RMJ

Original Article

Evaluating the Validity and Reliability of the Thai Translated Psychological Vulnerability Scale for Graduate Students

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Abstract

Background: Psychological vulnerability plays a pivotal role in mental health issues, marked by distorted thinking patterns leading to maladaptive coping behaviors.

Objective: To adapt the concise and user-friendly Psychological Vulnerability Scale (PVS) into Thai while assessing its psychometric properties.

Methods: This study employed purposive sampling, selecting 384 Thai graduate students from various academic disciplines, ensuring the inclusion of specific subgroups relevant to the study's focus on mental health and psychological vulnerability. Data were collected using an online survey that included the Thai version of the PVS, the Thai Mental Health Questionnaire (TMHQ), and demographic information. A pilot test was conducted with 30 students prior to the main survey to assess the clarity and reliability of the instruments.

Results: These findings indicated the translated Thai PVS's robust content validity and revealed 2 factors explaining 56.7% variance through exploratory factor analysis. Pearson correlation coefficients showed a significant moderate relationship between Thai PVS, TMHQ, and vulnerability perception. Furthermore, the Thai PVS showed a strong correlation with the original version and had acceptable internal consistency reliability, with Cronbach α at 0.668 and McDonald ω at 0.672.

Conclusions: These results affirm the Thai PVS's robust psychometric properties, making it a valuable tool for screening mental health issues among graduate students, addressing a critical need in this population.

Keywords: Psychological vulnerability, Psychometric property, Graduate students

Citation: Sumalrot T, Sathu K, Singhakant S. Evaluating the validity and reliability of the Thai translated Psychological Vulnerability Scale for graduate students. *Res Med J*. 2026;49(1): e273961. doi:10.33165/rmj.2026.e273961

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Received: 28 February 2025
Revised: 30 April 2025
Accepted: 6 May 2025
Published: 22 December 2025

Introduction

Understanding the role of psychological vulnerability in mental health disorders is pivotal. The vulnerability-stress model, a fundamental concept in psychology, suggests that vulnerability lowers the threshold for mental disorder onset.[1] Some individuals exhibit heightened susceptibility to negative outcomes under stress, while others display resilience. Sinclair et al[2] describe psychological vulnerability as cognitive tendencies involving false beliefs leading to maladaptive coping. Vulnerability is essential in understanding mental disorders[3] and is central to comprehending conditions like depression.[4] Despite extensive research, diverse interpretations and definitions persist.

Psychological vulnerability is a significant area of research in psychology. Psychological Vulnerability Scale (PVS) provides a well-constructed instrument for assessing this aspect.[2] The PVS focuses on specific cognitive paradigms related to self-concept, including dependency perception, perfectionism, negative attributions, and the need for external validation.

Distortions in these constructs are linked to unfavorable mental health outcomes. However, a universally agreed-upon definition remains elusive.

The PVS, initially developed for individuals with rheumatoid arthritis,[2] has been adapted for general population, such as adolescents and university students. Studies involving 1875 secondary school students and 267 Portuguese higher education students demonstrated the scale's one-factor structure, good internal consistency, test-retest reliability, and convergent validity with mental health measures.[5-6] These findings confirm that the PVS is a reliable and valid tool for assessing psychological vulnerability in nonclinical populations. In Thailand, there has been limited research on psychological vulnerability and its impact on student populations, particularly graduate students. Globally, graduate students face higher levels of depression and anxiety, largely due to the stress and changing responsibilities they encounter.[7] They are 6 times more likely to experience these issues than the general population.[8] Graduate students also face a higher risk of suicidal thoughts and actions, often accompanied by a sense of loss of control, eating disorders, hopelessness, desperation, and clinical depression.[9] However, there is a lack of instruments specifically adapted to assess psychological vulnerability within this population in Thailand.

This study aims to address this gap by adapting the PVS into Thai version, assessing its psychometric properties, and introducing it to Thai graduate students. By doing so, the study seeks to enhance mental health awareness and support preventive interventions for this critical population. A comprehensive understanding of psychological vulnerability will contribute to more targeted mental health initiatives, improving support systems for graduate students in Thailand.

Methods

Study Design

A cross-sectional validation study, it encompassed 2 primary phases: translating and adapting the PVS into Thai and assessing its psychometric attributes. Authorization for this translational work and subsequent assessment came from Vaughn Sinclair, a renowned expert from Vanderbilt University's psychiatric nursing department. The translation process adhered to the World Health Organization's (WHO) guidelines, following their established protocol for instrument translation, including forward and back translations to ensure methodological rigor and linguistic fidelity.[10] The study then scrutinized the psychometric properties of the Thai PVS, focusing on Thai graduate students.

Participants

The study included 414 participants, recruited through purposive sampling with specific inclusion criteria, and divided into 2 groups. The first group consisted of 30 graduate students from Mahidol University who met the following criteria: 1) enrollment in a graduate program, 2) proficiency in both Thai and English languages, with passing scores on the English proficiency exams required for graduate programs at Mahidol University, and 3) willingness to participate. This group was used for the pretest during the adaptation of the Thai version of the PVS, in accordance with Perneger's recommendations.[11] The second group included 384 graduate students who were actively enrolled in graduate programs at various universities in Thailand. The inclusion criteria for this group were: 1) enrollment in a graduate program in Thailand, 2) being a native Thai speaker with

the ability to read and understand Thai language, and 3) willingness to participate. This larger sample size was determined using the Cochran formula, with a 95% confidence interval and a 5% margin of error, to conduct a comprehensive examination of the Thai PVS's psychometric properties. Data from the first group were analyzed to initially evaluate parallel form reliability and semantic equivalence between the Thai and original versions of the PVS after establishing content validity. The second group participated by completing an online questionnaire with no missing data. Participants provided consent by action, which was recorded when they clicked the link to complete the questionnaire. Participants who did not provide consent or were not graduate students were automatically excluded. All questionnaires were distributed, and data were collected from August 2020 to February 2021.

Instrument

The PVS consists of 6 questions, each rated on a 5-point scale from 1 (does not describe me at all) to 5 (describes me very well). The original version of the PVS underwent internal consistency testing, yielding Cronbach α coefficients ranging from 0.71 to 0.87 across different populations. Additionally, test-retest reliability was evaluated twice, resulting in correlations of $r = 0.83$ at a 6-week interval and $r = 0.81$ at 3 months.[2] The PVS is a self-report instrument with clear instructions: 'Consider how well the following statements describe your behavior and actions on a scale from 1 to 5. Mark an X on the number that best reflects your behavior'. The scale is designed to assess psychological vulnerability by asking participants to rate how much each statement reflects their behavior and feelings. Example questions include: 'I am frequently aware of feeling inferior to other people' and 'I need approval from others to feel good about myself'. Scoring for the PVS involves summing the responses to all 6 questions, where a higher total score indicates greater psychological vulnerability in the individuals. Following the back-translation process, the Thai version of the PVS was subjected to content validity assessment. The revised scales were then administered to a group of 30 graduate students for the examination of the psychometric properties of the translated scale.

The Thai Mental Health Questionnaire (TMHQ) serves as a practical tool designed for screening mental health symptoms within the Thai general population. Its construct validity has been established through factor analysis, and it exhibits strong reliability, with a Cronbach α coefficient of 0.89. Comprising a total of 70 questions, TMHQ is an ordinal rating scale and a self-administered instrument that individuals can complete independently. The instructions for TMHQ, located at the top of the scale, are designed to be comprehensible to readers with a basic level of literacy. An example question from the scale is, 'In the past month, have you experienced any of these symptoms?'. Responses are rated on a scale of 0 = not at all, 1 = a little, 2 = somewhat, 3 = usually, and 4 = frequently. The sum of scores reflects 5 domains of mental health: somatization, anxiety, depression, psychotic, and social function. Scoring and interpreting TMHQ results require an answer sheet with specific instructions for calculating the raw score.[12] These 5 domains of TMHQ are relevant to mental health symptoms that may positively correlate with psychological vulnerability, especially within the depression domain. Given its robust psychometric properties and applicability to the Thai general population, TMHQ is an appropriate tool for assessing the criterion validity of the PVS.

The perception of vulnerability survey question is a single-item survey designed to explore the relationship between participants' self-perceived psychological vulnerability

and their scores on the PVS. Participants are asked to rate their perception of psychological vulnerability on a scale ranging from 1 (not at all vulnerable) to 5 (extremely vulnerable). A higher score indicates a stronger perception of psychological vulnerability.

The demographic survey collects personal information from participants, encompassing details such as age, gender, marital status, year of study, field of study, university type, and university location.

Statistical Analysis

All statistical analyses for this study were performed using SPSS version 29.0 (IBM SPSS Statistics for Windows, Version 29.0. Armonk, NY: IBM Corp; 2022) and Jamovi version 2.4 program software package. The initial stage of the research focused on adapting the PVS from its original language to Thai through forward and backward translation processes. This adaptation phase also involved assessing content validity based on the index of items objective congruence (IOC) and ensuring parallel reliability between the 2 different language versions by examining Pearson correlation coefficients. In the second phase of the study, construct validity was evaluated using exploratory factor analysis (EFA), where the number of factors was determined by examining the scree plot and eigenvalues greater than 1. Principal component analysis (PCA) was used as the extraction method, and an oblimin rotation with Kaiser normalization was applied. Criterion-related validity was assessed through the Pearson correlation coefficient to examine the relationships between the Thai PVS, perception of vulnerability, and the TMHQ. Additionally, internal consistency reliability was determined using Cronbach α and McDonald ω. *P* values less than .05 were considered statistically significant.

Results

Descriptive Analysis of Psychological Vulnerability Scale Scores and Demographic Variations

The adaptation of the PVS among 30 Thai graduate students (73.3% female) resulted in a mean (SD) Thai PVS score of 16.90 (5.55), with 66.7% passing the English proficiency exams (MUGrad test). Psychological vulnerability among 384 Thai graduate students with a mean (SD) age of 27.54 (4.79) years was assessed through a descriptive analysis of their scores on the Thai PVS (mean [SD], 18.32 [4.4]; median [range], 19 [7-30]). The range of scores on the Thai PVS spanned 23 points, and the interquartile range (IQR) was 6, suggesting a normal distribution of the data. In terms of interpretation, a mean (SD) PVS score of 18.32 (4.44) indicated a moderate level of psychological vulnerability, in accordance with the guideline that higher scores reflect greater vulnerability.[2] Furthermore, it's worth noting that female students reported slightly higher mean PVS scores compared to male students (mean [SD], 18.36 [4.31] vs 17.96 [5.52]), while students who chose not to identify their gender reported the highest mean PVS scores (mean [SD], 20.06 [5.52]). However, there were no significant differences in PVS mean scores based on gender, marital status, university location, or university type. Significant variations in PVS scores were observed among age groups, different fields of study and years of study, as determined by post hoc pairwise comparisons. The sample aged between 41-50 years reported the lowest PVS score (mean [SD], 14.85 [3.53]) and showed a significant difference compared to those aged 21-30 years and over 50 years. Business administration and law students tended to report the lowest PVS scores (mean [SD], 16.48 [4.68]), and this score was significantly

different from the group of students studying art and humanities (mean [SD], 19.21 [4.17]). Additionally, students in their fourth year of graduate studies reported the highest PVS scores (mean [SD], 20.28 [4.68]), which significantly differed from students in the first year of study (mean [SD], 17.51 [4.58]) (Table 1).

Table 1. Participants' Demographic Information and Psychological Vulnerability Scale Score

Characteristic	No. (%)	PVS Score, Mean (SD)	Statistics	Post Hoc Test
The adaptation of the PVS sample group	30 (7.2)	16.90 (5.55)	NA	NA
Gender				
Male	6 (20)	NA	NA	NA
Female	22 (73.3)	NA	NA	NA
Chose not to identify	2 (6.7)	NA	NA	NA
English proficiency test				
MUGrad (≥ 60)	20 (66.7)	NA	NA	NA
IELTS (≥ 5)	6 (20)	NA	NA	NA
TOEFL iBT (≥ 54)	3 (10)	NA	NA	NA
TOEFL ITP (≥ 480)	1 (3.3)	NA	NA	NA
The psychometric properties sample group	384 (92.8)	18.32 (4.44)	NA	NA
Gender				
Male	97 (25.3)	17.96 (4.58)	*F* (2, 381) = 1.475, *P* = .230	NA
Female	272 (70.8)	18.36 (4.31)		
Chose not to identify	15 (3.9)	20.06 (5.52)		
Age, y				
21-30	320 (83.3)	18.51 (4.26)	*F* (3, 380) = 2.769, *P* = .042	(21-30 vs 41-50) (41-50 vs >50)
31-40	54 (14.1)	17.48 (5.35)		
41-50	7 (1.8)	14.85 (3.53)		
> 50	3 (0.8)	21.33 (2.08)		
Marital status				
Single	359 (93.5)	18.33 (4.39)	*F* (2, 381) = 0.175, *P* = .839	NA
Married	23 (6.5)	18.43 (5.30)		
Divorced	2 (0.5)	16.50 (4.94)		
Fields of study				
Education	19 (4.9)	19.78 (4.44)	*F* (7, 376) = 2.764, *P* = .008	(Arts and humanities vs Business and law)
Arts and humanities	56 (14.6)	19.21 (4.17)		
Social sciences	94 (24.5)	17.90 (4.31)		
Business and law	58 (15.1)	16.48 (4.68)		
Natural sciences	38 (9.9)	19.21 (4.39)		
Information technologies	14 (3.6)	19.64 (3.10)		
Engineering and architecture	21 (5.5)	19.23 (3.61)		
Health science and welfare	84 (21.9)	18.30 (4.65)		

Table 1. Participants' Demographic Information and Psychological Vulnerability Scale Score (Continued)

Characteristic	No. (%)	PVS Score, Mean (SD)	Statistics	Post Hoc Test
Years of study				
1	131 (34.1)	17.51 (4.58)	*F* (4, 379) = 2.876, *P* = .023	(1 vs 4)
2	142 (37.0)	18.75 (4.09)		
3	61 (15.9)	18.31 (4.36)		
4	28 (7.3)	20.28 (4.68)		
≥ 5	22 (5.7)	18.00 (4.91)		
Location of university				
Bangkok and metropolitan areas	366 (95.3)	18.32 (4.47)	*t* (382) = -0.114, *P* = .910	NA
Other provinces	18 (4.7)	18.44 (3.83)		
Types of university				
Public university	338 (88.0)	18.30 (4.54)	*F* (3, 380) = 0.178, *P* = .911	NA
Autonomous university	5 (1.3)	19.00 (3.08)		
Rajabhat university	4 (1.0)	19.75 (5.31)		
Private university	37 (9.6)	18.27 (3.61)		

Abbreviations: NA, not applicable; PVS, Psychological Vulnerability Scale.

Validity

Content Validity: In assessing content validity, a series of steps were followed. First, a backward translation was conducted, and necessary adjustments were made. Subsequently, IOC analysis was performed as the final evaluation. This analysis involved input from 3 language and psychology experts who assessed the Thai translation of the PVS after the completion of the backward translation process and item revisions. The outcome of this content validity assessment revealed that all items in the scale received IOC scores ranging from 0.67 to 1.00, which fell within the acceptable range (IOC > 0.5) as outlined by Turner et al.[13] This indicated that the translation and adaptation of the PVS into Thai maintained a high level of content validity, reflecting the alignment between the original and translated versions of the items.

Construct Validity: To assess construct validity for the Thai version of the PVS, 2 main methods were employed: EFA and a known-groups comparison. The data were found to be suitable for EFA, meeting the necessary criteria with a significant Bartlett's test of sphericity and a Kaiser-Meyer-Olkin (KMO) result of 0.75, which exceeded the commonly recommended value of 0.6 (KMO = 0.705, Bartlett's $\chi^2 = 325.361$, $df = 15$, $P < .01$). EFA revealed 2 components (Table 2 and Figure 1). Component 1 consisted of 3 items from a 6-item scale, explaining 37.9% of the variance with factor loadings ranging from 0.603 to 0.718. Component 2 also comprised 3 items from the same scale, explaining 18.7% of the variance with factor loadings ranging from 0.565 to 0.811. Together, these 2 components accounted for a cumulative variance of 56.68%. The individual item variance (h^2) ranged between 0.438 and 0.692, all of which met the acceptable threshold of 0.4 suggested by Costello et al[14], indicating suitability for retaining these variables. However, item 2 had a lower corrected item-total correlation value (below 0.3), suggesting that it might not be strongly correlated with the overall scale, as per Cristobal et al.[15]

Lastly, the known-group method was employed to confirm construct validity by comparing PVS scores between 2 groups: students reporting no mental health symptoms (T-score < 65) and students at risk for mental health issues (T-score ≥ 65). The independent sample t test results demonstrated that the mean PVS score for students reporting at risk for depressive symptoms (mean [SD], 21.13 [3.74]) was significantly higher than that of students without depressive symptoms (mean [SD], 17.00 [4.12]; $t(261.11) = 9.764$; $P < .01$). This significant difference also applied to all domains of the TMHQ, except for the social function domain, which did not show a significant difference in mean PVS scores between the 2 groups (Table 3).

Criterion-Related Validity: Criterion-related validity was assessed through data analysis, which involved calculating bivariate Pearson correlation coefficients between the translated Thai-PVS and the TMHQ. Positive and moderate correlations between PVS scores and the scores across all domains of the TMHQ were found. Notably, the strongest correlation was observed between PVS scores and depression ($r = 0.537$, $P < .01$). Furthermore, significant, positive, and moderate relationships were found between PVS scores and other TMHQ domains, with correlations ranging from $r = 0.481$ (anxiety) to $r = 0.349$ (psychotic). These results indicated the ability of the PVS to measure psychological vulnerability effectively in relation to various mental health domains. Additionally, a positive and moderate correlation was identified between PVS scores and the perception of vulnerability ($r = 0.504$, $P < .01$) (Table 4).

Reliability

Reliability analysis was performed, and results are presented with correlation coefficient and mean (SD), for both PVS and its Thai translation with 30 initial sample groups. Notably, the correlation coefficient between the Thai and the original English version was robust at 0.835. This strong correlation was further supported by individual item correlations between the two versions, which ranged from 0.685 to 0.916, all of which were statistically significant ($P < .01$) (Table 5). Importantly, there were no significant differences in the means for each paired item across the scale, confirming the excellent parallel reliability of the Thai PVS. Furthermore, internal consistency reliability was assessed with a dataset of 384 participants. The Cronbach α and McDonald ω coefficients for the total score of the Thai translated version of the PVS were 0.668 and 0.672 respectively, indicating an acceptable level of internal consistency reliability. These coefficients reflected the degree to which the items within the scale measure the same underlying construct of psychological vulnerability consistently.

Table 2. Descriptive Data and Results of the Analysis of Psychological Vulnerability Scale Items

PVS Items	Mean (SD)	Corrected Item-Total Correlation	If Item Deleted		h^2	Factor Loading	
			α	ω		Component 1	Component 2
1) I am frequently aware of feeling inferior to other people.	2.74 (1.21)	0.403	0.642	0.631	0.438	NA	0.565
2) I tend to set my goals too high and become frustrated trying to reach them.	3.34 (1.23)	0.292	0.663	0.666	0.607	NA	0.811
3) I feel entitled to get better treatment from others than I generally receive.	2.40 (1.13)	0.362	0.638	0.645	0.509	0.718	NA
4) If I don't achieve my goals, I feel like a failure as a person.	3.25 (1.27)	0.463	0.602	0.617	0.622	NA	0.759
5) I often feel resentful when others take advantage of me or ignore my feelings.	3.55 (1.22)	0.383	0.632	0.635	0.692	0.854	NA
6) I need approval from others to feel good about myself.	3.04 (1.18)	0.487	0.595	0.601	0.533	0.603	NA
PVS total score	18.3 (4.44)	NA	NA	NA	NA	NA	NA
The variance explained, %	NA	NA	NA	NA	NA	37.9	18.7

Abbreviations: NA, not applicable; PVS, Psychological Vulnerability Scale.

Figure 1. The Scree Plot Showing Components and Eigenvalue of the Factor Analysis of Psychological Vulnerability Scale Items

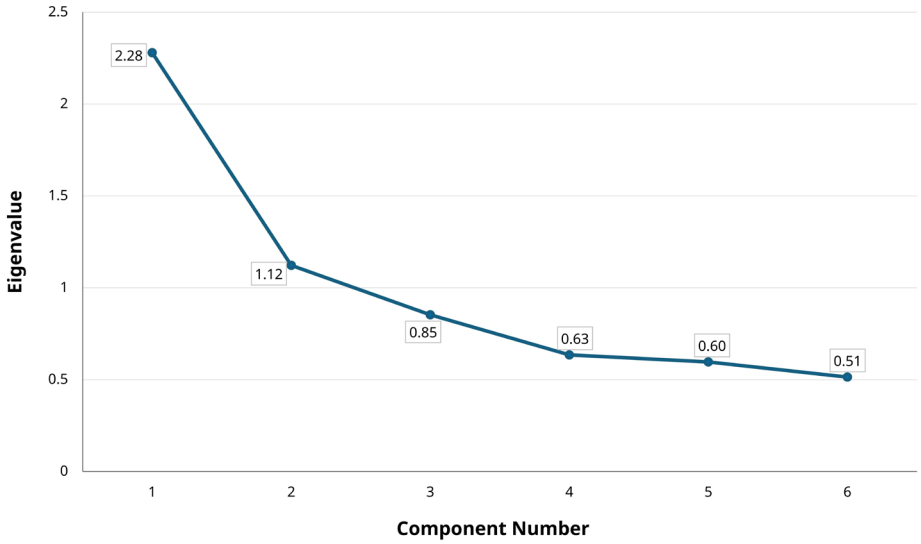

Table 3. Comparison of Psychological Vulnerability Scale Scores Between Samples Without Mental Health Problems and Those at Risk for Mental Health Problems

Mental Health Problem	No. (Mean [SD]) PVS Scores		Statistics	Cohen *d* Effect size
	No Mental Health Problems	At Risk for Mental Health Problems		
Somatization	237 (17.10 [4.20])	147 (20.30 [4.10])	t (382) = 7.327, P < .01	0.77
Depression	261 (17.00 [4.12])	123 (21.13 [3.74])	t (261.11) = 9.764, P < .01	1.05
Anxiety	246 (17.04 [4.34])	138 (20.62 [3.63])	t (327.26) = 8.633, P < .01	0.89
Psychotic	376 (18.25 [4.41])	8 (21.75 [4.52])	t (382) = 2.212, P = .028	0.78
Social function	378 (18.29 [4.42])	6 (20.33 [5.42])	t (382) = 1.114, P = .266	0.41

Abbreviations: PVS, Psychological Vulnerability Scale.

Table 4. Criterion Validity of the Thai Version of the Psychological Vulnerability Scale

Scale	TMHQ					POV
	Somatization	Depression	Anxiety	Psychotic	Social Function	
PVS	0.471	0.537	0.481	0.349	0.444	0.504

Abbreviations: POV, Perception of psychological vulnerability score; PVS, Psychological Vulnerability Scale; TMHQ, Thai Mental Health Questionnaire.

Table 5. Parallel Form Reliability of the Psychological Vulnerability Scale Items With 30 Graduate Students From the Translation and Adaptation Phase

Item of the Thai PVS	Correlation	Mean (SD)	
		English	Thai
1	0.732	2.77 (1.00)	2.60 (1.13)
2	0.897	2.90 (1.24)	3.03 (1.27)
3	0.685	2.53 (1.10)	2.37 (1.09)
4	0.902	2.87 (1.30)	2.90 (1.42)
5	0.880	3.40 (1.32)	3.30 (1.36)
6	0.916	2.80 (1.34)	2.70 (1.31)
PVS total score	0.835	17.27 (4.75)	16.90 (5.55)

Abbreviations: NA, not applicable; PVS, Psychological Vulnerability Scale.

Discussion

Significance of PVS Scores

The mean score of the PVS in this study was 18.32, which aligned with previous research on psychological vulnerability within populations with higher education, suggesting a moderate level of psychological vulnerability.[6, 16-19] Notably, no established norms exist for differentiating score levels among the Thai university population, making this study the first of its kind to investigate PVS scores among Thai graduate students. Additionally, it is important to highlight that >30% of the participants reported high levels of mental health symptoms, including somatization, anxiety, and depression, suggesting a need for professional assistance to address their mental health concerns.

Evidence of Validity

Content validity was assessed using the IOC, with values ranging from 0.67 to 1.00, exceeding the 0.5 threshold and indicating language equivalence.[13] Differences in translation preferences led to a score of 0.67 for items 2 and 3, particularly concerning the translation of frustrated and generally. All experts were psychology professionals fluent in both Thai and English languages. After careful evaluation of translation options, the final selections were made to ensure accuracy.

To assess the construct validity of the Thai PVS and determine if it measures its intended theoretical concept, EFA was employed. To ensure the suitability of the data for this analysis, Bartlett's test of sphericity and the KMO test were employed, confirming that the data met the requirements for factor analysis. The aim of the factor analysis was to either validate the PVS as a unidimensional scale or identify potential components if it deviated from this structure. Surprisingly, the factor analysis revealed the presence of 2 components, despite previous literature supporting the unidimensional structure of the PVS.[2, 20-23] These 2 components had eigenvalues of 2.28 and 1.12, surpassing the threshold of 1, indicating their significance.[24] Component 1 included items 3, 5, and 6, explaining 37.9% of the variance, while Component 2 comprised items 1, 2, and 4 from the same scale, accounting for 18.7% of the variance. Together, these 2 components explained a total variance of 56.68%, slightly below the 60% threshold. However, it's worth noting that Peterson[25] suggested in the meta-analysis that variance analysis in EFA that the average percentage of variance accounted for was 56.6%.

To further examine the 2 identified factors, the PVS item keywords were instrumental in identifying variables that align with both components: 1) the need for approval from others, and 2) self-criticism. The need for approval from others was evident in items 3, 5, and 6, all of which highlighted a reliance on others for one's self-esteem ('I feel entitled to better treatment from others than I generally receive', 'I often feel resentful when others take advantage of me or ignore my feelings', and 'I need approval from others to feel good about myself'). On the other hand, items 1, 2, and 4 reflected self-criticism, involving thoughts that place blame on oneself ('I am frequently aware of feeling inferior to other people', 'I tend to set my goals too high and become frustrated trying to reach them', 'If I don't achieve my goals, I feel like a failure as a person'). It is noteworthy that both factors are related to low self-worth and a negative attribution style, as initially described by Sinclair et al,[2] and they align with the work of Nogueira et al,[6] which found that the PVS consists of 2 key components reflecting self-criticism and social approval. While both components signify unhealthy cognitive patterns or psychological vulnerability, they appear to convey somewhat distinct meanings in the context of this study. The 2-factor structure of the Thai PVS can be particularly useful in identifying specific areas where individuals may need psychological support. For example, individuals with high scores in the need for approval from others may benefit from interventions focused on improving self-esteem and fostering greater independence from external validation. In contrast, those with higher self-criticism may require strategies that promote self-compassion, realistic goal setting, and reducing the tendency to excessively blame themselves. These insights can be applied in both clinical settings and preventive programs to target and address specific cognitive vulnerabilities, ultimately helping to improve overall mental health outcomes.

Furthermore, the communality value, which predicts the cumulative total variance of the scale ranging from 44% to 69%, signifies the percentage of a variable's variance explained by all other factors. However, the presence of 2 factors instead of one factor requires a more profound exploration within the cultural context. For instance, the inclination toward seeking approval and depending on others is not uncommon among Thai students. It's conceivable that in the Thai educational system, students lean more toward collectivism than individualism. This assumption is evident in various educational settings, from schools to universities, where group interests often take precedence over individual ones.[26] Furthermore, in pursuit of testing the validity of the Thai version of the PVS, an additional step was taken by employing the known group method. This method serves the purpose of confirming that the Thai PVS scale effectively distinguishes between 2 well-defined groups. In this study, these groups encompassed students who reported high levels of mental health issues in domains such as depression, anxiety, somatization, and psychosis, as well as those who did not report such issues. Significantly divergent PVS scores were observed across all domains of the TMHQ, except for the social function domain. This exception could be attributed to the fact that the capacity and inclination for effective social interaction may not align with the concept of psychological vulnerability as defined in this context.

To assess the suitability of the Thai version of the PVS as a predictive tool for mental health issues within the Thai population, criterion validity testing was conducted, examining the correlations between the PVS and 2 measurements: the TMHQ and participants' self-reported perception of psychological vulnerability. The results revealed significant correlations between PVS scores and all domains of the TMHQ ($P < .01$), with correlations of $r = 0.537$ for depression, $r = 0.481$ for anxiety, $r = 0.471$ for somatization,

r = 0.444 for social function, and r = 0.349 for psychosis. This suggests that higher PVS scores are associated with higher scores in each TMHQ domain and vice versa. Additionally, the PVS exhibited a positive and moderate relationship with participants' self-reported perception of psychological vulnerability (r = 0.504, P < .01). These findings align with a study by Nogueira et al[6] among higher education students, where the PVS demonstrated weak to moderate correlations with various subscales, including psychoticism (r = 0.61, P < .001), depression (r = 0.60, P < .001), somatization (r = 0.28, P < .05), and perception of vulnerability (r = 0.51, P < .0001). This convergence of results supports the conclusion that the PVS is a suitable tool for measuring psychological vulnerability, which is intricately linked to mental health problems.

In summary, the Thai version of the PVS demonstrated its appropriateness and credibility in terms of content, criterion, and construct validity. These findings affirm that the tool effectively measures its intended target, which is psychological vulnerability.

Evidence of Reliability

The reliability testing was conducted initially among a group of 30 graduate students proficient in English to assess the parallel reliability of the scale. The results confirmed a high correlation coefficient of 0.835 between the Thai translation of the PVS and the English version, signifying the equivalence of both versions. Furthermore, the correlations between the 6 items on the 2 questionnaires were notably strong, with values of 0.732, 0.897, 0.685, 0.902, 0.880, and 0.916. These findings suggest a high level of consistency and agreement between the original and Thai versions, as demonstrated by the absence of significant differences in mean scores between the 2 versions for the same group of graduate students (17.27 vs 16.90). This indicates that individuals who score higher in the Thai version also tend to score higher in the original version, affirming that the Thai-translated version effectively conveys the same concepts, even across 2 distinct languages. However, it's worth noting that the correlation for item number 3 was 0.685, which was slightly lower than the correlations observed for other pairs, suggesting slightly less confidence in the choice of vocabulary for that specific item. Nonetheless, overall, the translated version maintained consistent meaning with the English version following the backward translation process.

Cronbach α and McDonald ω were used to evaluate the internal consistency of the Thai-translated PVS. The resulting alpha coefficients of 0.668 and 0.672 are lower than the original PVS, which had α values ranging from 0.71 to 0.86 across various sample groups[2], and the Portuguese version, which reported a Cronbach α coefficient of 0.73 among higher education students.[6] Although a lower α suggests reduced reliability[27], several factors may explain this outcome. First, Taber[28] suggests that an α value of ≥ 0.6 is often considered acceptable in research, particularly when evaluating internal consistency. Additionally, while the PVS was originally designed as a unidimensional scale, our factor analysis revealed 2 components, suggesting that the translated scale may measure multiple constructs related to psychological vulnerability, even if they fall under the same broader concept. This aligns with Sinclair and Wallston's assertion[2] that PVS items could represent distinct psychological variables under the general umbrella of vulnerability. Furthermore, the Thai graduate student population in this study represents a new sample group that has not been examined with the PVS. Recent research has questioned whether Cronbach α is the best measure of reliability, as it primarily assesses homogeneity, which is only one aspect of internal consistency.[29] Dunn et al[30] also highlighted the limitations of

Cronbach α and suggested that McDonald ω is a more robust and comprehensive measure of internal consistency, particularly in multidimensional scales. This supports the rationale for presenting McDonald ω alongside Cronbach α and McDonald ω is considered a more reliable measure, especially in cases where the scale may measure multiple constructs or show multidimensionality. Omega is less sensitive to the assumptions of unidimensionality that Cronbach α assumes, making it particularly useful in scales with complex structures, such as the one found in this study. Several additional factors may explain the lower α coefficient observed in this study. Cultural differences between the Thai sample and the original population could lead to differences in how participants interpret and respond to the items. The adaptation of the PVS to the Thai context may have introduced variations in the understanding of some items, therefore impacting the responses. Additionally, the small sample size could have contributed to higher variability in the data, which might have affected the reliability coefficient. The translation process, although rigorous, may have also led to subtle discrepancies in meaning, which could further influence how participants responded to the items. For Item 2, the corrected item-total correlation was below 0.3. However, our analysis indicated that deleting this item did not increase Cronbach α and McDonald ω, which remained nearly unchanged. The α if item deleted value was 0.663 (0.666 for ω if item deleted), showing that the removal of Item 2 did not enhance the scale's internal consistency. Furthermore, the individual item variance values for all items ranged from 0.438 to 0.692, all exceeding the acceptable threshold of 0.4 suggested by Costello et al.[14] This suggests that each item contributes significantly to the overall scale, justifying the retention of all items in the final version of the Thai PVS. Finally, the method of data collection, including the use of an online questionnaire, may have influenced participants' willingness to provide honest and accurate responses, potentially leading to a lower internal consistency. Although the method was convenient and allowed for broader participation, it may have also introduced certain biases or factors that influenced the quality of the responses.

In summary, while the Thai version of the PVS does not exhibit excellent reliability, the scale's internal consistency remains acceptable according to some standards. Taber[28] suggests that an α value above 0.6 is acceptable, but a value below 0.7 may be considered poor or unreasonable. George et al[31] indicate that while a Cronbach α below 0.7 may be questioned, it can still be acceptable in certain contexts, such as when measuring complex or multidimensional constructs. Ultimately, the reliability of the translated PVS remains a subject of varying opinions in the literature, and further research is needed to better understand its consistency in different populations. Factors such as cultural differences, sample size, translation processes, and data collection methods should be considered in future adaptations of the scale to enhance its reliability and validity.

Several limitations should be considered in this study. Firstly, the participant sample, although intended to represent Thai graduate students from across the country, was predominantly located in Bangkok and metropolitan areas. This geographical concentration raises concerns about the generalizability of the findings to the entire population. Secondly, most participants were enrolled in public universities, which may have led to an uneven distribution of questionnaire responses. Additionally, since this study relied on an online self-report survey, it is susceptible to biases inherent in such data collection methods. For future research, it is advisable to reexamine the scale's psychometric properties to confirm its construct validity and internal consistency. Expanding the study to different populations that could benefit from the scale's use would also be valuable. Moreover,

further investigations into measuring psychological vulnerabilities can enhance our understanding of their impact on mental health. This could involve adapting the scale for specific populations, exploring additional aspects of psychological vulnerability, or even developing new scales to broaden the scope of this research area.

Conclusions

The results indicate that the Thai version of the PVS is a valid screening tool for identifying cognitive vulnerabilities related to mental health issues, especially depression, among graduate students. This study underscores the importance of using the PVS for early detection and intervention, tailoring psychotherapy to target cognitive vulnerabilities, and fostering mental health awareness among Thai graduate students to promote a healthier self-perception of vulnerability in the university setting.

Additional Information

Acknowledgments: We would like to express our heartfelt gratitude to all the participants in this study, the experts who provided valuable guidance in translating the PVS measurement tool, and the Faculty of Medicine Siriraj Hospital, Mahidol University for their unwavering support and encouragement throughout the course of this research. This study was partially supported by the Siriraj Graduate Scholarship.

Ethics Approval: All procedures performed in this study involving human subjects were in accordance with the ethical standards of the institutional research committees at the Institutional Review Board of the Faculty of Medicine Siriraj Hospital at Mahidol University, before being conducted (Si 179/2020 on 4 March 2020) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Clinical Trial Consideration: This study does not report on a clinical trial.

Financial Support: No financial support was provided for this study.

Conflict of Interest: The authors declare no conflict of interest.

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