Reliability and Validity Assessment of a Psychological Adaptation Measurement Tool for College Students

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ABSTRACT

Given the current limited availability of measurement tools and insufficient reference materials on the dimensions and assessment of college students' psychological adaptation, this study aimed to develop and validate a new instrument through literature analysis and a pilot study. A review of existing psychological adaptation instruments used by domestic and international scholars informed the initial dimensions and items for assessing psychological adaptation among college students. Subsequently, a survey was administered to a sample of college students. Exploratory factor analysis (EFA) identified five key dimensions of psychological adaptation: academic adaptation, interpersonal adaptation, emotional adaptation, self-adaptation, and campus life adaptation. Following the reliability and validity testing, the instrument demonstrated a Cronbach's α coefficient of .904 and a KMO measure of .932. After item refinement, 31 items were retained, resulting in a scale that shows potential as a measurement tool for assessing psychological adaptation in college students.

Keywords: psychological adaptation, measurement tool, dimensions, exploratory factor analysis (EFA), reliability, validity.

INTRODUCTION

College students are believed to experience higher levels of stress, anxiety, and psychological distress compared to the general population and other occupational groups (Manyeruke & Tansel, 2024). In recent years, there has been an increase in psychological crises among college students due to mental health issues, drawing significant attention from all sectors of society. A meta-analysis of 34 international studies indicated that the average prevalence of depression among college students was substantially higher than that in the general population (30% vs. 11%) (Solomou et al., 2024). International studies indicate that mental health issues are prevalent among college students, with depression, anxiety disorders, and high stress levels being particularly prominent (Brown, 2018; Mey & Yin, 2015; Yasuhiro et al., 2021). In other words, poor mental health in global higher education has become a serious public health concern (Stallman & Shochet, 2009; Y. Liu, 2024).

As mental health problems among college students have become increasingly prominent, they have also emerged as a major social issue and a key factor affecting the stable development of higher education institutions (Y. Zhang et al., 2025). Particularly in China, the large college student population not only presents growing challenges for the implementation of targeted mental health education but also exacerbates the overall severity of mental health issues among students. According to the latest statistics released in 2025 (for the year 2024), the total number of enrolled students in regular undergraduate, vocational undergraduate, and junior college programs nationwide reached 38.91 million. Among them, 20.86 million were registered in regular undergraduate programs, 0.41 million in vocational undergraduate programs, and 17.65 million in higher vocational (junior college) programs (Ministry of Education of the People's Republic of China, 2025). Simultaneously, the incidence of psychological issues among college students has been escalating each year (Wei & Wang, 2023). Table 1 presents data from a 2024 nationwide survey on the mental health status of undergraduate students in China. Mental health issues such as depression and anxiety symptoms are prevalent among college students, and the situation remains concerning.

Table 1. Risk of Depression and Anxiety in College Students (Y. Fang et al., 2025)

Group	Mild Depression Risk (%)	High Depression Risk (%)	Mild Anxiety Risk (%)	Moderate Anxiety Risk (%)	Severe Anxiety Risk (%)
Freshman	16.8	3.8	42.3	4.0	1.5
Sophomore	17.8	4.0	42.0	4.0	1.7
Junior	18.8	3.3	35.2	3.0	1.4
Senior	19.8	2.8	33.9	3.2	1.5

Nevertheless, it is noteworthy that mental health challenges among college students are often rooted in adaptation difficulties. Psychological adaptation has been found to be significantly associated with mental health, with individuals who demonstrate good psychological adaptation reporting better mental health and a stronger sense of empowerment (Ortega et al., 2022). Psychological adaptation is closely linked to factors such as loneliness and happiness, serving as an objective indicator of college students' psychological well-being. Deficiencies in psychological adaptation represent a primary source of various psychological issues among college students (Feng et al., 2023). The psychological adaptation of college students is directly correlated with their mental health. To effectively address the rising prevalence of psychological issues among college students, greater emphasis must be placed on their adaptation, particularly psychological adaptation. Assessment instruments play a crucial role in evaluating the psychological adaptation of college students. The scientific quality of these evaluation tools influences the accurate understanding of college students' psychological adaptation.

Given the correlation between psychological adaptation and mental health, interest in and research on psychological adaptation in China have been progressively increasing each year. Nonetheless, the majority of these studies are qualitative in nature. Currently, there is an absence of specialized instruments that focus on the integrated nature of psychological adaptation. In practice, for example, scales that directly assess adaptation or mental health status are commonly used (see Table 2 in the literature review section). Furthermore, as the adaptation process is influenced by institutional and cultural factors, research and intervention in this field are limited by the lack of multidimensional assessment tools. Furthermore, regarding the assessment and dimensions of psychological adaptation, the scarcity of pertinent reference materials has resulted in the absence of established theoretical models both domestically and internationally (Xia et al., 2021). These represent existing objective challenges that require further focused attention as potential research directions. This study aims to summarize the commonly used assessment tools for evaluating college students' psychological adaptation, based on prior research. It will conduct exploratory factor analysis (EFA), reliability and validity tests on the compiled questionnaire items, refine the items for psychological adaptation measurement, and delineate the dimensions based on the test results. In doing so, the study seeks to provide theoretical and practical support for future assessments of college students' psychological adaptation.

Research Objectives

This study has three primary objectives:

RO1. Evaluate the reliability and validity of the psychological adaptation assessment instrument.

RO2. Examine the dimensions encompassed in the psychological adaptation assessment instrument.

RO3. Identify the essential items constituting the psychological adaptation assessment instrument.

Scope and Significance

The primary purpose of this study is to assess the psychological adaptation of college students in China by evaluating and refining measurement instruments. Reliable, valid, and culturally relevant assessment tools can

be developed, given the vital role of adaptation in mental health and the rising incidence of psychological issues. This article aims to address the gaps in existing literature and practice by proposing a systematic framework for measuring and understanding psychological adaptation. The key findings from this study contribute to theoretical knowledge and inform practical interventions. This work assists counsellors, educators, and policymakers in designing targeted support strategies by providing evidence-based conclusions.

LITERATURE REVIEW

This section reviews the literature on psychological adaptation, measurement instruments, reliability, validity, and exploratory factor analysis (EFA).

Psychological Adaptation

"Adaptation" is a fundamental concept in biology (Mechnikov, 2019). Building on this biological foundation, evolutionary psychology posits that humans have evolved psychological adaptation mechanisms through natural selection to cope with recurrent challenges related to survival and reproduction in the ancestral environment (Mills, 2003). Apart from its use in biology, the term "adaptation" has also been prominently featured in the writings of scholars from various other disciplines. In scientific and pedagogical literature, adaptation is recognized as a multidimensional and multifaceted concept (Tarasova et al., 2017). Perspectives on adaptation have evolved across diverse scientific fields. In the mid-19th century, Hess Kowitz coined the term "acculturation," interpreting it as the process through which an individual develops into a member of a culture or society (Tang, 2022). Graves (1967) introduced the term "psychological acculturation," which refers to the process of personal change influenced both by contact with another culture and by general acculturation changes occurring in one's own culture (Le, 2004). This process inevitably involves some degree of retention of the individual's traditional psychological characteristics (Berry, 1990).

Historically, "psychological adaptation" has been a central concern for cross-cultural psychologists (Doucerain, 2019). Within the realm of acculturation studies, Canadian cultural psychologist Berry introduced the term "psychological adaptation". Berry suggests that the structure of cultural adaptation should distinguish between group-level and individual-level adaptation, with psychological adaptation primarily studied at the individual level (Xu & Xiao, 2009). Berry (1997) posited that psychological adaptation encompasses a distinct personal and cultural identity, subjective satisfaction with the host culture, and a favorable mental health state (Manyeruke & Tansel, 2024). This implies that students' adaptation to their new cultural environment is a two-way influential process, which contributes to their stable mental health and individual satisfaction. In 1992, Ward provided the initial definitions for the sociocultural and psychological dimensions of cross-cultural adaptation. He posits that psychological adaptation pertains to an individual's mental health and life satisfaction within a new culture, mainly focusing on the individual's experience of stressors and their responses to these pressures (Ward, 1996; M. E. Williams, 2008).

However, it's worth noting that within adaptation literature, some scholars argue for a distinction between psychological adaptation and acculturation (e.g., Bektaş et al., 2009; Searle & Ward, 1990; Ward & Rana-Deuba, 1999). In this context, psychological adaptation specifically relates to mental health, a clear sense of personal and cultural identity, and overall satisfaction within a new cultural context; sociocultural adaptation, on the other hand, focuses on an individual's ability to navigate daily life effectively in the new cultural environment (Bektaş et al., 2009; Berry et al., 2002). While these two concepts reflect different theoretical approaches to cultural adaptation, the distinction between psychological adaptation and sociocultural adaptation can be understood as a classification based on the foundation of adaptation (Zhao, 2017).

Moreover, as research in this field has progressed and become increasingly nuanced, some scholars have moved beyond cultural and cross-cultural perspectives. For example, Ano and Vasconcelles (2005) view psychological adaptation as a series of psychological outcomes that develop through continuous efforts and adjustments when individuals face stressful situations. This perspective on psychological adaptation focuses more on identifying the factors that influence psychological adaptation in different environments and delineating the characteristics of individual psychological adaptation under various circumstances. It posits that psychological adaptation primarily relates to psychological experiences and feelings that enable individuals to maintain a harmonious balance with their environment, such as having a positive self-image, reduced hostility, emotional stability, and

more (Rohner, 2004; Zhao, 2017). On this basis, Qin et al. (2022) proposed that psychological adaptation is a process in which individuals adjust to environmental changes prompted by external stimuli, utilize their regulatory systems to respond to these changes, and ultimately meet the developmental requirements for the integration of body and mind, thereby achieving a new equilibrium between themselves and their environment. Jia (2001) integrated cognitive psychology and social psychology to illustrate the internal mechanism of psychological adaptation in a model shown in Figure 1.
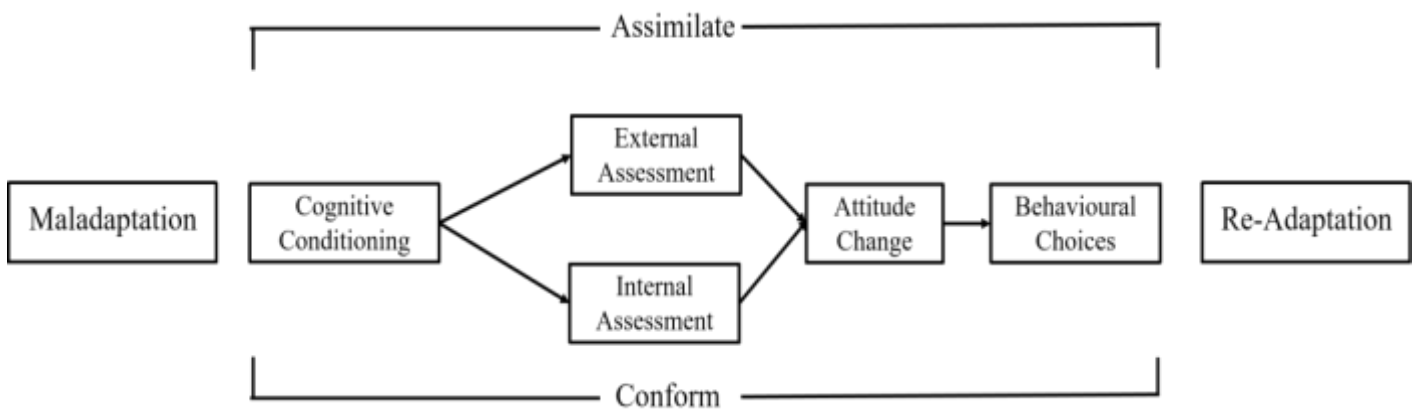

Figure 1. Intrinsic Mechanisms of Psychological Adaptation (Jia, 2001)

The diagram illustrates that the definition of psychological adaptation encompasses both the process and the outcome. Beyond this, addressing psychological adaptation requires attention not merely to the end results, but also to the integral components, including cognition, environmental context, subjective experience, and behavioral responses. This aligns with the prevailing tendency in conceptualizing psychological adaptation, which is categorized into two orientations: process orientation and outcome orientation, based on researchers' varying emphases. Psychological adaptation encompasses at least the dimensions of cognition, attitude, and behavioral selection (Waldeck et al., 2021). In view of the foregoing analysis, this study organizes and synthesizes existing psychological adaptation measurement instruments, conducts reliability and validity assessments, and identifies the measurement characteristics of psychological adaptation through component analysis. It thereby provides both theoretical and empirical foundations for evaluating psychological adaptation.

Instrumentation

Research instruments are systematically designed tools used for collecting, measuring, and analyzing data related to a study topic. Questionnaires are regarded as an efficient means of gathering extensive data from respondents in a cost-effective manner for assessing behaviors or psychological states (Oben, 2021). To measure psychological adaptation, various measurement tools have been developed, however, these tools may differ in their versions and applications. One of the most widely used scales is the Rosenberg Self-Esteem Scale (RSES), developed by Maurice Rosenberg in 1965, with the mean overall score being the most commonly used metric in scientific research (García et al., 2019). Some scholars also consider psychological adaptation as a dependent variable measured through life satisfaction and depression (Bektaş et al., 2009). Moreover, various other scales related to psychological distress and mental health are employed in the study of psychological adaptation. In specific fields, researchers have developed tailored psychological adaptation scales. For instance, the Psychological Adaptation Scale (PAS) assesses adaptation to chronic diseases or health risks and is derived from the Rosenberg Self-Esteem Scale (Biesecker et al., 2013). Additionally, a Youth Psychological Adaptation Scale has been developed for adolescents, reflecting the unique developmental characteristics of their psychological adaptation (Chen & Chen, 1988; D. J. Zhang & Jiang, 2006).

This study aims to develop and evaluate instruments for assessing psychological adaptation among Chinese college students. Drawing on existing literature, the questionnaire was developed based on the Chinese College Students' Adaptation Scale (X. Fang et al., 2005; as part of the Ministry of Education's College Students' Mental Health Assessment System). Given that both depression and self-esteem are widely recognized as key indicators of individuals' psychosocial adaptation, these two constructs were incorporated into the analysis. Through a comparative analysis of questionnaire items, the initial questionnaire integrated scales measuring anxiety,

depression, self-esteem, and related constructs. This resulted in a preliminary questionnaire consisting of 7 dimensions and 81 items. The specific structure and item source are detailed in Table 2.

Specifically, the compilation and evaluation of the tools were conducted in multiple phases: (1) Prior to developing the study instruments, the researchers conducted comprehensive literature reviews and analyses of tools used in psychological adaptation studies, particularly in China, to identify the frequently utilized questionnaire items. (2) Upon finalizing the questionnaire items, the assistance and evaluation of six experts were sought to assess the conceptual, content, and linguistic aspects of the questionnaire. Based on the insights and recommendations provided by the experts, the questionnaire was refined and enhanced, leading to the preliminary selection of items for testing. (3) Following the initial determination of the questionnaire items, they were submitted to the academic committee for review to obtain ethical approval for the study. The questionnaire was then distributed and collected, followed by exploratory factor analysis (EFA), as well as reliability and validity assessments. The components of the final research instrument were thereby established. The instrument utilized a 5-point Likert scale, with response options ranging from "Strongly Disagree" to "Strongly Agree."

Table 2. Structure and Sources of the Questionnaire

Dimension	Item	Source	Scoring Formula
Emotional Adaptation (EA)	A1, A3, A15, A21, A27, A39, A45, A53, A58	X. Fang et al. (2005) CCSAS	5 (1-5)
	A67, A68, A69	Zung (1971) SAS	4 (1-4)
	A70, A71, A72	Radloff (1977) CES-D	4 (0-3)
Interpersonal Adaptation (IA)	A11, A13, A18, A20, A35, A37, A43, A50, A55, A56	X. Fang et al. (2005) CCSAS	5 (1-5)
	A61, A62	Wang et al. (2021) C-PAS	5 (1-5)
	A63, A64	Radloff (1977) CES-D	4 (0-3)
Self-Adaptation (SA)	A6, A10, A16, A23, A25, A29, A33, A42	X. Fang et al. (2005) CCSAS	5 (1-5)
	A73, A74, A75, A76	Wang et al. (2021) C-PAS	5 (1-5)
	A77, A78, A79, A80	Rosenberg (1965) SES	4 (1-4)
	A81	Radloff (1977) CES-D	4 (0-3)
Campus Life Adaptation (CLA)	A17, A22, A26, A32, A38, A46, A54, A60	X. Fang et al. (2005) CCSAS	5 (1-5)
	A65, A66	Radloff (1977) CES-D	4 (0-3)
Academic Adaptation (AA)	A4, A9, A24, A28, A30, A34, A40, A44, A47, A49, A59	X. Fang et al. (2005) CCSAS	5 (1-5)
Career Choice Adaptation (CCA)	A5, A8, A12, A14, A19, A36, A41, A51, A57	X. Fang et al. (2005) CCSAS	5 (1-5)
Satisfaction Level (SL)	A2, A7, A31, A48, A52	X. Fang et al. (2005) CCSAS	5 (1-5)

Reliability

Reliability refers to the consistency and dependability of a measurement, which is essential for determining the credibility of key findings. Participants using an instrument designed to measure motivation should provide approximately consistent responses each time the instrument is administered (Heale & Twycross, 2015). Reliability is a critical consideration that researchers must address when conducting pilot or primary studies, especially when using previously validated questionnaires (Hazzi & Maldaon, 2015). Reliability encompasses three attributes: Homogeneity (or internal consistency), Stability, and Equivalence. Homogeneity (or internal consistency) refers to the extent to which all items on a scale measure a single construct. Stability denotes the consistency of an instrument's results across repeated administrations. Equivalence refers to the uniformity of responses among different users of an instrument or the consistency between different versions of an instrument (Heale & Twycross, 2015). This means that reliability directly affects the generalizability of research findings. The validity of conclusions may be compromised if the reliability is insufficient during measurement, which can ultimately lead to errors and undermine the credibility of the study.

Reliability assessment should involve an appropriate statistical measure. In this context, Creswell (2015) indicated that when a study instrument is a questionnaire, the most suitable approach is to evaluate its reliability using Cronbach's alpha (α) coefficient. The alpha (α) coefficient measures the internal consistency of a test or scale, represented by a value ranging from 0 to 1, which indicates the degree to which all items within the instrument assess the same concept or construct. However, values above 0.7 are generally considered acceptable, with higher thresholds required for more rigorous applications. Thus, Cronbach's alpha (α) reflects the intercorrelation among the test items (Tavakol & Dennick, 2011). Moreover, the dependability of a study is influenced by the Cronbach's alpha coefficient, which not only reflects the quality of the research but also supports its applicability across different contexts. Table 3 presents guidelines for interpreting Cronbach's alpha reliability coefficients. Overall, researchers should assess reliability when evaluating instruments to ensure the accurate measurement of intended constructs. This is particularly important in cross- disciplinary and longitudinal studies, where consistent measurement standards are crucial for comparative analysis.

Table 3. Interpretation of Cronbach's α (Hair, 2006; Jayaraman & Ghazali, 2023)

Cronbach's α	Interpretation
< .60	Unacceptably reliability
.61 - .79	Acceptable reliability
> .80	High reliability

Measuring the validity of a research instrument is essential to determine whether the test actually measures what it intends to measure. Validity indicates the extent to which the collected data captures the true domain of the research (Ghauri et al., 2020). It is defined as the degree to which a concept is accurately measured in research and is primarily categorized into three types, as detailed in Table 4 (Heale & Twycross, 2015). Establishing content validity is essential for substantiating the validity of evaluation instruments such as questionnaires, particularly in research contexts (Yusoff, 2019). Content validity assesses the comprehensiveness and representativeness of a scale's content (Yaghmaie, 2003). Methods for assessing content validity include a literature review followed by evaluation by professional judges or panels (Ghauri et al., 2020). The relevant information is typically derived from three sources: literature, members of the relevant population, and domain experts (Burns & Grove, 1993; Yaghmaie, 2003). In this study, the validity of the questionnaire was confirmed through consultation with specialists in the research domain. It is recommended that at least two specialists conduct the review (Jayaraman & Ghazali, 2023). Some scholars suggest involving a minimum of five experts (Burns & Grove, 1993) or between five and ten experts (Wilson, 1989) to evaluate the content validity of a scale using a rating system. This study engaged six specialists, each with extensive expertise in educational psychology.

Table 4. Types of Validity (Heale & Twycross, 2015)

Types of Validity	Description
Content Validity	The extent to which a research instrument accurately measures all aspects of a construct.
Construct Validity	The extent to which a research instrument measures the intended construct.
Criterion Validity	The extent to which a research instrument is related to other instruments that measure the same construct.

Exploratory Factor Analysis (EFA)

Exploratory factor analysis (EFA) is a member of the multivariate statistical methods family. It seeks to identify the minimal number of proposed structures (also referred to as factors, dimensions, latent variables, composite variables, or internal attributes) that can succinctly explain the covariation among a set of measured variables (also known as observed variables, manifest variables, effect indicators, reflective indicators, or surface attributes). It aims to uncover the common underlying elements that account for the patterns and structure among the assessed variables (Watkins, 2018). Typically, EFA is in nature. In exploratory factor analysis (EFA), researchers do not hold preconceived notions regarding the number or nature of the underlying factors. It is fundamentally exploratory, allowing researchers to examine the fundamental dimensions in order to develop a theory or model from a wide array of possible structures.

EFA factor analysis can be used to identify the hypothesized structures within a given dataset and to assess the extent to which these structures represent the original variables. It can also be employed to examine the correlations among observed variables (Sürücü et al., 2022). The items in this questionnaire have been adapted based on prior research and are better suited for measuring psychological adaptation specifically among college students. Therefore, EFA was conducted to examine the scientific soundness and structure validity of the questionnaire items. The process of exploratory factor analysis follows the five-step exploratory factor analysis protocol (see Figure 2).
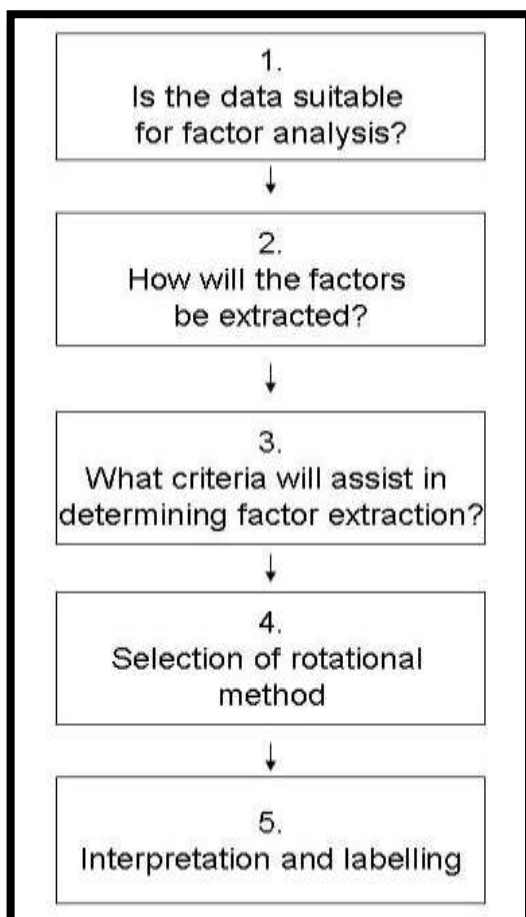

Figure 2. The 5-step Exploratory Factor Analysis Protocol (B. Williams et al., 2010)

METHODOLOGY

A pilot study is a preliminary, small-scale feasibility assessment designed to evaluate several components of the methodologies intended for use in a larger, more rigorous, or confirmatory research project (Arain et al., 2010; Lowe, 2019). A pilot study is primarily conducted to identify and address critical issues in the research design, which could otherwise lead to significant expenditures of time and resources (Lowe, 2019; Polit & Beck, 2017). Additional reasons for conducting a pilot study include assessing the wording and statements of the scales used, refining the scale items, and evaluating a specific research instrument (Hazzi & Maldaon, 2015). This study employs a pilot study to evaluate the newly developed psychological adaptation scale for college students.

Given the sample size requirements for a pilot study, the appropriate sample size depends on the specific purpose of the pilot study. A sample size of N = 30 is considered a reasonable minimum for bootstrap confidence intervals (Hazzi & Maldaon, 2015). However, since an appropriate analysis for validity studies clearly requires a larger sample than is typically used in pilot studies for initial instrument development, a comprehensive item analysis should be conducted with a larger sample, perhaps N = 100 to 200 (Crocker & Algina, 1986; Johanson & Brooks, 2010). In addition, there are specific sample size requirements when conducting exploratory factor analysis (EFA); for detailed reference standards, see Table 5. Accordingly, this pilot study adopted a convenience sampling method, involving 350 undergraduate students from a college in Henan Province.

Table5. Number of Sub-threshold Samples (Sürücü et al., 2022).

Sample Size	Interpretation
100	Poor
150	Fair
200	Enough
250	Good
300	Very Good
400	Excellent

RESULTS

The results of this study are based on three fundamental aspects: item analysis, the validity and reliability of the instrument, and the EFA outcomes. The analyses were conducted using SPSS 26.0. Following data coding, processing, and organization, validity and reliability analyses were performed, and exploratory factor analysis (EFA) was carried out. Through this process, 31 valid items were retained from the original pool of 81 items.

Content Validity

The Content Validity Index (CVI) was assessed using the formula established by Polit and Beck (2006). Experts were asked to evaluate each item on a 4-point scale indicating relevance to the construct: 1 - requires improvement, 2 - adequate, 3 - satisfactory, 4 - excellent. This study initially included 81 items. All feedback and comments provided by the experts were compiled and synthesized. The Content Validity Index (CVI) was calculated based on the average expert rating and the level of agreement. A CVI value of ≥ .83 is considered acceptable (Jayaraman & Ghazali, 2023). In this study, the overall Content Validity Index (CVI) for the instrument was .98 (see Table 6), which exceeds the threshold of .83. Furthermore, the CVI for every individual construct also surpassed .83. This indicates that the research instrument achieved satisfactory content validity according to the six experts. Thus, following the content validity assessment, the questionnaire retained all 81 original items. The revised questionnaire was then distributed to college students for pretesting and pilot trials.

Table 6. Content Validity Index (CVI) by Construct

Constructs	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	CVI
Total Score	1.00	1.00	.89	1.00	1.00	1.00	.98

EFA

The questionnaire underwent Exploratory Factor Analysis (EFA), yielding a Kaiser-Meyer-Olkin (KMO) value of .900 and a significant Bartlett's test of sphericity ($P < .05$). KMO values range from 0.00 to 1.00 and can be computed for the overall correlation matrix as well as for each individual variable (Watkins, 2018). KMO values of .70 or higher are preferred (Hoelzle & Meyer, 2013; Lloret et al., 2017; Watkins, 2018), indicating that the data are suitable for exploratory factor analysis. Principal component analysis with varimax rotation was conducted, resulting in the extraction of seven factors. These components collectively accounted for a cumulative variance of 48.03%. In the context of total variance explained, while the natural sciences often account for at least 95% of variance, the humanities may account for only 50% to 60% (Hair et al., 1995; Sürücü et al., 2022).

Therefore, items were incrementally revised and refined. According to the thresholds proposed by Comrey and Lee (1992), factor loadings can be categorized as follows: above .71 is considered excellent, above .63 very good, above .55 good, and above .45 fair (H. Liu, 2019). Furthermore, for structural stability, factors represented by fewer than three items were not retained (Worthington & Whittaker, 2006). Accordingly, items were retained if they exhibited factor loadings exceeding .45 after rotation, showed no substantial cross-loadings, had at least three items per factor, and demonstrated a communality of no less than .40. Based on these criteria, items were systematically removed and altered, resulting in the retention of 31 items. Factor analysis was performed once again. Five common elements were identified and categorized into five categories based on the content of the items: emotional adaptation, interpersonal adaptation, self-adaptation, life adaptation, and learning adaptation. The particular scenario is illustrated in Table 7.

Table7. EFA for PA Re-Specification

Item	KMO (Barttlet's Test)	Cummulative % of variance	loading					Communalities
			EA	IA	SA	CLA	AA	
A.47	.932	56.387					.727	.620
A.49							.606	.578
A.34							.564	.562
A.51							.614	.549
A.36							.557	.551
A.59						.569		.587
A.52						.573		.566
A.46						.659		.549
A.58						.532		.427
A.60						.621		.594
A.74					.713			.639
A.77					.606			.590

					.762			.601
A.79					.762			.601
A.80					.650			.559
A.73					.747			.633
A.13				.570				.527
A.35				.656				.625
A.43				.528				.472
A.50				.483				.443
A.56				.746				.689
A.61				.624				.637
A.62				.595				.527
A.15			.655					.591
A.1			.618					.535
A.3			.697					.642
A.7			.566					.502
A.9			.613					.594
A.27			.643					.557
A.10			.635					.550
A.16			.578					.462
A.25			.601					.523

Reliability

Reliability analysis was performed on the five dimensions identified through exploratory factor analysis (EFA), specifically, emotional adaptation (EA), interpersonal adaptation (IA), self-adaptation (SA), campus life adaptation (CLA), and academic adaptation (AA) — using SPSS 26.0. Cronbach's α was used to assess internal consistency reliability. The results indicated that coefficient values for all dimensions exceeded 0.70, suggesting good internal consistency of the scale. Furthermore, given that the data may not satisfy the tau-equivalence assumption, McDonald's ω was calculated based on the exploratory factor analysis (EFA) results to further validate reliability. This metric is generally more robust than α when the tau-equivalence assumption is violated. Specific outcomes of the reliability analysis are presented in Table 8. Both Cronbach's α and McDonald's ω coefficients exceeded .70 across all dimensions, demonstrating satisfactory reliability for the entire scale.

Table 8. Reliability Assessment by Dimension

Dimension	Cronbach's Alpha	McDonald's ω	No. of Items
EA	.876	.886	9
IA	.841	.851	7
SA	.823	.860	5
CLA	.791	.793	5
AA	.802	.815	5

In addition, Cronbach's alpha was further employed to assess the overall reliability of the entire questionnaire. The analysis revealed an overall Cronbach's α coefficient of .904 (see Table 9). This demonstrates that the

questionnaire has a high level of overall reliability, with strong internal consistency and an accurate reflection of the psychological adaptation of college students. It should be noted that the correlation coefficients of individual items did not reach .60—a phenomenon worthy of attention. However, although the correlation coefficients of certain items are relatively lower, the overall Cronbach's α coefficient of the scale exceeded .90, indicating extremely high internal consistency. Additionally, the corrected item-total correlation coefficients for all items were above .50, and removing any single item did not lead to a significant increase in Cronbach's α. Furthermore, the factor loadings of all items on their respective factors were greater than .45, further supporting the scale's good internal consistency and structural validity. Based on these results, all measurement items were retained.

Table 9. Cronbach's Alpha Coefficient of the Questionnaire

Items	Corrected Item-Total Correlation	Cronbach's Alpha if the Item Deleted	Cronbach's Alpha
A.47	.604	.758	.940
A.49	.552	.774	
A.34	.606	.757	
A.51	.581	.765	
A.36	.585	.764	
A.59	.596	.744	
A.5	.576	.750	
A.46	.533	.764	
A.58	.509	.770	
A.60	.643	.726	
A.74	.661	.775	
A.77	.613	.790	
A.79	.567	.802	
A.80	.618	.788	
A.73	.628	.785	
A.13	.534	.829	
A.35	.661	.810	
A.43	.539	.828	
A.50	.519	.831	
A.56	.700	.802	
A.61	.652	.812	
A.62	.574	.822	
A.15	.627	.862	
A.1	.598	.865	
A.3	.690	.857	
A.7	.553	.868	
A.9	.644	.861	

A.27	.647	.860	
A.10	.570	.867	
A.16	.616	.863	
A.25	.624	.862	

Following the exploratory factor analysis (EFA) and subsequent reliability and validity assessments, five dimensions and 31 items were ultimately retained. The scale demonstrated a reliability coefficient (Cronbach's α) of .940 and a validity metric (KMO) of .932. The instrument's reliability and validity meet established standards and are suitable for application. The specific distribution of dimensions and items is presented in Table 10. Details regarding item retention are provided in Appendix A1.

Table 10. Item Distribution After Analyses

Dimension	Initial Items	Final Items
EA	A1, A3, A7, A9, A10, A15, A16, A25, A27	A1, A3, A7, A9, A10, A15, A16, A25, A27
IA	A11, A13, A35, A43, A50, A56, A61, A62	A13, A35, A43, A50, A56, A61, A62
SA	A73, A74, A77, A79, A80	A73, A74, A77, A79, A80
CLA	A46, A52, A58, A59, A60	A46, A52, A58, A59, A60
AA	A4, A34, A36, A47, A49, A51	A34, A36, A47, A49, A51

DISCUSSION

Based on a review and synthesis of existing psychological adaptation instruments and dimensions, this study developed a new psychological adaptation measure through rigorous exploratory factor analysis (EFA), as well as reliability and validity tests. Rather than assuming the validity of existing instruments, this study adopts a critical and objective approach, particularly concerning the conceptualization and division of dimensions. Before confirming the dimensions, the composition of each dimension and its items was based on previous research and relevant theories. Through the EFA, the dimensions were then tested and adjusted according to the empirical results, so as to ensure that the measurement results can accurately reflect an individual's level of psychological adaptation. This provides a powerful measurement tool for in-depth exploration of the psychological adaptation mechanisms and influencing factors.

In the context of psychometric analyses, .40 is a commonly used threshold for acceptable communalities (Henson & Roberts, 2020), indicating that an item has sufficient shared variance with the extracted factors to meaningfully represent the underlying constructs. Communalities are explained by the extracted factors, whereby the proportion of variance in each item is captured (Njeri et al., 2024). Table 7 highlights all the items that exhibit acceptable communalities. For instance, A.47 (.620) and A.73 (.633) indicate that the underlying factors account for a considerable proportion of variance in these items. This supports their inclusion in the retained instrument. Although some values show communalities below .50, such as A.43 (.472) and A.50 (.443), all exceed the threshold of .40. Another indicator of construct validity is the cumulative percentage of variance explained by the extracted factors, which in this tool amounts to 56.387%, demonstrating its effectiveness in measuring the intended constructs.

The relationship between each item and its corresponding factor is reflected in its factor loading (Shrestha, 2021). To assess the internal consistency of the findings, Table 7 was examined in detail to evaluate the validity of the instrument based on factor loadings. This provides a clear understanding of how efficiently each item aligns with the intended construct. The strength of factor loadings was interpreted using the following thresholds (Comrey & Lee, 1992, as cited in H. Liu, 2019): above .71 (excellent), above .63 (very good), above .55 (good), and above .45 (fair). Based on the analytical findings, except for A50 (.483), the validity of the measurement tool is supported by the remaining items, all of which exhibit loadings above .50, indicating a strong relationship with their respective factors. Lower loadings may not accurately reflect the intended construct (Jordan & Spiess, 2019). The stronger loadings contribute effectively to the representation of constructs, demonstrating that the items are closely aligned with their corresponding factors. Weaker associations often stem from overlapping

content across factors or ambiguities in item phrasing, which can result in lower loadings. In the findings of this study, although the factor loading of A50 (.483) falls below .50, it remains above the acceptable threshold of .45. Therefore, it may still be considered for retention given its contextual relevance or theoretical contribution to the factor.

From a theoretical perspective, the extracted factors align with the established frameworks of psychological adaptation, particularly in the college context. The identified dimensions include academic adaptation, campus life adaptation, interpersonal, emotional adaptations, and self-adaptation. Therefore, by emphasizing empirically supported constructs, the content validity of the dimensions can be enhanced. College life represents both an opportunity and a challenge for students. However, if students, particularly freshmen, fail to adapt promptly to the new environment, they may experience difficulties in both academic and psychological development (Wang et al., 2006). Consequently, promoting college students' adaptation to their living environment serves not only as a crucial pathway for advancing their academic progress but also as a key objective of mental health education. Meanwhile, entering college signifies the need to adapt to a new academic setting, which is generally a challenging process (Shamionov et al., 2020). This process affects not only academic performance but also the psychological well-being and adaptation of students. This finding is consistent with the conclusion drawn by Sheng et al. (2022), who demonstrated a significant correlation between academic adaptation and psychological adaptation.

Furthermore, positive interpersonal relationships reflect an individual's capacity to interact and communicate effectively with others (Lo et al., 2016). Many psychological difficulties stem from interpersonal issues, with challenges in relationships representing a major source of psychological distress (X. Zhang et al., 2022). Previous research has identified interpersonal competence as a key factor in college students' identity development (Chickering, 1967; Garfield & David, 1986; Shim et al., 2017) and overall adaptation to college life (Shim et al., 2017; Tinto, 1997). This underscores why interpersonal adaptation constitutes an essential dimension in assessments of psychological adaptation. It is also important to recognize that successful adaptation to new environments depends on the effective interaction between individuals and their organizational contexts (Rean, 2006; Shapovalova et al., 2019). This implies that attention should be directed not only to psychological adaptation as an outcome but also to the individual, particularly their self-awareness and emotional state. Individuals must be able to evaluate their strengths and weaknesses objectively, affirm their self-worth, and accept their current reality (X. Zhang et al., 2022); among the various intrinsic factors influencing psychological distress, this represents a significant one. Emotional stability is a key psychological trait that determines one's ability to cope with stress amid life's adversities. Over the past decade, numerous psychological studies have examined the protective and adaptive role of emotional stability in stress responses (Serebryakova et al., 2016).

CONCLUSION

Based on multiple indicators and analytical results, the initial version of the "Psychological Adaptation Measurement Questionnaire for College Freshmen" developed in this study meets psychometric standards, demonstrating good reliability and validity. It can be used to assess the psychological adaptability of college freshmen. The development of this questionnaire is based on the synthesis, selection, and evaluation of existing psychological adaptation assessment tools for college students. The detection and analysis results indicate that, among the seven identified factors of psychological adaptation: academic adaptation, interpersonal adaptation, emotional adaptation, campus life adaptation, self-adaptation, career choice adaptation, and satisfaction; only the first five dimensions are retained at the freshman level. The Cronbach's α coefficient for the "Psychological Adaptation Questionnaire for College Freshmen" is .904, demonstrating high internal consistency. The KMO measure for the questionnaire is .932, reflecting excellent sampling adequacy of the research data. These results suggest that the streamlined version of the "Psychological Adaptation Measurement Questionnaire for College Students" can serve as a reliable and effective instrument for further examination, validation, and practical application in subsequent studies.

RECOMMENDATIONS

• Cross-Cultural Validation: The future studies should focus on linguistic dimensions and varied cultural contexts to improve the generalisability of the tools. This approach would require testing the dimensional

structure of the tool in different communities. Furthermore, it should reflect on the cultural aspects of different populations and their involvement in adapting to items.

- Inclusion of Emerging Dimensions: In the future, digital adaptations could be integrated with the iterations of the tools in a technology-driven world to highlight the revolutionized nature of psychological adaptation.

- Integration with Objectivities: The psychological indicators could be combined with the tools to yield objective measures. Additionally, behavioural observations could resolve the drawbacks of self-reported data to present a nuanced, comprehensive approach towards psychological adaptation assessment.

- Longitudinal Studies: More valuable insights could be drawn by conducting longitudinal studies post-use the tool. This could shed light on the dynamics of adaptation, and emphasise the elements that promote resilience over time.

Limitations

Despite efforts to ensure sample diversity throughout the study process, several limitations remain. The sampling method relied on convenience sampling, which posed challenges in adequately representing students from all majors and regions. The sample was predominantly drawn from specific institutions and largely consisted of freshmen, thereby limiting the generalizability of the newly developed instrument to broader populations. Secondly, during the reliability and validity assessments, particularly within the framework of Exploratory Factor Analysis (EFA)—the sequence of item deletion process and the researchers' interpretations inevitably introduced a degree of subjectivity into the study. Moreover, SPSS, as a statistical software, is subject to ongoing updates. As a result, output formats generated by current versions may exhibit slight variations across iterations. In other words, while the development of this new instrument contributes to expanding the theoretical and practical frameworks of college students' psychological adaptation, its testing process remains inevitably influenced by factors, such as respondent characteristics, the knowledge and perceptions of the researchers, and the analytical tools employed. These influences may affect the objectivity and scientific rigor of the research instrument. Furthermore, in the categorization of dimensions for college students' psychological adaptation, although the specific items were derived without a priori assumptions, the naming and classification of the dimensions remain grounded in established frameworks. It is therefore necessary to continuously enhance and refine the research instrument in accordance with evolving research needs. Moreover, conducting confirmatory factor analysis (CFA) in subsequent research would further validate the structural stability and scientific robustness of the instrument, thereby enhancing its utility and rigor. Additionally, the relationship between psychological adaptation and the development of mental health issues, such as anxiety and depression, as well as the evolving dynamics of psychological adaptation across different social support contexts, warrants further clarification and investigation in future studies to strengthen the practical relevance of psychological adaptation research.

Ethics Statements:

The study protocol was reviewed and adjudicated by the University research ethics committee, which concluded that there were no ethically relevant risks involved in the study and granted an ethical clearance waiver. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Generative AI Statement

The article does not use any AI tools

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APPENDIX

Table A1. Reorganization of Items and the Corresponding Results

EA	9	1. My daily life is filled with things that interest me.
		2. I always feel happy.
		3. I am very satisfied with my current college life.
		4. I have great enthusiasm for my current studies.
		5. I believe I have more strengths than weaknesses.
		6. I never feel lonely.
		7. I always recognize my strengths and encourage myself.
		8. When faced with setbacks, I focus on my positive qualities.
		9. I always feel energetic and lively.
IA	7	10. When I don't want to do things alone, I can always find someone to join me.
		11. When I am in trouble, many people are willing to help me.
		12. Many people enjoy socializing with me.
		13. I am good at communicating with others through words.
		14. When I want to talk, I can always find someone to chat with.
		15. I can appreciate the support and care given by others.
		16. I know whom I can rely on in difficult times.
SA	5	17. I feel comfortable with my current situation.
		18. I feel that I am a worthwhile person, at least on the same level as others.
		19. I hope to earn more respect for myself.

		20. I feel that I possess many good qualities.
		21. I face things with ease.
CLA	5	22. I am becoming more and more accustomed to college life.
		23. I feel very comfortable with my college life.
		24. I enjoy places on campus for entertainment, leisure or exercise.
		25. I go out to relax when I'm in a bad mood.
		26. I will try my best to participate in various activities to enrich my free time.
AA	5	27. I always reflect on the lessons learned from exam failures.
		28. I always find ways to improve my memory, attention and other learning abilities.
		29. I always set different learning goals for different stages of my studies.
		30. I often prepare for my future career by consciously participating in social practice activities.
		31. I have a clear career goal.