.04	01.63	.20	.08	04.22	.04
PCL-SF	.04	02.63	.11	.05	01.97	.16	.04	00.97	.33	.05	00.86	.35	.10	03.23	.07
DRF	.12	22.53	.01	.14	15.61	.01	.12	26.46	.01	.13	15.40	.01	.42	07.86	.01
SQ	.15	00.21	.65	.18	00.07	.80	.15	00.44	.51	.16	00.51	.48	.38	02.55	.11
SF	.14	00.08	.78	.16	01.31	.29	.14	00.55	.46	.15	01.56	.21	.31	00.48	.49
Gender	.33	00.50	.48	.30	03.12	.08	.34	00.77	.38	.37	00.59	.44	.79	00.09	.76
		χ^2=68.70 R^2=.40			χ^2=57.50 R^2=.36			χ^2=74.12 R^2=.43			χ^2 =76.47 R^2=.46			χ^2 =43.72 R^2=.53	

Note: N=146. All regression model df's were 8 and p's<.001. R^2 is computed based on Nagelkerke (1991). NFI=Nightmare Frequency Index; NFQ-M=Nightmare Frequency Questionnaire-Modified; MADRE-N= Mannheim Dream Questionnaire-Nightmare Scale; VDAS-NF=Van Dream Anxiety Scale-Nightmare frequency item; ISDI-NF=Iowa Sleep Disturbances Inventory-Nightmare frequency item; NDQ=Nightmare Distress Questionnaire; SCL-10R= Symptom Checklist-10-Revised; BFI-N= Big Five Inventory-Neuroticism Scale; PCL-SF= PTSD Checklist-Civilian Short Form; DRF= Manheim Dream Questionnaire-Dream Recall Frequency Scale; SQ=Sleep Quality; SF=Self-Fragmentation

coefficients. Indeed, the VDAS-NF and MADRE-N generally performed better than the NFQ-M, but not the NFI.

Using Cohen, Cohen, West, and Aiken's (2003) criteria for effect sizes (.10 = small, .30 = medium, .50 = large), inter-correlations of nightmare frequency measures in this study were generally large. The exception was for the ISDI-NF. Most correlations between nightmare frequency measures and criterion variables were small to medium. The single-item VDAS-NF, MADRE-N and the multiple-item NFI appeared the strongest performers in terms of intercorrelations with other nightmare frequency measures, correlations with hypothetically related measures, better fit in the regression analyses, and the strongest loadings on a factor which seemed to account for a latent nightmare frequency variable. The primary instance where the multiple-item measures (NFI and NFQ-M) performed better were unique predictions by neuroticism in the regressions. It might be conjectured that the enhanced sensitivity of multiple-item scales allowed for this finding. However, this seems less likely considering that the ISDI-NF, a binary measure which hypothetically would have the least sensitivity, had the most variance accounted for in the regression and was independently predicted by neuroticism. Interpretation of the variance accounted for in the regressions should be interpreted very tentatively considering that ordinal regressions do not have a clear measure of R^2 relative to linear regressions. Linear regressions were not utilized in this study due to the inclusion of ordinal outcome measures.

The current results could be construed to support the validity of most nightmare frequency measures in this study. The validity of the ISDI-NF was the least supported. All measures demonstrated convergent validity with other nightmare frequency measures. Also, all nightmare measures correlated more strongly with other nightmare frequency measures than criterion variables demonstrating some degree of discriminant validity, i.e., .65 compared with .27 for the NFI.

The general lack of relationships with sleep quality across most nightmare frequency measures were consistent with previous objective findings that sleep quality was not related to nightmares, but inconsistent with subjective findings for relationships between nightmares and sleep quality (Paul, Schredl, Alpers, 2015). The correlations between the three nightmare frequency measures with the highest validity coefficients and self-fragmentation were consistent with theoretical propositions by Kohut (1977) that nightmares represent attempts to manage feared dissolution of the self during sleep states.

Several findings were less consistent with previous research, and inconsistent across nightmare measures. First, the correlations between nightmare measures and neuroticism, distress, and trauma symptomatology were somewhat smaller than those reported in other student samples (Kelly & Mathe, 2019; Schredl, Landgraf, & Zeiler, 2003). Second, in previous research state distress was a stronger predictor of nightmare frequency than trait neuroticism (Schredl, 2003). In the current regression analyses trait neuroticism was a better predictor than distress for three of the five nightmare frequency measures. Third, across all nightmare frequency measures, no gender differences were observed (cf., Schredl & Reinhard, 2011). One possible difference between previous research and the current study that could have affected the results was the inclusion of nightmare distress in the regressions as this was a relatively strong predictor for all nightmare frequency measures. Also, current findings could reflect the nature of the sample. For instance, the average general distress levels and trauma symptoms in the current sample were substantially lower than those of trauma patients (Lang & Stein, 2005; Rosen et al., 2000). Given that nightmares are considered a feature of trauma (Secrist, Dalenberg, & Gevirtz, 2019) and general distress (Levin, Fireman, Spendlove, & Pope, 2011), the relatively moderate degrees of trauma and distress in this sample may have affected correlations of trauma and distress with nightmare frequency as well as gender differences (Levin & Nielsen, 2007; Schredl & Reinhard, 2011). Future research is needed to examine this more systematically.

The current findings should be considered preliminary. Nevertheless, they may provide researchers additional information to assist in selecting and understanding outcomes of nightmare frequency measures, at least among non-clinical samples. For instance, if researchers intend to

collect data on specific numbers of nightmare frequencies, the MADRE-N might be the most suitable of the instruments based on the current results. Previous findings (Strumbrys et al., 2013) indicated it to have adequate test-retest reliability. When combined with the current findings, the MADRE-N seems a useful metric both in terms of sensitivity to other variables and providing estimates of actual nightmare frequencies among samples. Though the test-retest reliability of the NFQ (Krakow, 2002b) and its good validity in clinical contexts (Krakow et al., 2002a) support its use in examining both specific nightmare frequencies and correlations, its lower validity coefficients in the current study among a nonclinical sample and cumbersome response format might make it less appealing. It should be noted that although the current study did not focus on this aspect, test-retest reliability could be important for scales intended to measure nightmare frequency as a trait-like phenomenon. Future research is needed to specifically compare test-retest reliability of multiple- and single-item nightmare frequency measures. It might also be noteworthy that the current project did not consider family-wise error. Thus, tests of statistical significance presented in this article should be interpreted with caution.

If researchers intend to examine relationships with other variables and do not need specific estimates of nightmare frequency, the NFI could be a suitable multi-item measure with additional validation in other samples. Though its properties were generally satisfactory, additional study of the NFI is warranted including confirmatory factor analysis. In the current sample, it was the only scale to correlate with all criterions, perhaps demonstrating its sensitivity. It also had the highest loading on a factor representing a nightmare frequency latent variable. The NFI would also allow for collecting internal consistency data if this is appealing to researchers. If specific estimates of nightmares and internal consistency reliability estimates are not deemed important, but questionnaire space is extremely limited, the VDAS-NF, or a similar nominal scale, seems appropriate given its simplicity and correlations with other measures. However, it should be considered that the VDAS-NF was the most saturated with general distress and nightmare distress. This may partly have resulted from using a specific time frame for respondents to more easily recall nightmare occurrences (one month) and including the waking criteria in the item itself. Though participants were given the waking criteria before beginning the questionnaire, additionally including it in the item may have been partly influenced the results (i.e., Zadra & Donderi, 2000). Given its lower validity coefficients in the current study, the ISDI-NF, and similar binary scales, though simple for researchers and participants alike, might be less sensitive to other measures.

In summary, given the results of the current study, if researchers desire an internally consistent multiple-item scale, the NFI, or a similar measure, might be useful relative to the NFQ-M If researchers prefer a single item scale, particularly one assessing specific numbers of nightmares, the MADRE-N might be the more useful of the single-item scales examined in the current study. Until more research can be done comparing multiple- and single-item nightmare frequency measures, if questionnaire space allows, the inclusion of both a multiple-item, scaled measure to collect internal consistency data and a single-item measure to examine specific numbers of nightmares could be useful. Regardless, until cross-validation of the current results using stronger methodology and larger samples can be conducted, the current results should be considered tentative. Additionally, considering results from the VDAS-NF, the usefulness of including the definition of nightmares and timeframes within nightmare frequency items themselves might also be further investigated.

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