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# Psychometric properties of the Arabic version of the Nightmares Distress Questionnaire (NDQ-AV) in a community sample of adolescents

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## Abstract

**Background** The Nightmare Distress Questionnaire (NDQ), known and commonly used for its adequate psychometric properties, is the most widely used instrument for the measurement of nightmare distress. This study aimed to assess the psychometric properties of a newly translated Arabic version of the Nightmare Distress Questionnaire (NDQ-AV).

**Methods** A total of 546 Lebanese adolescents was recruited for this study and completed the NDQ-AV, the Insomnia Severity Index (ISI), and the eight-item Depression, Anxiety and Stress Scale (DASS-8).

**Results** The results of the exploratory factor analysis (EFA) and the confirmatory factor analysis (CFA) supported both a one-factor model and a two-factor model of the NDQ-AV, with the latter consisting of seven items within both factors. The first factor was referred to as the "general nightmare distress and coping" while the second was named "nightmare impact and perception". The reliability of the scale was excellent (α = 0.930 and ω = 0.915). Moreover, measurement invariance was shown across gender, demonstrating that this measure performs consistently for both men and women. Additionally, the NDQ-AV scores exhibited excellent reliability alongside factorial and concurrent validity.

**Conclusion** In conclusion, these results support the psychometric validity of the Arabic version of the NDQ. The availability of the NDQ-AV is expected to facilitate the understanding of nightmare distress within the Lebanese context.

**Keywords** Nightmares Distress Questionnaire, Psychometric Properties, Arabic

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## Introduction

The DSM-5 defines nightmares as being "lengthy, elaborate, story like sequences of dream imagery that seem real and that incite anxiety, fear, or other dysphoric emotions" [4]. In other words, nightmares can be described as recurring, prolonged, and intensely unpleasant dreams, incorporated with a sense of endangerment to one's physical well-being, safety/survival, and are often vividly remembered [51]. Essentially, nightmare disorder is operationalized by the presence of recurrent nightmare episodes where the individual would abruptly become awake with rapid return to full alertness [46]. Within the realm of nightmare disorder, nightmares cause significant distress and impairment in social, occupational and other areas of functioning [46]. For instance, areas of distress pertaining to nightmares may include emotional, behavioral and cognitive disturbances, fear of sleeping, daytime sleepiness, fatigue [46] difficulty resuming sleep after a nightmare and experiencing restless sleep [32]. In elaboration, exposure to frequent and/or severe nightmares is associated with high levels of psychological distress [32, 33]. Nightmare distress can manifest in various ways. Some individuals can become fixated with the memory of their nightmares, while others develop faulty ideas pertaining to their nightmares, assuming that they are a sign of future events [32]. Additionally, nightmare distress can refer to the levels of waking distress felt by an individual as a result of nightmares [25]. Other researchers have defined it as the distress experienced both during and immediately following a nightmare [25]. Thus, there is no one clear conceptualization of nightmare distress. For instance, according to Böckermann et al. [9], nightmare distress can be evaluated in terms of (i) nightmare intensity or the distress experienced during and directly after a nightmare, (ii) nightmare effects or their impact on social functioning, (iii) nightmare-related symptoms or their impact on psychological functioning and sleep quality, and (iv) perception of nightmare distress or people's personal perception on the amount of distress experienced as a result of nightmares [9]. Nightmare distress seems to correlate with several psychopathologies [25, 51], including anxiety, depression, stress, insomnia [33, 34], decreased wellbeing [8], and even suicidal behaviors [37]. It is noteworthy mentioning that the literature has identified a triadic association between nightmare distress, nightmare frequency and neuroticism [48]. Neurocognitively, this relationship can be explained by the contribution of high emotional reactivity, measured as neuroticism, in conjunction with the frequency of nightmares to the overall distress experienced by nightmares [48]. Therefore, because of its high clinical relevance in a wide range of psychopathology, the assessment of nightmare distress appears to be highly needed and beneficial.

To measure nightmare distress, [7] designed the Nightmare Distress Questionnaire (NDQ), which is the most often used questionnaire for measuring the subjective distress caused by nightmares upon waking [7, 52]. The NDQ consists of thirteen self-reported items scored on a five-point Likert-type scale ranging from one ("never", "not at all", or "not at all interested") to five ("always", "a great deal", or "extremely interested"). The scale's reliability has proven to be excellent, with a Cronbach's alpha ranging from 0.83 to 0.88 [51]. The NDQ yielded three factors with good internal consistency, evaluating (i) "general nightmare distress", (ii) "impact on sleep", and (iii) "daytime reality perception" [9, 25]. Through the analysis of divergent and convergent validity by comparing their three subscales to other concepts related to nightmares, the reliability and validity of the third subscale were still questioned [9]. Stieger and Kuhlmann [52], on the other hand, proved the reliability of the third subscale across a sample of German participants,however, its validity remained unclear [52]. In another study by Martinez et al. (2005), three different factors with good internal consistency were identified for the NDQ, namely (i) "preoccupation fear", (ii) "interference", and (iii) "premonition" [9, 39]. When compared to the factors found by Böckermann et al. [9], the "interference" factor was shown to be identical to the "general nightmare distress" factor, referring to the subjective evaluation of nightmare distress. Similarly, the "premonition" factor was proven to be similar to the "impact on daily reality perception" which pertains to whether nightmares affect an individual's perception of reality when they are awake. Considering these similarities, further evidence is provided to support the validity of these two subscales [9]. One theory that can explain the presence of a variety of factor solutions of the NDQ is the idea that the definition of what nightmares are has evolved over the years, with the importance of distinguishing between their various components [35]. Concepts such as affect load and affect distress have been proposed as integral components of nightmares [35]. While affect load is linked to an increased frequency of all types of dreams, affect distress is associated with more severe nightmares [35]. This highlights the necessity of a multidimensional evaluation of nightmares to differentiate among subtypes and comprehend their effects more thoroughly [35].

To improve the psychometric evidence of the scale and address its identified gaps, a Chinese version, i.e., NDQ-CV, was translated and validated [36]. The NDQ-CV focused on unifying the Likert scales of the NDQ, making them all fall under the frequency scale that ranges from one ("never") to five ("always"). Moreover, the original scale was edited by modifying the eighth item (i.e., modifying "Do nightmares affect your well-being?" to "Do

nightmares affect your academic/job performance?") and adding a new item (i.e., "Are you ever upset/distressed by your nightmares?") to assess the overall distress related to nightmares [36]. Thus, the new NDQ-CV scale ended up with 14 items, with greater total scores implying more intense suffering caused by nightmares. Thus, with a sample of 11,831 adolescents, the reliability of the NDQ-CV was calculated to be 0.9. Following an exploratory factor analysis (EFA) to confirmatory factor analysis (CFA) strategy, two major factors were identified, namely "general nightmare distress" and "daytime reality perception". The scale was proven to be a valid scale for nightmare distress measurement among Chinese adolescents [36].

### The present study

The goal of the present study was to make an Arabic version of the NDQ-CV scale (i.e., NDQ-AV) available. Although sleep research has known a significant growth and evolution worldwide over the last three decades, it remains largely underdeveloped in the Arab world, subsequently mirroring the underdevelopment of sleep clinical services overall [3]. In this regard, some researchers called for more sleep research to overcome the challenges that hinder the progress of sleep medicine and educate healthcare providers and decision-makers about the size of the problem in the Arab region [3]. Following the recommended EFA-to-CFA strategy [55, 56], the original two-factor model of the NDQ-CV is expected to be replicated in our sample. In addition, we expected that the NDQ-AV would show good reliability and measurement invariance across gender groups. We also hypothesized that the concurrent validity of the scale would be demonstrated through adequate patterns of correlations with relevant constructs (i.e., depression, anxiety, stress, and insomnia).

## Methods

### Procedures and participants

Ethics approval for this cross-sectional study was obtained from the ethics committee of the School of Pharmacy at the Lebanese International University (approval code: 2023RC-009-LIUSOP). All data were collected via a Google Form link during March 2023 using a convenient sampling method; the research team approached adolescents, who were later asked to forward the link to other friends and family members within the same age group. Included participants were those residing in Lebanon and aged between 13 and 18 years. Internet protocol addresses were examined to ensure that no participant took the survey more than once. After providing digital informed consent, participants were asked to complete the anonymous survey, voluntarily and without remuneration.

A total of 546 adolescent Lebanese citizens and residents enrolled in this study with a mean age of 15.76 years ($SD = 1.65$) and 60.1% females. No significant difference was found between the two subsamples used for the EFA and CFA analyses respectively.

### Measures

#### *Demographics*

Participants were asked to provide their demographic details including age and sex (male and female).

#### *Nightmare Distress Questionnaire-Arabic version (NDQ-AV)*

The NDQ-AV is composed of 14 items rated on a five-point Likert scale — never, rarely, sometimes, often, always, with higher scores reflecting more nightmares. Liu et al. [36, 37] identified two factors, the first was referred to as "nightmare general distress" (NGD) which included 10 items, including "Are you ever afraid to fall asleep for fear of having a nightmare?". The second factor, named "nightmare daytime reality perception" (NDRP) included four items, including "In the past year have you considered seeking professional help for your nightmares?" [36]. To develop the NDQ-AV, the forward and backward translation method was applied to the NDQ-CV scale following international guidelines [6]. The English version was translated into Arabic by a Lebanese translator who was completely unrelated to the study. Afterward, a Lebanese psychologist with full working proficiency in English, translated the Arabic version back into English. The initial and translated English versions were compared to detect and later eliminate any inconsistencies by a committee composed of the research team, one psychologist, one psychiatrist, and two translators. A pilot study was conducted on 30 persons before the start of the official data collection to make sure all questions are well understood; no changes were done consequently. Therefore, the results of the pilot study were included in the final database.

#### *Insomnia severity index*

Validated in Lebanon [28], this scale is composed of seven items, rated on a five-point Likert scale from 0 (never) to 4 (very much). The seven items measure the onset and maintenance of sleep, awakening, one's satisfaction with their current patterns, interference and impairments caused by sleep patterns, and the distress levels pertaining to sleep problems [5]. The total score ranges from 0 to 28, with higher scores indicating more severe insomnia ($\alpha = 0.775$ and $\omega = 0.779$).

#### *Depression, Anxiety and Stress Scale-8 items (DASS-8)*

Validated in Arabic [2] this scale is composed of eight items that would measure psychological distress. It is

comprised of three subscales, with three items measuring depression, another three items measuring anxiety, and two items measuring stress [11]. The 4-point Likert scale ranges from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). The total score on the DASS-8 can range between 0 to 24, with subscale scores ranging 0 to 9 for depression, 0 to 9 for anxiety and 0 to 6 for stress [11]. Higher scores indicate more psychological distress ($\alpha = 0.873$ and $\omega = 0.874$).

### Analytic strategy

We assessed measurement properties following the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) guidelines (*COSMIN taxonomy of measurement properties.*; *COSMIN methodology for systematic reviews of Patient-Reported Outcome Measures (PROMs).*; [42]). R (version 4.1.2) and its compiler RStudio were used for all data analyses with packages "*MVN*" [31], "*psych*" [38], "*lavaan*" [45], "*semTools*" [53], and "*ufs*" [20, 44].

#### *Data treatment*

There were no missing responses in the dataset. To examine the factor structure of the NDQ, we used an EFA-to-CFA strategy [54]. To ensure adequate sample sizes for both EFA and CFA, we split the main sample using the SPSS computer-generated random technique. The recommended minimum sample size required for conducting an EFA and CFA was 10 times [16] and 3–20 times the number of the scale's items [43] respectively. The description of the total and two subsamples is summarized in Table 1.

#### *Structural validity*

Following the recommendation of Swami and Barron [54], an examination of the factorial validity structure of the NDQ-AV was undertaken using a two-step analytic strategy consisting of EFA followed by CFA on two different samples. Therefore, to shorten items and explore the structure of the NDQ-AV, EFA was applied using exploratory data on sample one ($N = 283$) [14]. Before EFA, Kaiser–Meyer–Olkin (KMO) test, and Bartlett's test were performed to check the accessibility for EFA of the data [57, 58]. KMO value higher than or equal to 0.800 and Bartlett's test is found significant ($P < 0.050$) were favored for conducting EFA. Then, EFA was initially conducted on a full item pool with Oblimin rotations using the maximum likelihood factoring method [10]. The item would be considered for removal if any of the following criteria were met: i) the target-loading is less than 0.450; ii) the cross-loading is higher than 0.320 or the gap between target-loading and possible cross-loading is greater than 0.200 [17, 57].

CFA was then applied to validate the factorial models and identify the relatively better factor structure in confirmatory data on sample two ($N = 263$) [40, 47]. The weighted least square mean and variance adjusted (WLSMV) estimator was used to adapt the ordinal properties of the data [21, 24, 59]. Goodness-of-fit (GOF) indices are considered acceptable if normed model chi-square ($\chi^2/df$) is below 5, Comparative Fit Index (CFI) is higher than 0.900, Tucker-Lewis Index (TLI) is higher than 0.900, and Root Mean Square Error of Approximation (RMSEA) is lower than 0.080 [29]. The final confirmed factor model would be used in the subsequent analytic approaches.

#### *Gender invariance*

Configural, threshold, metric, scalar, and strict invariance model is built on sex to analyze cross-sectional measurement invariance [53, 59]. All parameters of the configural invariance model were set free. Threshold invariance constrained the threshold parameter to test equality. Threshold and factor loadings were constrained to test whether they remain equal in metric invariance model. Besides threshold and factor loadings, scalar invariance further added restrictions on intercept parameters. Measurement invariance could be considered supportive in the model if the following GOF indices [27] and their changes within ($\Delta$) were met: $\Delta CFI \leq 0.010$, $\Delta TLI \leq 0.010$, $\Delta RMSEA \leq 0.015$ [12, 13, 41].

#### *Further analyses*

Composite reliability in both subsamples was assessed using McDonald's ω and Cronbach's α, with values greater than 0.700 reflecting adequate composite reliability for both [23]. The NDQ-AV total score was normally distributed according to its skewness and kurtosis values varying between ± 1 [26]. To assess concurrent validity, we examined bivariate correlations between NDQ scores and ISI and DASS-8 using the total sample. Partial correlations were done to examine those correlations after adjustment over age and gender. Based on Cohen [15] [15], values ≤ 0.100 were considered weak, 0.010 to 0.300 were considered moderate, and 0.030 to 0.500 were considered strong correlations.

**Table 1** Sociodemographic characteristics of the participants

| Variable | Total sample (*N* = 546) | Subsample 1 (*N* = 283) | Subsample 2 (*N* = 263) | *P* |
|---|---|---|---|---|
| Sex | | | | 0.599 |
| Male | 218 (39.9%) | 116 (53.2%) | 102 (46.8%) | |
| Female | 328 (60.1%) | 167 (50.9%) | 161 (49.1%) | |
| Age (in years) | 15.76 ± 1.65 | 15.66 ± 1.66 | 15.87 ± 1.62 | 0.143 |

## Results

### Exploratory Factor Analysis (EFA)

The EFA of the NDQ-AV items conducted on subsample one with an oblimin rotation yielded a two-factor solution (KMO = 0.932; Bartlett's test $\chi^2 = 2161.98$, $P < 0.001$) (Table 2). The internal consistency for the total scale was excellent according to Cronbach's α (0.949; 95% CI 0.940, 0.958) and McDonald's ω (0.949; 95% CI 0.940, 0.958) values.

### Confirmatory factor analysis

CFA indicated that the fit of the two-factor model of the NDQ-AV obtained in the EFA was acceptable (Table 3). The standardized estimates of factor loadings were all adequate (see Fig. 1). Internal consistency (α = 0.930 and ω = 0.915) of the scale's items in this subsample was also adequate.

#### *Gender invariance*

As reported in Table 4, all indices suggested that configural, thresholds, metric, and scalar invariance was supported across gender. Females scored significantly higher than males in terms of NDQ total scores (28.29 ± 11.33 vs 24.88 ± 9.90; $t = -3.717$; $P < 0.001$) and Factor 1 "general nightmare distress and coping" (15.59 ± 6.71 vs 13.08 ± 5.50; $t = -4.782$; $P < 0.001$) and Factor 2 "nightmare impact and perception" (12.70 ± 534 vs 11.80 ± 5.02; $t = -1.965$; $P = 0.050$).

**Table 2** Factor loadings for each item in the exploratory factor analysis of exploratory data ($N = 283$)

| | Factor 1 | Factor 2 | Communalities | Uniquenesses | Complexity |
|---|---|---|---|---|---|
| NDQ-AV 1 | **0.81** | -0.07 | 0.59 | 0.42 | 1.02 |
| NDQ-AV 2 | **0.88** | -0.14 | 0.67 | 0.34 | 1.05 |
| NDQ-AV 3 | 0.30 | **0.47** | 0.47 | 0.52 | 1.69 |
| NDQ-AV 4 | **0.54** | 0.24 | 0.50 | 0.50 | 1.39 |
| NDQ-AV 5 | **0.67** | 0.12 | 0.54 | 0.45 | 1.06 |
| NDQ-AV 6 | **0.70** | 0.15 | 0.63 | 0.37 | 1.09 |
| NDQ-AV 7 | **0.49** | 0.40 | 0.63 | 0.37 | 1.91 |
| NDQ-AV 8 | 0.34 | **0.50** | 0.56 | 0.45 | 1.77 |
| NDQ-AV 9 | -0.05 | **0.83** | 0.64 | 0.36 | 1.01 |
| NDQ-AV 10 | 0.25 | **0.45** | 0.39 | 0.61 | 1.56 |
| NDQ-AV 11 | 0.13 | **0.63** | 0.50 | 0.49 | 1.09 |
| NDQ-AV 12 | **0.49** | 0.33 | 0.52 | 0.47 | 1.75 |
| NDQ-AV 13 | -0.13 | **0.78** | 0.51 | 0.49 | 1.06 |
| NDQ-AV 14 | 0.28 | **0.48** | 0.47 | 0.53 | 1.61 |
| SS loadings | 4.09 | 3.55 | N/A | N/A | N/A |
| Proportion Var | 0.29 | 0.25 | N/A | N/A | N/A |
| Cumulative Var | 0.29 | 0.55 | N/A | N/A | N/A |
| Proportion Explained | 0.54 | 0.47 | N/A | N/A | N/A |
| Cumulative Proportion | 0.54 | 1.00 | N/A | N/A | N/A |
| Cronbach's α (95% CI) | 0.924 (0.911, 0.938) | 0.915 (0.900, 0.930) | | | |
| McDonald's ω (95% CI) | 0.925 (0.911, 0.938) | 0.915 (0.900, 0.930) | | | |

*NDQ-AV* the Arabic version of the Nightmare Distress Questionnaire, *N/A* Not applicable

**Table 3** Confirmatory factor analysis outcomes of the NDQ-AV items in subsample 2 ($N = 263$)

| Models | $\chi^2$ | *df* | $\chi^2/df$ | CFI | TLI | RMSEA (90% CI) |
|---|---|---|---|---|---|---|
| One-factor model | 297.478 | 77 | 3.863 | 0.967 | 0.961 | 0.105 (0.092, 0.117) |
| **Two-factor model** | 270.873 | 76 | 3.564 | 0.971 | 0.965 | 0.099 (0.086, 0.112) |
| Second-order factor model | 2064.97 | 77 | 26.818 | 0.702 | 0.648 | 0.314 (0.302, 0.326) |
| Cutoff | N/A | N/A | 5 | > 0.900 | > 0.900 | < 0.080 |

Bold font stands for the best fit model

$\chi^2$ Chi-square, *df* degrees of freedom, *CFI* Comparative fit index, *TLI* Tucker-Lewis index, *RMSEA* Root mean square error of approximation, *CI* Confidence interval, *N/A* Not applicable

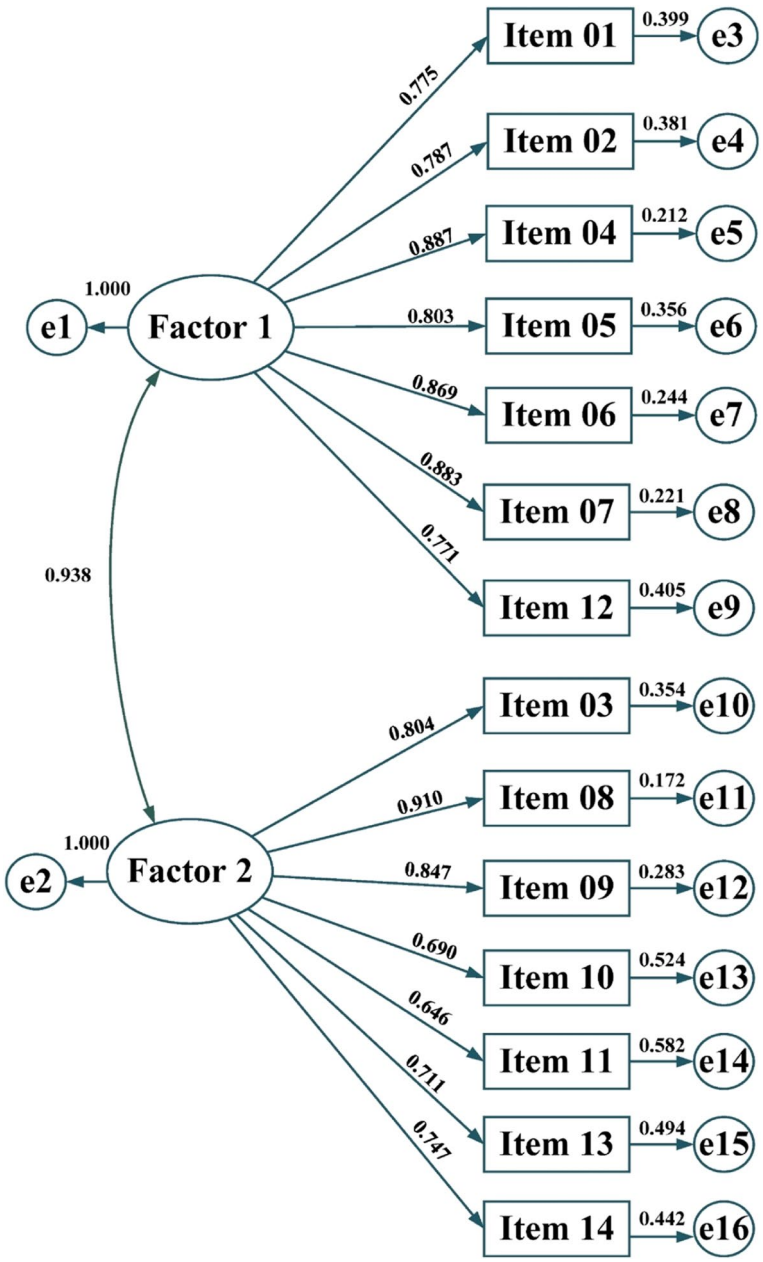


**Fig. 1** Standardized coefficients of confirmatory factor analysis results for a two-factor model of the NDQ ($N=263$). Note: The one-sided edges represent coefficient values (i.e., factor loadings) while the double-sided one the covariance between two factors

### Concurrent validity (total sample)

The total NDQ-AV scores correlated significantly and positively with the ISI scores ($r=0.440$; $P<0.001$) and the DASS scores ($r=0.543$; $P<0.001$). After adjusting over age and gender, the results showed that higher NDQ-AV scores remained significantly and positively correlated with ISI scores ($r=0.437$; $P<0.001$) and DASS scores ($r=0.539$; $P<0.001$).

## Discussion

With nightmares being a universal human experience, they should be measured only as a construct within a given cultural context, as the ways how they are interpreted and managed vary widely across social and cultural norms [30]. Therefore, this study aimed to contribute to this field by evaluating the psychometric properties of the NDQ-CV in its translated Arabic

**Table 4** Measurement invariance across gender in the second split-half Subsample ($N = 263$)

| **Two-factor model** | $\chi^2$ (*df*) | $\Delta\chi^2$ ($\Delta df$) | **CFI** | **ΔCFI** | **TLI** | **ΔTLI** | **RMSEA (90% CI)** | **ΔRMSEA** |
|---|---|---|---|---|---|---|---|---|
| Configural | 575.168 (152)*** | / | 0.996 | / | 0.995 | / | 0.146 (0.133, 0.159) | / |
| Thresholds | 611.611 (175)*** | 29.462 (23) | 0.996 | < 0.001 | 0.996 | 0.001 | 0.138 (0.126, 0.150) | -0.008 |
| Metric | 591.621 (187)*** | 9.713 (12) | 0.996 | < 0.001 | 0.996 | < 0.001 | 0.129 (0.117, 0.141) | -0.009 |
| Scalar | 589.467 (199)*** | 27.163 (12)** | 0.996 | < 0.001 | 0.997 | 0.001 | 0.123 (0.111, 0.134) | -0.006 |
| **One factor model** | $\chi^2$ (*df*) | $\Delta\chi^2$ ($\Delta df$) | **CFI** | **ΔCFI** | **TLI** | **ΔTLI** | **RMSEA (90% CI)** | **ΔRMSEA** |
| Configural | 584.961 (14)*** | / | 0.996 | / | 0.995 | / | 0.146 (0.134, 0.159) | / |
| Thresholds | 621.607 (177)*** | 29.462 (23) | 0.996 | < 0.001 | 0.996 | 0.001 | 0.139 (0.127, 0.151) | -0.007 |
| Metric | 598.577 (190)*** | 10.426 (13) | 0.996 | < 0.001 | 0.996 | < 0.001 | 0.128 (0.117, 0.140) | -0.011 |
| Scalar | 602.391 (203)*** | 33.227 (13)** | 0.996 | < 0.001 | 0.997 | 0.001 | 0.123 (0.112, 0.134) | -0.006 |

$\chi^2$ Chi-square, *df* degrees of freedom, *CFI* Comparative fit index, *TLI* Tucker-Lewis index, *RMSEA* Root mean square error of approximation, *CI* Confidence interval, Δ a change in $\chi^2$, *df*, CFI, TLI, and RMSEA, *N/A* Not applicable

*** $P < 0.001$

** $P < 0.010$

version (i.e., NDQ-AV) scale in a sample of native Arabic-speaking non-clinical adolescents from Lebanon. Findings demonstrated that the Arabic version of the scale reflects excellent reliability and offered support for its factorial and concurrent validity. Therefore, the results advocate the use of the NDQ-AV for the measurement of nightmare distress among Arab adolescents.

As for factorial validity, EFA was used to investigate the most appropriate model of the NDQ-AV in the first subsample while avoiding the modeling limitations. Then, using the EFA-derived model, cross-validation was done through CFA in the second sub-sample. Analyses revealed that the 14 items of the NDQ-AV had adequate standardized estimates of factor loadings ranging from 0.46 to 0.99, with both the single-factor and two-factor models showing a good fit to the data. Although the two-factor model was similar concerning the deduction of two factors by Liu et al. [36, 37], the latter's two factors consisted of 10 items for Factor one "nightmare general distress", and 4 items for Factor two "nightmare daytime reality perception" [36],whereas in our model, each factor was composed of seven items. The difference in the factor loading on the two factors between the Chinese and the Arabic versions of the scale could be explained by cultural differences [30]. For example, item nine (i.e., "Do nightmares affect your academic/job performance?") might reflect that daytime reality perception, or nightmares' influence on the perception of reality during waking life, rather than distress impacts daily functioning in the Arab culture. Even though the one-factor solution yielded a good fit to the data, the two-factor solution is theoretically more coherent. In addition, the two-factor model allows for the identification of two different facets of nightmares distress. As such, we endorse the two-factor model as the most conceptually and statistically sound.

The internal consistency was excellent for the two subscales with Cronbach's α from 0.915 to 0.924 and McDonald's ω from 0.915 to 0.925. These results allow for the deduction that the NDQ-AV displays a consistent two-dimensional structure and is in line with the Chinese validation study where the two subscales exhibited coefficient omega values of from 0.88 to 0.69 and coefficient alpha values from 0.68 to 0.88. In addition, the results of the EFA showed that the two-factor structures of the NDQ-AV scores were invariant between both males and females. This psychometric property will enable future latent mean comparisons to be made across genders without bias. In our sample, female adolescents displayed significantly higher NDQ-AV scores; this finding is in agreement with previous literature consistently showing that females tend to report significantly higher frequencies of nightmares compared to men [49, 50] as well as greater levels of nightmare distress [51]. A possible explanation for this occurrence is that females are more likely to seek rumination and emotion-focused coping strategies as well as the fact that, neurologically, women are prone to show higher levels of responses to emotional triggers [49].

To evaluate and prove the concurrent validity of our scale, a number of variables that serve as indicators of sleep disturbances and other psychopathology [22, 34, 51] were selected, namely the ISI and DASS-8. As anticipated, there were significant associations between the NDQ-AV scores and depression, anxiety, stress and insomnia symptoms scores. The presence of statistically significant relationships between the NDQ-AV total scale, its subscales, and sleep and psychological

disturbances lends support to the validity of the NDQ-AV as a measurement of nightmare distress among Lebanese adolescents, and provides further evidence to the clinical relevance of the construct in Arab contexts. This is concordant with the results of Liu et al. [36, 37], which demonstrated positive associations between the NDQ-CV and insomnia depressive and anxiety symptoms [36].

A few limitations existed in the current study which could be addressed in future academic research. Firstly, given that convenient sampling was used for the recruitment of participants, issues with the generalizability of results to the wider population of Lebanese adolescents are likely to ensure [1]. Furthermore, non-clinical samples of adolescents were considered for this study. Hence, the use of the NDQ-AV might require testing in clinical adolescents (e.g., those diagnosed with nightmare disorders or recurrent nightmares) before considering it for clinical use [36]. On the same note, nightmares resulting from substance use or medicinal prescriptions were not considered nor excluded from the results of this study knowing that such pharmaceuticals can increase the incidences of nightmares in adolescents. Future research can take this into account to ensure more control over any confounding variables [60]. Moreover, due to the lack of other validated and reliable Arabic scales known for the measurement of nightmare distress, comparison of the NDQ-AV with such a scale was impossible for additional support to its construct validity [36]. Additionally, a measure of nightmare frequency was not included, and future validation studies should address this limitation. Finally, since the online questionnaire consisted of self-reported answers, additional objectivity can be ensured through the measurement of neurophysiological measurements such as heart rate variability and skin conductance [60].

## Conclusion

Psychometric validity of the NDQ-AV can be concluded from the findings of the current study, indicating its utility in assessing nightmare distress among Arabic-speaking populations. This facilitates the existence of an Arabic tool measuring nightmare distress, which can be helpful for the facilitation of a more comprehensive exploration of the associations between nightmare distress and a variety of psychopathologies, sleep disturbances and disorders within a cultural and linguistic framework. This is crucial in light of the absence of an Arabic scale that measures nightmare distress based on our knowledge. Moreover, with the current results, the NDQ-AV can be an aid for clinicians working towards the interviewing and diagnosing of patients with nightmare disorders and nightmare distress in Lebanon.

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**Authors' contributions**
FFR, SO and SH designed the study; RC drafted the manuscript; CJ, RM and SH carried out the analysis and interpreted the results; DM, MD and FS collected the data; SO, RH and YZ reviewed the paper for intellectual content; all authors reviewed the final manuscript and gave their consent.

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**Availability of data and materials**
The datasets generated and/or analyzed during the current study are not publicly available due to restrictions from the ethics committee but are available from the corresponding author on a reasonable request.

## Declarations

**Ethics approval and consent to participate**
The Ethics and Research Committee at the Lebanese International University approved this study protocol (2023RC-009-LIUSOP). A written informed consent was considered obtained from each participant when submitting the online form and from parents or the legal guardian(s) of the participants below 16 years of age involved in the study. All experiments were performed in accordance with relevant guidelines and regulations (Declaration of Helsinki).

**Consent for publication**
Not applicable.

**Competing interests**
The authors declare no competing interests.

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## Publisher's Note