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Development and validation of a scale for measuring social environmental support, survival skills, and subjective well-being among Chinese ethnic minority university students

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Abstract

This study developed and validated a new set of questionnaires to measure social environmental support, survival skills, and subjective well-being among Chinese ethnic minority university students. The goal was to create a reliable and culturally specific instrument for evaluating these constructs. The research used a two-part process: An initial survey with 107 participants for Exploratory Factor Analysis (EFA) and reliability tests. A second survey with 113 participants for Confirmatory Factor Analysis (CFA) to confirm the model fit. The EFA confirmed a clear factor structure and led to the removal of eight items. The CFA demonstrated excellent model fit ($\chi 2/df = 1.534$; RMSEA = 0.048) and strong convergent validity (AVE > 0.50, CR > 0.70). The scales also showed high internal consistency, with Cronbach's α values all above 0.70. In conclusion, the validated scales are reliable and have strong psychometric properties, filling a research gap for culturally appropriate tools. These instruments can be reliably used in future studies and for practical applications in education, providing valuable support for understanding and improving student well-being.

Keywords: Confirmatory factor analysis, Exploratory factor analysis, Questionnaire development, Reliability, Social environmental support, Subjective well-being, Survival skills, Validity.

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1. Introduction

As the 21st century presents increasingly complex challenges, a central goal for knowledge-based societies has become the improvement of students' learning experiences and overall well-being. A supportive social setting can profoundly impact student motivation, academic performance, and the development of essential behaviors and attitudes [1-4]. Indeed, social environmental elements are widely acknowledged as crucial factors in determining a student's well-being [5-8]. Specifically, when students receive backing from their teachers, peers, parents, digital platforms, and the wider community, their learning is encouraged, which in turn boosts their well-being [1, 9-12]. Students' well-being is shaped by their family's socioeconomic conditions, like parental education and household income. The educational support given by parents is also connected to these factors [13]. Social capital theory says that social structures, like trust, rules, and personal networks, help people work together [14]. The theory says that taking part in social activities can build human potential, so people gain more skills [15], do better in school, and feel more satisfied in life [16]. Research shows that social capital has a strong effect on student well-being, and it is linked to soft skills, good social networks, and higher educational achievement [8, 17, 18]. When students take part in activities and give back to others, they can build social capital [14].

But even though research on human well-being has grown, there are still not enough good tools to measure subjective well-being among university students. This is true especially for tools that look at social environmental support and survival skills. Earlier research has often ignored the complex link between social factors, survival skills, and well-being. Current instruments also cannot fully measure student well-being for this study's focus. Also, many tools were created outside China and were not tested with Chinese ethnic minority students. If these scales are only translated or used directly, they may not work well because of cultural, language, and idea differences. This makes it hard to study the bad effects of weak social support, like low self-esteem, loneliness, and boredom. These problems can then lead to serious issues like dropping out of university or depression [19-21].

So, this study chose "social environmental support" and "survival skills" as the main parts of the questionnaire. By focusing on social factors and social capital, this choice matches past research and has both theoretical and practical support. To make sure the questionnaire is useful in the target culture, it is very important to test reliability and validity in Chinese. This helps fill a gap in the literature.

2. Theoretical Framework and Questionnaire Development

2.1. Theoretical Foundations of the Constructs

Social environmental support, survival skills, and subjective well-being are the three main parts of our questionnaire. They are based on strong theory and also bring together results from past studies.

2.2. Social Environmental Support

This construct comes from Bronfenbrenner's social ecological theory. The theory shows that a person's growth is shaped by their daily interactions and experiences in different social settings [22]. In this questionnaire, social environmental support is seen in five parts: support from parents, teachers, and peers about learning, and also support for learning from the local community and online platforms [1]. These five parts match the different levels of the ecological system that affect student well-being. Studies have looked at these areas. Valcke, et al. [10] studied support from parents, peers, and teachers. Puiu, et al. [7] looked at different kinds of social support. Swaminathan studied community groups Swaminathan [23]. Alnagrat, et al. [24] studied the role of online environments [24].

2.3. Survival Skills

In this study, "survival skills" is used as the independent variable. It is based on Putnam's social capital theory [14]. This construct is characterized by four dimensions: adapting to academic life, improving social capital, adjusting to campus life, and possessing skills for engaging with various communities. It's important to note that because of a lack of established, citable scales, the items for the first three dimensions—adapting to academic life, adjusting to campus life, and skills for engaging with various communities—were newly created based on their definitions. However, the "ability to enhance social capital" dimension is consistent with social capital theory's focus on networks and collaboration [14], as well as its known link to educational achievements [14, 16-18].

2.4. Subjective Well-Being

The study designates subjective well-being as its dependent variable, relying on Diener's conceptualization introduced in 1984. This concept has three main characteristics: it is inherently subjective, it encompasses positive measurements, and its evaluation typically involves a broad assessment of multiple facets of a person's life [25]. For this questionnaire, subjective well-being is defined by three dimensions: academic achievement, social relationships, and psychological well-being.

Consequently, this research draws upon two main theories to support its empirical work: ecosystem theory and social capital theory [14, 22]. Ecosystem theory will be applied to construct the social environmental support scale, while social capital theory will be used to build the survival skills scale. Diener [25] framework for subjective well-being will guide the development of the scale designed to measure subjective well-being among university students from ethnic minority background [25].

2.5. Questionnaire Design and Preliminary Validation

The initial draft of the questionnaire was developed following a standard survey methodology, which combined theoretical models, research hypotheses, and existing, established measurement scales for the variables. The overall design of the questionnaire was structured around the relationships between these variables. Wording for items drawn from various scales was carefully adjusted and refined to suit the specific context of this study.

It is particularly important to highlight that for some dimensions of the "survival skills" construct—specifically, the ability to adjust to academic life, the ability to adapt to campus life, and skills for engaging with different communities—the items were newly created from scratch based on their definitions. This was necessary because there were no established scales available for reference. This methodological detail underscores that certain parts of the questionnaire were custom-built to meet the study's needs, unlike other sections where mature, pre-existing scales were adapted. This suggests a potential variance in the initial reliability of items across the different sections of the preliminary item pool, making a subsequent psychometric analysis (especially Exploratory Factor Analysis for the survival skills scale) especially critical for confirming its structural integrity. This also highlights the unique contribution of this questionnaire in measuring these less-established dimensions.

In order to establish content validity, the preliminary draft was evaluated by three specialists with expertise in education and sociology. Their suggestions and feedback resulted in independent improvements and revisions for every questionnaire item. All items were checked by an English language expert to make sure the language was correct. Then, 10 students reviewed the revised version to test the face validity and to see if the items matched each construct. The items were answered on a five-point Likert scale.

3. Research Methodology

3.1. Research Design and Participants

This study aims to make and test questionnaires for measuring social environmental support, survival skills, and subjective well-being. The scales were developed following a careful psychometric process with several steps. First, a draft questionnaire was made based on theory and checked by experts to ensure the content was correct. Next, university students from ethnic minority backgrounds took part in two surveys. The first survey collected 107 valid responses. These were used to test reliability and perform Exploratory Factor Analysis (EFA) to check the scale and make revisions. After that, a second survey collected 113 valid responses for Confirmatory Factor Analysis (CFA). This was done to see how well the revised model fit the data.

3.2. Data Analysis Methods

The data for this study was analyzed in three steps. First, SPSS was used to prepare the survey data by checking for missing values, looking for outliers, and running basic statistics to make sure the data was good. Next, Exploratory Factor Analysis (EFA) was done in SPSS to find the main factors and to check if each question matched the concept it was supposed to measure. Then, a Confirmatory Factor Analysis (CFA) was conducted in AMOS to examine the model's fit to the actual data and to test the construct validity of the scale. The reliability of the items for each part of the scale was tested using Cronbach's alpha coefficient and Composite Reliability (CR) to ensure their consistency and stability.

3.2.1. Validity Analysis

Validity shows how well a measurement reflects the idea it is meant to measure. A measurement is more valid when its results match the concept it is supposed to represent [26] . In this study, the construct validity of the questionnaire was examined through Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA).

Exploratory Factor Analysis (EFA) is mainly used to check a questionnaire's structure and see if it measures what it is supposed to during the early testing phase. Using the principle of dimension reduction, its purpose is to extract a few core variables from a complex set to represent the essential structure of multivariate factors. The process of factor extraction for this study will utilize principal component analysis, followed by a Varimax orthogonal rotation to achieve a more defined factor structure. To conduct the Exploratory Factor Analysis (EFA), several criteria will be implemented. The Kaiser-Meyer-Olkin (KMO) measure will assess sampling adequacy, with a required minimum value of 0.70 to confirm the data's suitability for the analysis. Subsequently, Bartlett's Test of Sphericity will be performed to ascertain if sufficient correlations are present among the variables. The null hypothesis of this test posits that the correlation matrix is an identity matrix. EFA will proceed only when the probability value (p) falls below the significance threshold ($\alpha = 0.05$). Finally, factor loadings are considered. An item's factor loading coefficient must typically exceed 0.5 to be grouped with other items into a single factor. Items with weak loadings on their intended factor or strong cross-loadings across multiple factors will be considered for removal to improve the scale's structural clarity and validity. Confirmatory Factor Analysis (CFA): Once the latent factor structure is identified through EFA, CFA is applied to verify it. This method checks how well the model matches the actual data and shows if the questionnaire measures what it is supposed to. In this study, the questionnaire's structure was further tested by looking at model fit and checking convergent validity.

3.2.2. Reliability Analysis

The purpose of reliability analysis is to determine whether a measurement scale remains stable and demonstrates internal uniformity. To evaluate this, the study adopts Cronbach's α coefficient, with scores higher than 0.7 considered acceptable, according to Li [27]. Corrected Item-Total Correlation (CITC): This is a measure of each item's correlation with the total score of the other items, which helps assess item quality. According to Li [27], a minimum CITC value of 0.35 is

generally considered acceptable. The criteria for item elimination include a CITC value lower than the threshold or evidence that deleting the item substantially increases the total Cronbach's alpha coefficient.

4. Results

4.1. Exploratory Factor Analysis Results

Validity analysis refers to examining whether an instrument or method truly measures the construct it is designed to assess. As Wu explains, a tool possesses higher validity when its measurement outcomes closely align with the content under investigation [26]. Within Exploratory Factor Analysis (EFA), researchers often assess validity by employing factor analytic techniques, in which principal component extraction is combined with Varimax rotation. The next step is to examine the resulting factor loading matrix to see if the number of factors and their correspondence to specific items meet the preset expectations. This process is how the level of validity is judged. An adequacy test must be performed before the factor analysis can be conducted.

4.1.1. Social Environmental Support

The structural validity of the "social environmental support" scale was examined through Exploratory Factor Analysis (EFA) with principal component extraction. Prior to this step, both the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were carried out. The Kaiser-Meyer-Olkin (KMO) statistic for the scale was 0.880, surpassing the typical acceptance threshold of 0.70. This result confirms the dataset's suitability for factor analysis. Additionally, Bartlett's test of sphericity produced an approximate chi-square value of 3053.380, with 561 degrees of freedom and a significance level less than 0.05. These results collectively demonstrate that the correlations between variables were sufficiently strong to move forward with factor extraction. Exploratory factor analysis was carried out using principal component extraction together with Varimax orthogonal rotation. As detailed in the rotated component matrix in Table 1, five factors (or latent dimensions) were initially extracted, which is consistent with our theoretical framework. All items demonstrated strong factor loadings on their respective components, each one above 0.5. Nevertheless, item B4.1 from dimension four did not form a significant loading on any factor, indicating its inability to effectively measure a latent dimension; consequently, it was removed. In summary, the items established a clear statistical factor structure that aligns with the original theoretical model, thus demonstrating sound structural validity.

Table 1.
Social Environmental Support Exploratory Factor Analysis (N=107).

	Factor Loading				
Item	**1**	**2**	**3**	**4**	**5**
B1.1				0.697	
B1.2				0.792	
B1.3				0.784	
B1.4				0.747	
B1.5				0.681	
B2.1		0.729			
B2.2		0.803			
B2.3		0.798			
B2.4		0.790			
B2.5		0.746			
B2.6		0.665			
B2.7		0.701			
B3.1	0.810				
B3.2	0.814				
B3.3	0.851				
B3.4	0.800				
B3.5	0.779				
B3.6	0.830				
B4.2			0.631		
B4.3			0.644		
B4.4			0.570		
B4.5			0.758		
B4.6			0.752		
B4.7			0.630		
B5.1					0.756
B5.2					0.575
B5.3					0.552
B5.4					0.697
B5.5					0.764
B5.6					0.684

4.1.2. Survival Skills

To assess the "survival skills" scale's structural validity, an Exploratory Factor Analysis (EFA) was performed.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.894, which is significantly above the 0.70 standard. The outcome suggested that the correlations among the sample variables were sufficiently robust to warrant conducting factor analysis. Moreover, the Bartlett's sphericity test produced an approximate chi-square statistic of 2150.717 with 325 degrees of freedom, reaching significance at $p<0.05$. This evidence provided additional support that the dataset was appropriate for factor extraction.

Table 2 illustrates that applying principal component analysis together with Varimax rotation resulted in the identification of four underlying factors. This outcome largely aligns with the four dimensions established in the original theoretical model. However, this specific construct required more substantial item removal. This was a consequence of several dimensions—specifically, the ability to adapt to academic life, the ability to adapt to campus life, and skills for interacting with different communities—being newly created for this study rather than adapted from existing scales. While item development from the ground up is sometimes unavoidable, it frequently carries an increased likelihood of psychometric challenges, including weak alignment between items and their underlying dimensions or unclear measurement meaning. Therefore, in this study, Exploratory Factor Analysis (EFA) played a more crucial role in refining the instrument. The specific items were removed for the following reasons: Item C3.5 was deleted due to double loadings (cross-loadings) on multiple factors. This suggested its content was ambiguous and could not be clearly assigned to a single dimension, thereby compromising discriminant validity. Item C1.1 was removed because it lacked a significant loading on any factor, indicating it did not effectively measure a latent dimension. Items C2.2 and C2.6 were also deleted because they did not load onto the same component as other items within their intended dimension, suggesting a lack of convergent validity with their respective dimensions.

Overall, the four-factor structure of this variable is clear, and the item distribution is generally reasonable, indicating that the "survival skills" scale has good structural validity.

Table 2.
Survival Skills Exploratory Factor Analysis (N=107).

	Factor Loading			
Item	**1**	**2**	**3**	**4**
C1.2	0.624			
C1.3	0.653			
C1.4	0.775			
C1.5	0.817			
C1.6	0.749			
C1.7	0.725			
C2.1			0.596	
C2.3			0.510	
C2.4			0.776	
C2.5			0.589	
C3.1				0.516
C3.2				0.778
C3.3				0.707
C3.4				0.634
C4.1		0.723		
C4.2		0.756		
C4.3		0.646		
C4.4		0.795		
C4.5		0.883		
C4.6		0.843		
C4.7		0.759		

4.1.3. Subjective Well-being

In order to examine the construct validity of the "subjective well-being" scale, an Exploratory Factor Analysis (EFA) using Principal Component Analysis (PCA) was carried out. The Kaiser-Meyer-Olkin (KMO) index of sampling adequacy reached 0.934, which is considerably higher than the recommended cut-off of 0.70, demonstrating the appropriateness of the data for factor extraction. In addition, Bartlett's test of sphericity produced a chi-square value of 1822.535 ($df = 190$, $p < 0.05$), further verifying that the inter-item correlations were adequate to justify identifying underlying latent factors.

As presented in Table 3, a total of three principal components were extracted after Varimax rotation. These factors explained a high cumulative percentage of variance, which aligns with the theoretically proposed three-dimensional structure. Most items demonstrated factor loadings above 0.50 on their primary factors, a sign of good structural convergence. Despite these positive results, some items were still removed for specific reasons: Items D3.2 and D3.3, which were theoretically part of the "psychological well-being" dimension, did not show significant factor loadings on the primary factor for that dimension in the rotated component matrix (both were less than 0.50). Their structural affiliation

was inconsistent with the other items in the same dimension. Due to their limited contribution to the convergent validity of this dimension and their potential to compromise the overall structural clarity, these two items were removed to optimize the scale's structural validity. Item D3.4 was found to have significant factor loadings on two different factors (both greater than 0.50). This clear pattern of cross-loading reduces the item's measurement specificity to its assigned dimension and could negatively impact the scale's convergent and discriminant validity. Therefore, although the item was theoretically relevant, it was removed to enhance the clarity and explanatory strength of the overall scale structure.
Overall, the scale exhibits good structural validity.

Table 3.
Subjective Well-being Exploratory Factor Analysis (N=107).

	Factor Loading		
Item	**1**	**2**	**3**
D1.1		0.534	
D1.2		0.636	
D1.3		0.834	
D1.4		0.748	
D1.5		0.735	
D1.6		0.647	
D1.7		0.750	
D2.1	0.645		
D2.2	0.551		
D2.3	0.810		
D2.4	0.795		
D2.5	0.835		
D2.6	0.707		
D3.1			0.589
D3.5			0.747
D3.6			0.787
D3.7			0.838

4.2. Confirmatory Factor Analysis (CFA)

To further check the model and the convergent validity of the hidden constructs, this study used Confirmatory Factor Analysis (CFA). CFA tests how well the theoretical model matches the collected data and shows if the questionnaire measures the intended constructs correctly.

4.2.1. Overall Model Fit Assessment

In this study, the maximum likelihood method was used to run a Confirmatory Factor Analysis (CFA) on the questionnaire's proposed model. We checked the model fit indices to see how well the framework matched the data. All indices were within acceptable limits, and some were excellent. For example, the chi-square divided by degrees of freedom (χ^2/df) was 1.534, below the usual cutoff of 3 (or 5), showing a good fit. The Root Mean Square Error of Approximation (RMSEA) was 0.048, under the 0.08 guideline, also showing a strong fit. The Goodness of Fit Index (GFI = 0.945) and Adjusted Goodness of Fit Index (AGFI = 0.935) were above 0.90, showing strong explanatory power. The Comparative Fit Index (CFI) was 0.923, the Incremental Fit Index (IFI) was 0.927, and the Tucker–Lewis Index (TLI) was 0.918. All these values were above 0.90, which confirmed the measurement model fit.

The questionnaire's structure fits the data well. This shows that the theoretical model captures and explains the relationships between the latent constructs and their measurement items.

4.2.2. Convergent Validity Assessment

Convergent validity shows how well different items of the same variable group together. In this study, we checked convergent validity using Average Variance Extracted (AVE) and Composite Reliability (CR). AVE values above 0.50 and CR values above 0.70 indicate good convergent validity. In our results, all constructs had AVE values from 0.570 to 0.633 and CR values from 0.835 to 0.870. This shows that the items for each construct group well around their variable, giving strong evidence of convergent validity.

The CFA results show that the questionnaire's theoretical model fits the observed data well. All latent variables also have good convergent validity. This supports the structural validity of the questionnaire and shows that it can be used reliably in related research.

4.3. Reliability Analysis Results

The reliability analysis shows that the scales for social environmental support, survival skills, and subjective well-being used in this study are all reliable.

4.3.1. Social Environmental Support

The reliability test showed that social environmental support has five parts: support from parents, teachers, and peers for education, plus support from the local community and online networks. The Cronbach's α values for these parts were 0.822, 0.928, 0.937, 0.891, and 0.871. Since all of these values are greater than the 0.7 threshold, this indicates a high level of internal consistency across the scale.

Parental Educational Support: This part has 5 items and a Cronbach's α of 0.822. All item-total correlations (CITC) were above 0.35, and removing any item did not raise the α, showing strong internal consistency. Teacher Educational Support: This part includes 7 items and has a Cronbach's α of 0.928. All items had CITC values over 0.35, and no item removal improved the α value, indicating strong internal consistency. Peer Educational Support: With 6 items, this dimension's Cronbach's α coefficient was the highest at 0.937. All items had CITC values above 0.35, and removing any item did not raise the α value, demonstrating excellent internal consistency. Local Community Educational Support: This dimension, which has 6 items, achieved a Cronbach's α of 0.891. All items had CITC values greater than 0.35, and no item removal increased the α value, confirming good internal consistency. Virtual Support: Also consisting of 6 items, this dimension's Cronbach's α coefficient was 0.871. All items had CITC values above 0.35, and removing any item did not improve the α value, indicating good internal consistency.

In summary, all dimensions of the scale possess good statistical internal consistency.

Table 4.
Social Environmental Support Reliability Test Results (N=113).

Dimension	Item	CITC	Cronbach's α if item deleted	Cronbach'a
Parental Educational Support	B1.1	0.569	0.798	0.822
	B1.2	0.646	0.796	
	B1.3	0.663	0.787	
	B1.4	0.683	0.774	
	B1.5	0.688	0.771	
Teacher Educational Support	B2.1	0.665	0.927	0.928
	B2.2	0.756	0.920	
	B2.3	0.803	0.915	
	B2.4	0.849	0.909	
	B2.5	0.763	0.919	
	B2.6	0.799	0.914	
	B2.7	0.800	0.914	
Peer Educational Support	B3.1	0.790	0.928	0.937
	B3.2	0.788	0.930	
	B3.3	0.843	0.924	
	B3.4	0.841	0.923	
	B3.5	0.827	0.924	
	B3.6	0.863	0.922	
Local Community Educational Support	B4.2	0.783	0.863	0.891
	B4.3	0.701	0.873	
	B4.4	0.639	0.880	
	B4.5	0.732	0.869	
	B4.6	0.634	0.881	
	B4.7	0.661	0.878	
Virtual Support	B5.1	0.724	0.842	0.871
	B5.2	0.683	0.849	
	B5.3	0.713	0.844	
	B5.4	0.721	0.844	
	B5.5	0.640	0.855	
	B5.6	0.608	0.858	

4.3.2. Survival Skills

The reliability analysis indicated that survival skills are composed of four dimensions: the ability to adapt to academic life, the ability to enhance social capital, the ability to adapt to campus life, and skills for interacting with different communities. The reliability test demonstrated that social environmental support consists of several distinct dimensions. For four of these dimensions, the Cronbach's α coefficients were calculated as 0.902, 0.770, 0.777, and 0.938, in that order. Since all values exceed 0.7, this shows a good level of internal consistency for the scale.

Ability to Adapt to Academic Life: This dimension, consisting of 6 items, has a Cronbach's α of 0.902. All corrected item-total correlation (CITC) values were above 0.35, and deleting any item did not raise the α value, indicating excellent reliability. Ability to Enhance Social Capital: Comprising 4 items, this dimension has a Cronbach's α of 0.770. The CITC values for all items were greater than 0.35, and removing any item did not increase the α value, which demonstrates good internal consistency. Ability to Adapt to Campus Life: This dimension, with 4 items, has a Cronbach's α of 0.777. All items

had CITC values greater than 0.35, and the α value did not increase upon item removal, showing excellent reliability. Skills for Interacting with Different Communities: This dimension, comprising 7 items, achieved a high Cronbach's α of 0.938. All CITC values were greater than 0.35, and no item removal improved the α value, confirming a high level of internal consistency.

In conclusion, all dimensions have good internal consistency.

Table 5.
Survival Skills Reliability Test Results (N=113).

Dimension	Item	CITC	Cronbach's α if item deleted	Cronbach'a
Ability to Adapt to Academic Life	C1.2	0.664	0.893	0.902
	C1.3	0.685	0.890	
	C1.4	0.749	0.883	
	C1.5	0.763	0.881	
	C1.6	0.789	0.879	
	C1.7	0.738	0.884	
Ability to Enhance Social Capital	C2.1	0.575	0.723	0.770
	C2.3	0.632	0.716	
	C2.4	0.356	0.766	
	C2.5	0.540	0.732	
Ability to Adapt to Campus Life	C3.1	0.616	0.713	0.777
	C3.2	0.539	0.741	
	C3.3	0.469	0.763	
	C3.4	0.592	0.723	
Skills for Interacting with Different Communities	C4.1	0.788	0.930	0.938
	C4.2	0.802	0.928	
	C4.3	0.714	0.936	
	C4.4	0.843	0.925	
	C4.5	0.863	0.923	
	C4.6	0.836	0.925	
	C4.7	0.746	0.933	

4.3.3. Subjective Well-Being

The reliability analysis indicated that subjective well-being is composed of three dimensions: academic achievement, social relationships, and psychological well-being. The three dimensions reported Cronbach's α coefficients of 0.892, 0.918, and 0.934, in that order. Because each value is above the 0.70 benchmark, the results suggest that the scale demonstrates strong internal consistency.

Academic Achievement Dimension: This dimension includes 7 items with a Cronbach's α of 0.892. All corrected item-total correlation (CITC) values were above 0.35, and removing any item did not raise the α value, suggesting extremely high item consistency. Social Relationships Dimension: Comprising 6 items, this dimension has a Cronbach's α of 0.918. The CITC values for all items were greater than 0.35, and the α value did not increase upon item removal, indicating a stable structure for this dimension. Psychological Well-being Dimension: This dimension, consisting of 4 items, achieved a Cronbach's α of 0.934. All CITC values were above 0.35, and removing any item did not increase the α value, which demonstrates extremely high item consistency.

Therefore, all dimensions statistically possess good internal consistency and can be used for larger-scale survey research.

Table 6.
Subjective Well-being Reliability Test Results (N=113).

Dimension	Item	CITC	Cronbach's α if item deleted	Cronbach'a
Academic Achievement	D1.1	0.576	0.890	0.892
	D1.2	0.666	0.880	
	D1.3	0.704	0.874	
	D1.4	0.716	0.873	
	D1.5	0.718	0.873	
	D1.6	0.704	0.875	
	D1.7	0.761	0.869	
Social Relationships	D2.1	0.798	0.900	0.918
	D2.2	0.694	0.915	
	D2.3	0.736	0.909	
	D2.4	0.798	0.900	
	D2.5	0.837	0.897	
	D2.6	0.776	0.903	
Psychological Well-being	D3.1	0.696	0.932	0.934
	D3.5	0.854	0.917	
	D3.6	0.822	0.920	
	D3.7	0.778	0.924	

5. Discussion

5.1. Interpretation of Validity Results and Structural Consistency

Findings from the Exploratory Factor Analysis (EFA) provided evidence for the structural validity of the questionnaire. The Kaiser–Meyer–Olkin (KMO) values for all three factors were considerably higher than 0.70, and the results of Bartlett's test of sphericity reached significance. These outcomes indicate that the dataset was appropriate for factor analysis and revealed a well-defined latent factor structure.

Social Environmental Support: The EFA extracted five factors, which was consistent with the five theoretically established dimensions. Item B4.1 was removed because it lacked a significant loading on any factor. This streamlined the scale and eliminated a non-contributing item, confirming the construct's strong structural integrity. Subjective Well-being: The EFA extracted three principal components, matching the theoretically established three-dimensional structure. Items D3.2 and D3.3 were removed due to low loadings, while item D3.4 was removed because of cross-loading. These deletions were vital for improving the scale's convergent and discriminant validity, ensuring each item made a unique and strong contribution to its intended dimension. Survival Skills: The EFA extracted four common factors, which was largely consistent with the four theoretically established dimensions. However, because some of the dimensions were newly written during the initial development, EFA required the removal of more items (C3.5, C1.1, C2.2, C2.6) for this construct. This suggests that newly developed items carry a higher risk of psychometric issues and require more stringent refinement through EFA to ensure the final structure is empirically robust.

Based on these findings, the Confirmatory Factor Analysis (CFA) demonstrated that the model achieved an acceptable fit (for example, $\chi^2/df = 1.534$, RMSEA = 0.048, with CFI, IFI, and TLI all above 0.90). Furthermore, the Average Variance Extracted (AVE) for each latent construct exceeded 0.50, and the Composite Reliability (CR) indices were all higher than 0.70, supporting the presence of strong convergent validity. These results collectively show that the questionnaire not only presents a reasonable factor structure in exploratory analysis but also demonstrates a robust theoretical model fit in confirmatory analysis.

5.2. Interpretation of Reliability Results

The reliability analysis confirms that the measurement scales for social environmental support, survival skills, and subjective well-being all possess good reliability.

5.2.1. Social Environmental Support

The construct was composed of five dimensions: support from parents, teachers, peers, the local community, and online environments. The Cronbach's α coefficients corresponding to these five aspects were 0.822, 0.928, 0.937, 0.891, and 0.871, respectively. Since all coefficients were above 0.70, the scale demonstrated strong internal consistency. In addition, the Corrected Item-Total Correlation (CITC) for each item within every dimension exceeded 0.35, and eliminating any item did not result in an increase in the α coefficient. This demonstrates that each dimension has good statistical internal consistency.

5.2.2. Survival Skills

This construct is composed of four dimensions: the ability to adapt to academic life, the ability to enhance social capital, the ability to adapt to campus life, and skills for interacting with different communities. For the four dimensions, the Cronbach's α coefficients were 0.902, 0.770, 0.777, and 0.938. Since each coefficient was above the threshold of 0.70, the scale can be regarded as having satisfactory internal consistency. The CITC values for all items in all dimensions were

greater than 0.35, and no item removal improved the α value. Therefore, each dimension has good internal consistency, which supports subsequent validity verification and empirical analysis.

5.2.3. Subjective Well-being

This construct comprises three dimensions: academic achievement, social relationships, and psychological well-being. The reliability coefficients (Cronbach's α) for the three dimensions were 0.892, 0.918, and 0.934. As each of these values is greater than 0.70, the results demonstrate that the scale possesses strong internal consistency. The CITC values for all items across all dimensions were greater than 0.35, and the α value did not increase upon the removal of any item. Therefore, each dimension possesses good statistical internal consistency.

5.3. Overall Assessment and Implications

A full psychometric check, including reliability analysis, exploratory factor analysis, and confirmatory factor analysis, showed that the scales for social environmental support, survival skills, and subjective well-being are statistically sound. Problematic items were removed using clear statistical rules to improve the scale's structure and make measurements more accurate. This process made the final questionnaire more precise, consistent, and closer to the intended theoretical ideas. The step-by-step refinement shows that a strong measurement tool comes from testing and improving items, not from a perfect first draft. This process makes the questionnaire more reliable and valid than tools that only met initial requirements. The validated scales now give researchers a reliable way to measure these important constructs in education.

6. Conclusion

This study built and tested questionnaires to measure social environmental support, survival skills, and subjective well-being. Reliability and structural validity were checked using exploratory and confirmatory factor analyses. Items that did not meet the statistical criteria were removed. This created a refined scale with good internal consistency and a clear factor structure that matches the theoretical framework. The final questionnaire is reliable and valid for measuring these constructs in future research.

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