

Development and Validation of an Academic Resilience Tool for First-Born Learners in High School

Pavithra L.N.^{1*}

ABSTRACT

Background: Academic resilience is a vital construct for understanding how students overcome academic challenges, particularly among first-born children who often shoulder unique familial expectations. Despite the increasing interest in resilience research, culturally grounded tools tailored to this demographic are lacking in the Indian context. **Methods:** This study aimed to develop and validate a psychometric instrument to assess academic resilience among first-born school-going children in Tamil Nadu. Based on theoretical frameworks of birth order and resilience, a 41-item scale was initially developed, representing seven constructs. Content validation by experts was followed by item analysis and Exploratory Factor Analysis (EFA) to identify the underlying factor structure. Confirmatory Factor Analysis (CFA) was subsequently performed to validate the model. **Results:** The final version of the scale retained 23 items across five latent factors. The scale demonstrated strong internal consistency, with Cronbach's alpha ranging from .856 to .921, Composite Reliability (CR) of 0.758, and Average Variance Extracted (AVE) of 0.439. The Kaiser-Meyer-Olkin (KMO) value was 0.821, and Bartlett's Test of Sphericity was highly significant ($\chi^2 = 5485.796$, $df = 435$, $p < .001$). CFA results confirmed model robustness: CMIN/df = 3.169, GFI = 0.909, AGFI = 0.901, RMSEA = 0.0578, CFI = 0.923, TLI = 0.928, and IFI = 0.932. Parsimony indices (PGFI = 0.675, PCFI = 0.765, PNFI = 0.702) supported the model's adequacy. **Conclusions:** The newly developed Academic Resilience Scale for First-Born Learners in Tamil Nadu exhibits sound psychometric properties. It offers researchers and educators a culturally appropriate tool for identifying and supporting resilient academic behaviors in this unique population segment.

Keywords: Resilience Psychological, Birth Order, Psychometrics, Factor Analysis, Psychometrics, Adolescent Psychology

Birth order theory, as proposed by **Alfred Adler (1928)**, posits that a child's position within the family significantly shapes their personality, behavior, and coping mechanisms. According to his theory, first-born children develop traits of responsibility, achievement-oriented, and leadership roles due to the undivided attention and being accountable for younger children. **Sulloway (1996)** proposed in his work *Born to Rebel* that first-born children are more conforming, conscientious, and dominant. He argues that these traits stem from their role as surrogate parents or caregivers in the familial

¹Independent Researcher, Chennai, Tamil Nadu, India

*Corresponding Author

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hierarchy. First-borns mimic parental traits and they emphasize on alignment to the family values and social constructs (*Adler, 1928; Sulloway, 1996*). This could be due to conditioning from a young age to develop traits like self-discipline, independence, goal-orientation, and emotional regulation—all of which are the key components of academic resilience. However, this also poses great challenges to meet the increased expectations and pressures, particularly in collectivist societies such as India, where familial obligations and educational success are often intertwined. James Marcia's Identity Status Model (1966) expanded on Erikson's theory of psychosocial development by identifying **four identity statuses**: identity diffusion, foreclosure, moratorium, and identity achievement. Of these, **identity foreclosure** refers to individuals who commit to roles, values, and goals without undergoing a period of exploration or questioning. This status is often marked by conformity to parental or societal expectations. He posits that first-born children often exhibit foreclosure by adopting to the values and goals laid down by the parents. In collectivist society like India, family reputation, social standing, and educational achievement are closely linked to the academic success (Martin & Marsh, 2006). This results in early role internalization, a hallmark of identity foreclosure. Therefore, it can be hypothesized that first-borns may display higher levels of academic responsibility and resilience shaped by family expectations, responsibilities and societal norms. **Academic resilience**, defined as a student's capacity to effectively deal with academic challenges, recover from setbacks, and continue pursuing educational goals despite stress ((Martin & Marsh, 2006; Morales, 2008).), is influenced by both internal personality traits and external social pressures. The traits commonly found in first-borns—such as responsibility, perseverance, and self-efficacy—align closely with the characteristics of resilient students.

However, despite this advantage, there exists a **significant** research gap exists in the empirical validation of whether first-born children in within Tamil Nadu—demonstrate measurably higher levels of academic resilience.

Relevance to the Present Study

By developing a culturally grounded and psychometrically validated tool, the study seeks to offer a nuanced understanding of how resilience manifests in first-born students. It encourages educators, counselors, and psychologists to look beyond academic performance metrics and engage with the underlying developmental narratives that support or hinder students' academic perseverance.

REVIEW OF LITERATURE

Academic resilience refers to a student's ability to overcome adversity, stress, or challenges in academic contexts. Martin & Marsh (2006) asserted that resilient learners exhibit higher levels of motivation, navigate better in demanding situations and continue to perform well, even in the face of setbacks. Morales, E. E. (2008) emphasized, that resilience is not an organic trait, but it develops also by interactions with one's eco system such as family, peers, and school settings. In India, where academic excellence is seen as a pathway to social upward mobility and family honor, resilience becomes an essential trait for student success. Phillipson and Phillipson (2007) explored the dynamics involving parents' academic expectations, perceptions of their children's cognitive abilities, and levels of involvement at home and school influenced children's academic achievement, by focusing on the varied cultural and economic level. Benner, Boyle, and Sadler (2021) found that higher expectations from parent's and teachers positively correlated with academic pursuits. With reference to Indian context, Kumar (2021) in the context of parental bonding and academic resilience of the children found that parental bonding has a significant impact on

the academic resilience of the children. Letha (2013) investigated the perception of adolescents about their parents' influence in academic activities, indicating that parent's involvement reduced academic stress significantly.

Objectives

1. **To develop** a culturally and contextually grounded psychometric tool to assess academic resilience among first-born school-going children in Tamil Nadu.
2. **To explore** the underlying factor structure of academic resilience using Exploratory Factor Analysis (EFA).
3. **To confirm** the factor structure and validate the construct using Confirmatory Factor Analysis (CFA).
4. **To evaluate** the internal consistency and reliability of the developed academic resilience scale.

Hypotheses

1. **H1:** Academic resilience among first-born learners is a multidimensional construct comprising multiple underlying factors.
2. **H2:** The factor structure identified through exploratory factor analysis (EFA) will exhibit good model fit when tested using confirmatory factor analysis (CFA).
3. **H3:** The final version of the scale will demonstrate strong internal consistency across all factors.

METHOD AND MATERIALS

Significance of Tool Development

Academic resilience plays a crucial role in determining a student's capacity to overcome stress, recover from academic failure, and maintain motivation despite challenges. It positively correlates to characteristics like Hope, optimism, Efficacy and Resilience. Few research have given insights on the significant association to higher levels of academic resilience to greater emotional balance, as resilient individuals tend to exhibit better coping strategies, emotional regulation, and psychological adaptability in the face of academic stressors. The unavailability of a psychometrically sound and culturally relevant tool posed a challenge and limited the deeper insights particularly in the Indian context. While several scales on academic resilience exist globally, not many adequately reflect the lived realities of Indian students, particularly those in Tamil Nadu. Hence, there is a pressing need to create a tool that is culturally responsive, developmentally appropriate, and contextually grounded. In addition, first-born children often face heightened psychological and academic pressures due to their roles as leaders or caretakers of the siblings in the family. In traditional Indian households, especially within more conservative or achievement-oriented communities, the first-born is frequently subject to higher parental expectations, greater responsibility, and stricter academic demands.

The present tool was designed to cover **seven constructs** crucial to academic resilience: **Academic Resilience, Coping Strategies, Family Support, First-Born Challenges, Study Habits, Future Goals, and Role of the First-Born**. Tool construction was carried out with a strong psychometric foundation, ensuring both **reliability** and **validity**.

Research Design

A cross-sectional design was used to develop and validate the tool and it involved three phases. The first phase was item generation through literature review, followed by content

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reduction through expert opinion and finally an explanatory and confirmatory factor analysis was done to study the factors.

Participants and sample

The study was conducted among first-born high school students from various schools across Tamil Nadu. The sample consisted of 218 high school students. Schools included both CBSE and State Board institutions. A purposive sampling technique was used to include only first-born children across families.

Tool construction

The questionnaire initially consisted of **41 items**, categorized into seven constructs:

- 1. Academic Resilience**
- 2. Coping Strategies**
- 3. Family Support**
- 4. First-Born Challenges**
- 5. Study Habits**
- 6. Future Goals**
- 7. Role of First-Born**

Data Collection

The tool was administered to students, with consent obtained from the school, parents and the students. Responses were collected using a 5-point Likert scale ranging from *Strongly Disagree* to *Strongly Agree*.

Ethical consideration

Informed consent was obtained from all participants before proceeding to the questionnaire. There was a clear mention of the study's purpose, voluntary nature, and confidentiality measures (anonymous responses, aggregated reporting). No personally identifiable data was collected.

Data Analysis

The data analysis proceeded in two phases to examine the underlying structure of the construct using SPSS and AMOS. The sample consisted of 218 first-born students, which met the minimum sample size requirements for both exploratory and confirmatory factor analysis. Descriptive statistics were computed to examine the distribution, central tendency, and variability of item responses. To determine the underlying factor structure of the initial item pool, Exploratory Factor Analysis (EFA) was conducted using principal axis factoring with oblique rotation. Sampling adequacy was assessed using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. Based on the EFA results, a refined version of the scale was subjected to Confirmatory Factor Analysis (CFA) to validate the factor structure and assess model fit. Model fit was evaluated using multiple indices including the Chi-square/degrees of freedom ratio (χ^2/df), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). Reliability was assessed using Cronbach's alpha and composite reliability (CR). Convergent validity was evaluated through Average Variance Extracted (AVE) values, and discriminant validity was checked by comparing the square root of AVE with inter-factor correlations. All statistical decisions were made at a significance level of $p < 0.05$.

DISCUSSION

The developed Academic Resilience Scale demonstrated strong internal consistency, with the Cronbach's Alpha for 39 items is 0.844. This indicates very good internal consistency for the overall scale. The reliability analysis of the Academic Resilience scale identified several items with weak or problematic contributions to the overall internal consistency. Specifically, Item I_Q6 showed a near-zero corrected item-total correlation (-.004), and its removal would increase the Cronbach's alpha to .851, suggesting it may be misaligned with the rest of the scale. Item II_Q2 had a low correlation of .113, indicating it is a weak item and may benefit from revision. Similarly, Item II_Q3 demonstrated no correlation (0.000) with the total score, and removing it would improve the alpha to .855. Item III_Q3 showed a negative correlation (-.070), making it a strong candidate for removal. Among the items under domain IV, Items IV_Q2, IV_Q3, and IV_Q4 all had very low correlations (.048, .084, and .111 respectively), suggesting they do not contribute meaningfully to the overall scale consistency. Item V_Q1 also showed a negative correlation (-.010), which flags it as potentially problematic. Most notably, Item V_Q2 had a strongly negative corrected item-total correlation (-.322), and its deletion would significantly raise the Cronbach's alpha to .861, indicating it is likely inconsistent with the construct being measured. These findings suggest that, negative/zero correlations items are I_Q6, II_Q3, III_Q3, V_Q2 which are removed for high alpha increase and the weak correlation items are II_Q2, IV_Q2, IV_Q3, IV_Q4, V_Q1 which are also removed to enhance the scale's reliability and focus.

After removing the items with negative, zero, or weak corrected item-total correlations based on the initial reliability analysis, the revised reliability analysis was conducted on the remaining 30 items of the Academic Resilience scale. The results showed a significant improvement in internal consistency, with the Cronbach's Alpha rising to 0.913, indicating excellent reliability. The revised scale maintains strong internal coherence, with most items showing acceptable to high corrected item-total correlations, many exceeding .5, and a few as high as .830 (Item V_Q5) and .820 (Item VII_Q6). These values confirm that the remaining items contribute positively and consistently to the overall construct of academic resilience. Only Item IV_Q1 presented a very low correlation (.044), and Item III_Q4 (.199) was also relatively weak; however, their removal would have a marginal effect on the overall alpha, and they may still be retained depending on theoretical relevance. Overall, the refined 30-item version of the scale demonstrates high reliability and is statistically more robust than the original 39-item scale.

Exploratory Factor Analysis (EFA) was conducted on the 30-item Academic Resilience scale to assess the underlying factor structure and the suitability of the dataset for factor analysis. From the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy yielded a value of 0.821, which is well above the acceptable threshold of 0.60, indicating that the sample size is adequate and the data is appropriate for factor analysis. Additionally, Bartlett's Test of Sphericity was highly significant (Approx. Chi-Square = 5485.796, df = 435, $p < .001$), confirming that the correlation matrix is not an identity matrix and that there are significant relationships among the variables. These results collectively validate the appropriateness of proceeding with factor extraction and support the presence of latent constructs within the scale. The Total Variance Explained from the EFA conducted on the 30-item scale using Principal Axis Factoring revealed that seven factors had eigen values greater than 1, based on Kaiser's criterion (Fig 1). These seven factors together accounted for approximately 74.32% of the total variance before rotation, indicating a strong multidimensional structure within the scale. The first factor alone explained 34.12% of the variance, followed by the second and third factors, which contributed 12.21% and 9.95%

respectively. After extraction, these three factors collectively accounted for 53.35% of the total variance. The fourth to seventh factors added smaller, yet meaningful, portions of explained variance, ranging from 3.51% to 5.94%, cumulatively increasing the explained variance. Following rotation, the factor structure became clearer and more interpretable, with a more balanced distribution of item loadings across factors. This suggests that the scale captures multiple underlying dimensions, affirming the appropriateness of a multi-factor solution. The reliability analysis after EFA of Cronbach's alpha from 0.919 to 0.925.

The structure matrix derived from the EFA using Principal Axis Factoring with Oblimin rotation presents the pattern of relationships between the observed variables and the extracted seven factors. Items such as V_Q4, III_Q2, and II_Q1 demonstrated high loadings on Factor 1, indicating a strong association with the underlying construct represented by this factor. VII_Q6 and V_Q5 also showed substantial loadings on Factor 1, but with cross-loadings on other factors, suggesting their multidimensional nature. Factor 2 was defined most strongly by VI_Q1, VII_Q9, V_Q3, IV_Q1, and III_Q4, all of which loaded negatively, suggesting a distinct inverse relationship with the underlying latent construct. Factor 3 captured strong positive loadings from VII_Q1, VII_Q2, VII_Q3, VII_Q4, and VII_Q5, indicating this factor is dominated by items related to a shared theme within Section VII. Factor 4 had high loadings from I_Q2, I_Q1, and I_Q3, reflecting the coherence of items in Section I. Similarly, Factor 5 was shaped primarily by I_Q4 and I_Q5, implying another distinguishable construct within Section I. Factor 6 was anchored by VI_Q3, VI_Q2, VII_Q8, and II_Q4, with VI_Q3 showing the strongest association, and VII_Q8 presenting moderate cross-loadings on Factor 1. Lastly, Factor 7 comprised mainly VII_Q7 and IV_Q5, which loaded significantly, indicating a unique latent dimension associated with these items. Therefore, the structure matrix highlights the multidimensionality of the scale and the logical grouping of items within the extracted factors, with some items showing meaningful cross-loadings across factors, which is consistent with the use of an oblique rotation method like Oblimin.

The Factor Correlation Matrix reveals meaningful relationships among the seven extracted factors underlying the academic resilience of first-born children. Factor 1, associated with Factor 6 ($r = .388$) and Factor 7 ($r = .324$). Factor 3 is moderately correlated with Factor 4 ($r = .258$) and Factor 5 ($r = .262$). Factor 6, shows consistent and meaningful correlations with several other factors—particularly with Factors 1, 4, and 7. Conversely, Factor 2, demonstrates negative correlations with Factor 1 ($r = -.159$), Factor 3 ($r = -.233$), and Factor 4 ($r = -.130$). Therefore, the matrix supports a theoretically sound structure wherein the academic experience of first-born children is influenced by a combination of other factors. The use of oblique rotation (Oblimin) is justified by these inter-factor correlations, affirming that the constructs are related yet distinct. In EFA, although 30 questionnaire items were initially included, only 26 items were successfully loaded onto interpretable factors, leaving 4 items unassigned. Items III_Q5 (0.253), III_Q1(0.349), II_Q6 (0.367), II_Q5 (0.374) with low extraction communalities (typically below 0.4) suggest that a significant portion of their variance is not explained by the factor solution. These are the lowest extraction values in your data and correspond to the items that didn't appear in the rotated structure matrix. This strongly suggests that these 4 items were not retained in the factor solution. After conducting EFA, the internal consistency of each of the seven identified factors was reassessed using Cronbach alpha reliability estimates and presented Factor 1, which includes items such as II_Q1, III_Q2, V_Q4, V_Q5, and VII_Q6, exhibited excellent reliability with a Cronbach's alpha of 0.909, indicating strong internal consistency among items. Factor 2, which includes items III_Q4, IV_Q1, V_Q3, VI_Q1, and VII_Q9, showed a considerably lower alpha of

0.515, suggesting moderate to weak reliability, possibly due to the presence of items with negative or low item-total correlations (e.g., IV_Q1 with -0.514), indicating conceptual misalignment among items in this factor. Factor 3, composed of VII_Q1, VII_Q2, VII_Q3, VII_Q4, and VII_Q5, demonstrated strong reliability with an alpha of 0.919. Similarly, Factor 4, with items I_Q1, I_Q2, and I_Q3, showed good reliability ($\alpha = 0.817$). Factor 5, consisting of I_Q4 and I_Q5, produced a Cronbach's alpha of 0.708, a satisfactory level for two-item scales. Factor 6, including II_Q4, VI_Q2, VI_Q3, and VII_Q8, achieved a Cronbach's alpha of 0.856, indicating strong internal consistency. Lastly, Factor 7, with IV_Q5 and VII_Q7, had the lowest reliability among all, at 0.607, which is marginally acceptable for two items.

Based on the reliability analysis after EFA, it is advisable to consider removing a few items to improve the internal consistency of the respective factors. In Factor 1, the item II_Q1 (I talk to someone when I feel stressed about school) has a corrected item-total correlation of 0.599, and its removal would increase the Cronbach alpha from 0.909 to 0.921. Although the correlation is acceptable, removing the item slightly improves internal reliability and may help achieve a more thematically coherent factor. In Factor 2, the item IV_Q1 (I feel more pressure to succeed because I'm the eldest) demonstrates a negative item-total correlation of -0.514, which suggests it does not align well with the construct measured by the other items. Its removal would significantly improve the factor's Cronbach's alpha from 0.515 to 0.814, and is therefore strongly recommended. For Factor 3, the item VII_Q5 (I feel proud to take responsibility as a first-born) has a good corrected item-total correlation of 0.707; however, removing it would result in a slight increase in Cronbach's alpha from 0.919 to 0.925. While its deletion is not essential, it may be considered if a more concise and tightly focused scale is preferred. Therefore, the removal of these items can enhance the psychometric quality of the questionnaire by improving internal validity.

The results of the Confirmatory Factor Analysis (CFA) presented indicate that the measurement model demonstrates strong construct validity (Figure 2). The standardized factor loadings for the majority of items are high, generally exceeding 0.85, signifying that each observed variable is a strong indicator of its respective latent construct. The items under Factor 1 (V_Q4 = 0.887, V_Q5 = 0.904) and Factor 3 (VII_Q1 = 0.898, VII_Q4 = 0.905) show particularly high loadings, suggesting strong internal consistency within these constructs. All path coefficients are statistically significant at the $p < .001$ level, as evidenced by the critical ratios (C.R.) far exceeding the threshold value of 1.96, reinforcing the relevance of each indicator within its factor. One item under Factor 5 (I_Q4), shows a standardized estimate of 0.780, which falls within the acceptable range and maintains statistical significance. While slightly lower than other indicators in the model, this item can be retained if conceptually justified. Therefore, the measurement model displays adequate convergent validity, with all items contributing meaningfully to their respective constructs.

The model fit indices shown further support the robustness of the CFA model. The normed Chi-square (CMIN/df) value is 3.169, which is below the commonly accepted threshold of 5, indicating an acceptable model fit. Absolute fit indices such as GFI (0.909) and AGFI (0.901) exceed the minimum recommended values of 0.90, and the RMSEA value of 0.0578 suggests a close approximation to model-data fit. Incremental fit indices, including CFI (0.923), TLI (0.928), and IFI (0.932), all surpass the 0.90 threshold, indicating excellent comparative model fit. Additionally, the parsimony indices (PGFI = 0.675, PCFI = 0.765, and PNFI = 0.702) are all above the acceptable level of 0.50, confirming that the model balances complexity with explanatory power. Hence, the CFA model demonstrates a good

overall fit and strong measurement properties. The latent constructs are well-represented by their observed variables. Furthermore, the CFA results validate the revised 23-item scale as a reliable and valid measurement model. It shows strong factorial validity, good model fit, and theoretical coherence, making it appropriate for use in further research on academic resilience study. The results provide empirical support for Hypothesis reinforcing the assumptions.

CONCLUSION

The present study successfully established the factorial structure of the through rigorous exploratory and confirmatory factor analyses. The results of the EFA revealed a clear and interpretable factor structure, which was further supported by the CFA, demonstrating a good model fit with acceptable indices (CFI, TLI, RMSEA, SRMR). These findings confirm the construct validity of the scale and suggest that it is a reliable and psychometrically sound instrument for assessing academic resilience among first-born children. The validated scale can serve as a useful tool for both researchers and practitioners in educational and psychological contexts. Future studies may explore its predictive validity and applicability across diverse populations.

Key Messages

1. Developed a reliable and valid academic resilience tool tailored for first-born high school students in Tamil Nadu.
2. The scale demonstrated good psychometric properties through exploratory and confirmatory factor analysis.
3. Findings highlight the unique role of first-born responsibilities in academic resilience.
4. Tool can assist educators and psychologists in identifying and supporting resilient learners.
5. Further research can expand its application to diverse Indian populations.

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Conflict of Interest

The author declares that there are no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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TABLES AND FIGURES**1. Reliability Analysis****Table 1: Reliability Statistics**

Cronbach's Alpha	N of Items
0.844	39

From Table 1, the Cronbach's Alpha for 39 items is 0.844. This indicates very good internal consistency for the overall scale. But meanwhile, corrected item-total correlation and Cronbach's alpha if item deleted has been verified in the Table 2 whether it is suitable for further analysis.

Table 2: Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I Q1	152.53	175.697	.405	.838
I Q2	152.49	173.560	.434	.837
I Q3	152.54	170.471	.518	.835
I Q4	152.52	171.652	.415	.837
I Q5	152.22	174.105	.398	.838
I Q6	153.70	184.348	-.004	.851
II Q1	152.63	174.879	.587	.836
II Q2	153.38	183.111	.113	.844
II Q3	153.63	183.460	.000	.855
II Q4	152.60	176.167	.529	.837
II Q5	152.44	175.547	.319	.840
II Q6	152.33	177.542	.316	.840
III Q1	152.59	175.284	.289	.842
III Q2	152.05	172.551	.629	.834
III Q3	153.72	186.569	-.070	.852
III Q4	152.40	178.804	.189	.844
III Q5	152.30	176.323	.277	.842
IV Q1	153.17	178.731	.277	.841
IV Q2	153.02	183.668	.048	.847
IV Q3	153.04	182.782	.084	.846
IV Q4	153.47	182.905	.111	.845
IV Q5	152.56	178.413	.394	.839
V Q1	153.35	185.472	-.010	.846
V Q2	154.94	195.107	-.322	.861
V Q3	152.21	176.941	.418	.838
V Q4	152.12	171.064	.618	.833
V Q5	152.10	170.736	.694	.832
VI Q1	152.41	178.648	.209	.844
VI Q2	152.76	173.307	.613	.834
VI Q3	152.73	173.968	.582	.835
VII Q1	151.99	173.770	.555	.835
VII Q2	152.04	171.224	.613	.833
VII Q3	152.12	174.395	.479	.837
VII Q4	152.04	171.943	.615	.834
VII Q5	152.22	170.421	.529	.834
VII Q6	151.97	173.653	.710	.834
VII Q7	152.10	175.433	.460	.837
VII Q8	152.64	174.590	.624	.835
VII Q9	152.20	176.297	.385	.839

From the Table 2, the reliability analysis of the Academic Resilience scale identified several items with weak or problematic contributions to the overall internal consistency. Specifically, Item I_Q6 showed a near-zero corrected item-total correlation (-.004), and its removal would increase the Cronbach’s alpha to .851, suggesting it may be misaligned with the rest of the scale. Item II_Q2 had a low correlation of .113, indicating it is a weak item and may benefit from revision. Similarly, Item II_Q3 demonstrated no correlation (0.000) with the total score, and removing it would improve the alpha to .855. Item III_Q3 showed a negative correlation (-.070), making it a strong candidate for removal. Among the items under domain IV, Items IV_Q2, IV_Q3, and IV_Q4 all had very low correlations (.048, .084, and .111 respectively), suggesting they do not contribute meaningfully to the overall scale consistency. Item V_Q1 also showed a negative correlation (-.010), which flags it as potentially problematic. Most notably, Item V_Q2 had a strongly negative corrected item-total correlation (-.322), and its deletion would significantly raise the Cronbach’s alpha to .861, indicating it is likely inconsistent with the construct being measured. These findings suggest that, negative/zero correlations items are I_Q6, II_Q3, III_Q3, V_Q2 which are removed for high alpha increase and the weak correlation items are II_Q2, IV_Q2, IV_Q3, IV_Q4, V_Q1 which are also removed to enhance the scale’s reliability and focus.

Table 3: Revised Reliability Statistics

Cronbach's Alpha	N of Items
0.913	30

After removing the items with negative, zero, or weak corrected item-total correlations based on the initial reliability analysis, the revised reliability analysis was conducted on the remaining 30 items of the Academic Resilience scale. The results showed a significant improvement in internal consistency, with the Cronbach’s Alpha rising to 0.913, indicating excellent reliability.

The revised scale maintains strong internal coherence, with most items showing acceptable to high corrected item-total correlations, many exceeding .5, and a few as high as .830 (Item V_Q5) and .820 (Item VII_Q6). These values confirm that the remaining items contribute positively and consistently to the overall construct of academic resilience (Table 4).

Only Item IV_Q1 presented a very low correlation (.044), and Item III_Q4 (.199) was also relatively weak; however, their removal would have a marginal effect on the overall alpha, and they may still be retained depending on theoretical relevance. Overall, the refined 30-item version of the scale demonstrates high reliability and is statistically more robust than the original 39-item scale.

Table 4: Revised Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I_Q1	124.79	190.045	.413	.912
I_Q2	124.75	187.035	.472	.911
I_Q3	124.80	181.636	.635	.908
I_Q4	124.78	186.161	.412	.913
I_Q5	124.48	188.269	.410	.912
II_Q1	124.89	189.533	.578	.910
II_Q4	124.86	191.686	.474	.911
II_Q5	124.70	187.279	.418	.912
II_Q6	124.60	190.537	.385	.912

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	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
III_Q1	124.85	189.066	.313	.915
III_Q2	124.31	185.145	.719	.908
III_Q4	124.67	193.182	.199	.916
III_Q5	124.56	188.118	.370	.913
IV_Q1	125.43	198.845	.044	.917
IV_Q5	124.83	194.375	.320	.913
V_Q3	124.47	187.642	.615	.909
V_Q4	124.38	181.997	.771	.906
V_Q5	124.36	182.269	.830	.906
VI_Q1	124.67	190.554	.305	.914
VI_Q2	125.02	187.433	.628	.909
VI_Q3	124.99	188.590	.574	.910
VII_Q1	124.25	187.342	.598	.909
VII_Q2	124.30	185.740	.606	.909
VII_Q3	124.39	188.146	.512	.910
VII_Q4	124.30	185.795	.640	.908
VII_Q5	124.48	184.048	.555	.909
VII_Q6	124.23	186.288	.820	.907
VII_Q7	124.36	185.991	.649	.908
VII_Q8	124.90	190.014	.570	.910
VII_Q9	124.46	187.613	.528	.910

2. Descriptive Analysis

Table 5: Descriptive Statistics for 30 items of ARS

Scales	N		Mean	Variance	Skewness	Kurtosis
	Valid	Missing				
I_Q1	218	0	4.13	.743	-.566	-.695
I_Q2	218	0	4.17	.956	-.834	-.278
I_Q3	218	0	4.13	1.089	-.775	-.591
I_Q4	218	0	4.14	1.358	-1.039	-.399
I_Q5	218	0	4.45	1.014	-1.871	2.521
II_Q1	218	0	4.03	.446	-.786	1.695
II_Q4	218	0	4.06	.420	-1.395	5.417
II_Q5	218	0	4.22	1.134	-1.061	-.308
II_Q6	218	0	4.33	.766	-1.031	-.047
III_Q1	218	0	4.07	1.386	-1.067	.079
III_Q2	218	0	4.62	.578	-2.030	3.304
III_Q4	218	0	4.26	1.245	-1.456	1.300
III_Q5	218	0	4.36	1.228	-1.782	2.305
IV_Q1	218	0	3.50	.712	.618	-.116
IV_Q5	218	0	4.10	.423	-1.319	5.217
V_Q3	218	0	4.45	.544	-1.092	.206
V_Q4	218	0	4.55	.738	-1.796	2.057
V_Q5	218	0	4.56	.625	-1.880	2.813
VI_Q1	218	0	4.26	1.123	-1.140	-.140
VI_Q2	218	0	3.90	.539	-.764	.927
VI_Q3	218	0	3.94	.530	-.984	1.541
VII_Q1	218	0	4.67	.599	-2.919	9.196
VII_Q2	218	0	4.63	.732	-2.722	7.350
VII_Q3	218	0	4.54	.701	-2.200	5.199
VII_Q4	218	0	4.63	.659	-2.563	6.885
VII_Q5	218	0	4.44	1.059	-2.078	3.674
VII_Q6	218	0	4.70	.387	-2.117	4.011

Scales	N		Mean	Variance	Skewness	Kurtosis
	Valid	Missing				
VII_Q7	218	0	4.57	.624	-1.841	2.556
VII_Q8	218	0	4.02	.419	-.845	2.123
VII_Q9	218	0	4.47	.720	-1.520	1.361

After the removal of items with negative, zero, or weak item-total correlations, a refined 30-item Academic Resilience scale was finalized, and descriptive statistics were performed on the updated dataset and presented in Table 5. All 30 items received valid responses from 218 participants, with no missing values, indicating complete data for the entire sample. The mean scores for the items ranged from 3.50 (IV_Q1) to 4.70 (VII_Q6), with most items having means above 4.0. This suggests that respondents generally agreed or strongly agreed with the items, indicating a high level of perceived academic resilience. The item-wise variances ranged from 0.387 (VII_Q6) to 1.386 (III_Q1), reflecting moderate to low variability in responses. Skewness values were predominantly negative, ranging from -0.566 to -2.919, indicating that the distribution of responses was skewed toward higher scores. This further supports the observation that most participants endorsed the resilience-related statements positively. Kurtosis values varied, with some items (e.g., VII_Q1, VII_Q2, and IV_Q5) showing high positive kurtosis, suggesting peaked distributions with less spread around the mean. A few items displayed near-normal or slightly flat distributions. These patterns, including the presence of ceiling effects in some items, should be considered in future refinements of the scale. Overall, the consistency in item responses, along with the earlier Cronbach’s Alpha of 0.913, confirms the strong internal reliability and robustness of the 30-item Academic Resilience scale.

3. Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) was conducted on the 30-item Academic Resilience scale to assess the underlying factor structure and the suitability of the dataset for factor analysis. From the Table 6, the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy yielded a value of 0.821, which is well above the acceptable threshold of 0.60, indicating that the sample size is adequate and the data is appropriate for factor analysis. Additionally, Bartlett’s Test of Sphericity was highly significant (Approx. Chi-Square = 5485.796, $df = 435, p < .001$), confirming that the correlation matrix is not an identity matrix and that there are significant relationships among the variables. These results collectively validate the appropriateness of proceeding with factor extraction and support the presence of latent constructs within the scale.

Table 6: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.821
Bartlett's Test of Sphericity	Approx. Chi-Square	5485.796
	df	435
	Sig.	.000

The communalities Table 7 from the Exploratory Factor Analysis (EFA) using Principal Axis Factoring reveals the proportion of each item's variance that can be explained by the extracted factors. Initially, all items were assumed to have a communality of 1.000, indicating total variance. After extraction, most items retained substantial communalities, demonstrating good representation by the underlying factor structure.

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Specifically, several items demonstrated high extracted communalities, such as V_Q5 (.892), VII_Q1 (.880), VII_Q6 (.840), VI_Q3 (.827), and I_Q2 (.823), indicating that a large portion of their variance is accounted for by the common factors. Items such as III_Q5 (.253), III_Q1 (.349), and II_Q6 (.367) showed relatively low communalities, suggesting weaker representation by the extracted factors and may be candidates for further review or refinement. In overall, the extracted communalities suggest that the majority of items are meaningfully contributing to the underlying factor structure of the scale.

Table 7: Communalities in EFA

	Initial	Extraction
I Q1	.647	.749
I Q2	.689	.823
I Q3	.710	.648
I Q4	.631	.793
I Q5	.618	.527
II Q1	.738	.578
II Q4	.745	.516
II Q5	.492	.374
II Q6	.556	.367
III Q1	.467	.349
III Q2	.780	.694
III Q4	.598	.411
III Q5	.408	.253
IV Q1	.751	.710
IV Q5	.686	.588
V Q3	.825	.777
V Q4	.808	.739
V Q5	.914	.892
VI Q1	.849	.816
VI Q2	.808	.721
VI Q3	.861	.827
VII Q1	.841	.880
VII Q2	.833	.804
VII Q3	.855	.809
VII Q4	.861	.773
VII Q5	.673	.626
VII Q6	.891	.840
VII Q7	.838	.847
VII Q8	.737	.650
VII Q9	.726	.695

Extraction Method: Principal Axis Factoring.

The Total Variance Explained Table 8 from the EFA conducted on the 30-item scale using Principal Axis Factoring revealed that seven factors had eigenvalues greater than 1, based on Kaiser's criterion (Figure 1). These seven factors together accounted for approximately 74.32% of the total variance before rotation, indicating a strong multidimensional structure within the scale. The first factor alone explained 34.12% of the variance, followed by the second and third factors, which contributed 12.21% and 9.95% respectively. After extraction, these three factors collectively accounted for 53.35% of the total variance. The fourth to seventh factors added smaller, yet meaningful, portions of explained variance, ranging from 3.51% to 5.94%, cumulatively increasing the explained variance. Following rotation, the factor structure became clearer and more interpretable, with a more balanced distribution of item loadings across factors. This suggests that the scale captures multiple underlying dimensions, affirming the appropriateness of a multi-factor solution.

Table 8: Total Variance Explained in EFA

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	10.236	34.120	34.120	9.961	33.205	33.205	5.122
2	3.664	12.212	46.332	3.351	11.170	44.375	4.258
3	2.986	9.953	56.285	2.691	8.971	53.346	6.388
4	1.781	5.936	62.221	1.502	5.006	58.352	3.956
5	1.407	4.690	66.912	1.012	3.372	61.724	2.143
6	1.168	3.894	70.806	.809	2.698	64.422	4.917
7	1.054	3.513	74.319	.750	2.501	66.923	3.800
8	.917	3.055	77.374				
9	.856	2.854	80.228				
10	.727	2.424	82.652				
11	.643	2.143	84.795				
12	.537	1.788	86.583				
13	.488	1.627	88.210				
14	.482	1.605	89.816				
15	.437	1.457	91.272				
16	.354	1.180	92.452				
17	.321	1.071	93.524				
18	.253	.845	94.369				
19	.243	.812	95.180				
20	.218	.725	95.906				
21	.212	.708	96.614				
22	.192	.639	97.253				
23	.168	.559	97.812				
24	.157	.524	98.336				
25	.123	.411	98.747				
26	.105	.350	99.097				
27	.089	.296	99.393				
28	.076	.253	99.646				
29	.060	.199	99.844				
30	.047	.156	100.000				

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

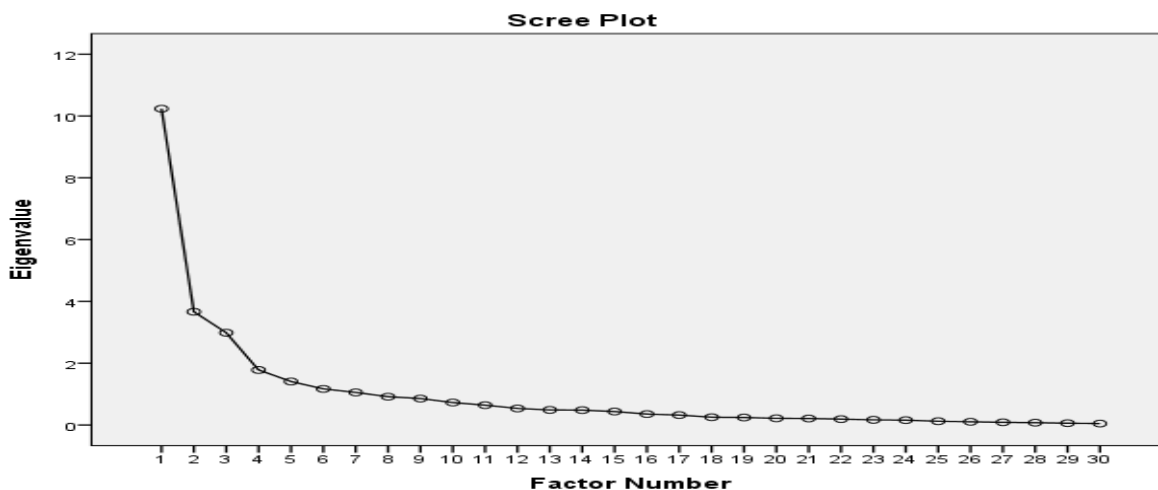


Figure 1: Scree Plot for EFA

Table 9: Structure Matrix in EFA

	Factor						
	1	2	3	4	5	6	7
V_Q4	.688		.500				
III_Q2	.682					.536	
II_Q1	.660					.538	
VII_Q6	.653		.633				.527
V_Q5	.625	-.524				.603	.569
II_Q5	.597						
II_Q6	.541						
III_Q1	.509						
III_Q5							
VI_Q1		-.898					
VII_Q9		-.766					
V_Q3	.531	-.724					
IV_Q1		.687					
III_Q4		-.554					
VII_Q1			.918				
VII_Q3			.863				
VII_Q4			.857				
VII_Q2			.855				
VII_Q5			.723				
I_Q2				.862			
I_Q1				.809			
I_Q3				.711			
I_Q4					.872		
I_Q5			.543		.563		
VI_Q3	.508					.889	
VI_Q2						.788	
VII_Q8						.671	.590
II_Q4						.610	
VII_Q7							.757
IV_Q5							.697

Extraction Method: Principal Axis Factoring.
 Rotation Method: Oblimin with Kaiser Normalization.

The structure matrix Table 9 derived from the EFA using Principal Axis Factoring with Oblimin rotation presents the pattern of relationships between the observed variables and the extracted seven factors. Items such as V_Q4, III_Q2, and II_Q1 demonstrated high loadings on Factor 1, indicating a strong association with the underlying construct represented by this factor. VII_Q6 and V_Q5 also showed substantial loadings on Factor 1, but with cross-loadings on other factors, suggesting their multidimensional nature. Factor 2 was defined most strongly by VI_Q1, VII_Q9, V_Q3, IV_Q1, and III_Q4, all of which loaded negatively, suggesting a distinct inverse relationship with the underlying latent construct. Factor 3 captured strong positive loadings from VII_Q1, VII_Q2, VII_Q3, VII_Q4, and VII_Q5, indicating this factor is dominated by items related to a shared theme within Section VII. Factor 4 had high loadings from I_Q2, I_Q1, and I_Q3, reflecting the coherence of items in Section I. Similarly, Factor 5 was shaped primarily by I_Q4 and I_Q5, implying another distinguishable construct within Section I. Factor 6 was anchored by VI_Q3, VI_Q2, VII_Q8, and II_Q4, with VI_Q3 showing the strongest association, and VII_Q8 presenting moderate cross-loadings on Factor 1. Lastly, Factor 7 comprised mainly VII_Q7 and IV_Q5, which loaded significantly, indicating a unique latent dimension associated with these items. Therefore, the structure matrix highlights the multidimensionality of the scale and the logical grouping of items within the extracted factors, with some items showing meaningful

cross-loadings across factors, which is consistent with the use of an oblique rotation method like Oblimin.

Table 10: Factor Correlation Matrix

Factor	1	2	3	4	5	6	7
1	1.000	-.159	.194	.215	.085	.388	.324
2	-.159	1.000	-.233	-.130	.093	-.020	.019
3	.194	-.233	1.000	.258	.262	.245	.281
4	.215	-.130	.258	1.000	.165	.287	.200
5	.085	.093	.262	.165	1.000	.120	.087
6	.388	-.020	.245	.287	.120	1.000	.297
7	.324	.019	.281	.200	.087	.297	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.

The Factor Correlation Matrix Table 10 reveals meaningful relationships among the seven extracted factors underlying the academic resilience of first-born children. Factor 1, associated with Factor 6 ($r = .388$) and Factor 7 ($r = .324$). Factor 3 is moderately correlated with Factor 4 ($r = .258$) and Factor 5 ($r = .262$). Factor 6, shows consistent and meaningful correlations with several other factors—particularly with Factors 1, 4, and 7. Conversely, Factor 2, demonstrates negative correlations with Factor 1 ($r = -.159$), Factor 3 ($r = -.233$), and Factor 4 ($r = -.130$). Therefore, the matrix supports a theoretically sound structure wherein the academic experience of first-born children is influenced by a combination of other factors. The use of oblique rotation (Oblimin) is justified by these inter-factor correlations, affirming that the constructs are related yet distinct.

In EFA, although 30 questionnaire items were initially included, only 26 items were successfully loaded onto interpretable factors, leaving 4 items unassigned. Items III_Q5 (0.253), III_Q1(0.349), II_Q6 (0.367), II_Q5 (0.374) with low extraction communalities (typically below 0.4) suggest that a significant portion of their variance is not explained by the factor solution. These are the lowest extraction values in your data and correspond to the items that didn't appear in the rotated structure matrix. This strongly suggests that these 4 items were not retained in the factor solution.

Table 11: Revised Reliability Statistics after EFA

Factors	Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach Alpha
Factor 1	II Q1	18.43	7.527	.599	.921	0.909
	III Q2	17.84	6.449	.813	.879	
	V Q4	17.91	6.061	.796	.885	
	V Q5	17.89	6.242	.835	.874	
	VII Q6	17.76	6.994	.846	.878	
Factor 2	III Q4	16.67	4.285	.402	.369	0.515
	IV Q1	17.44	9.326	-.514	.814	
	V Q3	16.48	4.831	.621	.285	
	VI Q1	16.68	3.611	.659	.144	
	VII Q9	16.47	4.453	.618	.248	
Factor 3	VII Q1	18.24	9.586	.832	.895	0.919
	VII Q2	18.29	9.137	.831	.893	
	VII Q3	18.38	9.452	.780	.903	
	VII Q4	18.29	9.285	.854	.889	
	VII Q5	18.47	8.794	.707	.925	

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Factors	Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach Alpha
Factor 4	I_Q1	8.30	3.383	.629	.791	0.817
	I_Q2	8.26	2.812	.717	.697	
	I_Q3	8.31	2.712	.674	.747	
Factor 5	I_Q4	4.45	1.014	.554	--	0.708
	I_Q5	4.14	1.358	.554	--	
Factor 6	II_Q4	11.86	3.437	.614	.850	0.856
	VI_Q2	12.02	2.889	.762	.789	
	VI_Q3	11.99	2.848	.794	.774	
	VII_Q8	11.90	3.396	.636	.842	
Factor 7	IV_Q5	4.57	.624	.444	--	0.607
	VII_Q7	4.10	.423	.444	--	

After conducting EFA, the internal consistency of each of the seven identified factors was reassessed using Cronbach's alpha reliability estimates and presented in Table 11. Factor 1, which includes items such as II_Q1, III_Q2, V_Q4, V_Q5, and VII_Q6, exhibited excellent reliability with a Cronbach's alpha of 0.909, indicating strong internal consistency among items. Factor 2, which includes items III_Q4, IV_Q1, V_Q3, VI_Q1, and VII_Q9, showed a considerably lower alpha of 0.515, suggesting moderate to weak reliability, possibly due to the presence of items with negative or low item-total correlations (e.g., IV_Q1 with -0.514), indicating conceptual misalignment among items in this factor. Factor 3, composed of VII_Q1, VII_Q2, VII_Q3, VII_Q4, and VII_Q5, demonstrated strong reliability with an alpha of 0.919. Similarly, Factor 4, with items I_Q1, I_Q2, and I_Q3, showed good reliability ($\alpha = 0.817$). Factor 5, consisting of I_Q4 and I_Q5, produced a Cronbach's alpha of 0.708, a satisfactory level for two-item scales. Factor 6, including II_Q4, VI_Q2, VI_Q3, and VII_Q8, achieved a Cronbach's alpha of 0.856, indicating strong internal consistency. Lastly, Factor 7, with IV_Q5 and VII_Q7, had the lowest reliability among all, at 0.607, which is marginally acceptable for two items.

Based on the reliability analysis after EFA, it is advisable to consider removing a few items to improve the internal consistency of the respective factors. In Factor 1, the item II_Q1 (I talk to someone when I feel stressed about school) has a corrected item-total correlation of 0.599, and its removal would increase the Cronbach's alpha from 0.909 to 0.921. Although the correlation is acceptable, removing the item slightly improves internal reliability and may help achieve a more thematically coherent factor. In Factor 2, the item IV_Q1 (I feel more pressure to succeed because I'm the eldest) demonstrates a negative item-total correlation of -0.514, which suggests it does not align well with the construct measured by the other items. Its removal would significantly improve the factor's Cronbach's alpha from 0.515 to 0.814, and is therefore strongly recommended. For Factor 3, the item VII_Q5 (I feel proud to take responsibility as a first-born) has a good corrected item-total correlation of 0.707; however, removing it would result in a slight increase in Cronbach's alpha from 0.919 to 0.925. While its deletion is not essential, it may be considered if a more concise and tightly focused scale is preferred. Therefore, the removal of these items can enhance the psychometric quality of the questionnaire by improving internal validity.

Table 12: Reliability and Validity Indicators for Revised 23-items Scale

Factors	No. of Items	Cronbach Alpha	Composite Reliability (CR)	Average Variance Explained (AVE)
Factor1	4	0.921	0.758	0.439
Factor2	4	0.814	0.83	0.556
Factor3	4	0.919	0.928	0.763
Factor4	3	0.817	0.838	0.634
Factor5	2	0.708	0.691	0.539
Factor6	4	0.856	0.832	0.558
Factor7	2	0.607	0.692	0.529

After the removal of three items, II_Q1, IV_Q1, and VII_Q5, to enhance the internal consistency of the scale, the remaining 23 items were re-analyzed across the seven identified factors. The revised reliability and validity indicators demonstrate improved psychometric properties. Factor 1 recorded a high Cronbach's Alpha of 0.921, indicating excellent internal consistency, with a Composite Reliability (CR) of 0.758 and an Average Variance Extracted (AVE) of 0.439. Although the AVE is slightly below the recommended threshold of 0.50, the CR suggests acceptable convergent validity. Factor 2 showed a Cronbach's Alpha of 0.814, CR of 0.83, and AVE of 0.556, reflecting strong reliability and valid construct representation. Factor 3 demonstrated excellent psychometric strength, with an Alpha of 0.919, CR of 0.928, and a high AVE of 0.763. Factor 4 also indicated good reliability, with a Cronbach's Alpha of 0.817, CR of 0.838, and AVE of 0.634. Despite being composed of only two items, Factor 5 maintained acceptable levels, with an Alpha of 0.708, CR of 0.691, and AVE of 0.539. Factor 6 showed strong consistency with an Alpha of 0.856, CR of 0.832, and AVE of 0.558. Factor 7, though displaying the lowest reliability score with a Cronbach's Alpha of 0.607, had moderate CR (0.692) and acceptable AVE (0.529), suggesting it remains a marginally reliable dimension in exploratory contexts. Therefore, the revised 23-item scale demonstrates solid internal reliability and acceptable construct validity, supporting its use in assessing academic resilience among first-born children.

Table 13: Linkage and Estimation for Confirmatory Factor Analysis for Revised 23-items

Indicators			Unstandardised Estimate	Standardised Estimate	S.E.	C.R.	P
V Q4	<---	Factor1	1.000	.887			
III Q2	<---	Factor1	1.007	.893	.053	19.132	***
VII Q6	<---	Factor1	.991	.879	.054	18.503	***
V Q5	<---	Factor1	1.019	.904	.052	19.633	***
III Q4	<---	Factor2	1.000	.884			
V Q3	<---	Factor2	1.013	.895	.053	18.952	***
VI Q1	<---	Factor2	.996	.880	.054	18.333	***
VII Q9	<---	Factor2	1.003	.886	.054	18.597	***
VII Q1	<---	Factor3	1.000	.898			
VII Q2	<---	Factor3	1.002	.900	.049	20.263	***
VII Q3	<---	Factor3	1.004	.902	.049	20.361	***
VII Q4	<---	Factor3	1.008	.905	.049	20.560	***
I Q3	<---	Factor4	1.000	.879			
I Q2	<---	Factor4	1.023	.899	.058	17.705	***
I Q1	<---	Factor4	.993	.872	.058	17.023	***
I Q5	<---	Factor5	1.000	.823			
I Q4	<---	Factor5	.182	.780	.011	12.444	***
VII Q8	<---	Factor6	1.000	.885			
VI Q3	<---	Factor6	.987	.873	.055	18.009	***
VI Q2	<---	Factor6	.991	.877	.055	18.166	***
II Q4	<---	Factor6	1.006	.890	.054	18.706	***

Indicators			Unstandardised Estimate	Standardised Estimate	S.E.	C.R.	P
VII_Q7	<---	Factor7	1.000	.819			
IV_Q5	<---	Factor7	1.182	.968	.230	15.146	***

Table 14: Model Fit Indices for Confirmatory Factor Analysis for Revised 23-items

Name of Index	Index Value	Adequate fit
CMIN/Df (normed/relative Chi-Square)	3.169	Less than 5
GFI (Goodness of fit)	0.909	Greater than 0.90
AGFI (Adjusted Goodness of Fit)	0.901	Greater than 0.90
RMSEA (Root Mean Square of Approximation)	0.0578	Less than 0.10
NFI (Normal Fit Index)	0.899	Greater than 0.90
CFI (Comparative Fit Index)	0.923	Greater than 0.90
TLI (Tucker Lewis Index)	0.928	Greater than 0.90
IFI (Incremental Fit Index)	0.932	Greater than 0.90
PGFI (Parsimony Goodness of Fit Index)	0.675	Greater than 0.50
PCFI (Parsimony Comparative Fit Index)	0.765	Greater than 0.50
PNFI (Parsimony Normed Fit Index)	0.702	Greater than 0.05

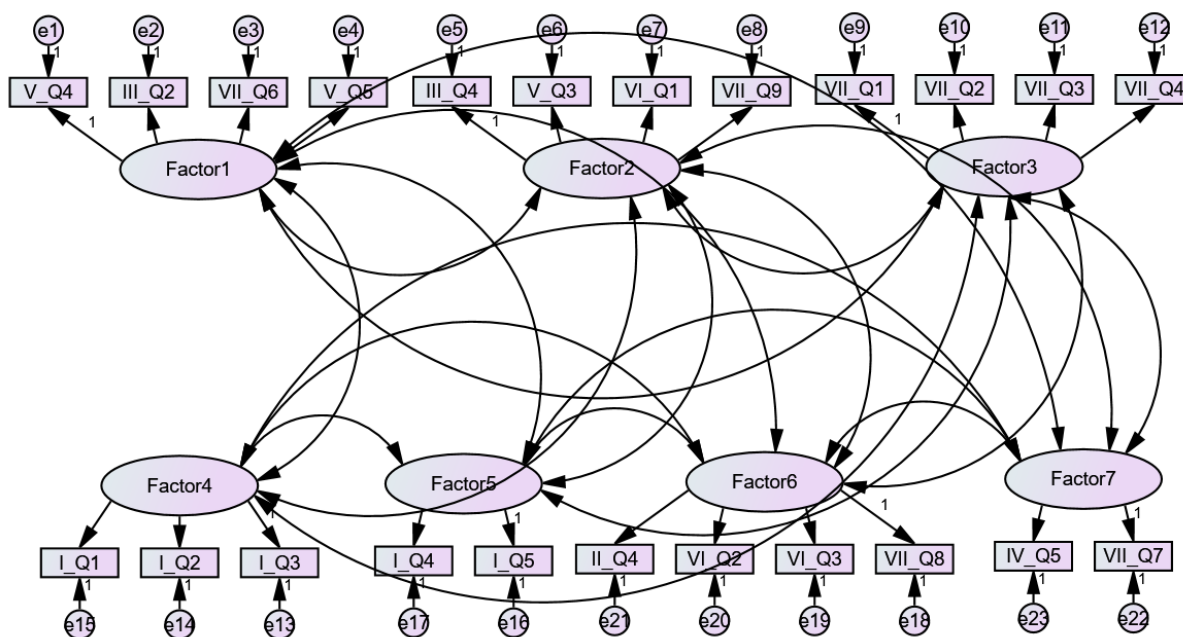


Figure 2: Confirmatory Factor Analysis Model for Revised 23-Items

The results of the Confirmatory Factor Analysis (CFA) presented in Table 13 indicate that the measurement model demonstrates strong construct validity (Figure 2). The standardized factor loadings for the majority of items are high, generally exceeding 0.85, signifying that each observed variable is a strong indicator of its respective latent construct. The items under Factor 1 (V_Q4 = 0.887, V_Q5 = 0.904) and Factor 3 (VII_Q1 = 0.898, VII_Q4 = 0.905) show particularly high loadings, suggesting strong internal consistency within these constructs. All path coefficients are statistically significant at the $p < .001$ level, as evidenced by the critical ratios (C.R.) far exceeding the threshold value of 1.96, reinforcing the relevance of each indicator within its factor.

One item under Factor 5 (I_Q4), shows a standardized estimate of 0.780, which falls within the acceptable range and maintains statistical significance. While slightly lower than other indicators in the model, this item can be retained if conceptually justified. Therefore, the

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measurement model displays adequate convergent validity, with all items contributing meaningfully to their respective constructs.

The model fit indices shown in Table 14 further support the robustness of the CFA model. The normed Chi-square (CMIN/df) value is 3.169, which is below the commonly accepted threshold of 5, indicating an acceptable model fit. Absolute fit indices such as GFI (0.909) and AGFI (0.901) exceed the minimum recommended values of 0.90, and the RMSEA value of 0.0578 suggests a close approximation to model-data fit. Incremental fit indices, including CFI (0.923), TLI (0.928), and IFI (0.932), all surpass the 0.90 threshold, indicating excellent comparative model fit. Additionally, the parsimony indices (PGFI = 0.675, PCFI = 0.765, and PNFI = 0.702) are all above the acceptable level of 0.50, confirming that the model balances complexity with explanatory power.

Hence, the CFA model demonstrates a good overall fit and strong measurement properties. The latent constructs are well-represented by their observed variables. Furthermore, the CFA results validate the revised 23-item scale as a reliable and valid measurement model. It shows strong factorial validity, good model fit, and theoretical coherence, making it appropriate for use in further research on academic resilience.