



Taking Heart: Cardiac Symptoms and Nightmares Differentiate Nightmare Proneness and Psychological Distress among Young Adults

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Abstract

Introduction Nightmare proneness, a trait-like disposition to experience frequent nightmares, has been strongly related to psychological distress. The aim of the present study was to examine if cardiac symptoms and hypothetically-related variables, nightmares, and perceived physical health could be used to differentiate nightmare proneness and psychological distress.

Materials and Methods In the present cross-sectional study, 254 young adults completed measures of nightmare proneness, psychological distress, cardiac symptoms, nonspecific and posttraumatic nightmares, nightmare distress, health behaviors, perceptions of physical health, perceived stress, Type-D personality, sleep fragmentation, and dream recall.

Results After controlling for psychological distress, nightmare proneness remained significantly correlated with nightmares, nightmare distress, cardiac symptoms, sleep fragmentation, physical health, perceived stress, and Type-D personality. After controlling for nightmare proneness, distress remained correlated with perceived stress and Type-D personality. Regression analyses indicated that after accounting for all variables, nightmare distress, physical health, and nightmare proneness predicted cardiac symptoms. Posttraumatic nightmares, sleep fragmentation, distress, perceived stress, Type-D personality, and chest pain predicted nightmare proneness.

Conclusion Nightmare proneness and psychological distress can be considered separate constructs. The findings were consistent with those of previous research and supported the theoretical propositions that nightmare proneness includes hyperarousal, vulnerability to stressors, and concretization, a mental process in which vague internal states are made more concrete.

Keywords

- ▶ nightmare proneness
- ▶ psychological distress
- ▶ nightmares
- ▶ chest pain
- ▶ sleep fragmentation

Introduction

Nightmares, disturbing dreams that awaken the sleeper, are a relatively common sleep disturbance. Approximately 4% of

adults report frequent nightmares (that is, at least weekly), while 40% report nightmares at least once a month.¹ The accepted etiologies of nightmares are not usually tied to specific, but rather to more general, traits. For instance, it has

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been suggested that idiopathic nightmares result from hyperarousal and general maladjustment² or indicate the presence of some form of psychopathology.³ To better understand the specific aspects of maladjustment involved in nightmares, the construct nightmare proneness (NP), a trait-like disposition to frequently experience nightmares, was recently proposed.⁴ Given its recent identification, little is known about the dynamics or characteristics of NP.

In student samples, NP has been found to predict variance in nightmare frequency above indices of psychopathology, including social anxiety, hypomanic traits, insomnia,⁴ and posttraumatic stress symptomatology.⁵ Nightmare proneness has been related to trait negative affect and its sibling, neuroticism,^{5,6} which are putative risk factors for psychopathology.⁷ However, NP also accounts for nightmares unrelated to negative affect or neuroticism.^{5,6} Though NP has been related to both nightmares and maladjustment, why and how it relates to these variables has not been well understood to date. One possible link between NP and psychopathology is psychological distress.

Psychological distress (hereafter, distress) and NP have been strongly correlated previously, and they share about half of their variance.^{5,6} Given this, it is surprising that little attempt has been made to conceptually differentiate the two. It has been suggested that NP might be a nightmare-specific form of maladjustment.⁴ Indeed, the measure most used to operationalize NP, the Nightmare Proneness Scale,⁴ was developed based on a longer measure of maladjustment. Nevertheless, stating NP is a form of maladjustment provides limited benefit in distinguishing it from distress, which can also be considered maladjustment.⁷

Distress has been conceptualized as including emotional arousal and discomfort, demoralization, and suffering, typically in response to stressors.⁸ Distress may result from the perceived inability to cope, and it has subsequent effects on health, relationships, and self-image.⁸ Similarly, NP has been theorized to include feelings of vulnerability,⁵ which could reflect coping inefficacy. Also similar to distress, NP includes hyperarousal.⁶ In terms of differences, NP, but not distress, appears to include general psychical dysregulation.^{4,6,8} Moreover, NP is hypothesized to include concretization: a process in which vague feelings of discomfort are made concrete in the form of nightmarish images during sleep states.⁵

Based on these conceptualizations, it seems possible that NP and distress overlap with the shared empirical referents vulnerability and hyperarousal. However, other elements such as concretization and general psychic dysregulation separate the two. The fact that they tap two shared conceptual referents might partly account for their high correlation. If concretization and general psychical dysregulation differentiate NP and distress, the findings that NP predicts nightmares incremental of distress^{5,6} would make theoretical sense.

One realm of variables in which NP and distress might be empirically distinguishable are health behaviors and cardiac symptoms, that is, chest pain and irregular heartbeat. In a large sample of adults,⁹ distress was related to unhealthy

behaviors, such as diet, smoking, and physical inactivity. Similarly, Arbinaga et al.¹⁰ found in a large student sample that both NP and nightmare frequency related to insufficient physical activity. More broadly, Kelly and Yu¹¹ found that students with higher NP engaged in fewer cardio-related health behaviors (such as healthy diet and exercise), yet distress and NP did not independently predict health behaviors. While they did not examine cardiac symptoms, Kelly and Yu¹¹ proposed that NP might influence the relationship between nightmares and cardiac symptoms noted in later life¹² through less engagement in cardiac health behaviors.

Previous research¹³ found that cardiac symptoms reflect distress rather than cardiac disease among young adults. Similarly, in community samples of young adults, psychotic experiences, which might partly represent psychical dysregulation, predicted cardiac symptoms unrelated to health behaviors and distress.¹⁴ It has been proposed that the relationship between health complaints and maladjustment reflects a general negative reporting bias rather than actual physical health conditions; in other words, distressed individuals tend to express both poor mental and physical health.¹⁵ Another possibility is that, in healthy samples, specific physical symptoms such as chest pain could indicate waking concretization. Asnes et al.¹⁶ reported that among children cardiac symptoms are often psychogenic. While those findings do not necessarily lead to the conclusion that chest pain is a concrete manifestation of psychological states, the possibility remains. If this is the case, concretized cardiac symptoms might distinguish NP and distress.

It is also possible that, even among healthy individuals, cardiac symptoms result from other physiological and psychological processes. For instance, previous research has indicated that sleep fragmentation, perhaps secondary to distress,¹⁷ affects the cardiovascular system.¹⁸ Additionally, the Type-D personality pattern, a combination of social inhibition and negative affect,¹⁹ has been related to cardiac symptoms among adults without apparent cardiovascular disease.²⁰ Further, perceived difficulties coping with stressors have been related to cardiac symptoms.²¹

The primary objective of the current study was to investigate if NP accounts for independent variance in physical and psychological processes outside of distress; namely, potentially-concretized cardiac symptoms, other conditions which might affect cardiac symptoms (sleep fragmentation, Type-D personality, health behaviors, perceived stress), as well as overall perceptions of physical health, nightmares, and general dream recall. A secondary aim was to extend previous findings which related nightmares to cardiac symptoms in middle-aged and older populations^{12,22} while investigating other processes which might be involved. Given the previous findings and conceptualizations of NP and distress, we expected that, outside of distress, NP would independently account for independent variance among constructs that might reflect concretization (cardiac symptoms) and nightmares. Further, we expected that NP would account for cardiac symptoms unrelated to other possible influences, including distress, sleep fragmentation, Type-D personality, and health behaviors.

Table 1 Self-reported demographics of the study sample.

Gender – n	Age in years	Ethnicity – %	Diagnosis of Cardiovascular Condition
Female – 175	Mean = 19.13	Latinx – 68%	No – 248
Male – 79	Standard deviation = ± 1.93	White/Caucasian – 12%	Yes – 6
	Range = 18–37	Asian – 11%	
	Median = 19	African American – 6%	
		“Other” – 3%	

Material and Methods

Participants

The study included 254 undergraduate students enrolled at a university in the Western United States. ►Table 1 displays the available demographics of the current sample.

Instruments

Nightmare Proneness

The 14-item Nightmare Proneness Scale⁴ was used to assess NP. Its items assess a range of markers, but previous research suggested the scale includes three factors: general psychical dysregulation, depressiveness, and somatization.⁶ The participants responses ranged from 1 (strongly disagree) to 7 (strongly agree), and they were added to generate a total NP score.

Distress

The four-item Patient Health Questionnaire-4²³ (PHQ-4) was used in the present study as a general marker of distress. The measure assesses distress symptoms of depression and generalized anxiety. The participants indicated how often they had been bothered by symptoms over the past 2 weeks using a 4-point scale (from 0 = not at all to 3 = nearly every day). Though brief, the PHQ-4 has been found to have relatively equal psychometric qualities compared with a longer version of the scale.²³

Nightmares

Before completing the nightmare portion of the questionnaire, participants were informed that nightmares are “disturbing, easily remembered dreams that awaken you from sleep,” and were asked to respond accordingly. The 5-item SLEEP-50 Nightmare Scale²⁴ was used as a measure of general, nonspecific nightmares. Participants rated items to describe nightmare experiences over the past four weeks. The rating scale ranged from 1 (not at all) to 4 (very much). The three-item Posttraumatic Nightmare Index²⁵ assesses nightmare occurrences with content similar to traumatic experiences. The rating scale ranges from 1 (strongly disagree) to 5 (strongly agree). A brief four-item version of the Nightmare Distress Questionnaire²⁶ was developed for the present study by selecting the highest loading items from Böckermann et al.’s²⁷ “General Nightmare Distress” factor. Though Böckermann et al.²⁷ initially assigned six items to the

factor, two items regarding treatment seeking were not included due to relatively low commonalities and cross-loadings on other factors. The rating scale ranges from 1 (not at all) to 5 (very much).

Cardiac Symptoms

Cardiac symptoms were operationalized using two measures. First, the three-item WHO Rose Angina Questionnaire-Short Form²⁸ assessed chest pain. Because of the brevity of the measure, the rating scale was extended from the original yes/no format to scores ranging from 0 (never) to 4 (very often) to increase sensitivity. Second, using the single-item scale from Asplund and Aberg,²² the participants indicated how often they were troubled by Irregular Heartbeat (0 = never, 4 = very often). To differentiate actual cardiac disease, the participants were asked if they had been diagnosed with a cardiovascular condition by a physician. “Yes” responses were coded as 1 and “no”, as 0.

Other Measures

The participants indicated their general Dream Recall Frequency over the past several months using a single item from the Mannheim Dream (MADRE) questionnaire.²⁹ The response scores range from 0 (never) to 6 (almost every morning). The eight-item Cardiac-Related Health Behaviors Index³⁰ was used to measure health behaviors (such as exercise and diet). The rating scale range from 0 (never) to 4 (almost always). Higher scores indicated more healthy behaviors. To assess general perceived physical health, the seven-item Physical Health Scale of the Short-Form-12 Health Survey³¹ was used. The responses were based on the past 4 weeks. Higher scores indicated better perceived health. Perceived inability to cope with stressors over the past month were assessed using the four-item version of the Perceived Stress Scale.³² The response scores range from 0 (never) to 4 (very often). The Type-D Personality pattern was assessed using the 14-item Type-D Personality Scale.³³ The Type-D scale includes two subscales: social inhibition and negative affect. The rating scale ranges from 0 (false) to 4 (very true). Individuals were classified as Type-D if they scored above 10 on both subscales.³³ Individuals classified as Type-D were coded as 1, and the others, as 0. Finally, the nine-item Sleep Fragmentation Scale of the Iowa Sleep Disturbance Inventory³⁴ was used as a measure of difficulties in sleep maintenance. The participants responded false/true.

Procedure

The present study was approved by the local research ethics review board. The participants were recruited from the university's undergraduate psychology participants' pool to complete a study on "Stress, Sleep, and Health." Participation was voluntary, and the undergraduates could choose from several studies in which to participate. After electing to participate, the subjects were directed to an online survey system (Qualtrics), provided written informed consent, and filled out the questionnaire. Data was collected over a four-month period. A small amount of course credit was provided in exchange for participation. There was no time limit to fill out the questionnaire and no exclusionary criteria were used.

Statistical Approach

The analyses were conducted using the IBM SPSS Statistics for Windows (IBM Corp., Armonk, NY, US) software, version 28.0. Gender differences were examined using *t*-tests. Pearson correlations were used to examine relationships between NP and distress and their relationships to other variables. To determine if NP and distress each reflect unique individual variance, partial correlations were calculated for NP and distress with all other variables while holding the other constant.³⁵

To better understand the unique contributions of variables in predicting cardiac symptoms, a linear regression was calculated. A composite cardiac symptoms measure (Rose angina + irregular heartbeat; $\alpha = 0.62$) was used as the criterion. In Step 1, gender and the cardiac diagnosis were entered. In Step 2, dream recall, health behaviors, Type-D personality, physical health perceptions, sleep fragmentation, perceived stress, general nightmares, posttraumatic nightmares, and nightmare distress were entered. Distress was added in Step 3, while NP was added in Step 4.

A second regression was calculated using NP as the criterion. Gender, cardiovascular diagnosis, and dream recall were entered in Step 1. In Step 2, the nightmare variables

were entered (general nightmares, posttraumatic nightmares, and nightmare distress). In Step 3, health and distress variables were entered (health behaviors, physical health, sleep fragmentation, Type-D personality, perceived stress, and distress). In Step 4, potentially-concretized physical experiences (Rose angina and irregular heartbeat) were entered. The results were considered statistically significant if $p < 0.05$ (two-tailed).

Results

Age only significantly correlated with health behaviors ($r = 0.15$; $p = 0.020$); older individuals reported more healthy behaviors. Gender differences were observed (females scored higher than males) for NP ($t [252] = 3.79$; $p < 0.001$), nightmare distress ($t [252] = 3.04$; $p = 0.001$), sleep fragmentation ($t [252] = 1.94$; $p = 0.027$), psychological distress, ($t [252] = 3.62$; $p < 0.001$), and Type-D personality ($t [252] = 2.08$; $p = 0.019$).

Zero-order correlations are presented in ►Table 2. Consistent with previous research, NP and distress were strongly correlated, sharing 50% of their variance. In the present study, NP was significantly correlated with all variables, except the frequency of dream recall. Similarly, distress significantly correlated with all variables except dream recall and posttraumatic nightmares.

To better understand the characteristics of individuals who have higher nightmare proneness, two groups were created and compared using *t*-tests – a nightmare prone group and a control group. Because no established system has been developed to classify nightmare-prone individuals, a cut score of 64 (± 1 standard deviation, SD) was used for the study sample. As such, 43 individuals were placed in the nightmare-prone group and 211, in the control group. Results of *t*-tests comparing the both groups are presented in ►Table 3. As seen in the table, nightmare-prone individuals can be described as more psychologically distressed,

Table 2 Scale descriptives and Pearson correlations.

Variable	Nightmare Proneness	Psychological Distress	Mean (\pm Standard Deviation)	α
Nightmare proneness			47.49(\pm 16.37)	0.88
Psychological distress	0.71***		03.86(\pm 03.15)	0.85
General nightmares	0.25***	0.20***	10.15(\pm 03.26)	0.74
Posttraumatic nightmares	0.22***	0.09	08.31(\pm 03.43)	0.84
Nightmare distress	0.30***	0.25***	07.66(\pm 03.45)	0.75
Dream recall frequency	0.10	0.11	03.35(\pm 01.51)	–
Healthy behaviors	–0.21***	–0.18**	18.02(\pm 05.57)	0.66
Chest pain	0.37***	0.22***	02.10(\pm 01.86)	0.55
Irregular heartbeat	0.24***	0.19**	00.47(\pm 00.86)	–
Sleep fragmentation	0.41***	0.27***	03.77(\pm 02.60)	0.77
Physical health	–0.34***	–0.28***	26.36(\pm 03.30)	0.70
Perceived stress	0.60***	0.67***	06.80(\pm 02.83)	0.65
Type-D personality	0.52***	0.56***	00.54(\pm 00.50)	0.89

Notes: $N = 254$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3 Uncorrected t-tests comparing nightmare-prone individuals and controls.

	Nightmare-0Prone	Control			
Variable	Mean (\pm Standard Deviation)	Mean (\pm Standard Deviation)	t	p	d
Psychological distress	7.72 (\pm 2.82)	3.08 (\pm 2.58)	10.58	< .0001	1.77
General nightmares	11.65 (\pm 3.34)	9.84 (\pm 3.16)	3.39	< 0.001	0.57
Posttraumatic nightmares	9.51 (\pm 3.38)	8.06 (\pm 3.40)	2.55	0.011	0.43
Nightmare distress	8.81 (\pm 3.67)	7.42 (\pm 3.24)	2.51	0.013	0.42
Dream recall frequency	4.00 (\pm 1.33)	3.22 (\pm 1.52)	3.13	0.002	0.52
Healthy behaviors	17.02 (\pm 4.77)	18.23 (\pm 5.70)	1.30	0.197	0.22
Chest pain	3.42 (\pm 2.41)	1.83 (\pm 1.61)	5.37	< 0.001	0.90
Irregular heartbeat	0.81 (\pm 1.12)	0.40 (\pm 0.78)	2.93	0.004	0.49
Sleep fragmentation	5.60 (\pm 2.27)	3.40 (\pm 2.51)	5.34	< 0.001	0.89
Physical health	24.02 (\pm 4.12)	26.83 (\pm 2.90)	5.37	< 0.001	0.90
Perceived stress	9.47 (\pm 2.38)	6.25 (\pm 2.60)	7.48	< 0.001	1.25
Type-D personality	0.95 (\pm 0.21)	0.46 (\pm 0.50)	6.42	< 0.001	1.08

Note: $N = 254$.

recalling more dreams and nightmares, reporting nightmare distress, more chest pain, sleep fragmentation, sensitivity to stressors, a Type-D personality, and worse perceived physical health. These findings were generally consistent with the correlations. The notable exception was that using categories rather than continuous data, we found that nightmare-prone individuals recall more dreams. Further, there was no significant difference between the groups in terms of healthy behaviors, though a significant relationship was found with continuous data.

Partial correlations for distress and NP while holding the other constant are presented in ►Table 4. Nightmare proneness accounted for significant variance independent of distress for all variables except dream recall and health

Table 4 Partial correlations of nightmare proneness and psychological distress while holding the other constant.

Variable	Partial r with Nightmare Proneness Holding Psychological Distress Constant	Partial r with Psychological Distress Holding Nightmare Proneness Constant
General nightmares	0.15*	0.04
Posttraumatic nightmares	0.22***	0.10
Nightmare distress	0.18**	0.05
Dream recall frequency	0.03	0.06
Healthy behaviors	-0.12	-0.04
Chest pain	0.32**	-0.07
Irregular heartbeat	0.14*	0.04
Sleep fragmentation	0.32***	-0.03
Physical health	-0.22***	-0.05
Perceived stress	0.24***	0.43***
Type-D personality	0.21***	0.31***

Notes: $N = 254$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

behaviors. However, after accounting for NP, distress only accounted for significant independent variance in perceived stress and Type-D personality. The results did not appreciably change after also holding constant cardiovascular diagnoses (results not presented).

The regression predicting cardiac symptoms is presented in ►Table 5. Being diagnosed with a cardiac condition independently predicted cardiac symptoms across all models. Similarly, perceived physical health and nightmare distress consistently predicted cardiac symptoms. General experiences of nightmares predicted cardiac symptoms until Step 4, when NP was added. Variables which would be expected to contribute to cardiac disease, such as health behaviors and sleep fragmentation, contributed little to cardiac symptoms in this sample of young adults. Distress, Type-D, and perceived stress, which would indicate the influence of distress/psychopathology, also contributed little independent variance to cardiac symptoms. Nightmare proneness contributed modestly, but significantly, to the variance above all other measures. The latter finding supports the contention that cardiac symptoms could represent concretization among healthy young adults rather than negative-symptom reporting or psychopathology. When the regression was recalculated without including cardiovascular diagnoses, the results did not change appreciably. When recalculated using only chest pain as the criterion, the results were similar, but cardiovascular diagnoses, nightmare distress, and general nightmares did not predict chest pain in Step 2 or thereafter. Predicting only chest pain slightly increased the strength of physical health and NP (results of the recalculated regressions not presented).

The regression predicting NP is presented in ►Table 6. Gender predicted NP until sleep fragmentation and distress-related variables were entered in Step 3. Similarly, nightmare distress and general nightmares predicted NP until Step 3. It should be noted that posttraumatic nightmares predicted NP

Table 5 Regression models predicting cardiac symptoms.

Variable	Model 1			Model 2			Model 3			Model 4		
	β	<i>t</i>	<i>p</i>	<i>B</i>	<i>t</i>	<i>p</i>	β	<i>t</i>	<i>p</i>	β	<i>t</i>	<i>p</i>
Gender	0.08	1.26	0.207	0.01	0.25	0.801	0.01	0.15	0.880	-0.01	0.23	0.816
Cardiac diagnosis	0.24	3.92	0.001	0.18	3.21	0.002	0.18	3.24	0.001	0.18	3.30	0.001
Dream recall frequency				0.02	0.42	0.672	0.02	0.39	0.695	0.03	0.44	0.660
Healthy behaviors				-0.05	0.90	0.368	-0.05	0.91	0.361	-0.04	0.75	0.452
Type-D personality				0.02	0.34	0.737	0.01	0.11	0.910	-0.03	0.40	0.690
Physical health				-0.21	3.34	0.001	-0.21	3.34	0.001	-0.19	3.14	0.002
Sleep fragmentation				0.06	0.95	0.341	0.05	0.87	0.386	0.01	0.07	0.946
Perceived stress				0.08	1.21	0.229	0.05	0.68	0.497	0.10	0.12	0.906
General nightmares				0.14	2.11	0.036	0.13	2.03	0.043	0.11	1.75	0.081
Posttraumatic nightmares				0.05	0.82	0.412	0.05	0.86	0.393	0.02	0.35	0.730
Nightmare distress				0.16	2.42	0.016	0.16	2.36	0.019	0.16	2.38	0.018
Psychological distress							0.06	0.68	0.497	-0.07	0.74	0.463
Nightmare proneness										0.28	3.21	0.001
	$\Delta R^2 = 0.06; F = 8.45; p < 0.001$			$\Delta R^2 = 0.21; F = 7.71; p < 0.001$			$\Delta R^2 = 0.01; F = 0.46; p < 0.497$			$\Delta R^2 = 0.03; F = 10.32; p < 0.001$		

Table 6 Regression models predicting nightmare proneness.

Variable	Model 1			Model 2			Model 3			Model 4		
	β	<i>t</i>	<i>p</i>	β	<i>t</i>	<i>p</i>	β	<i>T</i>	<i>p</i>	β	<i>t</i>	<i>p</i>
Gender	0.23	3.67	0.001	0.20	3.28	0.001	0.08	1.88	0.061	0.07	1.79	0.075
Cardiac diagnosis	-0.01	0.07	0.943	-0.03	0.51	0.613	0.01	0.02	0.981	-0.01	0.32	0.749
Dream recall frequency	0.09	1.38	0.168	0.01	0.16	0.871	-0.01	-0.20	0.843	-0.01	0.26	0.797
Nightmare distress				0.15	2.12	0.035	0.00	0.09	0.932	-0.02	0.30	0.761
Posttraumatic nightmares				0.14	2.24	0.026	0.11	2.53	0.012	0.10	2.27	0.024
General nightmares				0.15	2.19	0.030	0.07	1.51	0.133	0.06	1.19	0.234
Healthy behaviors							-0.04	-0.86	0.391	-0.03	0.68	0.498
Sleep fragmentation							0.17	3.94	0.001	0.17	3.86	0.001
Physical health							-0.06	1.21	0.227	-0.02	0.35	0.725
Psychological distress							0.43	7.27	0.001	0.42	7.31	0.001
Perceived stress							0.16	2.77	0.006	0.15	2.72	0.007
Type-D personality							0.13	2.52	0.013	0.13	2.56	0.011
Rose angina										0.15	3.24	0.001
Irregular heartbeat										0.00	0.08	0.938
	$\Delta R^2 = 0.06; F = 5.42; p = 0.001$			$\Delta R^2 = 0.10; F = 9.42; p < 0.001$			$\Delta R^2 = 0.47; F = 49.73; p < 0.001$			$\Delta R^2 = 0.02; F = 5.83; p = 0.003$		

regardless of distress. Sleep fragmentation and distress-related variables appeared to be strong, consistent predictors of NP. Interestingly, chest pain, but not irregular heartbeat, contributed modestly, but significantly, to the variance in NP above all other variables.

Discussion

The results of the present study suggest that NP has several characteristics which identify it as a construct separate from distress. These findings characterize individuals with NP as

more likely to experience distressing nightmares, particularly posttraumatic nightmares, having fragmented sleep, feeling overwhelmed with stressful situations, experiencing more depressive and anxious distress, having a combination of social inhibition and negative affect, and reporting more experiences of chest pain. These findings were consistent with those of previous research that found NP related to insomnia, social anxiety,⁴ posttraumatic stress symptoms, and psychological distress,⁵ as well as theoretical speculations that NP includes heightened vulnerability to stressors, hyperarousal, psychical dysregulation, and concretization.⁵ The current results also were in accordance with the aforementioned conceptualizations of NP and distress.

If NP is a form of maladjustment,⁴ it is a form that appears independent of distress, several risk factors for psychopathology, and perhaps a negative reporting bias. Similarly, but inconsistent with previous assertions,^{13,15} chest pain among healthy young adults did not appear solely to be a manifestation of distress or a general reporting bias. Yet, it did appear partly to reflect perceptions of poor physical health. This could indicate an overconcern with, or sensitivity to, somatic processes.³⁶ The current data did not allow for this distinction or possible mechanisms, though it appears to occur independent of maladjustment.

Given its independent relations with NP outside of physical health perceptions and distress, chest pain could represent a concrete manifestation of psychological states among relatively healthy young adults. This is consistent with findings that chest pain among children is psychogenic, linked to real or imagined stressful experiences.¹⁶ However, considering its lack of independent relationships with NP, irregular heartbeat might be more a manifestation of distress rather than concretization.³⁷ Whether or not chest pain among young adults is considered concretization, findings that cardiac symptoms were related to nightmares among large community samples of middle-aged²² and older¹² adults should be revisited examining possible effects of distress and NP.

To the extent that chest pain in healthy individuals indicates concretization, the current findings support theoretical assertions that NP partly includes concrete manifestations of vague, uncomfortable psychological states.⁵ The findings that chest pain predicted NP independent of cardiovascular diagnoses, sleep fragmentation (which increases sensitivity to actual physical pain³⁸), as well as distress-related variables, which have been related to chest pain,^{13,20} lends some credence to the tentative conceptualization of chest pain as concretization among healthy young adults. However, it remains possible that chest pain in young adults could instead result from hyperventilation secondary to hyperarousal or other mechanisms.³⁷

The present study extended knowledge of NP relative to other psychological and physical processes in several ways. For instance, NP was related not only to general nightmare frequency and nightmare distress,⁵ but also to posttraumatic nightmares. Indeed, posttraumatic nightmares were more strongly related to NP than nonspecific nightmares. Also, it was found that NP was more strongly related to physical

health perceptions and cardiac symptoms than it was to health-related behaviors. Given the current results, speculations that NP affects cardiovascular disease later in life through health behaviors¹¹ seems unlikely.

Further, the current findings suggest it is unlikely that individuals with higher NP report more nightmares as a result of dream recall. This adds to previous findings that NP was independent from typical sleep duration.⁵ Together, these findings mitigate an explanation that NP individuals report more nightmares as a result of having access to longer sleep episodes or recalling more vivid, emotional dreams. It might also suggest that dreams and nightmares are somewhat disparate, though likely related, processes influenced by somewhat different mechanisms. Nevertheless, it is possible that individuals with NP have more nightmares due to a greater proportion of REM sleep,³⁹ or that fragmentation of sleep might enable a greater recall of bad dreams.⁴⁰

Additional systematic investigations are needed to better understand the origins and mechanisms of NP and why it is strongly related to distress but remains statistically separate. It has been speculated that NP results from weakened psychic structures.⁵ The notion of weakened psychic structures among individuals with NP is consistent with previous findings that “thin” psychological boundaries independently predicted NP apart from neuroticism and nightmare frequency.⁴¹ Thin boundaries suggest an incohesive and dysregulated mental organization leaving individuals feeling dysregulated and vulnerable to distress.^{42,43}

Another possible origin of NP and its link with distress is high sensory sensitivity. A recent study⁴⁴ found that sensory sensitivity, heightened responsiveness to stimuli, and emotional processing were related to nightmare frequency and distress. It is possible that individuals with high NP and those who experience distress are more responsive to internal and external stimuli and easily overwhelmed by stress, both of which could indicate thin boundaries as well. Moreover, the responsiveness and overwhelmedness of highly-sensitive individuals correspond to Kelly and Yu's⁵ notion of a weakened psychic structure and corresponding sensitivity and vulnerability which underly NP.

The current study had several limitations which should be considered before generalizing the results. For instance, the reliance on a relatively homogenous student sample makes extending the results to other populations difficult. Indeed, the sample mostly consisted of young Latinx females, which might have biased the results. The use of retrospective self-report measures without controlling for social desirability or other biases is problematic. Underlying, undiagnosed cardiovascular syndromes in the current study may have influenced the results. While this seems unlikely given the nature of the sample, it should be considered in future research. It is regrettable that, aside from a few demographic variables, the background of the current sample, which involves trauma history and medications, was not thoroughly examined. This provides less context to understand the results. Given the limitations of the current study, its findings should be considered tentative.

Additional research is needed to account for the limitations of the current study and to clarify its results. For instance, it would be helpful to understand how background factors such as the use of medications, previous psychiatric treatment, socioeconomic status, and family history might influence relationships regarding NP, distress, nightmares, and cardiac symptoms. Also, additional research is needed to better understand the relationship between NP and nightmares themselves. Outside speculations of concretization, the mechanisms of this relationship are not known. It is possible that individuals with NP have more nightmares due to increased amounts of REM and/or fragmented sleep, giving NP individuals more “access” to nightmares. Also, research could examine how thin boundaries and sensory sensitivity might influence NP and connect it with nightmares and distress. Importantly, to understand the implications of the current results, additional study is needed to establish if chest pain represents concretized inner states among healthy samples or other mechanisms such as hyper-ventilation related to hyperarousal. Finally, additional studies using a more diverse community and clinical samples would be of interest.

Conflict of Interests

The authors have no conflict of interests to declare.

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