Evaluation of reliability and validity of the family adaptability and cohesion evaluation scale (FACES III) among medical students

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Abstract

Background: Family functioning significantly impacts individual mental health, particularly during the transition to university life. While the Family Adaptability and Cohesion Evaluation Scale (FACES III) is a widely used tool to assess family dynamics, its psychometric properties need validation in specific cultural contexts like Vietnam. **Objectives:** This study aimed to evaluate the reliability and validity of a Vietnamese version of the FACES III scale among medical students. **Methods:** A cross-sectional study was conducted with 405 medical and preventive medicine students at a medical university. A subset of 106 students participated in a retest evaluation. Reliability was assessed using Cronbach's alpha and test-retest reliability (Intraclass Correlation Coefficient - ICC). Construct validity was examined using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). Data were analyzed using SPSS and AMOS. **Results:** The initial sample included 405 students (55.6% male). EFA confirmed based on 13 items suggested a three-factor structure explaining 55.6% of the total variance (Factor 1: 7 items, Factor 2: 3 items, Factor 3: 3 items), differing from the original two-factor model. The Kaiser-Meyer-Olkin (KMO) measure was 0.857, and Bartlett's Test of Sphericity was significant ($p < .001$), supporting factorability. The overall Cronbach's alpha for the 13-item revised scale was 0.792. ICC was 0.79, 95%CI [0.71 - 0.86]. CFA indicated acceptable model fit for the three-factor structure (Chi-square/df = 3.331, GFI = 0.926, CFI = 0.898, AGFI = 0.892, RMSEA = 0.076). **Conclusion:** The revised 13-item, three-factor Vietnamese version of FACES III demonstrated acceptable reliability and construct validity among medical students. This adapted scale appears suitable for assessing family dynamics in this specific population. Further research should confirm these findings in broader populations.

Keywords: *FACES III; Reliability; Validity.*

1. INTRODUCTION

Medical training is known for its rigorous academic and clinical demands, requiring significant personal adjustment from students. This demanding environment is widely recognized for its potential impact on student mental health, with studies documenting elevated rates of anxiety, depression, and academic burnout among medical trainees compared to their peers in other fields or the general population [1]. Family functioning, broadly defined as the ability of a family system to meet the diverse needs of its members throughout the life cycle [2], serves as a foundational element of an individual's psychosocial environment. Olson's Circumplex Model of Marital and Family Systems, a prominent theoretical framework, conceptualizes family functioning along two primary dimensions: cohesion and adaptability (also referred to as flexibility) [2]. Cohesion refers to the emotional bonding, closeness, and sense of togetherness among family members [1]. Adaptability describes the family system's capacity to modify its power structure, roles, rules, and relationships in response to situational and developmental stressors [1]. A third dimension, communication, is considered crucial for facilitating healthy levels of both cohesion and adaptability [3].

Numerous studies have highlighted the impact of family functioning on youth psychological health and adjustment of young people, including university students. Positive family dynamics—characterized by high cohesion, balanced (moderate) levels of adaptability, and effective communication—are consistently linked to a range of favorable outcomes. These include lower levels of anxiety and depression [1], reduced psychological distress and stress [3], enhanced overall psychological well-being [2], greater hope,[4] increased resilience in the face of adversity, [4] and better overall adaptation [3]. Some evidence also suggests links to better academic performance [3] and reduced engagement in risk behaviors [5]. Conversely, dysfunctional family environments—marked by low cohesion (disengagement), extreme

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levels of adaptability (rigidity or chaos), high conflict, and poor communication—are associated with adverse outcomes such as emotional disturbances heightened family conflict, increased risk of psychological problems [4], trauma symptoms and suicidal ideation [2-4].

The significance of family functioning is particularly pronounced for medical students. Due to high training pressures, the family environment often plays a key role in supporting students' well-being, influencing students' capacity to adapt to and cope with academic and clinical demands [1]. Furthermore, family cohesion and adaptability have been implicated as protective factors against academic burnout in this population [6].

The Family Adaptability and Cohesion Evaluation Scale (FACES), particularly its third version (FACES III), is one of the most widely utilized self-report instruments designed to assess the core dimensions of Olson's Circumplex Model. FACES III has seen extensive use globally, featuring in over 1200 studies across various disciplines, including psychology, medicine, and psychiatry, often applied in mental health contexts [7]. However, to date, there is no appropriate tool available for medical students in Vietnam to assess family functioning in in the context of academic pressure and mental health. This study aimed to evaluate the reliability and construct validity of FACES III scale among Vietnamese medical students.

2. MATERIAL AND METHODS

Participants

Participants were undergraduate students enrolled in the Medicine and Preventive Medicine programs at Hue University of Medicine and Pharmacy, Vietnam.

Inclusion and exclusion criteria: Participants were first-year students who maintained regular contact with their family members. We excluded students who failed to provide informed consent or submitted incomplete questionnaires.

Study Design: The study employed a cross-sectional survey design to evaluate the factor structure and internal consistency of the revised Vietnamese FACES III. A subset of participants (n=106) was re-assessed after 2 weeks to evaluate test-retest reliability.

Sample size: We used a convenience sampling method. The initial sample included 405 students. From this group, 106 students were invited back and participated in a second assessment for test-retest reliability analysis. The sample size was sufficient according to the rule of thumb suggested by Wolf et al [8]. These guidelines recommend including at least ten cases per variable for model validation. Since FACES III consists of 20-items, a sample size of 405 participants was considered adequate to ensure sufficient statistical power.

Variables & Measurements

Family Adaptability and Cohesion Evaluation Scale (FACES III): The original FACES III is a 20-item self-report questionnaire assessing family cohesion (10 items, e.g., odd-numbered items) and adaptability (10 items, e.g., even-numbered items) based on Olson's Circumplex Model. Items were rated on a 5-point Likert scale from 'Never' (scored 1) to 'Almost Always' (scored 5), with higher scores indicating higher levels of the respective dimension. The Vietnamese version was translated by a Vietnamese psychiatrist fluent in both English and Vietnamese.

Sociodemographic Questionnaire: Variables included participants' age, gender, ethnicity, religion, academic major, place of origin, current living situation, parental marital status, parental occupation and education levels, number of siblings, birth order, and pre-university family structure (number of generations living together).

Data collection

Data were collected via self-administered questionnaires distributed to consenting students. The initial assessment (N = 405) provided data for demographic description, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and internal consistency analysis. The second assessment (N = 106) occurred after a time interval (2 weeks) and provided data for test-retest reliability analysis.

Statistical Analysis

Descriptive Statistics: Frequencies, percentages, means, and standard deviations were calculated to describe the sociodemographic characteristics of the sample and the response patterns for the FACES III items. Exploratory Factor Analysis (EFA): EFA was performed on the initial sample (N = 405) to explore the underlying factor structure of the Vietnamese FACES III items (eg, Factor loadings ≥ 0.5). Criteria for factor extraction probably included eigenvalues greater than 1, examination of the scree plot, and interpretability of the factor solution. Item retention would typically depend on factor loadings exceeding a certain threshold (e.g., > 0.40) and the absence of significant cross-loadings. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity were used to assess the suitability of the data for factor analysis.

Confirmatory Factor Analysis (CFA) was conducted based on the final set of items retained after EFA.

Maximum Likelihood estimation was used. Model fit was evaluated using multiple indices: the ratio of chi-square to degrees of freedom (χ2/df), Goodness-of-Fit Index (GFI), Comparative Fit Index (CFI), Adjusted Goodness-of-Fit Index (AGFI), and Root Mean Square Error of Approximation (RMSEA).

Reliability Analysis: Internal Consistency: Cronbach's alpha coefficient was calculated based on the revised scale. Test-Retest Reliability: The Intraclass Correlation Coefficient (ICC) was calculated to assess the stability of scores over time for the total revised scale and each factor, using data from the subgroup (N=106) assessed at two time points. Significance Level: The threshold for statistical significance was set at $p < 0.05$ for all inferential tests. Data were analyzed using SPSS and AMOS version 20.

Ethical approval: Ethical approval was granted by the Ethics Committee in Biomedical Research, University of Medicine and Pharmacy, Hue University (Approval Code: H2024/579).

3. RESULTS

Sample Characteristics

A total of 420 students were invited, of whom 405 were included in our initial assessment (e.g., participation rate of 96.4%). A subsample of 106 students was included in the retest evaluation. Regarding gender distribution, the proportions of males and females were 55.6% and 44.4%, respectively. A majority reported their parents were living together (91.1%). Parental occupations included state officials and farmers (most common). Regarding parental education, nearly half of fathers (47.2%) and mothers (48.9%) had attained university or postgraduate degrees. Regarding family structure, almost half the students had one sibling (49.1%), the most common birth order was eldest child (42.7%), and most came from families comprising two generations living together prior to university (79.8%). The demographic profile of the retest subgroup (N=106) was broadly similar to that of the initial sample.

FACES III Revised Item Analysis

Analysis focused on the 13 items retained following initial psychometric evaluation (retained from EFA on the original 20 items). Factor Structure Analysis (Construct Validity)

Exploratory Factor Analysis (EFA)

The Kaiser-Meyer-Olkin measure of sampling adequacy was high (KMO = 0.857), well above the recommended minimum of 0.60, and Bartlett's Test of Sphericity was statistically significant ($\chi2(78) =1481.519$, $p<.001$), indicating that correlations between items were sufficiently large for factor analysis. EFA was conducted on the 13 retained items from 20 original items. The analysis yielded a three-factor components. This structure accounted for a substantial portion of the shared variance among the items, explaining 55.6% of the total variance after rotation. The composition of the factors and the variance explained by each were as follows: Factor 1: Comprised 7 items (F11, F9, F15, F13, F19, F7, F17) with proportion of variance (28.6% after rotation). The items primarily reflect emotional closeness, mutual support, shared activities, open expression, and togetherness, strongly suggesting a “Cohesion/ Connectedness” dimension. Factor 2: Comprised 3 items (F4, F2, F3) corresponding with 14.4% of the variance after rotation. The items relate to discussing problems effectively, accepting children's input, and accepting each other's friends, pointing towards a dimension of “Open Communication and Flexibility in Problem-Solving/Relationships”. Factor 3: Comprised 3 items (F6, F12, F14) with 12.5% of the variance after rotation. The items concern the desire for leadership within the family, difficulty changing rules, and fairness of discipline, suggesting a dimension related to “Flexibility in Rules, Roles, and Leadership”.

Table 1 presents the factor loadings for each of the 13 items on the three extracted factors.

Table 1. Factor Loadings from Exploratory Factor Analysis (EFA) for the 13-Item Revised Vietnamese FACES III (N = 405)

FACES III item		Factor 1	Factor 2	Factor 3
F11	Family members like to spend our free time together.	0.813		
F9	Family members are free to express themselves.	0.778		
F15	Family members share interests and hobbies	0.775		
F13	Family members support each other in difficult times	0.678		
F19	Family unity is a primary concern	0.674		
F7	When problems arise, we negotiate to find a solution.	0.628		
F17	Family members consult each other about our personal decisions.	0.592		

F4	Children have a say in their discipline.	0.784	
F2	In solving problems, the children's suggestions are followed.	0.729	
F3	We approve of each other's friends.	0.647	
F6	Different persons act as leaders in our family		0.760
F12	The children make the decisions in our family.		0.678
F14	Rules change in our family.		0.621

Confirmatory Factor Analysis (CFA)

To further evaluate the construct validity of the revised scale, CFA was performed on the initial sample (N = 405) to test the goodness-of-fit of the three-factor model identified through EFA (Figure 1). The analysis yielded the following fit indices: χ2/df = 3.331, GFI = 0.926, CFI = 0.898, AGFI = 0.892, and RMSEA = 0.076. These indices generally indicate an acceptable fit of the three-factor model to the data. The χ2/df ratio ranged within the acceptable range. The RMSEA value was below the conventional cutoff of 0.08, suggesting a good approximation of the population covariance structure. The GFI and AGFI values was close to or above the 0.90 threshold often considered indicative of acceptable fit. While the CFI value (0.898) was marginally below the common 0.90 benchmark, collectively, these indices suggest a reasonable model fit for this sample. Figure 2 provided a CFA model, illustrating the relationships between the three latent factors and the 13 observed item indicators.

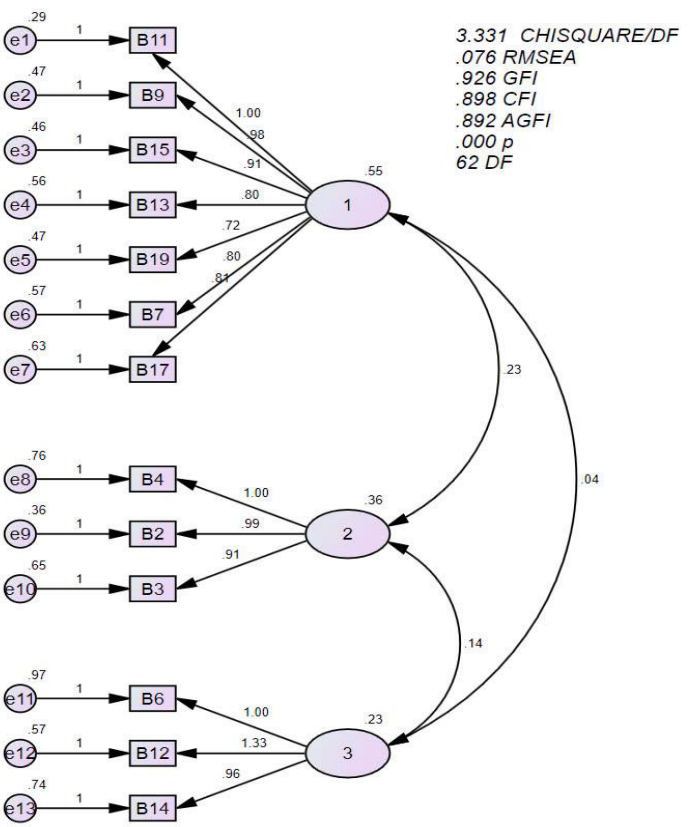

Figure 1. Confirmatory Factor Analysis (CFA) Path Diagram for the 3-Factor Revised Vietnamese FACES III (N = 405). It would show three correlated latent factors, each with arrows pointing to its respective item indicators, along with standardized loadings and error terms)

Reliability Analysis

The reliability of the 13-item revised Vietnamese FACES III scale was assessed using measures of internal consistency and test-retest stability. The results are summarized in Table 2.

Table 2. Internal consistency of FACES III

		FACES III item	Corrected item-Total Correlation	Cronbach's alpha if item dropped
Factor 1	F11	Family members like to spend our free time together.	0.597	0.763
	F9	Family members are free to express themselves.	0.524	0.768
	F15	Family members share interests and hobbies	0.591	0.763
	F13	Family members support each other in difficult times	0.538	0.768
	F19	Family unity is a primary concern	0.475	0.774
	F7	When problems arise, we negotiate to find a solution.	0.438	0.777
	F17	Family members consult each other about our personal decisions.	0.558	0.765
Factor 2	F4	Children have a say in their discipline.	0.354	0.785
	F2	In solving problems, the children's suggestions are followed.	0.492	0.773
	F3	We approve of each other's friends.	0.411	0.779
Factor 3	F6	Different persons act as leaders in our family.	0.034	0.816
	F12	The children make the decisions in our family.	0.221	0.796
	F14	Rules change in our family.	0.359	0.784
		Cronbach's alpha (95% CI)	0.792	

Internal Consistency

The overall Cronbach's alpha coefficient for the 13-item scale was α = 0.792, indicating good internal consistency.

Test-Retest Reliability

Test-retest reliability was assessed using the subgroup of 106 participants who completed the scale on two separate occasions. ICC for the total score on the 13-item revised scale was 0.79 (95% CI: 0.71 - 0.86), indicating good temporal stability. The stability of the individual factors derived from the EFA was also examined: Factor 1 (Cohesion/ Connectedness): ICC = 0.87 (95% CI: 0.79 - 0.92), indicating excellent stability; Factor 2 (Open Communication/Flexibility): ICC = 0.72 (95% CI: 0.68 - 0.77), indicating good stability; Factor 3 (Flexibility in Rules/Roles/Leadership): ICC = 0.82 (95% CI: 0.75 - 0.94), indicating excellent stability.

4. DISCUSSION

This study conducted a psychometric evaluation of a Vietnamese adaptation of the FACES III scale among medical students. With a revised 13-item version of the scale, EFA and CFA suggested a three-factor structure for these 13 items, explaining approximately 56% of the total variance and demonstrating acceptable model fit within this specific sample. This structure is distinct from the original two-factor (Cohesion and Adaptability) model of FACES III. The revised 13-item scale exhibited good internal consistency (overall Cronbach's α=0.792) and good test-retest reliability over a follow-up

period (overall ICC = 0.79). Reliability estimates for the individual factors were also generally good to excellent.

Reliability: the 13-item revised scale demonstrated acceptable reliability. The good test-retest reliability (ICC = 0.79 for the total score, and 0.72-0.87 for factors) indicates that the scale provides a stable measurement over time. These findings support the potential utility of this revised scale for research purposes in populations within similar contexts.

However, the analysis of internal consistency also highlighted a potential issue with item F6 ("Different persons act as leaders in our family."). The item demonstrated a very low corrected item-total correlation (0.034) and its removal would improve the overall Cronbach's alpha of the scale to 0.816. These results suggest that item F6 functions poorly within the scale, particularly in the cultural context of Vietnamese sample. Concepts related to family leadership, decision-making, and hierarchy are often deeply embedded in cultural norms.[9] It is plausible that the phrasing or underlying concept of this item does not resonate with, or is interpreted differently within, the Vietnamese family context represented by this sample. The item might tap into aspects of perceived conflict or disagreement rather than adaptive leadership, or perhaps the notion of multiple individuals "wanting to lead" is culturally less common or viewed negatively, thus reducing its correlation with other items reflecting positive functioning. These finding warrants caution regarding the interpretation of Factor 3 (which includes F6) and suggests that this item might need revision or removal in future iterations of the scale for Vietnamese populations.

Validity: The most significant finding of this study is confirmation of a three-factor structure for the revised Vietnamese FACES III, differing from the original two-factor model. The acceptable fit indices from the CFA provide empirical support for this three-factor solution in our study population. This structure, comprising factors interpreted as Cohesion/Connectedness, Open Communication/ Flexibility, and Flexibility in Rules/Roles/Leadership, appears to be a statistically viable representation of how these students perceive their family dynamics as captured by these 13 items.

The divergence from the widely known two-factor structure necessitates careful consideration. Several factors likely contribute to this outcome. Firstly, the process of translation and linguistic adaptation itself can subtly alter item meaning and nuance [7]. This represents one of the main limitations in our instrument translation supervision process. Therefore, future studies should exercise greater caution in developing the translation procedures for this instrument. Secondly, genuine cultural differences in how family cohesion and adaptability are conceptualized, experienced, and expressed in Vietnam, particularly among families in the Hue region, may underlie the different factor structure [7]. The original FACES III was developed in a predominantly Western cultural context (USA). The three factors identified here might represent dimensions of family life that are particularly salient or are differentiated more clearly within Vietnamese culture. For example, while Factor 1 aligns well with the universal concept of cohesion, Factors 2 and 3 might capture culturally specific ways in which flexibility manifests – perhaps distinguishing between interpersonal openness (Factor 2) and structural rule-setting (Factor 3).

Thirdly, this finding must be viewed within the broader context of FACES III's known psychometric variability across cultures [10]. The frequent reports of alternative factor structures (e.g., bi-factor, different numbers of factors) in various international validations suggest that the original two-factor model may lack universal robustness. The current study adds Vietnam to the list of contexts where the original structure does not appear to hold perfectly. This may stem partly from limitations in the original item pool itself, particularly its documented difficulty in capturing the extreme ends of the dimensions and thus the model's intended curvilinearity [11]. The items retained and the resulting factor structure in this study might simply reflect the best fit achievable with this subset of items in this population. Finally, the specific characteristics of the sample – medical students under considerable academic stress, living with family in a specific city – could potentially influence their perceptions and reporting of family dynamics [1].

While the deviation from the original model complicates direct comparisons with studies using the standard FACES III scoring, the empirically derived three-factor structure may, in fact, offer a more ecologically valid representation of the salient dimensions of family functioning as perceived by this group of Vietnamese medical students [12].

In terms of distinction with other studies, The three-factor solution identified here stands in contrast to the original two-factor model [7]. It also differs from other alternative structures proposed in the literature, such as the bi-factor models found

suitable for health science students in several Latin American countries (Colombia, Chile, Mexico) [10], the one-factor structure reported for a modified Family Communication Scale (derived from FACES concepts) in China [9], or the five-factor structure of a scale specifically developed for Asian family characteristics in Thailand [13]. This comparison also suggests that the factor structure of FACES III items is sensitive to cultural context and translation, and a single universal structure may not be appropriate.

Despite the structural differences, the validation of a psychometrically sound tool, even in a revised format, is crucial. It provides a means to investigate the important links between family functioning and student outcomes like mental health, stress, and burnout within the Vietnamese context, relationships consistently highlighted in the broader literature [1]. Future studies should further test validation across various populations to gain a general picture of this scale use in the Vietnamese context.

5. CONCLUSION

This study provides initial evidence regarding the psychometric properties of the FACES III scale for use within the Vietnamese context, specifically among medical students in Hue. The findings provide evidence supporting a revised 13-item version of the scale with a three-factor structure (interpreted as Cohesion/Connectedness; Open Communication/ Flexibility; and Flexibility in Rules/Roles/Leadership). This revised scale demonstrated good internal consistency and test-retest reliability in the studied sample. However, the identified factor structure deviates significantly from the original two-factor model of FACES III. This difference is consistent with previous international findings that indicate the cross-cultural variability and potential structural limitations of the original FACES III items. While the revised scale appears reliable for measuring these three empirically derived dimensions in this population, its construct validity requires further confirmation through additional studies, and its departure from the original model limits its direct comparability with international research using standard FACES III scoring. The significant associations found between scale scores and parental marital status and mother's education provide preliminary insights into correlations of perceived family functioning in this group.

Declaration of Generative AI Use:

In preparing this manuscript, the authors used ChatGPT (OpenAI) only to help refine the English language. The authors take full responsibility for all content in this manuscript.

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