

RELIABILITY AND VALIDITY OF THE APGAR FAMILY SCALE IN FAMILY MEDICINE CLINICS IN HO CHI MINH CITY, VIETNAM

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ABSTRACT

Introduction: This study examined the APGAR family scale's reliability and validity in family medicine clinics in Ho Chi Minh City, Vietnam. **Methods:** The scale was independently translated by a family physician and an English instructor, followed by consensus and pilot testing with 51 participants for clarity and understanding. A cross-sectional study involving 289 participants at family medicine clinics in Ho Chi Minh City was then conducted. Reliability was assessed using Cronbach's Alpha (alpha). Exploratory Factor Analysis (EFA) with Principal Component Analysis (PCA) explored unidimensionality, and Confirmatory Factor Analysis (CFA) tested the one-factor model. **Results:** The APGAR family scale demonstrated good internal reliability (alpha = 0.81). Item-total correlations for each item ranged from 0.56 to 0.71, with Cronbach's Alpha coefficients if the item was deleted ranging from 0.77 to 0.81. EFA revealed a single factor structure (Eigenvalue = 2.96), accounting for 49% of the total variance, with factor loadings between 0.62 and 0.80. CFA results showed good fit indices: Comparative Fit Index (0.95), Tucker-Lewis Index (0.91), though Root Mean Square Error of Approximation (RMSEA) was 0.13 with a p-value for the hypothesis test ($H_0: RMSEA \geq 0.080$) being ≥ 0.05 . **Conclusions:** The APGAR family scale is a reliable and valid measure for assessing family functioning in this context, though the RMSEA value suggests room for model improvement.

Keywords: family functioning, APGAR, family medicine, Vietnam

I. INTRODUCTION

Family functioning plays an important role in the growth and welfare of each family member. It has a profound impact on both the mental and emotional health, as well as the academic and professional achievements of every individual. Key aspects of family functioning include support, emotional bonding, communication, and conflict resolution. Evaluating family functioning enables health and social practitioners to understand the family's condition comprehensively and implement necessary interventions to improve the quality of life of its members (1).

Several instruments have been developed to assess family functioning, one of which is the APGAR family scale. This scale was created by Gabriel Smilkstein in 1978 (2). It consists of five items that assess five dimensions of the performance and dynamics of families: Adaptability, partnership, growth, affection, and resolution. Due to its simplicity and effectiveness, the APGAR scale has been widely used to evaluate family function in research and clinical settings.

Research has been conducted to verify the reliability and validity of the APGAR scale in different contexts (3-5). These studies focus on testing internal consistency using Cronbach's Alpha and exploratory factor analysis (EFA) to determine the factor structure of the scale. In addition, confirmatory factor analysis (CFA) is also

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Date of receipt: 12/8/2024

Date of scientific judgment: 16/9/2024

Reviewed date: 14/10/2024

used to test the fit of the one-factor model to the empirical data. The results show that the APGAR scale is highly reliable and applicable to diverse populations, from families in Spain to communities in developing countries.

In Vietnam, research on family functioning and assessment tools is still limited. This study aims to test the reliability and validity of the APGAR scale in assessing family functioning in Ho Chi Minh City's Family Medicine clinic, contributing to the development of a suitable assessment system for Vietnamese cultural and social characteristics.

II. METHODS

2.1 Translation and pilot testing of the APGAR family scale

Firstly, the APGAR family scale was independently translated by two translators who had lived and studied abroad. The first translator was a family physician, and the second translator was an English graduate with no prior knowledge of the scale. A panel of three family medicine experts reviewed the translations, comparing and discussing the differences until a consensus was reached. The final Vietnamese version was pilot-tested with 51 patients to evaluate its clarity and comprehensibility.

2.2 Reliability and validity study of the scale

2.2.1 Study design and participants

We conducted a cross-sectional study at family medicine clinics at the University Medical Center Ho Chi Minh City. With the convenience sampling method, we recruited patients aged 18 years and older visiting the clinic who were capable of understanding, responding and completing all questions in the questionnaire. Follow-up patients who

had already participated in the study were excluded.

2.2.2 Variable measurement

Baseline characteristics: To contextualize the study results, we collected background information on the study participants, including age, gender, education, occupation, marital status, cohabitation status, and health insurance coverage (Table 1).

APGAR family scale (2): The scale consists of five items, corresponding to five domains of family function: Adaptability, Partnership, Growth, Affection, and Resolve. Each item is presented as a question with three response options, scored 0, 1, or 2 points. Higher total scores indicate better family function.

All data were collected through face-to-face interviews conducted by trained researchers.

2.2.3 Statistical analyses

Descriptive statistics were used to summarize the baseline characteristics of the study participants. Reliability was assessed through Cronbach's alpha and item-total correlations (6). We performed exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to evaluate the structural validity of the scale (7).

EFA was used to identify the underlying factor structure of the scale. The suitability of the data for factor analysis was assessed using Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) measure. Principal Component Analysis (PCA) was conducted to extract factors, with the number of factors determined based on the Eigenvalue and Scree plot.

We conducted CFA to test the one-factor model identified by EFA. Model fit was evaluated using indices such as the Comparative Fit Index (CFI), Tucker-Lewis

Index (TLI), and Root Mean Square Error of Approximation (RMSEA).

Data analysis was performed using R (version 4.0.1) and the lavaan package (8).

2.2.4 Ethics

All personal information was anonymized and kept confidential. Written informed consent was obtained from all participants. Our study was approved by the Ethics Committee of the University of Medicine and Pharmacy at Ho Chi Minh City (Decision No. 1052/HĐĐĐ-ĐHYD).

III. RESULTS

3.1 Translation and pilot study

The APGAR family scale was translated from English to Vietnamese by two translators. Translator 1 is a specialist in family medicine, while Translator 2 works in a different field and was not provided with information regarding family functioning or the APGAR scale.

Across all items, the two translated versions did not exhibit any substantial differences in terminology or expression. In addition, a panel of experts consolidated the translations to create a unified version.

The final version was piloted on 51 patients at the family medicine clinic. All participants reported the translation as easy to understand and clear in conveying the purpose of the scale. With a Cronbach's alpha of 0.86 for the entire scale, the final version was used for the main study.

3.2 Main study

During the research period, we invited 371 individuals to participate in the main study, and 296 (79.8%) consented. Of these, seven participants were excluded for not meeting the inclusion criteria: five were unable to understand the scale's items, and two were unable to complete the questionnaire. Ultimately, the final analysis comprised 289 participants. Their baseline characteristics are presented in Table 1.

Table 1. Baseline characteristics of study participants (n=289)

Characteristic	Frequency	Percentage (%)
Age (years) *	50 ± 14.5	
Gender		
Female	171	59.2
Male	118	40.8
Marital Status		
Married	219	75.8
Single/divorced/widowed	70	24.2
Educational Status		
High School or Below	163	56.4
Above High School	126	43.6
Occupation		
Full-time	131	45.3
Part-time/Housewife/Student	85	29.4
Retired	73	25.3
Living Arrangement		
With Family	258	89.3
Other	31	10.7
Health Insurance		
Yes	221	76.5
No	68	23.5

* mean ± standard deviation

The data indicates a diverse age range among the participants, with the mean age being 50 years. Nearly 60% were female and three-quarters were married. In terms of occupation, 45.3% were employed full-time,

25.3% were retired, and 29.4% were in other categories. Most participants lived with their families and had health insurance (89.3% and 76.5%, respectively).

3.2.1 Reliability of APGAR family scale

Table 2. Reliability of the APGAR family scale (n = 289)

	Corrected item-total correlation	Cronbach's alpha (if item is deleted)
Cronbach's Alpha of the entire scale: 0.83		
Item 1 (Adaption)	0,56	0,81
Item 2 (Partnership)	0,61	0,80
Item 3 (Growth)	0,67	0,78
Item 4 (Affection)	0,56	0,81
Item 5 (Resolve)	0,71	0,77

Table 2 presents the correlation between each item score and the total scale score, the Cronbach's Alpha of the scale if the corresponding item is deleted, and the overall Alpha coefficient of the entire APGAR scale. All items exhibited corrected item-total correlations (i.e., item-total correlation

excluding the item itself) that met the requirement of ≥ 0.3 , showing that each item correlated well with the scale. Furthermore, the scale demonstrated good internal consistency, as shown by a Cronbach's Alpha coefficient of 0.83.

3.2.2 Validity of APGAR family scale

Explanatory factor analysis results

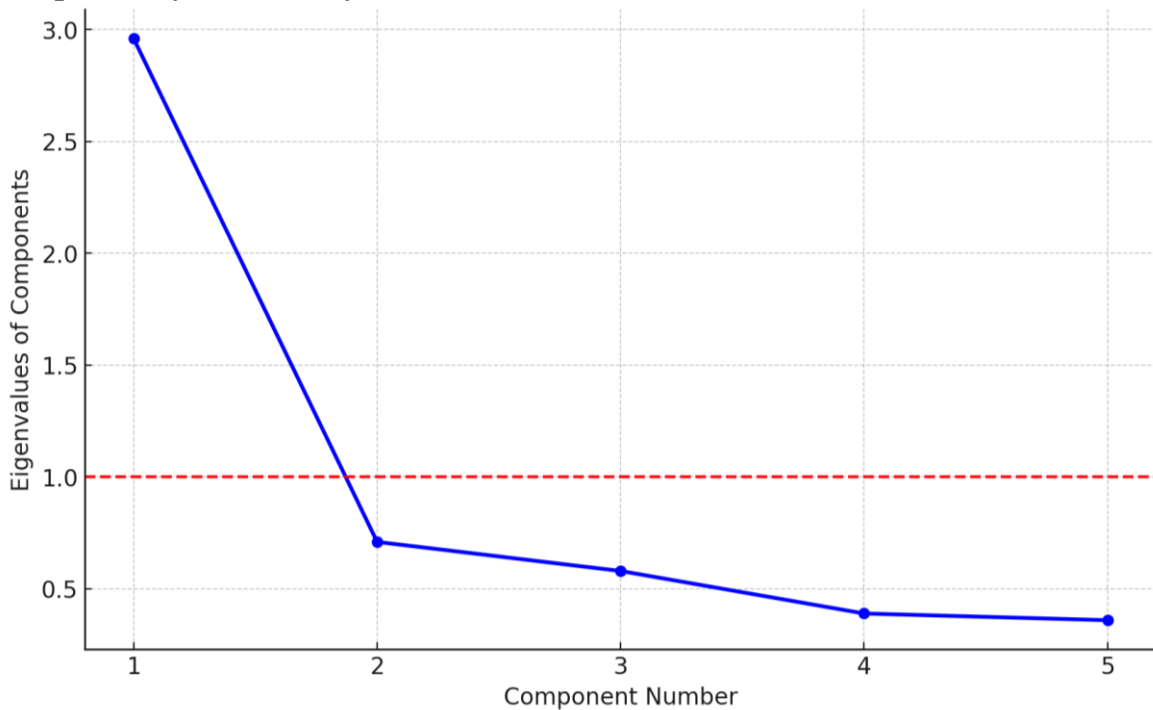


Figure 1. Scree plot of the APGAR family scale (n=289)

With Bartlett’s test of sphericity χ^2 (1306.1), $p < 0.001$, and a KMO index of 0.86, the collected data is suitable for factor analysis. Using Principal Component Analysis (PCA), we identified that the 5 items of the APGAR scale load onto a single factor with an Eigenvalue of 2.96 (Figure 1),

explaining 49% of the total variance. The factor loadings for each item in the scale are presented in Table 3. All items show a strong relationship with the underlying factor, with 'Growth' and 'Resolve' showing the strongest associations (0.76 and 0.80, respectively).

Table 3. Factor loadings of the APGAR family scale item (n=289)

Item	Vietnamese translation	Factor loading
Adaption	<i>I am satisfied that my family helps me when I have difficulties.</i>	0,63
Partnership	<i>I am satisfied with the way my family talks to me and shares life problems with me.</i>	0,68
Growth	<i>I am satisfied with my family accepting and supporting my wishes when I have a new job or direction.</i>	0,76
Affection	<i>I feel comfortable with my family members and I expressing our feelings to each other.</i>	0,62
Resolve	<i>I am satisfied with the way my family and I share time together.</i>	0,80

Confirmatory factor analysis model results

In addition, we conducted confirmatory factor analysis (CFA) for a one-factor model consisting of the 5 items of the APGAR scale. The results are presented in Table 4 and Figure 2.

Table 4. Fit indices for the CFA model on 289 study participants

Index	Result
CFI (Comparative Fit Index)	0.95
TLI (Tucker-Lewis Index)	0.91
RMSEA (Root Mean Square Error of Approximation)	0.13
p-value H₀: RMSEA ≥ 0.080	≥ 0.05

The results from the CFA indicate that the APGAR family scale model demonstrates a good fit with the collected data. Particularly, the CFI value of 0.95 surpasses the commonly accepted threshold of 0.90, and the TLI value of 0.91 further supports the

model’s good fits. Although the RMSEA is 0.13, the associated p-value for the hypothesis test (H₀: RMSEA ≥ 0.080) is ≥ 0.05; this suggests that the model does not significantly deviate from a good fit at the 0.08 threshold.

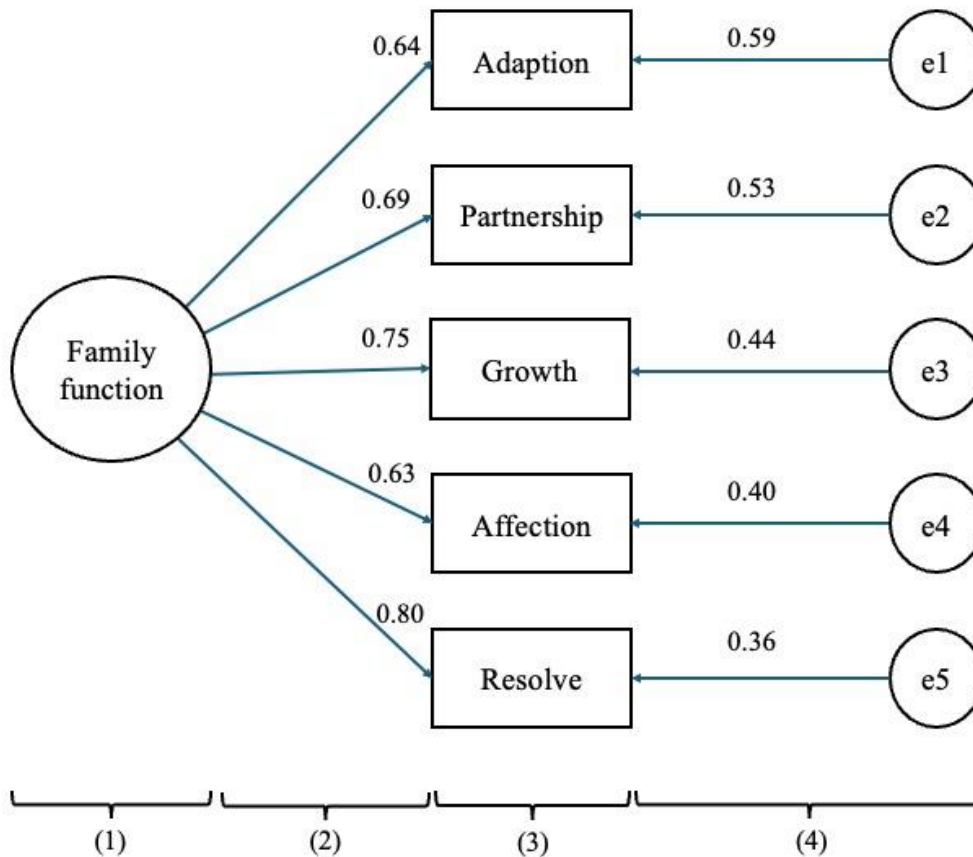


Figure 2. Confirmatory factor analysis of the APGAR family scale (n=289).
 (1) one-factor model; (2) Standardized factor loading; (3) APGAR items; (4) Error variance

IV. DISCUSSION

The objective of this study was to assess the reliability and validity of the APGAR Family scale in family medicine clinics in Ho Chi Minh City, Vietnam. Our findings suggest that the scale is useful for evaluating family function in this context.

Reliability of APGAR family scale

We assessed internal reliability using Cronbach's alpha and corrected item-total correlations. A higher Cronbach's alpha coefficient indicates greater consistency in responses, demonstrating that the observed variables measure the same underlying concept. Strong corrected item-total correlations suggest that the items on the

scale are closely related, ensuring accurate measurement of the intended construct (6).

The Cronbach's alpha result of 0.83 for the Family APGAR scale in our study demonstrates high internal reliability, confirming the scale's consistency in measuring family functioning within our sample. This finding aligns with prior research on the APGAR scale in other countries, including the original research conducted by Smilkstein (2), who developed this scale. In another study of 327 Spanish families with and without children with autism, Serrano et al. also reported a Cronbach's alpha of 0.91 (4). Furthermore, Karimi et al. reported a Cronbach's alpha of 0.89 in their investigation of the cultural adaptation and psychometric

analysis of the APGAR scale for Iranian elderly individuals (5).

The corrected item-total correlations support the scale's robustness, suggesting that all items are integral to accurately measuring the construct of family functioning. Indeed, all items have a moderate to strong relationship with the overall scale, as evidenced by the corrected item-total correlations, which range from 0.56 to 0.71. These values suggest that each item contributes meaningfully to the construct being measured and that there is a reasonable level of internal consistency among the items.

Validity of the APGAR family scale

Construct validity refers to the extent to which the scale accurately measures what it is intended to measure. It plays a crucial role when no gold standard is available for comparison (7).

In our study, the validity of the APGAR family scale was examined through Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The results of these analyses provide strong evidence for the scale's construct validity in assessing family functioning in the context of family medicine clinics in Ho Chi Minh City.

Using Principal Component Analysis, we identified that the five items of the APGAR scale load onto a single factor with an Eigenvalue of 2.96, explaining 49% of the total variance (Figure 1). This finding supports the scale's unidimensional structure, suggesting that all items measure a single underlying construct of family functioning.

The CFA for the one-factor model of the APGAR scale, consisting of five items, was conducted to validate the underlying structure identified by the EFA. The results indicate a good fit between the model and the

collected data, as evidenced by the fit indices (Table 4).

The standardized factor loadings for each item on the APGAR scale are depicted in Figure 2. All items show significant loadings on the single latent factor, reinforcing their relevance in measuring family functioning. These loadings indicate that each item has a strong relationship with the underlying construct of family function.

Our results from both EFA and CFA confirm the unidimensionality and construct validity of the APGAR family scale. The high factor loadings and fit indices indicate that the scale is a robust and reliable tool for measuring family functioning in the context of family medicine clinics in Ho Chi Minh City. The APGAR scale's strong construct validity suggests its effectiveness in capturing the dynamics of family functioning, making it a valuable instrument for clinical and research applications in this setting. The one-dimensional structure has also been reported in several studies, including those conducted on families in Spain (4), the Iranian elderly (5), and high school students in Colombia (9).

Practical implication

The consequences of family dysfunction can severely impact outpatient treatment processes and exacerbate patients' conditions (10). The role of assessing family functioning in individuals visiting Family Medicine Clinics should be emphasized, becoming an indispensable link in a modern healthcare system that is patient-centered. By evaluating patients' family function, physicians can make individualized treatment decisions, ensuring that no issues related to family dysfunction are overlooked.

Globally, numerous studies have been conducted on family function and its

associated factors on a variety of study populations, including people with chronic conditions, families of children with and without autism, geriatric individuals, people with HIV, as well as antenatal and postpartum women (5, 10-14). However, there are currently very few studies in Vietnam addressing this issue. Vietnamese family structure is experiencing significant shifts due to rapid economic, cultural, and social transformations. These alterations may affect family function, including roles, responsibilities, and relationships among members. Therefore, evaluating family function is crucial in understanding the physical, mental, and social health of individuals, especially in the presence of stress or conflict. Study results from these assessments may inform the development of policies and programs to enhance the people's quality of life and sustainability of the family value system in Vietnam.

Our research is one of the studies investigating the psychometric properties of a tool for assessing family function in the context of primary care in Vietnam. The APGAR family scale has proven useful in assessing family function in family medicine clinics. Its ease of use and clarity in the context of Vietnamese people have been confirmed through initial translation and testing. These research findings contribute to a system of family function assessment tools suitable for the cultural and social characteristics of Vietnam.

However, one limitation is the fact that we found the RMSEA value of 0.13, which, although statistically non-significant, exceeds the commonly accepted threshold, suggesting room for model improvement. Another limitation is the context-specific nature of the study, conducted in Ho Chi Minh City,

Vietnam, which may restrict the generalizability of the findings to other regions and cultural settings. These factors highlight the need for caution when applying the results beyond the studied context.

Recommendations for future research

Future research should aim to replicate this study in diverse cultural and clinical settings to enhance the generalizability of the findings. It is also essential to investigate the higher RMSEA value and explore potential refinements to the scale for better model fit. Conducting longitudinal studies would be beneficial to assess the scale's sensitivity to changes in family functioning over time, providing a more comprehensive understanding of its applicability and effectiveness in various contexts.

V. CONCLUSION

This study demonstrated that the APGAR family scale is reliable and valid for assessing family function in family medicine clinics in Ho Chi Minh City, Vietnam. Future research could focus on improving the model to reduce the RMSEA index, as well as expanding the scope of the study to confirm the validity and reliability of this scale in various contexts in Vietnam. The widespread application of the APGAR family scale will contribute to improving the quality of family healthcare and enhancing the quality of life for the population.

ACKNOWLEDGMENT:

We would like to express our gratitude to Arielle Nguyen for her invaluable assistance in translating the APGAR scale and for her efforts in English reviewing and editing the draft of this manuscript.

CONFLICT OF INTEREST STATEMENT:

No potential conflict of interest relevant to this article was reported.

FUNDING:

This research was funded by the University of Medicine and Pharmacy at Ho Chi Minh City under contract number 83/2024/HĐ-ĐHYD dated 17/04/2024.

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