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Validation of the *Stress Mindset Measure* (SMM) in an Italian sample: Practical utility of a short version

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Abstract

Introduction: The Stress Mindset Measure (SMM) is a self-report scale assessing the extent to which individuals believe that the effects of stress are beneficial or harmful. It has been linked to physiological and behavioural outcomes relevant to wellbeing and validated across different languages and cultures. However, its factorial structure remains inconsistent across studies, raising questions about its optimal conceptualization. This study aimed to validate the SMM and examine its factorial structure in an Italian sample.

Methods: A sample of 215 adults completed the Italian version of the SMM, along with measures of perceived stress, life satisfaction, and self-efficacy. An Exploratory Factor Analysis (EFA) was conducted to investigate the SMM factorial structure emerging from the data. Confirmatory Factor Analyses (CFA) were then used to compare this model with the original unidimensional model and previously proposed two- and four-factor structures. Additional CFAs explored the psychometric properties of two shortened versions of the SMM. The practical utility of each model was evaluated through regression analyses predicting adjustment outcomes.

Results: EFA supported a novel two-factor model distinguishing between beliefs about the effects of stress on learning/productivity and on health/wellbeing. CFA confirmed this model provided superior fit compared to alternative structures (CMIN/df = 1.21, RMSEA = 0.032). However, regression analyses indicated that the unidimensional model best predicted perceived stress (β = -.205), life satisfaction (β = .150), and self-efficacy (β = .229). A shortened version including only the four positively worded items (SMM-4P) showed strong psychometric properties and similar predictive validity to the full unidimensional scale.

Discussion: Findings support the Italian adaptation of the SMM and suggest that the novel two-factor solution may offer greater conceptual clarity. Nonetheless, the unidimensional structure remains more practical for predicting adjustment outcomes. The results also highlight the potential utility of the SMM-4P in time-constrained contexts such as clinical assessment.

Take-home message: Our Italian validation of the Stress Mindset Measure (SMM) identified a novel two-factor structure that may offer deeper insight into stress beliefs in specific contexts. A short version including four positively worded items (SMM-4P) demonstrated excellent psychometric and predictive properties, suggesting its value for quick assessments in time-constrained applied settings.

Keywords: Stress Mindset Measure (SMM); Italian validation; factorial structure; predictive utility; Short Stress Mindset Measure (SMM-4P).

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INTRODUCTION

Stress is an inherent aspect of human life. It is typically triggered by challenging or threatening situations and influences cognitive, emotional, physiological and behavioural responses [1]. A large body of research has documented the detrimental effects of stress on several important outcomes. For example, chronic stress has been associated with an increased risk of mental health disorders, such as depression and anxiety [2]. It can also impair cognitive functions, particularly those relying on the hippocampus and prefrontal cortex, such as explicit memory formation and flexible reasoning [3], and has been identified as a risk factor for mild cognitive impairment and dementia [4]. Prolonged exposure to stress in the workplace is known to be a strong risk factor for the development of physiological and psychological disorders, such as hypertension and depression [5,6], and it can also lead to negative organizational consequences, including absenteeism and decreased work productivity [7].

However, this is only one part of the story. Indeed, although stress is often regarded as harmful, its effects are not necessarily negative. Rather, they depend on multiple factors, such as the duration of stress exposure and an individual's perception and beliefs about stress. For example, while prolonged stress is generally associated with adverse outcomes, short-term stress can instead activate adaptive psycho-physiological mechanisms that enhance immune function, facilitate recovery, and promote resilience [8]. Importantly, a growing body of research indicates that the way individuals think about stress can influence how they experience and respond to it. This is captured by the concept of stress mindset, which refers to the extent to which individuals believe that stress can have either beneficial or harmful effects on important aspects of life, such as health, wellbeing, performance, and productivity [9]. Those who perceive stress as beneficial are said to have a stress-is-enhancing mindset, whereas those who view it as harmful hold a stress-is-debilitating mindset.

Several studies have shown that stress mindset can play an important role in shaping various psychological, physiological, and behavioural outcomes. For instance, Park et al. found that adolescents with a stress-is-enhancing (vs. stress-is-debilitating) mindset exhibited a weaker negative association between adverse life events and perceived distress, which in turn resulted in a better self-regulation [10]. Huebschmann and Sheets reported that, even after controlling for initial mental health symptoms, college students experiencing higher levels of stress were less likely to develop symptoms of depression and anxiety when holding a stress-is-enhancing mindset rather than a stress-is-debilitating mindset. Specifically, the authors found that stress mindset moderated the association between perceived stress and depressive symptoms, both at baseline and at one-month follow-up. These findings suggest that believing stress can have positive effects may help buffer against the development of psychological symptoms in populations exposed to high levels of stress.[11]. Experimental research has further demonstrated that stress mindset can be changed to promote more adaptive stress responses. For instance, Crum et al. experimentally manipulated stress mindset by

presenting brief videoclips to frame stress as either enhancing or debilitating [12]. They found that participants induced to adopt a stress-is-enhancing mindset exhibited greater increases in positive emotions, improved cognitive flexibility, and higher levels of dehydroepiandrosterone sulphate (DHEA-S, a hormone involved in stress adaptation), even under stressful conditions. Similarly, Goyer et al. tested a stress mindset intervention in a real-world academic setting, demonstrating that fostering a stress-is-enhancing mindset before a high-stakes exam period improved students' psychological wellbeing and reduced the negative association between stress and performance outcomes, particularly among students from disadvantaged backgrounds [13].

The increasing recognition of the importance of stress mindset across a wide range of adjustment outcomes highlights the need for reliable and valid tools to assess it. To this aim, Crum et al. [9] developed the Stress Mindset Measure (SMM), an eight-item self-report scale designed to assess individuals' beliefs about stress. The measure exists in two equivalent versions, both containing the same eight items, but differing in contextual focus: one assessing stress mindset in general (SMM-G) and the other assessing stress mindset in relation to a specific stressor (SMM-S). In the present study, we focused exclusively on the general version (SMM-G), hereafter referred to as the SMM.

In the original validation study of the SMM, Crum et al. conceptualized stress mindset as a unidimensional construct and provided empirical support for a single-factor structure through confirmatory factor analysis (CFA) in a U.S. sample [9]. They also demonstrated that stress mindset is conceptually distinct from other well-established psychological constructs in the domain of stress responses, including stress amount, stress appraisal, and coping strategies. Although stress mindset was weakly to moderately correlated with these constructs, it remained an independent predictor of psychological health and life satisfaction. Specifically, individuals with a stress-is-enhancing mindset reported fewer symptoms of depression and anxiety and greater life satisfaction, even after controlling for stress levels and coping strategies. These findings highlight stress mindset as a distinct and influential variable in shaping stress responses and broader psychological wellbeing.

The unidimensional conceptualization of the SMM was further corroborated in subsequent validation studies conducted in Brazilian [14] and Turkish [15] samples, where CFA again supported a single-factor structure. However, studies in Greek [16] and Iranian [17] samples found support for a two-factor model using CFA, suggesting that the SMM factorial structure may be more complex. In this two-factor model, positively worded items (e.g., *Experiencing stress facilitates my learning and growth*) loaded onto a stress-is-enhancing factor, while negatively worded items (e.g., *Experiencing stress inhibits my learning and growth*) loaded onto a stress-is-debilitating factor. However, it remains unclear whether this structure captures genuinely distinct dimensions of stress mindset or merely differences in item wording. Indeed, research suggests that the inclusion of both positively and negatively worded items may introduce secondary sources of variance, which can artificially create separate factors rather than reflecting a meaningful conceptual distinction [18,19]. Karampas et al. [16] and Tedadi et al. [17] also acknowledged this possibility, noting that the two-factor structure observed in their studies may also reflect methodological artifacts rather than a theoretically meaningful distinction. From a practical standpoint, the utility of treating stress-is-enhancing and stress-is-debilitating beliefs as independent factors also remains unclear, particularly if they overlap in content while differing only in wording.

Other studies have proposed an even more complex factorial structure for the SMM [20]. Specifically, the Polish validation study by Mierzejewska-Floreani et al. identified a hierarchical four-factor model through confirmatory factor analysis (CFA), distinguishing between beliefs about stress consequences across four domains: general, health and vitality, productivity and performance, and learning and growth [21]. While this domain-based approach may allow for a more differentiated assessment of stress mindset, it also fragments the SMM into a high number of factors considering the relatively limited number of items included in the scale. Indeed, each of these four factors is represented by only two items, both concerning the same domain but one positively framed and one negatively framed. Consequently, also this model raises questions about whether it reflects distinct

conceptual dimensions of stress mindset rather than stemming from method-related variance, potentially inflating measurement error due to limited item coverage per factor [22].

The inconsistent factorial solutions found across previous studies, along with the potential issues they raise, underscore the need for further investigation into the factorial structure of the SMM, particularly in new linguistic and cultural contexts [23]. A preliminary aim of the present study was to translate and adapt the SMM for use in an Italian sample. Beyond this, the study had four main objectives:

1. To explore which factorial structure of the SMM emerges from our sample.
2. To evaluate which factorial solution best represents our data by comparing the factorial structures identified in previous validation studies with the structure emerged in ours.
3. To explore whether a shortened version of the SMM maintains psychometric properties comparable to the full scale, in order to promote its use in applied settings requiring a quick assessment.
4. To evaluate the practical relevance of the different factorial solutions by examining how each structure correlates with adjustment variables relevant to stress adaptation and overall psychological wellbeing. This would help determine which factorial solution of the SMM best fits the data and provides the strongest predictive utility for relevant outcomes.

This comprehensive approach can help clarify whether the SMM is best understood as a unidimensional construct, a two-factor construct that distinguishes stress-is-enhancing and stress-is-debilitating beliefs, a four-factor construct that distinguishes stress beliefs across different life domains, or a novel factorial solution potentially capturing facets of the construct in a different way. The results from this investigation could contribute to both the theoretical refinement of the stress mindset construct and the practical application of the SMM across different contexts.

METHODS

Translation

The translation of the SMM from English into Italian was conducted following the standard back-translation procedure [24]. First, one of the authors of the present paper, fluent in English, translated the SMM items from English into Italian. Then, a native English speaker, fluent in Italian, independently translated the scale back into English. The final translated version was checked to ensure conceptual and linguistic accuracy and shared with the first author of the original scale. Table 1 presents both the original and the final Italian version of the scale.

Table 1. Original and Italian versions of the Stress Mindset Measure (SMM) Items.

Item No.	Original version	Italian version
1	The effects of stress are negative and should be avoided.	Gli effetti dello stress sono negativi e dovrebbero essere evitati.
2	Experiencing stress facilitates my learning and growth.	Provare stress favorisce il mio apprendimento e la mia crescita.
3	Experiencing stress depletes my health and vitality.	Provare stress peggiora la mia salute e la mia vitalità.
4	Experiencing stress enhances my performance and productivity.	Provare stress migliora le mie prestazioni e la mia produttività.
5	Experiencing stress inhibits my learning and growth.	Provare stress blocca il mio apprendimento e la mia crescita.
6	Experiencing stress improves my health and vitality.	Provare stress migliora la mia salute e la mia vitalità.

7	Experiencing stress debilitates my performance and productivity.	Provare stress peggiora le mie prestazioni e la mia produttività.
8	The effects of stress are positive and should be utilized.	Gli effetti dello stress sono positivi e dovrebbero essere utilizzati.

Note: Items 1, 3, 5, and 7 are negatively framed; items 2, 4, 6, and 8 are positively framed.

Study participants and sampling

Participants in the present study were recruited between 3 May 2017 and 30 June 2018 through email invitations and announcements on social media platforms. The online questionnaire was administered using SurveyMonkey software, and written informed consent was obtained on the first page of the questionnaire, which explained the purpose of the study, emphasized the confidentiality of the data, and informed participants of their right to withdraw at any time without penalty.

A total of 329 individuals took part in the study. Individuals with missing responses on more than 5% of the items were excluded from the analyses, resulting in the removal of 114 participants. The final sample consisted of 215 participants (67.91% female; age: M = 29.68 years, SD = 9.79 years, Min = 20 years, Max = 60 years). The study was part of a broader research project on psychophysical wellbeing, which included multiple individual differences measures. In the following section, we report only the measures relevant to the validation of the SMM and the comparison between factorial structures.

Study instruments

Given that stress mindset has been linked to various adjustment outcomes [10,11], beyond administering the SMM and collecting demographic information on age and gender, we also administered measures of perceived stress, life satisfaction, and self-efficacy. We included these measures to explore how the different SMM factorial models examined in this study relate to adjustment variables and whether their correlation patterns differ, as this would provide insight into their practical relevance.

Stress Mindset Measure – SMM

The SMM [9] consists of eight statements expressing beliefs about the effects of stress across different life domains. Four statements are positively framed to reflect a stress-is-enhancing mindset (see Table 1, Items 2, 4, 6, and 8), whereas the remaining four are negatively framed to reflect a stress-is-debilitating mindset across the same domains (see Table 1, Items 1, 3, 5, and 7). Participants rate their agreement with each statement on a five-point scale (0 = *strongly disagree* to 4 = *strongly agree*). Higher scores indicate a stress-is-enhancing mindset, whereas lower scores reflect a stress-is-debilitating mindset. The Italian version of the SMM showed good internal consistency (Cronbach's α = .88, McDonald's ω = .88).

Perceived Stress Scale – PSS-10

The PSS-10 [25; for the Italian version, see 26] measures the perceived unpredictability and uncontrollability of events in one's life and the feeling of overwhelm experienced in one's everyday life over the past month. Specifically, the PSS-10 requires participants to rate how frequently they experienced these feelings across 10 items using a five-point scale (0 = never to 4 = very often). Higher scores indicate greater perceived stress. In the present study, the scale demonstrated good internal consistency (Cronbach's α = .88, McDonald's ω = .89).

Satisfaction With Life Scale – SWLS

The SWLS [27; for the Italian version, see 28] is a five-item self-report measure designed to assess individual's overall satisfaction with life. Participants in our study rated their agreement with each item using a five-point Likert scale (1 = *Not at all* to 5 = *A lot*) [29]. Higher scores indicate greater life satisfaction. In the present study, the scale demonstrated adequate internal consistency (Cronbach's α = .81, McDonald's ω = .82).

Generalized Self-Efficacy Scale – GSES

The GSES [30; for the Italian version, see 31] is a 10-item self-report measure that assesses individual's perceived self-efficacy in handling daily challenges and adapting to stressful life events.

Participants rate how well each statement describes them using a four-point Likert scale (1 = *Not at all true* to 4 = *Exactly true*). In the present study, the scale demonstrated good internal consistency (Cronbach's α = .88, McDonald's ω = .88).

Data analysis

As part of a cross-validation procedure for the Stress Mindset Measure (SMM), participants were randomly assigned to two subsamples. To examine the latent factorial structure of the SMM based on our data, we conducted an Exploratory Factor Analysis (EFA) on the first subsample (N = 108), whilethe second subsample (N = 104) was used to validate these results through Confirmatory Factor Analysis (CFA). The EFA was conducted using the Minimum Residuals (MinRes) extraction method with Oblimin rotation, given the expected correlation between factors. The number of factors to retain was determined using parallel analysis.The sample size of 108 participants used for the EFA is consistent with established methodological recommendations for factor analytic studies involving short scales. With 8 items, this corresponds to a participant-to-item ratio of approximately 13:1, which exceeds the commonly used rule-of-thumb consisting in a participant to item ratio of 10:1 [32]. Furthermore, simulation studies have shown that reliable EFA results can be obtained with sample sizes around 100, especially when the number of factors is limited [33,34]. Therefore, the sample of 108 was considered adequate for identifying the underlying factor structure of the scale.

To evaluate which factorial model(s) of the SMM best represented our data, we conducted a series of CFA. Specifically, we tested the following six models: (a) a first-order single-factor model, based on the unidimensional structure proposed by Crum et al., assuming that all SMM items load onto a single latent construct [9,14,15]; (b) a first-order two-factor model, distinguishing between correlated factors representing stress-is-enhancing and stress-is-debilitating beliefs [16,17]; (c) a hierarchical two-factor model, where the stress-is-enhancing and stress-is-debilitating factors are correlated and load onto a superordinate factor; (d) a first-order four-factor model, differentiating beliefs about stress consequences across four domains: general impact, health and vitality, productivity and performance, and learning and growth [21]; (e) a hierarchical four-factor model, extending the four-factor model by introducing a higher-order general factor accounting for shared variance across the four domain-specific factors [21]; and (f) the model identified in our EFA.

CFAs were performed using the diagonally weighted least squares (DWLS) estimation method with robust standard errors on the full sample (N = 215) for all models, except for the model emerging from the EFA, which was tested separately on the second subsample (N = 104). To evaluate the statistical power of the CFA subsample, a post-hoc power analysis was conducted using the RMSEA-based method implemented in the R package *semPower* [35]. Assuming a null RMSEA of .05, an alternative RMSEA of .08, df = 20, and α = .05, the achieved power with N = 104 was approximately 0.81, indicating sufficient sensitivity to detect model misspecification. Model fit was evaluated using multiple goodness-of-fit indices: Chi-square Minimum Discrepancy divided by Degrees of Freedom (CMIN/df; < 3) [36], Tucker-Lewis Index (TLI; > 0.90), Comparative Fit Index (CFI; > 0.90), and Root Mean Square Error of Approximation (RMSEA; < 0.08) [37].

To assess whether a shortened version of the SMM maintains psychometric properties comparable to the full scale, we conducted two additional CFA, one on the four positively framed items and one on the four negatively framed items. In other words, the stress-is-enhancing factor and the stress-is-debilitating factor from the two-factor model were independently tested as potential brief versions of the SMM. The same model fit indices described above were used to evaluate these shortened models.

Finally, to evaluate the practical relevance of the SMM factorial solutions beyond their statistical fit, we conducted a series of hierarchical regression analyses. Specifically, for each adjustment variable (perceived stress, life satisfaction, and general self-efficacy), we tested separate regression models for each factorial solution, comparing their ability to account for variance in these outcomes.

All analyses were performed using Jamovi v 2.5.5.0 Software, with missing data managed using listwise deletion.

Ethical aspects

The present study adhered to the principles of the Declaration of Helsinki and was conducted in accordance with the Ethical Code of the Italian Psychological Association (*Codice Etico dell'Associazione Italiana di Psicologia*). The study was approved by the Ethics Committee of the University of Trieste (Record No. 79 – 03.05.2017).

RESULTS

Preliminary analysis

After reversing the negative items, the SMM mean score was 1.38 (SD = 0.74), and skewness (0.024) and kurtosis (-0.651) values suggested that the distribution was approximately normal. The inter-item correlations ranged from .31 to .67, suggesting adequate item homogeneity and supporting the assumption that all items measure the same construct without excessive redundancy (de Vaus, 2004). SMM score was not correlated with gender (r = .02, p = .741), whereas it was weakly correlated with age (r = -.14, p = .049).

Explorative Factor Analysis

Before conducting the Exploratory Factor Analysis (EFA), we assessed key assumptions to ensure the suitability of the data for factor analysis. The Kaiser–Meyer–Olkin (KMO) test of sampling adequacy was 0.84, indicating that the first subsample (N = 108) was adequate for factor extraction. Bartlett's test of sphericity was significant, $\chi^2(28) = 351.437$, $p < .001$, supporting the appropriateness of EFA.

The EFA supported a two-factor solution, which accounted for 52.1% of the total variance (Factor 1 = 27.7%, Factor 2 = 24.5%). Table 2 presents the factor loadings and uniqueness values for each item.

Table 2. Factor Loadings and Uniqueness Values from the EFA on the SMM (N = 108).

Item No.	Factor		Uniqueness
	1	2	
2	**.90**		.29
4	**.63**		.34
5	**.56**		.06
7	**.53**		.68
1		**.82**	.36
6		**.66**	.56
3		**.57**	.62
8	.40	**.46**	.38

Note: Items 5, 7, 1, and 3 have been reversed. Factor loadings above .40 are in bold

Factor 1 had high loadings from items 2, 4, 5 (reversed), and 7 (reversed), suggesting that it captures beliefs about the effects of stress on learning and productivity. Factor 2 had high loadings from items 1 (reversed), 6, 3 (reversed), and 8, reflecting beliefs about stress consequences in general and for health and wellbeing in particular. However, item 8 showed notable cross-loadings on both factors, indicating that it may tap into both aspects of stress mindset.

Confirmatory Factor Analyses

To assess which factorial solution(s) best represented our SMM data, we conducted a series of CFA using Structural Equation Modeling (SEM) with Diagonally Weighted Least Squares (DWLS) estimation and Robust Standard Errors. Specifically, we tested the six factorial models described in the Data Analysis section. Additionally, we tested a hierarchical two-factor EFA-derived model, in which the two factors identified in the EFA loaded onto a superordinate factor. Finally, we conducted CFA on two single-factor models to evaluate two shortened versions of the SMM: one including only

positively framed items (i.e., Stress Mindset Measure-4 Positive items, SMM-4P) and one including only negatively framed items (i.e., Stress Mindset Measure-4 Negative items, SMM-4N). Table 3 summarizes the goodness-of-fit indices for all tested models.

The single-factor model and the first-order two-factor model (stress-is-enhancing vs. stress-is-debilitating) exhibited similar fit indices. Both models had CFI and TLI values above 0.95, indicating good incremental fit. However, their RMSEA values exceeded the 0.08 threshold, suggesting less than optimal absolute fit. These results indicate that distinguishing between stress-is-enhancing and stress-is-debilitating beliefs does not substantially improve model fit compared to a unidimensional representation of stress mindset.

The hierarchical two-factor model, in which the stress-is-enhancing and stress-is-debilitating factors loaded onto a superordinate factor, exhibited a slight deterioration in fit compared to the first-order two-factor model. While CFI and TLI remained above 0.95, RMSEA increased to 0.095, exceeding the recommended 0.08 threshold, indicating poorer absolute fit.

The first-order four-factor model (General, Health and Vitality, Productivity and Performance, Learning and Growth) demonstrated better fit than the single-factor and two-factor models, with CFI and TLI reaching 1.00 and RMSEA falling below 0.08, indicating good fit. However, introducing a superordinate factor (hierarchical four-factor model) resulted in notable deterioration, with RMSEA exceeding the acceptable threshold (0.083).

The EFA-derived two-factor model (Learning and Productivity, and Health and Wellbeing) exhibited the best overall fit, with all fit indices largely meeting the recommended thresholds. This suggests that this conceptualization provides the optimal balance between model fit and parsimony, achieving excellent fit with only two factors. Importantly, each factor included four items, thus meeting the minimum recommended threshold of three items per factor for factorial stability [22]. Notably, the two-factor model identified in prior studies distinguished between stress-is-enhancing and stress-is-debilitating factors, which essentially capture the same beliefs on stress effects, framed either positively or negatively. By contrast, the EFA-derived two-factor model in the present study differentiates between a more instrumental component (stress effects on learning and productivity) and a broader component (stress effects in general and on health and wellbeing in particular), suggesting greater theoretical distinctiveness.

The hierarchical EFA-derived two-factor model exhibited a slight deterioration in fit compared to its first-order counterpart, with RMSEA increasing slightly to 0.037 but still well below the acceptable threshold (< 0.08). CFI and TLI remained unchanged, suggesting that the hierarchical structure remained interpretable despite a modest reduction in fit.

Among the two shortened versions of the SMM, the model including only positively worded items (SMM-4P) demonstrated excellent fit across all indices, suggesting it may serve as a reliable and practical alternative to the full scale. In contrast, the model including only negatively worded items (SMM-4N) exhibited substantially poorer fit, with RMSEA = 0.162, far exceeding the recommended threshold of 0.08.

In summary, CFA results indicated that distinguishing between stress-is-enhancing and stress-is-debilitating beliefs did not improve fit compared to the unidimensional model of stress mindset. Although the four-factor solution showed better fit than both, the EFA-derived two-factor solution (Learning and Productivity, and Health and Wellbeing) provided the best overall fit while retaining a reasonably parsimonious structure.

Among the shortened versions, the SMM-4P demonstrated excellent fit, while the SMM-4N performed poorly, suggesting that the shortened version including only positively framed items may represent a valid brief alternative to the full scale. Internal consistency and construct coherence (see Table 4) further supported the CFA findings. Among all tested models, the only multidimensional model exhibiting both good internal consistency (McDonald's $\omega > .80$) and acceptable convergent validity (AVE > .50) across all factors was the EFA-derived two-factor model. Similarly, the SMM-4P outperformed the SMM-4N not only in terms of model fit but also with respect to these psychometric properties.

Table 3. Goodness-of-Fit Indices for Confirmatory Factor Analyses (CFA) of the Stress Mindset Measure (SMM).

	CMIN/df	CFI	TLI	RMSEA	98% CI Lower	98% CI Upper
SMM - Full Scale						
• Single-factor model [9,14,15]	2.63	0.99	0.99	0.088	0.059	0.117
• Two-factor model (stress-is-enhancing and stress-is-debilitating) [16,17]	2.74	0.99	0.99	0.091	0.062	0.121
• Hierarchical two-factor model (two-factor model + superordinate factor)	2.90	0.99	0.99	0.095	0.065	0.125
• Four-factor model (general impact, health and vitality, productivity and performance, learning and growth) [21]	1.49	1.00	1.00	0.048	0.000	0.089
• Hierarchical four-factor model (four-factor model + superordinate factor) [21]	2.44	1.00	0.99	0.083	0.050	0.116
• EFA-derived two-factor model (learning-productivity and health-wellbeing)	1.21	1.00	1.00	0.032	0.000	0.071
• Hierarchical EFA-derived two-factor model (EFA-derived two-factor model + superordinate factor)	1.28	1.00	1.00	0.037	0.000	0.076
SMM – Short Form						
• SMM-4P (single-factor, positively framed items)	0.15	1.00	1.00	0.000	0.000	0.072
• SMM-4N (single-factor, negatively framed items)	6.57	0.99	0.96	0.162	0.087	0.250

Note: CMIN/df = Chi-square Minimum Discrepancy divided by Degrees of Freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; 98% CI = 98% confidence interval for RMSEA.
Abbreviations: SMM-4P = short form of the Stress Mindset Measure including only the four positively framed items; SMM-4N = short form of the Stress Mindset Measure including only the four negatively framed items.

Table 4. Model-Based reliability and convergent validity statistics for the Tested Stress Mindset Measure (SMM) models.

Factorial Model	Factor	McDonald's ω	AVE
SMM - Full Scale			
• Single-factor [9,14,15]	–	0.90	0.55
• Two-factor [16,17]	Stress-is-enhancing	0.84	0.61
	Stress-is-debilitating	0.77	0.50
• Four-factor [21]	General impact	0.75	0.66
	Health & vitality	0.56	0.48
	Productivity & performance	0.76	0.67
	Learning & growth	0.70	0.59
• EFA-derived two-factor	Learning-productivity	0.80	0.56
	Health-wellbeing	0.84	0.62
SMM - Shortened Scale			
• SMM-4P	-	0.83	0.61
• SMM-4N	-	0.77	0.49

Note: AVE = Average Variance Extracted.
Abbreviations: SMM-4P = Stress Mindset Measure-4 Positive items; SMM-4N = Stress Mindset Measure-4 Negative items.

Multiple regression analyses

To extend the evaluation of the SMM factorial solutions to their practical relevance, we conducted a series of hierarchical multiple regression analyses to compare their ability to predict three adjustment-related variables: perceived stress (PSS-10), life satisfaction (SWLS), and general self-efficacy (GSES).

For each adjustment variable, we performed four separate hierarchical regressions. Specifically, we tested the single-factor solution, the two-factor solution, the four-factor solution, and the EFA-derived two-factor solution. In addition, we tested the shortened version of the SMM that showed better fit in CFA (SMM-4P) to examine whether this brief form exhibited associations with adjustment variables comparable to the full scale.

In each analysis, age and gender were entered in the first block as control variables, while the SMM total or subscale scores derived from the selected factorial solutions were entered in the second block as predictors. For clarity and brevity, Table 5 reports the results for the overall regression models and the individual SMM predictors.

The regression models including the single-factor solution accounted for a significant proportion of variance in all three adjustment variables, with a higher total SMM score associated with lower perceived stress, higher life satisfaction, and higher self-efficacy.

The regression models including the two-factor solution also accounted for significant variance in perceived stress and self-efficacy, though not in life satisfaction. However, the stress-is-enhancing score was significantly associated only with lower perceived stress, while the stress-is-debilitating score was not significantly associated with any of the adjustment variables.

Similarly, the regression models including the four-factor solution accounted for a significant proportion of variance in perceived stress and self-efficacy, but not life satisfaction. Focusing on the individual factors, none of the subscale scores were significantly associated with perceived stress, and only the productivity and performance score was significantly associated with self-efficacy.

The regression models including our EFA-derived two-factor solution accounted for significant variance in all three adjustment variables. Nevertheless, neither the learning-productivity score, nor the health-wellbeing score significantly predicted perceived stress or life satisfaction. Yet, stronger beliefs that stress can enhance learning and productivity (i.e., higher learning-productivity scores) were significantly associated with higher self-efficacy.

Finally, the regression models including the shortened SMM-4P solution produced results closely aligned with the single-factor solution, with higher SMM-4P scores significantly associated with lower perceived stress, higher life satisfaction, and higher self-efficacy.

Table 5. Multiple regression analyses predicting Perceived Stress, Life Satisfaction, and Self-Efficacy from Stress Mindset Measure (SMM) Factorial Solutions.

	Outcome Variable	**Perceived Stress (PSS)**		**Life Satisfaction (SWLS)**		**Self-efficacy (GSES)**	
Factorial Model	**Predictor**	**R^2adj (model)**	**β (predictor)**	**R^2adj (model)**	**β (predictor)**	**R^2adj (model)**	**β (predictor)**
SMM - Full Scale							
• Single-factor [9,14,15]	○ SMM total score	.106***	-.205**	.029*	.150*	.119***	.229***
• Two-factor [16,17]	○ Stress-is-enhancing score	.107***	-.215*	.025	.120	.116***	.188
	○ Stress-is-debilitating score		-.005		.039		0.056
• Four-factor [21]	○ General impact score	.096***	.009	.020	.001	.125***	-.106
	○ Health & vitality score		-.112		-.001		.089
	○ Productivity & performance score		-.091		.139		.216*
	○ Learning & growth score		-.057		.035		.076
• EFA-derived two-factor	○ Learning-productivity score	.101***	-.126	.028*	.160	.123***	.252**
	○ Health-wellbeing score		-.097		.003		-.003
SMM - Shortened Scale							
• SMM-4P	○ SMM-4P total score	.096***	-.165*	.027*	.155*	.122***	.221*

Note: $*p < .05$. $**p < .01$. $***p < .001$. Adjusted R^2 values refer to the full regression models including control variables (age and gender).
Abbreviations: PSS = Perceived Stress Scale; SWLS = Satisfaction With Life Scale; GSES = General Self-Efficacy Scale; SMM = Stress Mindset Measure; SMM-4P = short form of the Stress Mindset Measure including only the four positively framed items.

DISCUSSION

The present study aimed to translate and validate the Stress Mindset Measure (SMM) in an Italian sample and to deepen the investigation of its factorial structure, both in terms of psychometric properties and practical utility. Specifically, we tested several factorial solutions proposed in previous studies, explored whether a novel factorial structure could better capture stress mindset in our sample, and examined whether a shortened version of the scale could provide a practical alternative for use in applied settings. Finally, we evaluated the practical utility of the different factorial solutions by examining how they correlated with adjustment outcomes, specifically perceived stress, life satisfaction, and general self-efficacy.

Overall, findings suggest that the Italian version of the SMM demonstrates good psychometric properties. Our exploratory factor analysis (EFA) supported a two-factor solution, which was subsequently confirmed as the best-fitting model in confirmatory factor analysis (CFA). However, findings also support the practical utility of the unidimensional model, as it was the only one that significantly correlated with all three adjustment outcomes, reinforcing its robustness in capturing general stress mindset beliefs. Additionally, the SMM-4P, a shortened version including only positively worded items, exhibited strong psychometric properties and very good predictive validity, suggesting its potential usefulness as a brief alternative.

Our findings build on and extend prior research on the factorial structure of the SMM. The unidimensional structure of the SMM originally proposed by Crum et al. [9] and subsequently supported in Brazilian [14] and Turkish [15] validation studies was found to exhibit acceptable fit, although it was not the best-fitting solution. However, our regression analyses showed that this model was the only one to show consistent associations with all the adjustment variables here considered. Specifically, higher total SMM scores were associated with lower perceived stress, higher life satisfaction, and higher general self-efficacy, consistent with previous evidence [9,16,21]. From a practical perspective, our results suggest that a unidimensional approach to measuring stress mindset remains advantageous, particularly in applied settings where predictive validity is a key consideration. While multidimensional models may offer a more detailed examination of this construct, their added complexity risks obscuring important associations with variables relevant to stress responses and overall wellbeing.

The two-factor solution identified in previous studies, which separates stress mindset into stress-is-enhancing and stress-is-debilitating factors [16,17], demonstrated fit indices in our CFA that were comparable to the unidimensional model. This indicates that distinguishing between these two dimensions does not seem to provide additional explanatory power beyond treating stress mindset as a single construct. Results from the regression analyses further questioned the added value of this two-factor structure. Although the overall two-factor solution accounted for variance in perceived stress and self-efficacy, only the stress-is-enhancing factor showed a significant (negative) association with perceived stress, while the stress-is-debilitating factor was unrelated to any adjustment outcome. These findings align with concerns raised in previous research that the distinction between stress-is-enhancing and stress-is-debilitating factors may primarily reflect item wording effects rather than substantively distinct constructs [16,17]. The lack of significant associations for the stress-is-debilitating factor further calls into question the practical relevance of maintaining a strict distinction between them.

The four-factor model, which differentiates between beliefs on stress effects in general, on health and vitality, on productivity and performance, and on learning and growth, showed better fit than the single-factor and two-factor solutions in CFA. However, when adding a superordinate factor, as proposed by Mierzejewska-Floreani et al. [21], the model significantly worsened in fitting our data. Importantly, the regression analysis revealed that none of the four individual factors were significantly associated with perceived stress and life satisfaction, and only the productivity and performance factor significantly predicted self-efficacy. This pattern of results, combined with the high fragmentation of the scale into four factors, raises concerns about the practical utility of this

conceptualization of the SMM. Notably, each of the four factors includes only two items expressing the same belief – one positively and one negatively framed – thus failing to meet the recommended threshold of at least three items per factor for factorial stability [22] and calling into question whether these factors capture genuinely distinct dimensions of stress mindset.

Our EFA-derived two-factor model, which was the best-fitting structure in CFA among all tested SMM factorial models, substantially differs from the two-factor model reported in previous validation studies [16,17]. Unlike that model, which primarily distinguished between positively and negatively worded items, our structure differentiates beliefs about stress effects on learning and productivity versus health and wellbeing, suggesting a more meaningful conceptual distinction. Interestingly, the Polish validation study also identified a similar two-factor structure in their EFA, but this was not confirmed in their CFA [21]. Future research should further examine whether this differentiation between performance-related and wellbeing-related stress beliefs is supported across different linguistic and cultural contexts.

The predictive performance of our SMM model in regression analyses was mixed. Neither factor was significantly associated with perceived stress or life satisfaction. However, higher scores on the learning and productivity factor were significantly associated with greater general self-efficacy, suggesting that beliefs about stress in performance-related contexts may be particularly relevant to self-efficacy, a key variable for adaptive stress responses. Thus, whereas our EFA-derived two-factor model exhibits limitations similar to other multidimensional solutions of the SMM in relation to adjustment outcomes, it also presents potential strengths. It overcomes concerns about item framing and redundancy raised by previous two-factor and four-factor models, while offering a structure which appears theoretically coherent. This may allow for a more detailed perspective on stress mindset in specific contexts, particularly as a targeted framework for intervention strategies. For instance, individuals struggling with stress in high-performance settings may benefit more from interventions addressing beliefs about stress effects on learning and productivity, whereas those perceiving stress as a risk factor in general or specifically for health may require a different cognitive reframing approach. In this regard, Castellini et al. [38] found that lower mentalization skills, such as reduced goal-directed behavior and greater use of avoidance coping, were associated with higher levels of burnout symptoms among psychiatry residents. Future studies could explore whether stress mindset, and particularly believing that stress negatively impacts learning and productivity, also contributes to burnout risk, either independently or by influencing coping style and goal-directed behavior. Such investigations may help inform the design of preventive interventions aimed at reducing burnout in populations exposed to demanding work settings such as healthcare environments.

Future research should explore whether tailoring interventions to these specific dimensions enhances effectiveness compared to generalized stress mindset interventions, particularly in professional and academic settings, where performance-related stress beliefs may be most influential [12]. Previous studies have shown that stress responses, as well as many other health- and performance-related outcomes, improve significantly through a synergistic mindset intervention, which promotes both a growth-oriented mindset (i.e., the idea that it is always possible to learn and grow, even while facing existential threats), and a reappraisal of stress response (i.e., the idea that physiological arousal is useful to sustain the performance) [39,40]. However, it remains to be explored whether interventions that focus more specifically and deeply on distinct dimensions of stress mindset—such as those identified in the present study—can yield comparable or even better results, depending on the context. Similarly, future studies should determine how these interventions, aimed at modifying the individual's belief systems, can be meaningfully integrated with other types of psychological interventions, particularly those specifically focused on emotional regulation skills [41], whose effectiveness in promoting psychological wellbeing is also supported by data from programmes targeting developmental age groups [42].Finally, our results suggest that the SMM-4P, a shortened version of the scale that includes only positively worded items, represents a psychometrically acceptable alternative to the full scale. This version exhibited excellent model fit

and demonstrated associations with adjustment outcomes comparable to the unidimensional model of the full SMM, suggesting that it may serve as a practical tool for assessing stress mindset in time-limited settings. Notably, the SMM-4P corresponds to the stress-is-enhancing factor of the two-factor model found in previous studies. The fact that this shortened version outperforms the full SMM two-factor model in both model fit and associations with key outcomes further calls into question the conceptual and practical utility of distinguishing stress-is-enhancing and stress-is-debilitating factors. Overall, our findings reinforce doubts that the two-factor structure observed in prior research may primarily reflect item valence effects rather than distinct psychological dimensions of stress mindset [16,17]. Moreover, because the same stress-effect domains are equally represented in both the stress-is-enhancing and stress-is-debilitating factors, the SMM-4P may offer the additional advantage of reducing redundancy across items while maintaining conceptual coverage.While our findings provide valuable insights, they should be interpreted in light of certain limitations. Although our sample size was adequate for factor analysis, it was relatively small compared to other validation studies on the SMM, especially considering that we split the sample into two random subsamples, conducting EFA on one subsample and testing the emerged factorial structure with CFA on the other subsample. This cross-validation approach is commonly used in factorial validation studies to reduce the risk of model overfitting and provide a preliminary check of replicability within the same dataset [43]. However, future studies with larger samples are needed to further assess the stability and generalizability of our findings, particularly those concerning the EFA-derived new two-factor solution. Longitudinal studies are also needed to determine whether the factorial structure of the SMM identified in EFA and confirmed in CFA (learning and productivity vs. health and wellbeing) remains stable over time.

Remarkably, whereas most previous validation studies of the SMM have relied solely on CFA, we used both EFA and CFA in examining its factorial structure. We believe that conducting EFA before testing predefined structures in CFA represents a methodological strength, as it allows for a more flexible approach that may help identify alternative conceptualizations and contribute to theoretical refinements [24].

Our study was conducted on a sample from the general Italian population. Future research should explore whether our EFA-derived two-factor model and the shortened version SMM-4P are also supported in clinical populations and individuals exposed to high-stress environments, where stress mindset may play a particularly relevant role in adaptation. Additionally, future research could investigate whether changes in one domain (e.g., learning and productivity) are associated with broader shifts in overall stress mindset and well-being over time.

CONCLUSIONS

The current study provides new insights into the factorial structure of the Stress Mindset Measure (SMM). While the findings support the practical relevance of the unidimensional model, they also suggest that the EFA-derived two-factor model—distinguishing between beliefs about stress effects on learning and productivity versus health and wellbeing—may offer a valid alternative for specific contexts. Results also highlight the potential utility of a shortened version of the SMM, the SMM-4P, which includes only the four positively framed items and may be particularly valuable in applied settings requiring brief assessments (e.g., large-scale surveys, educational interventions, clinical contexts). Taken together, these findings contribute to the ongoing examination of the stress mindset construct and offer practical insights for future research and applications of the SMM.

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