



# OPEN Psychometric properties of the Arabic Stress Numerical Rating Scale (SNRS-11) in adolescents

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Meta-analytic results have revealed a significant influence of stress on a wide array of psychological and behavioral markers, underscoring its considerable clinical importance. Providing a simple and cost-effective tool assessing stress for the Arabic-speaking population would be immensely beneficial. Therefore, our research objective was to examine the psychometric properties of an Arabic version of the Stress Numerical Rating Scale-11 (Arabic SNRS-11), including its reliability, and construct validity. 763 adolescents were recruited during November 2023. An anonymous self-administered Google Forms link was distributed via social media networks. The results of the EFA revealed two factors, which explained 66.43% of the common variance. When adding the SNRS-11, Bartlett's test of sphericity,  $\chi^2(55) = 4127.1$ ,  $p < 0.001$ , and KMO (0.88) remained adequate. The two-factor solution obtained explained 63.28% of the variance. The same structure was obtained in both males and females separately. McDonald's  $\omega$  and Cronbach's  $\alpha$  were very good for all models. Both PSS and Arabic SNRS-11 scores correlated significantly and positively with each other, as well as with higher depression, anxiety and stress scores. Finally, no significant difference was found between males and females in terms of PSS ( $27.08 \pm 6.43$  vs.  $27.72 \pm 6.06$ ;  $p = 0.163$ ; Cohen's  $d = 0.102$ ) and Arabic SNRS-11 ( $4.68 \pm 2.56$  vs.  $4.97 \pm 2.52$ ;  $p = 0.125$ ; Cohen's  $d = 0.113$ ) scores. The findings indicate that the Arabic SNRS-11 is a cost-effective, valid, and reliable tool for assessing stress. Therefore, it is recommended to use this single item to assess momentary or day-to-day stress among Arabic-speaking adolescents in Arab clinical and research settings. To evaluate the practical effectiveness of the Arabic SNRS-11 and to further enhance the data on its construct validity, future studies should assess the measure in diverse contexts and among specific populations.

**Keywords** Stress numerical rating scale, Arabic SNRS-11, Psychometric properties

Stress is intricately intertwined with both physical and psychological dimensions of health and overall well-being, underscoring its significance as a vital subject of examination in the field of psychiatry<sup>1</sup>. Perceived stress is defined as 'the feelings or thoughts of an individual about how much they are under stress at a given point in time'<sup>2</sup>. The stress phenomenon encompasses a combination of physiological<sup>3,4</sup>, psychological<sup>5</sup>, and social<sup>6</sup> reactions occurring when unpredictable environmental changes disrupt an individual's equilibrium or homeostasis, subsequently eliciting a stress response<sup>7</sup>. Thus, the progression of stress responses is influenced by factors such as environmental predictability and physiological limits<sup>8</sup>.

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Adding to that, demographic variables are clearly linked to stress levels. Thus, gender, age group, and education significantly impact stress intensity levels: men report lower stress, stress intensity decreases with age, and individuals with higher education levels experience less stress<sup>9</sup>.

Strong evidence suggests that the cumulative effects of stress have been linked to various mental health issues, including depression<sup>10–12</sup>, anxiety and suicidal ideations<sup>13</sup>, poor sleep quality<sup>14</sup>, challenging living conditions, health problems<sup>15</sup>, and difficulties in interpersonal relationships<sup>16</sup>. Additionally, stress was found to be linked to socio-demographic and psychosocial factors in both males and females, including lower household income, lower educational attainment, and living alone<sup>17</sup>. Hence, evaluating stress holds great significance for both research and clinical objectives.

### Measures of stress

While concise instruments like the Subjective Units of Distress Scale<sup>18</sup>, Kessler Psychological Distress Scale<sup>19</sup>, Beirut Distress Scale<sup>20</sup>, Stress Overload Scale (SOS) which measures stress perceived as overwhelming relative to one's resources<sup>21</sup>, Digital Stress Scale (DSS)<sup>22</sup>, COVID Stress Scales<sup>23,24</sup>, Parental Stress Scale (PSS)<sup>25</sup>, have been employed to gauge momentary emotions and internal states (including anxiety, anger, agitation, stress, or other distressing feelings), there hasn't been a scale specifically designed for measuring momentary stress. Littman, White, Satia, Bowen, and Kristal<sup>26</sup> highlight that stress assessment has predominantly concentrated on quantifying stressors or investigating psychological reactions to stressors.

Subjective stress scales validated for use with pediatric populations include the Children's Hassles Scale (comprising 43 questions)<sup>27</sup>, the Perceived Stress Scale (with 14 questions; a shorter version has 10 questions)<sup>6</sup>, the Adolescent Distress-Eustress Scale (with two 5-item subscales)<sup>28,29</sup>, and the Children's Hassles and Uplifts Scale (consisting of 25 questions)<sup>30</sup>. While these tools are valuable, their completion can be time-consuming, ranging from 10 to 43 questions<sup>31</sup>. With the exception of The Children's Hassles Scale, most of these scales primarily assess past stress levels to estimate current stress. As an example, the Perceived Stress Scale (PSS), validated in different languages<sup>32–35</sup> including Arabic<sup>36–39</sup>, assesses an individual's overall life stressors over the preceding month. The respondent's evaluation of the frequency with which they have experienced nervousness and stress in the past month may be susceptible to retrospective bias, influenced by their recall of past events and their current emotional state.

Overall, the currently employed subjective stress scales have drawbacks, such as their length, mode of administration, potential retrospective bias<sup>40,41</sup>, and the challenge of evaluating past stress to estimate present stress<sup>42</sup>. Therefore, creating a concise and easily administered tool for assessing current stress response levels, adaptable to various modes of administration, and incorporating a brief screening approach, would be valuable for both clinical and research purposes, particularly in large exploratory or field studies, as well as multipoint assessments where time constraints, participant burden, and survey costs need to be considered<sup>43</sup>. Beyond their convenience, single-item measures have consistently demonstrated validity and reliability, leading to growing recommendations for their use and gradual inclusion in various guidelines<sup>44</sup>. Additionally, single-item scales are psychometrically robust, as the analysis of Likert-type response data at the item level is statistically sound<sup>45</sup>. Constructs such as narcissism<sup>46</sup>, risk-taking<sup>47</sup>, Fear of Missing Out<sup>48</sup>, job satisfaction<sup>49</sup>, self-esteem<sup>50</sup>, and social identification<sup>51</sup> have all been reliably and validly measured using single-item scales. In pursuit of this objective, the Stress Numerical Rating Scale-11 (SNRS-11) has been developed<sup>31</sup>.

### The stress numerical rating scale-11 (SNRS-11)

The Stress Numerical Rating Scale (SNRS-11) captures both momentary (state) and day-to-day stress, as indicated by Karvounides et al.<sup>31</sup>. Modeled closely after the pain Numerical Rating Scale (NRS) by Von Baeyer<sup>52</sup>, the SNRS-11 is a single-item scale with a range of 0 to 10 and similar endpoint anchors: 0 = "No stress" and 10 = "Highest stress possible." For momentary stress, respondents provide their level of stress factually in the moment, while for day-to-day stress, they rate stress experienced over the past week. Emphasizing stress intensity as one dimension of the multidimensional stress construct, the SNRS-11 mirrors the NRS-11's focus on assessing and measuring pain intensity as one dimension of pain.

The Stress Numerical Rating Scale-11 (SNRS-11) is a straightforward, one-item stress scale with demonstrated preliminary validation in samples of adolescents and emerging adults<sup>31</sup>. Additionally, the 0–10 scale is readily comprehensible and accomplished by children, as indicated by Crandall et al.<sup>53</sup>. Moreover, employing a numerical scale with straightforward anchors helps prevent misunderstandings and reduces the likelihood of a broad range of interpretations<sup>53</sup>. Indeed, a recent study conducted in both pediatric inpatient and outpatient pain settings showed that the SNRS-11 is a quick, easy, and free stress measure to be used in both settings<sup>42</sup>. It's important to note, that apart the initial validation<sup>31</sup> and the one conducted in pediatric inpatient and outpatient pain settings<sup>42</sup>, no other studies have been published reporting the validity and reliability of the SNRS-11.

### The present study

Stress is a universal aspect of everyday life, but its manifestations vary significantly across cultures<sup>54</sup> due to differences in physical, climatic, ecological, social, and political factors. Thereby, Western cultures differ from Eastern cultures in terms of the four theoretical dimensions<sup>55</sup>: individualism vs. collectivism, cognitivism vs. emotionalism, free will vs. determinism, and materialism vs. spiritualism. Research by Hashimoto et al.<sup>56</sup> has shown that collectivist societies often report higher levels of perceived stress, particularly related to interpersonal relationships. This heightened sensitivity in interdependently oriented cultures, where social harmony is highly valued, can lead to greater perceived stress. Moreover, individualistic societies tend to prioritize acknowledging and expressing their psychological states and emotions<sup>57</sup>. In contrast, collectivist individuals often believe that psychological states and bodily sensations are intertwined and place a higher value on emotional reserve for the sake of social harmony<sup>57</sup>. It is worth noting, however, that there is a scarcity of literature on stress from the Arab

world to date (e.g.,<sup>58</sup>). To encourage both national and cross-national research on this topic in Arab countries, we aimed to examine the psychometric properties of an Arabic translation of the SNRS-11 (Arabic SNRS-11), focusing on its reliability, and construct validity.

In the past decade, numerous Arab nations have experienced wars, conflicts, and significant social and geopolitical transformations, all of which have had detrimental effects on the mental well-being of their populations<sup>59,60</sup>. A recent study involving secondary school students in Saudi Arabia indicated a prevalence of anxiety at 35.2%, followed by depression at 30.8%, and stress at 14.7%<sup>61</sup>. This underscores the significance of addressing social stressors like bullying and physical assault and advocating for a secure and supportive school environment to prevent mental health disorders in this population. Another study conducted among adolescents in the United Arab Emirates<sup>62</sup>, utilizing the PSS-14, found that the overall perceived stress level was high in 20% of respondents and moderate in 76%. This emphasizes the importance of early identification of adolescents experiencing severe academic stress. Data collected from Lebanon underscores the high levels of stress experienced by the population, all within a country grappling with limited resources<sup>63</sup>.

Arab adolescents experience distinct stressors shaped by cultural norms. Academic pressure is a major factor, driven by the high educational expectations families place on them<sup>64</sup>. Family expectations often focus on traditional roles, which may clash with personal ambitions<sup>65</sup>. Additionally, the stigma surrounding mental health can discourage adolescents from seeking help, leading to a lack of adequate support<sup>66</sup>. Understanding these challenges is crucial for improving the support provided to Arab adolescents. It's also important to address the specific stressors faced by Arab minorities in Western countries, who may encounter discrimination and acculturation stress<sup>67–69</sup>. For example, a study found that the link between racism and psychological issues in Arab American youth could partly be attributed to stress<sup>67</sup>. Furthermore, due to conflicts and terrorism, Arab youth in regions like Palestine, Syria and Lebanon are often exposed to more stressful environments<sup>70–72</sup>. To that end, the development and/or adaptation of tools to assess momentary stress among Arab adolescents is crucial. This study presents a potentially valid and reliable method for evaluating momentary stress in Arab adolescents, addressing a critical gap in psychological resources available to Arabic-speaking communities.

In order to facilitate and encourage research both within and across Arab nations on the stress topic, we embarked on an investigation into the psychometric properties of an Arabic translation of the SNRS-11, denoted as Arabic SNRS-11. This investigation encompassed an exploration of its reliability, and construct validity. Furthermore, we analyzed the connections between Arabic SNRS-11 scores and indicators such as psychological distress, and perceived stress. The aim of introducing this straightforward and cost-effective tool for assessing stress to the Arabic-speaking community, which largely resides in low- and middle-income countries, where research endeavors can be particularly challenging, holds substantial value. Hence, having a straightforward, rapid, and precise assessment method could offer numerous advantages, such as streamlining the creation of tailored interventions<sup>53</sup>. Likewise, offering this simple and cost-effective measure of global stress to the Arabic-speaking community, the majority of whom live in low- and middle-income countries where conducting research can be challenging, would be highly beneficial. Therefore, this study's goal was to investigate the psychometric properties of an Arabic translation of the SNRS-11 in a group of adolescent Lebanese participants. The Arabic SNRS-11 is expected to (1) have good convergent validity; (2) exhibit strong composite validity and invariance of measurements by sex; and (3) show sufficient patterns of correlations with measures of psychological distress and perceived stress.

## Methods

### Procedures

A total of 763 Lebanese adolescents participated in this cross-sectional study in November 2023. Using a snowball sampling approach, a survey was created on Google Forms and circulated across messaging applications and social media networks (WhatsApp, Instagram, Messenger). The research group conducting the study contacted adolescents, who were subsequently requested to share the link with their friends and relatives within the same age group, describing the method of snowball sampling that was used. Included participants were those residing in Lebanon between the ages of 13 and 18 years. Those who declined to complete the questionnaire were not included. The introductory paragraph included the objectives of the study, as well as a request to the adolescent to ask for parental permission before filling the survey. After the provision of digital informed consent, participants were then instructed to complete the relevant scales in the Google Forms. The process assured the anonymity, confidentiality, and voluntary participation of individuals without any form of remuneration.

### Minimal sample size calculation

A minimum of 100–110 participants was deemed necessary based on 10 participants per item's scale<sup>73</sup>.

### Measures

The Arabic questionnaire assessed the sociodemographic characteristics of the included participants (sex, marital status and education level), as well as the following scales:

#### *The Stress Numerical Rating Scale-11 (SNRS-11)*

To gauge momentary stress, participants answered the question, "On a scale of 0 to 10, with 0 being no stress and 10 being worst stress possible, what number best describes your level of stress right now?"<sup>31</sup>. Below the question, the 11 numerical options were evenly spaced on the page, with reference points labeled beneath the "0" and "10." Participants indicated their stress level by circling the corresponding number. The scores were then classified into categories: no stress (0), mild stress (1–3), moderate stress (4–7), and severe stress (8–10)<sup>74</sup> (added as a supplementary file).

### *The Cohen Perceived Stress Scale-10 (PSS-10)*

He PSS-10 is a self-report measure comprising 10 items designed to assess global perceived stress<sup>6</sup> (e.g. “*In the last month, how often have you been upset because of something that happened unexpectedly?*”). To derive a total score ranging from 0 to 40, the four positively worded items are reverse-scored, and the sum of all scale items is calculated. Higher total scores on this scale are indicative of elevated levels of perceived stress. The Arabic validated version of the PSS-10 was used<sup>38</sup> ( $\omega = 0.81/\alpha = 0.83$ ).

### *The Depression Anxiety Stress Scale (DASS-8)*

The DASS-8, a shortened version of the DASS-21, consists of eight items divided into three subscales: depression (3 items; e.g. “*I was unable to become enthusiastic about anything*”), anxiety (3 items; e.g. “*I felt scared without any good reason*”), and stress (2 items; e.g. “*I felt that I was using a lot of nervous energy*”)<sup>75</sup>. Responses to the items are scored on a 4-point scale, ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). The DASS-8 has a score range of 0 to 24, whereas the subscale scores fall into the ranges of 0 to 9, 0 to 9, and 0 to 6, respectively. Higher scores equate to a higher level of symptom affirmation. The reliability coefficients were as follows: depression ( $\omega = 0.75/\alpha = 0.75$ ), anxiety ( $\omega = 0.77/\alpha = 0.77$ ) and stress ( $\alpha = 0.58$ ).

## Translation procedure

Prior to implementation in the current study, the SNRS-11 scale underwent translation and adaptation into the Arabic language and context. The translation process involved rendering the scale into literary Arabic (Modern Standard Arabic), the official language across Arab nations and utilized for cross-group communication. The objective was to achieve semantic equivalence between the original and Arabic versions in accordance with international norms and recommendations<sup>76</sup>. This was accomplished through a forward and backward translation method.

A Lebanese translator, not affiliated with the study, translated the English version into Arabic. Subsequently, a Lebanese psychologist proficient in English translated the Arabic version back into English. The translation team ensured a balanced approach, addressing any specific or literal translations. A committee of experts, consisting of two psychiatrists, one psychologist, the research team, and the two translators, compared the initial and translated English versions to identify and rectify any inconsistencies, thereby ensuring translation accuracy<sup>77</sup>. In cases where agreement could not be reached, the team consulted additional experts in the field to ensure that the final translation captured both the literal meaning and the underlying intent of the original items.

To adapt the measure to the specific context, the translation team scrutinized for potential misunderstandings in item wording and evaluated the ease of item interpretation. This process aimed to guarantee conceptual equivalence between the original and Arabic scales in both contexts<sup>78</sup>. In other words, beyond linguistic accuracy, careful attention was paid to cultural adaptations. This involved reviewing terms, idioms, and references that might not be culturally relevant or might be misunderstood in Arabic. These adaptations were reviewed by a panel of experts from the Mental Health field in Lebanon to ensure the scale was culturally appropriate while maintaining the integrity of the original scale's content.

Following the translation and adaptation, a pilot study involving 20 participants was conducted to confirm comprehension of all questions. No changes were made after the pilot study, indicating the clarity and appropriateness of the translated scale.

## Analytic strategy

There were no missing responses in the dataset. To examine the convergent validity of the Arabic SNRS-11, we used an exploratory factor analysis, using a principal component analysis using the FACTOR software version 12.04.02<sup>79</sup>. We merged both instruments (Perceived Stress Scale and the SNRS-11 scale) in the EFA to test whether the single item stress scale would load on the same factor/factors as the 10-item Perceived Stress Scale. In case it did, then we can conclude that on the factor level, both instruments belong together. If it loads on another factor than the PSS-10 items, this would mean that on the factor level they do not belong together. We verified all requirements related to item-communality<sup>80</sup>, average item correlations, and item-total correlations<sup>81</sup>. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy (which should ideally be  $\geq 0.80$ ) and Bartlett's test of sphericity (which should be significant) ensured the adequacy of our sample<sup>82</sup>. The Measure of Sampling Adequacy (MSA) at the item level was also verified, with values below 0.5 leading to the elimination of the item<sup>83</sup>. The procedure followed for determining the number of dimensions was the Parallel Analysis (PA)<sup>84</sup>, using the polychoric correlation matrix in view of the ordinal nature of the data. Item retention was based on the recommendation that items with “fair” loadings and above (i.e.,  $\geq 0.33$ )<sup>85</sup>.

Composite reliability in both subsamples was assessed using McDonald's  $\omega$  and Cronbach's  $\alpha$  coefficients, with values greater than 0.70 reflecting adequate composite reliability<sup>86</sup>. The total PSS and Arabic SNRS-11 scores followed a normal distribution, with skewness and kurtosis values varying between  $-1$  and  $+1$ <sup>87</sup>. The Student t test was used to compare the scores between sex groups. To assess convergent and concurrent validity, the Pearson test was used to correlate the scores with the DASS subscales scores. Values  $\leq 0.10$  were considered weak,  $\sim 0.30$  were considered moderate, and  $\sim 0.50$  were considered strong correlations<sup>88</sup>.

## Results

### Descriptive statistics

Seven hundred sixty-three Lebanese adolescents completed the survey, with a mean age of 16.08 years ( $SD = 1.74$ ), with 62.4% females. Table 1 presents the descriptive statistics of the used scales, which were all considered as normally distributed. The Arabic SNRS-11 had a mean of 4.79 ( $SD = 2.47$ , range: 0–10), a median of 5.00, a mode of 5, with the majority of the participants scoring 5 (21.9%) and 4 (14.9%) respectively.

	Mean	SD	Median	Mode	Min	Max	Skewness	Kurtosis
Arabic SNRS-11	4.86	2.54	5	5	0	10	0.096	-0.657
Perceived stress	27.48	3.20	28	30	10	50	-0.125	10.348
Depression	3.66	2.16	4	3	0	9	0.112	-0.411
Anxiety	3.61	2.17	3	3	0	9	0.168	-0.405
Stress	2.65	1.49	3	2	0	6	0.181	-0.405

**Table 1.** Descriptive statistics of all scores. SNRS, Stress Numerical Rating Scale-11.

## Exploratory factor analysis

### *Factor analysis on the total sample*

The relevance of the items was analyzed using the MSA index, which indicated that all items measured the same domain as the rest of the questionnaire, with a value greater than 0.50 for all items. The Bartlett's test of sphericity,  $\chi^2(45)=3874$ ,  $p<0.001$ , and KMO (0.874) indicated that the PSS items had adequate common variance for factor analysis. The results of the EFA revealed two factors, which explained 66.43% of the common variance. When adding the SNRS-11, Bartlett's test of sphericity,  $\chi^2(55)=4127.1$ ,  $p<0.001$ , and KMO (0.88) remained adequate. The two-factor solution obtained explained 63.28% of the variance. The same structure was obtained in both males and females separately (Table 2). McDonald's  $\omega$  and Cronbach's  $\alpha$  were very good for all models.

## Convergent and concurrent validity

Both PSS and Arabic SNRS-11 scores correlated significantly and positively with each other, as well as with higher depression, anxiety and stress scores (Table 3). Finally, no significant difference was found between males and females in terms of PSS ( $27.08 \pm 6.43$  vs.  $27.72 \pm 6.06$ ;  $p=0.163$ ; Cohen's  $d=0.102$ ) and Arabic SNRS-11 ( $4.68 \pm 2.56$  vs  $4.97 \pm 2.52$ ;  $p=0.125$ ; Cohen's  $d=0.113$ ) scores (Table 4).

## Discussion

In this study, our objective was to translate and validate the Arabic version of the Stress Numerical Rating Scale-11 (SNRS-11). The results of the EFA revealed two factors, and the McDonald's  $\omega$  and Cronbach's  $\alpha$  were very good for all models. EFA affirmed good congruence of convergent validity across sex (no significant difference was found between males and females in terms of PSS and Arabic SNRS-11 scores). Comparisons between the PSS and Arabic SNRS-11 indicated similar relationships with the variables under investigation, including anxiety, depression, and stress. These findings established a sufficient level of construct validity for both measures.

## Factor analysis

We found a mean Arabic SNRS-11 score of  $4.79 \pm 2.47$ . EFA results showed that the Arabic SNRS-11 loaded on one of the two factors obtained, in opposite to the one-dimensional measure obtained in the original validation<sup>31</sup> and another validation in both inpatient and outpatient settings<sup>42</sup>. Although there are advantages to the one-dimensional measure as discussed, it does reduce the ability to measure multiple dimensions of stress<sup>53</sup>. Additionally, we found positive correlations between the PSS and Arabic SNRS-11 scores, suggesting that the single-item scale is informative and relevant to assess the stress construct.

The distinct factor loading of the PSS and Arabic SNRS-11 indicates that these instruments assess different dimensions of stress. Indeed, stress is a multi-faceted construct encompassing various elements, including physiological responses, emotional reactions, cognitive appraisals, and behavioral manifestations<sup>89</sup>. The PSS specifically captures the cognitive-emotional aspect of stress, emphasizing how individuals perceive and interpret stressors<sup>90</sup>. In contrast, the SNRS-11 appears to measure a more immediate, physiological, or surface-level response, as it asks individuals to rate the intensity of their stress at that moment<sup>91</sup>.

Additionally, the separate loading of the Arabic version of the SNRS-11 from the PSS items may reflect cultural influences on how stress is perceived and expressed. In certain cultures, direct expressions of stress intensity (such as those measured by the SNRS-11) might be more pronounced, while the more reflective cognitive appraisal of stress (as captured by the PSS) could serve a different function<sup>89</sup>. For example, in Arabic-speaking contexts, social and familial expectations may shape how stress is perceived and communicated, leading individuals to report their stress levels differently depending on the situational context<sup>92</sup>.

## Convergent and concurrent validity

Both PSS and Arabic SNRS-11 scores correlated significantly and positively with higher depression, anxiety and stress scores, in line with existing research that highlights a relationship between the stress response to a stressor (termed perceived stress) and psychological distress, defined as a comprehensive concept encompassing a wide spectrum of symptoms, ranging from everyday feelings of vulnerability and fear to severe mental conditions like depression, anxiety, and adjustment disorder<sup>93,94</sup>. For instance, a study involving Chinese physicians<sup>95</sup> demonstrated that perceived stress played a substantial role in explaining the variation in psychological distress (43.1%), self-affirmation (23.2%), depression (23.6%), and anxiety (23%). Furthermore, another study suggested that the total distress score, along with its emotional and social distress subscales, exhibited positive correlations with anxiety and depression, hinting at a potential overlap between these two constructs<sup>96</sup>. Hence, it is advisable



	Model 1: EFA of PSS items alone			Model 2: EFA of PSS items + SNRS-11		
	Factor 1	Factor 2	Communality	Factor 1	Factor 2	Communality
EFA 1: conducted on the total sample						
PSS 1	<b>0.72</b>	0.16	0.55	0.17	<b>0.73</b>	0.56
PSS 2	<b>0.83</b>	0.07	0.69	0.09	<b>0.83</b>	0.69
PSS 3	<b>0.78</b>	0.09	0.61	0.10	<b>0.79</b>	0.63
PSS 4	0.22	<b>0.71</b>	0.55	<b>0.71</b>	0.20	0.55
PSS 5	-0.001	<b>0.78</b>	0.61	<b>0.78</b>	-0.02	0.61
PSS 6	<b>0.69</b>	0.19	0.51	0.21	<b>0.68</b>	0.51
PSS 7	0.15	<b>0.78</b>	0.62	<b>0.77</b>	0.13	0.62
PSS 8	0.13	<b>0.75</b>	0.58	<b>0.76</b>	0.10	0.59
PSS 9	<b>0.71</b>	0.13	0.52	0.15	<b>0.71</b>	0.53
PSS 10	<b>0.76</b>	0.09	0.58	0.12	<b>0.73</b>	0.55
Arabic SNRS-11	-	-	-	-0.11	<b>0.52</b>	0.29
Explained variance	43.68%	22.75%		41.32%	21.96%	
McDonald's $\omega$	0.86 [95% CI 0.84; 0.88]	0.82 [95% CI 0.78; 0.84]		0.82 [95% CI 0.78; 0.84]	0.79 [95% CI 0.76; 0.82]	
Cronbach's $\alpha$	0.86 [95% CI 0.85; 0.88]	0.82 [95% CI 0.79; 0.84]		0.82 [95% CI 0.79; 0.84]	0.79 [95% CI 0.76; 0.81]	
EFA 2: conducted on males only						
PSS 1	<b>0.77</b>	0.14	0.61	<b>0.76</b>	0.16	0.61
PSS 2	<b>0.80</b>	0.10	0.65	<b>0.80</b>	0.13	0.65
PSS 3	<b>0.76</b>	0.12	0.59	<b>0.77</b>	0.14	0.61
PSS 4	0.22	<b>0.74</b>	0.60	0.20	<b>0.75</b>	0.60
PSS 5	0.03	<b>0.81</b>	0.66	0.001	<b>0.82</b>	0.67
PSS 6	<b>0.74</b>	0.19	0.58	<b>0.73</b>	0.20	0.57
PSS 7	0.20	<b>0.82</b>	0.72	0.17	<b>0.82</b>	0.70
PSS 8	0.16	<b>0.77</b>	0.61	0.13	<b>0.77</b>	0.61
PSS 9	<b>0.70</b>	0.22	0.54	<b>0.70</b>	0.24	0.54
PSS 10	<b>0.76</b>	0.10	0.59	<b>0.75</b>	0.13	0.58
Arabic SNRS-11	-	-	-	<b>0.45</b>	-0.09	0.21
Explained variance	46.79%	22.26%		43.58%	21.46%	
McDonald's $\omega$	0.87 [95% CI 0.83; 0.89]	0.85 [95% CI 0.80; 0.88]		0.77 [95% CI 0.71; 0.82]	0.85 [95% CI 0.80; 0.88]	
Cronbach's $\alpha$	0.87 [95% CI 0.84; 0.89]	0.85 [95% CI 0.82; 0.87]		0.77 [95% CI 0.73; 0.81]	0.85 [95% CI 0.82; 0.87]	
EFA 3: conducted on females only						
PSS 1	<b>0.69</b>	0.19	0.52	<b>0.71</b>	0.20	0.54
PSS 2	<b>0.85</b>	0.07	0.72	<b>0.84</b>	0.09	0.72
PSS 3	<b>0.79</b>	0.08	0.63	<b>0.80</b>	0.10	0.65
PSS 4	0.22	<b>0.68</b>	0.52	0.20	<b>0.69</b>	0.52
PSS 5	-0.004	<b>0.77</b>	0.59	-0.02	<b>0.76</b>	0.58
PSS 6	<b>0.67</b>	0.20	0.48	<b>0.65</b>	0.22	0.47
PSS 7	0.14	<b>0.75</b>	0.57	0.12	0.74	0.57
PSS 8	0.13	<b>0.74</b>	0.57	0.10	0.76	0.58
PSS 9	<b>0.71</b>	0.09	0.52	<b>0.71</b>	0.11	0.52
PSS 10	<b>0.76</b>	0.09	0.58	<b>0.73</b>	0.12	0.54
Arabic SNRS-11	-	-	-	<b>0.58</b>	-0.12	0.34
Explained variance	42.98%	22.37%		41.08%	21.71%	
McDonald's $\omega$	0.86 [95% CI 0.83; 0.88]	0.79 [95% CI 0.75; 0.83]		.80 [95% CI 0.77; 0.84]	0.79 [95% CI 0.75; 0.83]	
Cronbach's $\alpha$	0.86 [95% CI 0.84; 0.88]	0.80 [95% CI 0.76; 0.82]		.80 [95% CI 0.77; 0.82]	0.80 [95% CI 0.76; 0.82]	

**Table 2.** Rotated factor loads obtained from the exploratory factor analysis (EFA). Numbers in bold indicate the highest loading factor; PSS, Perceived Stress Scale; Arabic SNRS-11, Arabic Stress Numerical Rating Scale-11.

	1	2	3	4
1. Arabic SNRS-11	1			
2. Perceived Stress	0.31*** [95% CI 0.24; 0.37]	1		
3. Depression	0.34*** [95% CI 0.28; 0.40]	0.34*** [95% CI 0.28; 0.40]	1	
4. Anxiety	0.33*** [95% CI 0.26; 0.39]	0.34*** [95% CI 0.27; 0.40]	0.70*** [95% CI 0.67; 0.74]	1
5. Stress	0.39*** [95% CI 0.32; 0.44]	0.43*** [95% CI 0.37; 0.48]	0.68*** [95% CI 0.64; 0.72]	0.64*** [95% CI 0.60; 0.68]

**Table 3.** Correlation of the perceived stress scale score and the Arabic SNRS-11 with other continuous variables. \* $p < .05$ ; \*\*\* $p < .001$ ; SNRS, Stress Numerical Rating Scale-11.

	PSS			A-SNRS-11		
	Mean $\pm$ SD	$p$	Effect size	Mean $\pm$ SD	$p$	Effect size
Sex		0.163	0.102		0.125	0.113
Male	27.08 $\pm$ 6.43			4.68 $\pm$ 2.56		
Female	27.72 $\pm$ 6.06			4.97 $\pm$ 2.52		

**Table 4.** Bivariate analysis of the Perceived Stress Scale (PSS) and the Arabic SNRS-11 with categorical variables. Numbers in bold indicate significant  $p$  values. SNRS = Stress Numerical Rating Scale-11.

to incorporate stress reduction strategies into interventions aimed at preventing and treating psychological distress.

### Sex invariance

In the sex comparison of stress scores, no statistically significant differences were observed between males and females in terms of PSS and Arabic SNRS-11 scores. Multiple studies showed that females generally reported lower well-being compared to men<sup>97</sup> and suggested that males and females have different responses to stress<sup>98–100</sup>, and this sex disparity can be attributed to a combination of biological and social determinants. These determinants encompass sex stereotypes, cultural background, inequities, social segregation, and issues related to autonomy<sup>101</sup>.

### Validation of the Arabic SNRS-11 in comparison with the stress measurement in Arabic-speaking populations

The validation of the Arabic SNRS-11 fits into the broader context of stress measurement in Arabic-speaking populations (e.g., SOS, PSS and DSS) by providing a streamlined, universal measure of stress intensity. Unlike other tools, which capture specific types of stressors, the SNRS-11 provides a straightforward numerical rating that can be quickly used in clinical, educational, and community settings, offering an initial glimpse into stress levels without requiring cultural adaptation for each context.

As such, while the SOS has been validated in both Western<sup>102,103</sup> and Arabic-speaking populations<sup>21</sup>, the emphasis in Arabic contexts often includes communal and familial sources of overload, aligning with collective cultural values<sup>21</sup>. In Western settings, individualistic stressors such as career pressure and personal success are more pronounced<sup>104</sup>. The Arabic SNRS-11 bypasses these cultural distinctions, allowing it to be used universally without focusing on the specific type of stress, as the SOS might.

Another example, in Western studies, the PSS often reflects the stress of balancing work with parenting, while Arabic studies show stress related to social expectations of parental success and children's achievement<sup>25</sup>. This difference underscores the SNRS-11's role as a general tool that can quickly capture parental stress levels without cultural specificity, suggesting further PSS use when high stress levels appear in parents.

A last example is related to the DSS; with digital device use increasing worldwide, the DSS addresses stress from technology, capturing screen time issues, social media pressures, and online expectations<sup>22</sup>. Arabic DSS research shows unique stressors tied to social media visibility and family expectations, with young users experiencing heightened pressure due to cultural norms around public self-presentation<sup>22</sup>. In contrast, Western studies emphasize privacy and work-life boundaries, reflecting more individualistic perspectives<sup>105</sup>. The SNRS, while less specific than the DSS, effectively indicates when digital stress is present and can prompt further assessment using tools like the DSS in high-risk cases.

### Clinical implications

Making the Arabic SNRS-11 available is of high relevance, especially in the current context of ongoing war, economic and political crises in Lebanon, aggravated by the outbreak of COVID-19, which have substantially affected Lebanese youth mental health, describing it as the "tomorrow's silent epidemic"<sup>106</sup>. The tool is applicable to both males and females, enabling its use across the population without requiring sex-specific adaptations.

Furthermore, the availability of an Arabic version of the SNRS-11 facilitates comparisons across different cultural contexts. In educational settings, the Arabic SNRS-11 could be a valuable tool for identifying students facing high levels of stress and for shaping appropriate support strategies. Educators can leverage insights from the scale to create programs that reduce day-to-day-stress, contributing to a healthier school environment. In a clinical setting, the Arabic SNRS-11 may provide mental health professionals with a reliable tool for evaluating

adolescent stress, helping to shape individualized treatment plans such as virtual and electronic mindfulness training workshops aiming to reduce the day-to-day stress<sup>107,108</sup>. Lastly, this study holds important implications as it provides researchers with a valid and reliable tool to assess momentary stress in Lebanese adolescents, thereby expanding research opportunities in Arabic-speaking populations.

### Study limitations

When discussing the limitations of the current study, it's crucial to begin by highlighting that the single-item measures have faced criticism for their potentially lower and uncertain reliability. This arises from the fact that estimating measurement error may not conform to the prescribed model, which typically relies on intercorrelations among multiple items to determine reliability (i.e., the internal consistency approach)<sup>109</sup>. Consequently, when only a single item is employed, the measure may not be amenable to internal consistency assessment procedures<sup>109</sup>. To overcome this limitation, it is advisable to explore alternative methods, such as test-retest reliability assessments, as recommended<sup>109</sup>. These approaches should be taken into account in future research endeavors.

Additional limitations need to be considered. This study is cross-sectional in nature, which implies that causation cannot be directly inferred from the findings. Furthermore, the symptoms were self-reported and not evaluated by healthcare professionals, making them inherently subjective. It's also important to note that the results of this study may not be easily generalized to the entire population due to the sample composition, which predominantly consisted of females (62.4%). Furthermore, this study was conducted exclusively in Lebanon, thereby restricting the generalizability of our results to Arab-speaking individuals in other Arab and non-Arab countries. To overcome these limitations, future research should include more representative samples of Lebanese adolescents, including minorities and different sexual orientation and to adopt longitudinal and cross-cultural approaches.

Adding to that, our data was gathered using a convenience (non-probabilistic) and web-based sampling methods, which may limit the generalization of the present findings. We did not implement practices to ensure the integrity of the data (embedding attention checks throughout the survey) and did not have the option to check the response time of participants with Google forms. In addition, we used a self-report survey, meaning the answers could be affected by recall or social desirability biases. Future studies are recommended to minimize these risks by employing more randomized or stratified sampling methods, which can enhance the representativeness of the sample and improve the generalizability of the findings. We did not perform known groups validity (i.e., comparing people with high vs low stress). Lastly, it is important to acknowledge that the survey was distributed through online platforms, potentially excluding adolescents with limited access to technology or the internet—an issue that is particularly relevant in Lebanon due to the current economic crisis. This may have biased the sample towards participants with better digital access, leading to the underrepresentation of more disadvantaged groups.

Although the abovementioned limitations, this study indicates potential promise for the Arabic SNRS-11. The availability of a practical and clinically relevant self-report measure, which facilitates the collection and categorization of momentary or day-to-day stress in an uncomplicated and cost-free manner, will enable systematic assessment and tracking of stress over time.

### Conclusion

The objective of the current study was to give evidence of the Arabic SNRS-11 reliability and validity in adolescents. This was accomplished by looking at the Arabic SNRS-11 consistency across sex, composite reliability, and construct validity. The scale's high internal consistency, as reflected in both Cronbach's alpha and McDonald's omega coefficients, underscores its potential utility in educational and clinical settings. Adding to that, the Arabic SNRS-11 is a two-dimensional scale with strong psychometric properties among Lebanese adolescents, effectively assessing an individual's momentary stress. Subsequently, it is recommended to use this single item to assess momentary or day-to-day stress among Arabic-speaking adolescents in Arab clinical and research settings. To evaluate the practical effectiveness of the Arabic SNRS-11 and to further enhance the data on its construct validity, future studies should assess the measure in diverse contexts and among specific populations. Such efforts would improve the generalizability and relevance of the Arabic SNRS-11 in different cultural settings within the Arabic-speaking world. Ultimately, this advancement supports the broader goal of enhancing adolescent mental health and well-being through culturally sensitive measures. At last, psychology researchers can use the findings of this study to plan preventative strategies when adolescents encounter day-to-day stress.

### Data availability

All data generated or analyzed during this study are not publicly available due the restrictions from the ethics committee, but are available upon a reasonable request from the corresponding author.

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## Author contributions

SO, FFR and SH designed the study; SO drafted the manuscript; SH carried out the analysis and interpreted the results; SEK, FS and MD collected the data. RH and DM reviewed the paper for intellectual content; all authors reviewed the final manuscript and gave their consent.

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## Declarations

## Competing interests

The authors declare no competing interests.

## Ethics approval and consent to participate

Ethics approval for this study was obtained from the ethics committee of the School of Pharmacy at the Lebanese International University. Informed consent was obtained from the parent and/or legal guardian for participants under age 16 before filling the survey; the online submission of the soft copy was considered equivalent to receiving a written informed consent. All methods were performed in accordance with the relevant guidelines and regulations (In accordance of Helsinki declarations).

## Consent for publication

Not applicable.

## Additional information

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