

## The Interplay of Academic Resilience and Birth Order in Predicting Academic Success in Pre-Service Teachers

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### ABSTRACT

Academic resilience is a significant predictor of student performance, yet conditions under which its effects vary remain underexplored. This cross-sectional study examined academic resilience and tested birth order as a moderator of the resilience–achievement relationship among 140 pre-service teachers in Manipur, India. Using the Academic Resilience Scale (ARS-30; Cassidy, 2016), three dimensions were assessed: Perseverance, Reflective and Adaptive Help-Seeking, and Negative Affect and Emotional Regulation. Results indicated predominantly moderate resilience levels (67.9%). Welch's one-way ANOVA revealed significant between-group differences by birth order,  $F(2, 90.9) = 3.23, p = .044$ , with middle-born teachers showing comparatively lower resilience. Moderation analysis confirmed academic resilience as a significant positive predictor of achievement ( $B = 0.209, p = .004$ ); however, the birth order  $\times$  resilience interaction was non-significant ( $p = .838$ ), indicating universally distributed resilience benefits. Findings affirm resilience's universal predictive value and suggest targeted support for middle-born pre-service teachers.

**Keywords:** *Academic Resilience, Birth Order, Pre-Service Teachers, Academic Achievement, Moderation Analysis, Teacher Education*

The preparation of pre-service teachers represents one of the most psychologically demanding phases in the professional lifespan of educators. Situated at the convergence of rigorous academic demands, practicum-based challenges, and the formation of a professional identity, pre-service teachers face a unique constellation of stressors that can undermine both performance and long-term commitment to the profession (Mansfield et al., 2016). High rates of attrition during training and in the early career stages underscore the urgency of identifying the psychological resources that enable pre-service teachers not merely to endure these pressures but to function effectively under them. The complex interplay of individual characteristics, social background, and psychological resources that shapes this capacity for sustained functioning remains an area of active inquiry in teacher education research.

Among the psychological resources that have attracted considerable empirical and theoretical attention, academic resilience occupies a prominent position. Defined by Cassidy

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(2016) as the capacity to sustain academic effort and engagement in the face of significant adversity, academic resilience is a multidimensional construct encompassing Perseverance (motivational persistence), Reflective and Adaptive Help-Seeking (strategic use of support networks and institutional resources), and Negative Affect and Emotional Regulation (effective management of distress emotions that accompany academic adversity). For pre-service teachers, higher academic resilience is consistently associated with greater professional commitment, enhanced teaching self-efficacy, reduced burnout risk, and stronger academic outcomes (Martin & Marsh, 2008; Mansfield et al., 2016). The direct positive relationship between academic resilience and academic performance is well-established across international samples and educational levels (Cassidy, 2016; Martin & Marsh, 2006).

Despite this robust evidence for a main effect, a more nuanced and theoretically generative question is emerging in the resilience literature: for whom, and under what conditions, is academic resilience most effectively translated into academic success? This conditional framing shifts inquiry from whether resilience matters to when and for whom it matters most, and directs attention toward the identification of personal, social, and contextual moderators that may amplify or attenuate the resilience–achievement relationship (Fergus & Zimmerman, 2005). Understanding such moderators is not merely a theoretical exercise; it has direct practical implications for the design of targeted, efficient, and equitable resilience-building interventions in teacher education programs.

One theoretically compelling but empirically underexplored candidate moderator is birth order—an individual's ordinal position within the family of origin. Adlerian psychology (Adler, 1927) and Sulloway's (1996) family niche theory both propose that birth position creates distinct socialization environments that systematically shape personality dispositions, coping orientations, and motivational strategies in ways that can persist into adulthood. First-born and only children, socialized under heightened parental expectations and elevated responsibility norms, tend to develop conscientious, achievement-oriented, and authority-aligned dispositions. Later-born children, strategically differentiating themselves within the family system to carve out distinct developmental niches, are theorized to develop more socially agile, open, collaborative, and flexible personalities. Middle-born children occupy a particularly complex psychosocial position, compelled to compete for parental resources while establishing identities that are neither anchored by primacy nor secured by indulgence. These dispositional profiles, if they condition the pathways through which academic resilience is translated into achievement, could render birth order a meaningful moderator of the resilience–performance relationship.

Notwithstanding the theoretical plausibility of this moderating role, no prior study has empirically tested birth order as a moderator of the academic resilience–achievement relationship in pre-service teacher populations. This gap is particularly notable given the growing call in teacher education research for conditional models that can identify for whom resilience-building interventions are most efficacious and under what conditions their effects are largest (Mansfield et al., 2016). The present study addresses this gap. Using a cross-sectional quantitative design with a sample of 140 pre-service teachers in India, and employing hierarchical moderation regression analysis, two hypotheses are tested:

- **Hypothesis 1 (H1):** Academic resilience will be a significant positive predictor of academic achievement among pre-service teachers.

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- **Hypothesis 2 (H2):** Birth order will significantly moderate the resilience–achievement relationship, such that the positive association will be stronger for later-born than for first-/only-born pre-service teachers.

By testing these hypotheses, this study contributes to the conditional resilience literature, extends the birth order literature to the domain of teacher education, and provides an empirical evidence base for differentiated support design in pre-service teacher preparation programs. The study also contributes to the growing body of research situating resilience-relevant processes within non-Western educational contexts, where familial socialization patterns and birth order norms may take on distinctive forms (Damian & Roberts, 2015).

### **THEORETICAL FRAMEWORK AND LITERATURE REVIEW**

#### *Academic Resilience in Teacher Education*

Cassidy's (2016) Academic Resilience Scale (ARS-30) operationalizes academic resilience as a three-dimensional construct that captures distinct but interrelated facets of resilient functioning in academic contexts. Perseverance captures the sustained motivational commitment to academic tasks despite setbacks, failures, or prolonged difficulty. Reflective and Adaptive Help-Seeking encompasses the strategic identification and utilization of institutional, social, and informational resources when encountering academic obstacles—reflecting not a passive request for assistance, but a thoughtful and self-directed process of resource mobilization. Negative Affect and Emotional Regulation refers to the effective management of distress-related emotions—anxiety, frustration, self-doubt, and rumination—that accompany academic adversity and can derail performance if unmanaged. This domain-specific framework distinguishes academic resilience from related but conceptually and empirically distinct constructs such as grit, academic self-efficacy, and general coping orientations (Martin & Marsh, 2008), and its tripartite structure permits more nuanced examination of which resilience facets are most relevant for specific outcomes and populations.

Empirical evidence robustly supports academic resilience as a predictor of positive educational outcomes across educational levels and cultural contexts. Martin and Marsh (2006, 2008) demonstrated significant associations between resilience and academic performance, motivation, and persistence across primary, secondary, and tertiary educational settings. In the context of teacher education specifically, Mansfield et al. (2016) identified resilience as a central determinant of pre-service teachers' professional commitment and retention intentions, and proposed an evidence-informed framework through which resilience-building curricula could be systematically integrated into teacher preparation programs. Cross-cultural studies have replicated the positive association between academic resilience and performance outcomes in samples from Europe, Asia, and North America, establishing it as a generalizable predictor of academic success rather than a culturally bound phenomenon (Cassidy, 2016). The ARS-30 has demonstrated consistently strong psychometric properties across international samples, including sound internal consistency ( $\alpha = .85-.92$ ) and significant criterion validity with academic performance outcomes, supporting its utility as a measurement instrument across diverse institutional and cultural contexts.

The Negative Affect and Emotional Regulation subscale is of particular relevance in the teacher education context, given well-documented evidence that pre-service teachers frequently experience elevated levels of academic anxiety, practicum-related stress, and

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identity-related distress (Mansfield et al., 2016). The capacity to regulate these emotional responses without disengaging from academic effort is arguably among the most critical psychological competencies for sustainable functioning across the multifaceted demands of teacher training. Research on burnout in teacher education has further indicated that inadequate emotional regulation is among the strongest proximal predictors of attrition, underscoring the practical importance of this resilience dimension for program completion and early career retention.

### *Birth Order: Theory and Evidence*

Alfred Adler (1927) proposed that each child's ordinal position within the family constellation creates a unique psychological situation that fundamentally shapes their motivational orientations, interpersonal strategies, and coping dispositions. In Adlerian theory, the family is understood as a social microcosm in which children occupy distinct positions that carry differential access to parental attention, resources, and affirmation—positions that, over time, shape enduring personality characteristics and adaptive strategies. First-born children, having experienced the displacement of their initially privileged only-child status upon the arrival of a sibling, are theorized to develop strong affiliations with authority structures, achievement striving, and conservative orientations. Deprived of exclusive parental attention, first-borns frequently compensate by internalizing parental values and norms, emerging as conscientious, responsible, and authority-aligned individuals. Only children, lacking the sibling displacement experience, share several of these characteristics while also bearing a distinctive psychological burden of elevated parental expectations that are undiluted by sibling comparisons.

Middle-born children occupy what Adler (1927) described as the most psychologically complex position within the family system. Lacking both the primacy associated with first-born status and the relative indulgence sometimes afforded to later-born children, middle-borns are compelled to develop flexible, diplomatic, and socially attuned strategies for securing recognition and belonging. This positional ambiguity may generate both adaptive capacities—including social intelligence, negotiation skills, and empathic attunement—and vulnerabilities, including heightened sensitivity to perceived inequity, comparative social evaluation, and motivational uncertainty. The middle-born position, in this theoretical reading, creates a developmental environment that is simultaneously demanding and formative, but whose psychological outcomes are more variable and context-dependent than those of other ordinal positions.

Sulloway (1996) elaborated and extended this Adlerian framework through an evolutionary and personality-science lens, proposing that siblings strategically diversify their personalities and behavioral repertoires to minimize direct competition for parental investment—a process he termed family niche partitioning. Under this account, first-borns align with parental authority and dominant social norms, acquiring traits that maximize approval from the existing power structure, while later-borns cultivate alternative niches characterized by openness to experience, agreeableness, and social intelligence. Sulloway's (1996) meta-analytic review provided initial support for these predictions, documenting consistent associations between birth order and the Big Five personality dimensions, particularly Openness to Experience. However, subsequent large-scale population-based studies have significantly tempered these conclusions. Rohrer et al. (2015) and Damian and Roberts (2015), employing nationally representative samples with rigorous statistical controls for family size, socioeconomic status, and birth spacing, found that birth order

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effects on personality—while statistically detectable at very large sample sizes ( $N > 5,000$ )—are small in magnitude and sensitive to confounding. These findings suggest that birth order effects, if present, operate at a level of subtlety that may have population-level significance while remaining difficult to detect in smaller samples.

In educational contexts, modest first-born advantages in academic attainment have been reported and attributed to two complementary mechanisms: resource dilution effects, whereby additional siblings reduce per-child parental investment in time, attention, and educational resources (Blake, 1981); and tutoring effects, whereby first-borns consolidate their own knowledge through teaching younger siblings, thereby reinforcing conceptual understanding and academic skills (Kristensen & Bjerkedal, 2007). However, these effects are inconsistently replicated across studies and are frequently attenuated when confounds such as family socioeconomic status, total sibship size, and birth spacing are appropriately controlled (Damian & Roberts, 2015). The current study is therefore agnostic regarding the main effect of birth order on academic achievement, and focuses instead on its theoretically motivated potential as a moderator of the resilience–achievement relationship.

### *Birth Order as a Moderator: Competing Hypotheses*

Two distinct theoretical mechanisms generate competing predictions about the direction of birth order moderation of the resilience–achievement relationship.

The Amplification Hypothesis predicts a stronger resilience–achievement relationship for later-born pre-service teachers. If later-borns' theorized social agility, openness to experience, and collaborative orientation enable them to deploy resilience outwardly—through active and adaptive help-seeking, collaborative problem-solving, and flexible strategy adaptation in response to feedback—then their resilience resources may be more efficiently converted into academic performance gains. In the social ecology of teacher training, which is characterized by hierarchical relationships with supervisors, peer collaboration in practicum settings, and continuous adaptation to mentor evaluations, these socially mediated resilience pathways may be particularly effective at translating internal psychological resources into observable performance improvements. This hypothesis predicts a positive, statistically significant interaction between birth order and academic resilience, with the resilience slope being steeper for later-born than for first-/only-born students.

The Suppression Hypothesis, by contrast, predicts an attenuated resilience–achievement relationship for first-/only-born pre-service teachers. The high conscientiousness, achievement orientation, and disciplined study habits theorized to characterize first-borns may already account for substantial variance in academic achievement, leaving less unique variance to be explained by resilience over and above these trait-level predictors. Additionally, performance anxiety and maladaptive perfectionism—constructs associated with first-born socialization within high-expectation family environments—may partially offset the protective benefits of resilience, weakening the observable statistical relationship between resilience scores and achievement outcomes. Under this hypothesis, birth order does not amplify resilience effects for later-borns but rather suppresses them for first-borns, producing a negative interaction pattern—though the directional prediction at the level of the interaction term is the same: a positive birth order  $\times$  resilience interaction favoring later-born students.

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Together, these competing mechanisms form the theoretical basis for H2 and define the parameters of the empirical question to be addressed. The present study provides the first test of these competing hypotheses in a pre-service teacher sample, and positions its findings within the broader conditional resilience literature.

### METHODOLOGY

#### *Research Design and Participants*

A cross-sectional, quantitative survey design was employed. This design was selected as appropriate for the study objectives, which required the simultaneous measurement of academic resilience, birth order, and academic achievement to enable both group comparison and moderation analysis. The sample comprised 140 pre-service teachers enrolled in a teacher education program under Manipur University, Canchipur.

#### *Measures*

- **Academic Resilience Scale (ARS-30):** Academic resilience was assessed using Cassidy's (2016) ARS-30, a 30-item self-report instrument rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), yielding a total score (range: 30–150) and three subscale scores corresponding to the three resilience dimensions (Perseverance, Reflective and Adaptive Help-Seeking, and Negative Affect and Emotional Regulation). The ARS-30 was selected on the basis of its strong psychometric properties, domain-specificity, and prior use in teacher education research contexts.
- **Academic Achievement:** Academic achievement was operationalized as each participant's cumulative academic percentage score, derived from official institutional academic records.
- **Birth Order:** Participants self-reported their ordinal birth position within their family of origin.

#### *Data Analysis*

Continuous predictors (ARS total score, birth order) were mean-centered prior to analysis to reduce multicollinearity and facilitate interpretation of lower-order effects. The moderation model was specified as: Step 1—control variables (gender, socioeconomic background); Step 2—main effects of centered ARS and centered birth order; Step 3—the ARS × Birth Order interaction term. The significance of  $\Delta R^2$  at Step 3 constituted the primary test of moderation. Following the non-significant interaction result, exploratory simple slope analyses were conducted following Aiken and West's (1991) recommendations to characterize the direction of conditional effects and generate hypotheses for future adequately powered investigations. Effect sizes (Cohen's  $f^2$  for moderation) were calculated to contextualize the practical significance of the observed effects (Lakens, 2022).

### RESULTS

#### *Descriptive Statistics and Normality*

Table 1 presents descriptive statistics and normality test results for all resilience variables. Perseverance recorded the highest subscale mean ( $M = 58.0$ ,  $SD = 6.18$ ), indicating relative strength in motivational persistence within this sample of pre-service teachers. Negative Affect and Emotional Regulation showed slight positive skewness (+0.37), suggesting greater variability in emotional management capacity and a possible tendency toward mild emotional regulation challenges in a subset of participants—a pattern consistent with

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evidence of elevated academic anxiety in pre-service teacher populations (Mansfield et al., 2016).

**Table 1 Descriptive Statistics and Normality Tests for Academic Resilience Variables (N = 140)**

Variable	M	SD	Skewness	Kurtosis	S-Wp
Perseverance	58.0	6.18	-0.64	0.98	.001
Reflective & Adaptive Help-Seeking	37.0	4.42	-0.53	0.15	.007
Negative Affect & Emotional Reg.	21.1	4.70	+0.37	1.43	.004
ARS Total Score	116	11.0	-0.55	0.16	.007

### Level of Academic Resilience

Using the mean  $\pm$  1 SD criterion (M = 116, SD = 11), participants were classified into three resilience levels (Table 2). Approximately 67.9% (n  $\approx$  95) demonstrated moderate academic resilience (ARS = 105–127), with roughly equal proportions in the low (n  $\approx$  22, 15.7%) and high (n  $\approx$  23, 16.4%) categories. The finding that approximately 16% of participants scored below the low resilience threshold carries practical significance: this subgroup may be at elevated risk for academic disengagement, performance difficulties, and early career attrition, and constitutes a priority target for resilience-building intervention in teacher education programs. The subscale profile—with Perseverance as the strongest dimension and Negative Affect and Emotional Regulation as comparatively weaker—is consistent with patterns observed in analogous populations and suggests that emotional regulation difficulties may represent the most salient resilience challenge for pre-service teachers in this context.

**Table 2 Distribution of Academic Resilience Levels Among Pre-Service Teachers**

Resilience Level	Score Range	n	%
Low	< 105	~22	~15.7
Moderate	105–127	~95	~67.9
High	> 127	~23	~16.4

### Birth Order Differences in Academic Resilience

A Welch's one-way ANOVA was conducted to examine group differences in ARS total scores across the three birth order categories. Given evidence of heterogeneous group variances (Levene's test  $p < .05$ ), Welch's correction was applied to the F-statistic, and Games-Howell post-hoc comparisons were used as a robust alternative to Tukey's HSD. The overall analysis revealed a statistically significant between-group difference,  $F(2, 90.9) = 3.23$ ,  $p = .044$ ,  $\eta^2 = .04$ , indicating that birth order is associated with meaningful variation in academic resilience levels among pre-service teachers. The effect size ( $\eta^2 = .04$ ) falls in the small-to-medium range, reflecting a modest but theoretically coherent association between birth position and resilience.

Games-Howell post-hoc comparisons (Table 3) revealed that no individual pairwise comparison reached the  $\alpha = .05$  threshold after correction for multiple comparisons. The comparison between first-/only-born and middle-born participants yielded a mean difference of 4.89 ( $p = .085$ ), approaching but not reaching significance. The comparison between middle-born and later-born participants produced a mean difference of -5.49 ( $p = .052$ ), also

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approaching significance. The first-/only-born versus later-born comparison was non-significant ( $MD = -0.60$ ,  $p = .955$ ), indicating that these two groups demonstrated comparable resilience levels. This pattern directionally suggests that middle-born pre-service teachers may demonstrate lower academic resilience relative to both first-/only-born and later-born peers—a pattern consistent with Adlerian theory's characterization of the middle-born position as relationally and motivationally demanding (Adler, 1927) and with evidence that the absence of a clear psychological niche may attenuate the development of stable resilience resources.

**Table 3** Welch's One-Way ANOVA Results and Games-Howell Post-Hoc Comparisons for ARS by Birth Order

Comparison	Mean Diff.	p
First-/Only-born vs. Middle-born	4.89	.085
First-/Only-born vs. Later-born	-0.60	.955
Middle-born vs. Later-born	-5.49	.052

### Moderation Analysis

The hierarchical moderation regression tested birth order as a moderator of the academic resilience–academic achievement relationship (Table 4). The overall model was statistically significant,  $F(3, 136) = 7.89$ ,  $p < .001$ ,  $R^2 = .15$ , Adjusted  $R^2 = .13$ , indicating that the predictors collectively accounted for approximately 15% of the variance in academic percentage score—a meaningful proportion for a parsimonious psychological model in an educational context.

Main effect of academic resilience (H1). Academic resilience was a statistically significant positive predictor of academic percentage score,  $B = 0.209$ ,  $SE = 0.072$ ,  $t(136) = 2.91$ ,  $p = .004$ . For each one-unit increase in ARS total score, academic percentage score increased by approximately 0.21 percentage points, representing a practically meaningful relationship given the range of both variables. Cohen's  $f^2$  for the main effect was .07, reflecting a small-to-medium effect size in the context of the moderation model. H1 was fully supported.

Main effect of birth order. Birth order did not independently predict academic percentage score when resilience was statistically controlled,  $B = 1.323$ ,  $SE = 0.760$ ,  $t(136) = 1.74$ ,  $p = .082$ . This non-significant main effect is consistent with contemporary meta-analytic evidence suggesting that birth order main effects on academic outcomes are weak, context-dependent, and frequently attenuated when potential confounds such as family size and socioeconomic status are controlled (Damian & Roberts, 2015; Rohrer et al., 2015).

Moderation effect (H2). The  $ARS \times$  Birth Order interaction term was not statistically significant,  $B = 0.016$ ,  $SE = 0.076$ ,  $t(136) = 0.20$ ,  $p = .838$ . The  $\Delta R^2$  attributable to the interaction term was negligible ( $\Delta R^2 < .001$ ), indicating that birth order does not significantly moderate the relationship between academic resilience and academic achievement in this sample. H2 was not supported. These results indicate that the positive relationship between academic resilience and academic achievement operates with equivalent strength across all birth order groups, affirming the universal predictive utility of resilience in this pre-service teacher sample.

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**Table 4 Moderation Analysis: Birth Order as Moderator of the ARS–Academic Achievement Relationship**

Predictor	B	SE	T	p
Academic Resilience (ARS)	0.209	0.072	2.91	.004**
Birth Order	1.323	0.760	1.74	.082
ARS × Birth Order	0.016	0.076	0.20	.838

### Exploratory Simple Slope Analysis

Given the theoretical motivation for the moderation hypothesis and the directionally interesting pattern present in the data, exploratory simple slope analyses were conducted following Aiken and West's (1991) recommendations for probing non-significant interactions of theoretical interest. This exploratory approach was undertaken to generate empirically grounded hypotheses for future adequately powered investigations, and the findings are explicitly interpreted as hypothesis-generating rather than confirmatory. Table 5 presents the conditional effects of academic resilience on academic percentage score at three birth order levels.

The resilience–achievement slope was statistically significant for later-born participants ( $B = 0.225$ ,  $SE = 0.103$ ,  $t = 2.18$ ,  $p = .031$ ) and for the middle-born/average group ( $B = 0.209$ ,  $SE = 0.072$ ,  $t = 2.91$ ,  $p = .004$ ). For first-/only-born participants, the slope was positive but did not reach conventional significance ( $B = 0.192$ ,  $SE = 0.107$ ,  $t = 1.79$ ,  $p = .077$ ). The directional pattern—with a numerically stronger resilience slope for later-born ( $B = 0.225$ ) compared to first-/only-born ( $B = 0.192$ ) participants—is consistent with the Amplification Hypothesis and with the theoretical proposition that later-borns' social flexibility and open, help-seeking orientation may enable more efficient translation of resilience resources into performance gains. However, because the interaction term was non-significant, the differences between slopes cannot be interpreted as statistically reliable, and these findings should be treated exclusively as exploratory. Replication in larger, adequately powered samples with pre-registered hypotheses is necessary before any conditional interpretation can be advanced with confidence.

**Table 5 Exploratory Simple Slope Estimates: Effect of Academic Resilience on Academic Achievement at Three Birth Order Levels**

Birth Order Level	Group	B	SE	t	p
Low (First-/Only-born)	First-/Only-born	0.192	0.107	1.79	.077
Average (Middle-born)	Middle-born	0.209	0.072	2.91	.004**
High (Later-born)	Later-born	0.225	0.103	2.18	.031*

## DISCUSSION

This study examined the level of academic resilience among pre-service teachers, tested birth order as a moderator of the resilience–achievement relationship, and situates its findings within the conditional resilience literature and the evidence base for teacher education practice. Three principal findings emerge from this investigation, each carrying both theoretical and practical significance.

### Predominantly Moderate Resilience and Subscale Profiles

The finding that approximately 68% of pre-service teachers demonstrated moderate academic resilience, with roughly equal proportions in low and high categories, is consistent

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with normative distributions reported in comparable student populations (Cassidy, 2016; Martin & Marsh, 2008). This distribution indicates that academic resilience is neither universally high nor alarmingly low in this sample, but that meaningful subgroups at both ends of the resilience continuum exist and merit differential attention from program administrators and teacher educators. The approximately 16% of participants classified as low in academic resilience are of particular practical concern, as research consistently links lower resilience with increased vulnerability to attrition, academic disengagement, and early career burnout in teacher education (Mansfield et al., 2016).

The subscale profile—with Perseverance as the strongest dimension and Negative Affect and Emotional Regulation as comparatively weaker—is theoretically meaningful and has clear practical implications for curriculum design. Pre-service teachers in this sample appear relatively well-equipped with motivational persistence but demonstrate greater vulnerability in the domain of academic-related emotional management. This asymmetry aligns with evidence that emotion regulation difficulties, including academic anxiety, rumination, and distress intolerance, are prevalent among pre-service teachers and constitute significant contributors to early career burnout and performance difficulties (Mansfield et al., 2016).

The finding suggests that teacher education programs should not assume that motivational resources (perseverance) will automatically compensate for emotional regulation deficits; rather, targeted skill-building in the domain of emotional regulation—through evidence-based approaches such as cognitive reappraisal training, mindfulness-based stress reduction, constructive feedback processing workshops, and emotional literacy development—should be considered a core rather than supplementary component of resilience-building curricula.

This subscale-level finding also has implications for measurement and intervention design in future research. Studies that rely exclusively on total resilience scores may obscure meaningful within-person profiles in which strengths in one dimension coexist with deficits in another. Profile-based analyses—such as latent profile analysis or cluster analysis of subscale scores—could provide richer insights into the typological distribution of resilience configurations in pre-service teacher populations and more precisely identify which subgroups require which types of targeted support.

### ***Birth Order Differences in Academic Resilience Levels***

The significant Welch's ANOVA result,  $F(2, 90.9) = 3.23, p = .044, \eta^2 = .04$ , represents an important finding: birth order is associated with between-group variation in academic resilience levels, extending the birth order literature to the domain of domain-specific psychological resources in pre-service teacher education. To the authors' knowledge, this is among the first demonstrations that birth order is associated with academic resilience in an educational psychology context, and the finding therefore warrants careful interpretation and thoughtful discussion.

The directional pattern in post-hoc comparisons—with middle-born pre-service teachers tending toward lower resilience relative to both first-/only-born and later-born peers—is interpretable within Adlerian theory's characterization of the middle-born position as relationally demanding and psychologically complex (Adler, 1927). The absence of a stable, socially recognized family niche for middle-born children—compelled to compete for both parental attention and peer recognition without the anchoring effects of primacy or the relative freedom of youngest-child status—may create developmental conditions that are

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less consistently conducive to the formation of robust academic resilience resources. This is not to suggest that middle-born individuals are uniformly disadvantaged; indeed, the social flexibility and diplomatic competencies associated with middle-born socialization may constitute genuine assets in collaborative educational environments. Rather, the finding suggests that the particular motivational and emotional demands of academic training may disproportionately challenge middle-born individuals who lack the resilience resources that buffer against these pressures.

The borderline significance of the pairwise comparisons (first-/only-born vs. middle-born:  $p = .085$ ; middle-born vs. later-born:  $p = .052$ ) likely reflects limited statistical power given the sample size and unequal group distributions rather than the true absence of pairwise differences. A priori power analyses for ANOVA designs with three groups suggest that detecting small-to-medium effect sizes ( $\eta^2 = .04-.06$ ) with adequate power ( $1-\beta = .80$ ) typically requires sample sizes of  $N = 200-300$  (Lakens, 2022). Future studies should pre-register their hypotheses and conduct a priori power analyses to ensure sufficient sensitivity for detecting birth order group differences of the magnitude observed in the present study.

### ***Birth Order Does Not Moderate the Resilience–Achievement Relationship***

The non-significant interaction term ( $B = 0.016$ ,  $p = .838$ ) constitutes the primary finding of the moderation analysis and carries several important theoretical and practical implications. Most fundamentally, it indicates that the positive and robust effect of academic resilience on academic achievement—confirmed by the significant main effect ( $B = 0.209$ ,  $p = .004$ )—operates with equivalent strength across all birth order groups. Academic resilience appears to function as a generalizable, context-independent psychological resource whose positive relationship with academic performance is not contingent on early familial socialization history or birth order-related dispositional profiles.

This result is consistent with contemporary meta-analytic evidence demonstrating that birth order effects on psychological processes are typically small in magnitude, highly dependent on sample size for reliable detection, and sensitive to confounding by socioeconomic and family structural variables (Damian & Roberts, 2015; Rohrer et al., 2015). The null moderation finding aligns with a trait-like conceptualization of academic resilience as a portable, broadly applicable psychological resource whose predictive utility transcends specific biographical contexts and early socialization experiences (Windle, 2011). It further suggests that, at the level of the resilience–achievement relationship, the socialization-based dispositional differences theorized to distinguish birth order groups do not introduce meaningful heterogeneity into the mechanisms through which resilience translates into academic performance.

For teacher education practice, this null moderation finding carries a practically important and affirmative implication: universal resilience-building programs are likely to benefit all pre-service teachers equitably, regardless of birth order, and there is no current empirical basis for directing substantially differentiated resilience curricula to students on the basis of their ordinal family position. This finding thus provides empirical support for universal, rather than targeted, resilience intervention design in teacher preparation contexts, consistent with the framework proposed by Mansfield et al. (2016).

The exploratory simple slope analysis does, however, reveal a directionally interesting pattern that merits acknowledgment and hypothesis-generating discussion. The numerically

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larger resilience slope for later-born students ( $B = 0.225$ ) relative to first-/only-born students ( $B = 0.192$ ) is directionally consistent with the Amplification Hypothesis and with the theoretical proposition that later-borns' social flexibility may facilitate more efficient deployment of resilience resources in the collaborative, feedback-intensive environment of teacher training. While this pattern cannot be interpreted confirmatorily given the non-significant interaction, the practical significance of even a modest differential—if replicated in larger samples—could inform the design of socially oriented resilience interventions that leverage collaborative learning structures and peer support networks particularly beneficial for students who may not be maximally utilizing these resources. Future studies with larger, adequately powered samples should pre-register and test this differential slope hypothesis as a primary aim.

### *Limitations and Future Directions*

Several limitations circumscribe the interpretation of these findings and point to important directions for future research. First, the cross-sectional design precludes causal inference. While resilience is theorized as a predictor of academic performance, reverse causation—whereby higher-performing students develop stronger resilience resources over time through positive feedback cycles—cannot be excluded. Longitudinal studies with repeated measurement of both resilience and achievement across teacher training would enable examination of developmental trajectories, directionality of effects, and whether resilience-building interventions produce durable performance improvements.

Second, with  $N = 140$ , the study was adequately powered to detect medium-to-large main effects but was likely underpowered for the detection of small-to-medium interaction effects, which typically require  $N = 200$ – $400$  for adequate power in moderation regression designs (Aguinis et al., 2005; Lakens, 2022). The non-significant interaction should therefore be interpreted as inconclusive rather than definitively disconfirming the birth order moderation hypothesis. Future studies should conduct a priori power analyses specifically for interaction detection and recruit accordingly.

Third, the three-group birth order classification—while consistent with standard practice in the birth order literature—inevitably obscures within-group variability that may be theoretically relevant. Distinctions between only-children and first-born children, between second-born middle children and those embedded in larger sibships, or between second-to-last and last-born individuals may carry meaningfully different theoretical implications. Future research should explore finer-grained birth order distinctions, particularly in samples with sufficient representation at each ordinal position to permit subgroup-level analysis.

Fourth, generalizability is limited by the single-institution, single-cultural-context sample. The socioeconomic, ethnocultural, and institutional context of Manipur, India, where family structure norms, sibling dynamics, and educational expectations may take distinctive forms, shapes the conditions under which birth order effects manifest. Cross-cultural replication—particularly comparisons between collectivist contexts (where family dynamics and sibling roles carry particular social weight) and individualist contexts (where birth order norms may be less pronounced)—would substantially advance the generalizability and boundary conditions of these findings.

Fifth, academic percentage score, while a valid and ecologically meaningful outcome, captures only the formal academic dimension of pre-service teacher success. Practicum

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performance, professional commitment, well-being, and identity development are equally important outcomes in teacher education, and birth order may moderate the resilience relationship with these broader indicators in ways not detectable at the level of academic grades. Future research should extend the outcome space to include these multidimensional indicators of pre-service teacher development.

Finally, the birth order classification relied on self-reported data without objective verification of family structure or the specific sibling contexts (e.g., birth spacing, number of siblings, gender of siblings) that may mediate or moderate birth order effects. Future studies should collect richer family structure data to permit more nuanced analysis of the conditions under which birth order position translates into differential developmental outcomes.

### CONCLUSION

This study makes several empirically and theoretically substantive contributions to the teacher education and educational psychology literatures. It confirms the significant positive relationship between academic resilience and academic achievement in a pre-service teacher sample from a non-Western educational context ( $B = 0.209$ ,  $p = .004$ ), replicating and extending Cassidy's (2016) foundational findings and affirming the cross-cultural generalizability of the resilience–performance relationship. It demonstrates, for the first time, a statistically significant association between birth order and level of academic resilience among pre-service teachers,  $F(2, 90.9) = 3.23$ ,  $p = .044$ —a novel finding with theoretically meaningful directional patterns suggesting that middle-born pre-service teachers may represent a group warranting additional targeted resilience support. And it provides the first empirical test of birth order as a moderator of the resilience–achievement relationship in teacher education, finding no significant moderation ( $B = 0.016$ ,  $p = .838$ ) and thereby affirming that academic resilience is a universally beneficial psychological resource across birth order groups, with no differential benefit or deficit as a function of ordinal family position.

These findings carry clear implications for teacher education practice. Programs should prioritize systematic, universal resilience-building as a core—rather than elective or supplementary—component of pre-service preparation, with particular attention to the Negative Affect and Emotional Regulation dimension where the present sample showed the greatest relative weakness. Interventions specifically targeting emotion regulation capacity, including cognitive reappraisal, mindfulness-based approaches, and structured feedback processing, represent high-priority components for inclusion in resilience curricula. Middle-born pre-service teachers merit particular attention in this regard, given the directional trend suggesting lower resilience levels in this group. The exploratory simple slope patterns—directionally consistent with greater resilience efficacy for later-born students—offer theoretically grounded hypotheses for future, adequately powered investigations into conditional resilience processes and the design of socially oriented intervention approaches that may differentially benefit students who have not yet fully mobilized their social resilience pathways.

In sum, academic resilience is a robust, universal predictor of academic success in pre-service teachers, and its development should be a foundational priority in teacher education. The conditions under which its effects are further amplified by individual background characteristics such as birth order remain an empirically productive area for future conditional resilience research.

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### ***Conflict of Interest***

The author(s) declared no conflict of interest.

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