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Interpersonal Disturbance and Psychological Security among China's Left-Behind Children: The Serial Mediation Effect of Resilience and Self-Esteem

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Received: 04 February 2026; Accepted: 15 April 2026; Published: 30 July 2026

ABSTRACT: Backgrounds: Left-behind children are particularly vulnerable to emotional and social maladjustment due to prolonged parental absence, yet the psychological mechanisms linking interpersonal disturbance to their psychological security remain insufficiently understood. Guided by the Conservation of Resources Theory, this research aims to explore how interpersonal disturbance influence psychological security among left-behind children, specifically through the serial mediation effect of resilience and self-esteem. **Methods:** Survey questionnaires were distributed via convenience sampling to left-behind children whose age ranging from 10 to 13 years old in Guangxi, China, finally, 696 valid responses (Mean age = 11.40, Standard Deviation (SD) = 0.98) were retained for analysis to test the hypothesized mediation model. **Results:** Interpersonal disturbance showed a significant negative association with psychological security among left-behind children ($\beta = -0.493$, 95% Confidence Interval (CI) $[-0.548, -0.438]$, $p < 0.001$). Resilience and self-esteem functioned as key links within the connection between these two variables ($\beta = -0.101$, 95%CI $[-0.134, -0.068]$; $\beta = -0.058$, 95%CI $[-0.080, -0.036]$, both $p < 0.001$, respectively). This relationship was also characterized by the serial mediation effect of resilience and self-esteem ($\beta = -0.052$, 95%CI $[-0.069, -0.035]$, $p < 0.001$). **Conclusions:** Interpersonal disturbance is not only directly associated with lower psychological security among left-behind children but also relates to it through its connection with diminished resilience and self-esteem. This research highlights the complex interface of factors surrounding the psychological security of left-behind children in school environment, indicating that educational support might be most effective when focusing on interpersonal environments and the stability of children's internal resources.

KEYWORDS: Interpersonal disturbance; resilience; self-esteem; psychological security; left-behind children

1 Introduction

In the wake of China's rapid urbanization, large-scale internal migration has become a structural social phenomenon. Constrained by institutional factors such as the household registration policy and uneven resource distribution, approximately 66.93 million minors have been identified as left-behind children (LBC), representing nearly 22% of the national youth population [1]. Extant literature indicates that long-term parent-child separation correlates significantly with challenges in socio-emotional adjustment, coping mechanisms under adversity, and self-concept among these children [2–5].

Within this context, psychological security, as one of the most fundamental psychological needs of individuals [6], shapes individuals' perception of environmental stability and interpersonal support,

and serves as the cornerstone for emotional regulation and social adaptation [3,4]. While LBC often display compromised psychological security due to the lack of parental presence [7], research highlights that affirmative experiences within school settings can serve as a compensatory mechanism [8]. This shift underscores the necessity of scrutinizing the interplay between LBC and their school interpersonal environments as a potential pathway for intervention.

Given the absence of family support, interpersonal relationships in school become a crucial compensatory channel for LBC to obtain emotional support [9]. However, this implies that they are also more sensitive to the peer environment. In this context, interpersonal disturbance refers to the experience of persistent tension, discomfort, and psychological conflict in interactions with not just peers, but also teachers or members of the opposite sex, caused by unmet interaction needs or inappropriate interaction styles [10]. From the perspective of the Cumulative Risk Model [11], the inherent structural deficits in the family life of LBC can be exacerbated by interpersonal disturbance at school. This “compounded adversity” reflects a synergistic relationship between different stressors, resulting in a state of diminished mental health. Existing research confirms that negative interpersonal relationships are direct factors that undermine adolescents’ psychological security. For instance, bullying and peer victimisation can directly induce insecure attachment responses in adolescents [12]. For LBC, when they encounter interpersonal disturbance, the lack of timely parental guidance makes these external negative events more prone to being internalised into deep-seated declines in psychological security [7,13]. Although the direct effect of interpersonal disturbance on psychological security has been established, the underlying mechanisms through which it occurs among LBC warrant further investigation.

Accordingly, the current research is designed to clarify the potential roles of resilience and self-esteem within a serial mediation effect framework, focusing on how these factors interconnect within the observed relationship.

1.1 Mediating Role of Resilience

Resilience is conceptualized as a dynamic process through which individuals regain equilibrium and sustain adaptive functioning amidst adversity or significant pressure [14]. Given the absence of direct parental guidance, left-behind children (LBC) rely on resilience as an essential protective mechanism and psychological asset. We propose that resilience bridges the connection between interpersonal disturbance and psychological security, a mechanism consistent with the Conservation of Resources (COR) Theory [15] regarding resource depletion and acquisition.

First, interpersonal disturbance leads to the depletion of resilience among LBC. According to Hobfoll’s COR theory [15], the psychological resources (e.g., emotional energy, attention) individuals possess are limited. For LBC, parent-child separation itself has already caused an initial deficit in emotional resources [16]. When they are persistently immersed in interpersonal risks within the school environment, these continuous stressors force them to invest substantial cognitive and emotional resources in coping. This prolonged “coping consumption” not only exhausts the limited psychological assets of children but also impairs their capacity to draw support from their surroundings, ultimately resulting in a marked decline in resilience [17]. In this sense, a deleterious interpersonal climate obstructs the external sustenance essential for fostering resilience, entangling these individuals in a loss spiral of resources.

Building upon this downward trajectory, resilience functions as a pivotal internal asset for establishing and maintaining psychological security. At its core, such security is rooted in a sense of environmental mastery and a predictable outlook on the future [18]. In typical developmental contexts, robust resilience acts as an adaptive mechanism that allows individuals to cognitively reframe threats and maintain emotional

equilibrium, thereby safeguarding their inner safety [19]. However, once the resilience of LBC is depleted within the aforementioned spiral, this protective framework is compromised, leaving their psychological security fundamentally vulnerable [20]. Previous studies indicate that children with higher resilience perceive fewer threats and experience less anxiety [21]. Consequently, this diminished resilience renders children more sensitive to external risks and more prone to helplessness, thereby directly leading to a decline in psychological security. In summary, for LBC, interpersonal disturbance is not merely a social issue but a process of “resource depletion”. It systematically drains the resilience needed to cope with adversity, weakens psychological defence systems, and ultimately results in reduced psychological security. Although LBC face significant challenges in psychological security and may rely on school relationships to compensate for absent parental support, research has largely focused on the direct effects of interpersonal disturbance. The underlying mechanisms, particularly the roles of resilience and self-esteem, remain underexplored, as does how LBC use these internal resources to cope with compounded family and school-related risks. Based on this, the study proposes the following hypotheses:

H1: *Interpersonal disturbance is significantly and negatively associated with psychological security among LBC.*

H2: *Interpersonal disturbance is significantly and negatively associated with resilience among LBC.*

H3: *Resilience is significantly and positively associated with psychological security among LBC.*

H4: *Resilience functions as a link in the association between interpersonal disturbance and psychological security among LBC.*

1.2 The Mediating Role of Self-Esteem

Self-esteem, encompassing an individual’s subjective appraisal of their personal worth, represents a critical indicator of mental health and a vital link between environmental factors and internal security [22]. The present research identifies self-esteem as a focal point in the association between interpersonal disturbance and psychological security among LBC. This connection is consistent with the Sociometer Theory [23], particularly when considering the distinct socialization patterns within the LBC population.

First, interpersonal disturbance is significantly and inversely associated with the level of self-esteem observed in LBC. According to Leary’s Sociometer Theory [23], self-esteem functions essentially as a psychological mechanism for monitoring social acceptance. For children in upper elementary to junior high school, interpersonal relationships in the school environment gradually replace the family as the primary reference frame for self-evaluation [24], making peer relationships a crucial factor in their self-assessment. Research indicates that when children are at interpersonal risk, their self-esteem levels are lower compared to those without interpersonal issues [25]. However, for the specific group of LBC, due to the long-term lack of emotional validation and positive guidance from parents, they are more prone to negative self-evaluation when facing interpersonal disturbances such as peer rejection, bullying, or conflict [26]. They may easily misinterpret social failures (e.g., “no one plays with me”) as negative self-evaluations (e.g., “I am an unpopular, bad child”). This distorted attribution process causes external interpersonal disturbances to be rapidly internalised into a negative self-concept, leading to a significant decline in self-esteem.

Secondly, impaired self-esteem directly threatens an individual’s psychological security. As an “anxiety buffer”, self-esteem helps children maintain physical and mental health when facing social threats [27]. However, when self-esteem is low, LBC often struggle to mobilise psychological resources to actively solve

problems. Instead, there is a greater inclination toward maladaptive coping mechanisms such as self-blame, avoidance, and fantasising to handle life stress [28]. This not only exacerbates internal anxiety [29] but also weakens their ability to handle interpersonal conflicts [30]. Consequently, negative life events arising from interactions with significant others (e.g., family members, teachers) are further amplified, thereby undermining their psychological security [7]. This cognition of being unable to adapt to external challenges directly weakens the individual's sense of certainty, causing them to feel fear and unease when facing a constantly changing environment, thus leading to a decline in psychological security [31]. In summary, for LBC lacking a familial "secure base", interpersonal disturbance is not merely an external social stressor but also a mechanism of self-worth negation. By lowering children's self-esteem, it weakens the internal pillars for maintaining psychological balance, ultimately decreasing psychological security. Based on this, the study proposes the following hypotheses:

H5: *Interpersonal disturbance is significantly and negatively associated with self-esteem among LBC.*

H6: *Self-esteem is significantly and positively associated with psychological security among LBC.*

H7: *Self-esteem mediates the relationship between interpersonal disturbance and psychological security among LBC.*

1.3 The Serial Mediation Model of Resilience and Self-Esteem

In addition to considering resilience and self-esteem as separate mediators, the current study highlights a serial pathway involving both factors in the connection between interpersonal disturbance and the psychological security of LBC. This hypothesis is grounded in the theoretical logic that resilience serves as an antecedent variable to self-esteem. According to Self-Determination Theory [32], the sense of competence individuals obtain while coping with environmental challenges is the foundation for building self-worth. As a core capacity for individuals to cope with adversity and restore adaptation, resilience helps individuals maintain and enhance self-evaluation [33]. When LBC possess high levels of resilience, they are tended to adopt positive coping strategies. This successful coping experience translates into an affirmation of their own abilities, thereby promoting self-esteem [34]. Conversely, children with lower resilience are more likely to exhibit low self-esteem when facing dilemmas [35]. Empirical studies also support this pathway, suggesting that negative states usually first weaken an individual's stress-resistance resources (i.e., resilience) before subsequently affecting self-esteem [36].

From the perspective of the Conservation of Resources (COR) Theory [15], the erosion of LBC's psychological security by interpersonal disturbance is a continuous process of resource depletion. For LBC, the psychological defence system is more fragile due to the lack of real-time familial support. Specifically, as a continuous environmental stressor, interpersonal disturbance first impacts and consumes children's resilience, which acts as the primary defence resource (Initial Resource Loss). With the exhaustion of coping resources, individuals become unable to effectively resolve external rejection and conflict. This maladaptation further weakens their self-esteem. Ultimately, with the dual depletion of both resilience and self-esteem, children lack psychological security regarding the external environment. In summary, interpersonal disturbance is associated with the psychological security of LBC not only through a direct link but also through a sequential pathway involving variations in resilience and self-esteem. Accordingly, the present study proposes a conceptual framework (see Fig. 1) and hypotheses:

H8: *Resilience is significantly and positively associated with self-esteem among LBC.*

H9: *Resilience and self-esteem function as sequential intervening factors within the association between interpersonal disturbance and psychological security among LBC.*

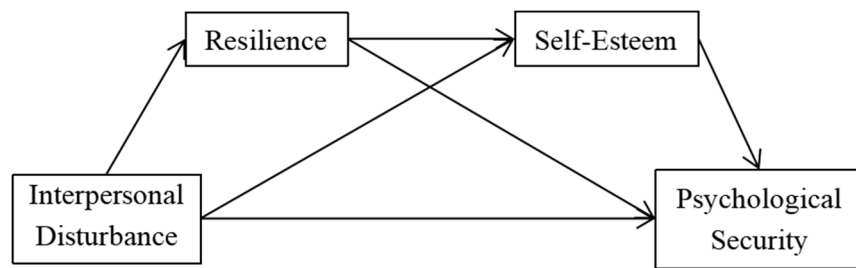


Figure 1: The hypothesised model.

2 Methodology

2.1 Sample and Procedure

Participants were recruited using convenience sampling. Three economically disadvantaged towns in the Guangxi border area were first identified, from which eight public schools (Grades 1–9) were selected. Students in Grades 4 through 7 were then invited to participate. Given that the overwhelming majority of students in these schools are left-behind children (LBC). Finally, non-LBC were excluded, and the final sample was comprised exclusively of LBC currently enrolled in these schools. This study was approved by the Ethics Committee of Guangxi Minzu Normal University (Approval number: GXMZNU-2022-LL–SC-001). Subsequently, permission was obtained from the school administration, and informed consent was secured from both the participating children and their guardians prior to data collection. The children completed standardized, structured paper-and-pencil questionnaires independently, with researchers present to answer questions and ensure procedural consistency, while also emphasizing that participation was voluntary and withdrawal was allowed at any time. The average completion time was approximately 20 min.

900 questionnaires were initially distributed and returned. However, invalid responses such as patterned answering (e.g., selecting the same option for all items) or those missing key information (e.g., demographic or primary scale data) were excluded from analysis. Ultimately, the final records consisted of 696 LBC ranging in age from 10 to 13 years old (Mean age = 11.40, SD = 0.98). Among these participants, 320 (46%) were female and 376 (54%) were male. In terms of grade distribution, 135 students (19.4%) were in Grade 4, 259 (37.2%) in Grade 5, 189 (27.2%) in Grade 6, and 113 (16.2%) in Grade 7. Regarding school region, 394 participants (56.6%) were from rural schools, while 302 (43.4%) were from urban schools.

2.2 Measures

2.2.1 Interpersonal Disturbance

Interpersonal disturbance was measured using the Interpersonal Relation Synthetic Diagnose Scale [10]. The scale consists of 28 items assessing interpersonal functioning, for example, “Hard to speak out about my own troubles to others”, each item was rated by a binary scoring system, ranging from “1 = Yes” to “0 = No”, and the total score of 28 items was used in the following analysis, with higher scores indicating higher levels of interpersonal disturbance. In the current sample, the Cronbach’s α was 0.834, and the composite reliability (CR) was 0.853.

2.2.2 Resilience

Resilience was evaluated through the Resilience Scale for Chinese Adolescents [37]. This scale consists of 27 items to assess the resilience of children and adolescents in the face of adversity, covering multiple psychological resources including emotion regulation, coping with setbacks, self-motivation, utilization of social support, and perceived family support. “I concentrate all my effort when facing difficulties”. Participants responded to each item via a 5-point Likert scale, anchored from “1 = completely does not fit” to “5 = completely fits”. For the subsequent analysis, the average score across all items was calculated, where elevated scores reflect a greater degree of resilience. Within the present study, the Cronbach’s α and composite reliability (CR) were 0.847 and 0.869, respectively.

2.2.3 Self-Esteem

Self-esteem was appraised via the Rosenberg Self-Esteem Scale [22]. This 10-item measure captures global self-worth (e.g., “I feel that I’m a person of worth”), utilizing a four-point rating format (1 = strongly disagree, 4 = strongly agree). Summed scores were utilized, with higher results signifying more substantial self-regard. The scale demonstrated sound reliability in this study (Cronbach’s α = 0.817, CR = 0.838).

2.2.4 Psychological Security

Psychological security was assessed using the Psychological Security Questionnaire [18]. The scale consists of 16 items to assess individual’s sense of control and certainty, for example, “I feel that life is always full of uncertainty and unpredictability”, each item was rated by a 5-point scale, ranging from “1 = completely fits” to “5 = completely does not fit”, and the average score of 16 items was used in the following analysis, with higher scores indicating higher levels of psychological security. In the current sample, the Cronbach’s α was 0.875, and the composite reliability (CR) was 0.897.

2.3 Statistical Analysis

Data evaluations were conducted via SPSS version 22.0 (IBM Corp., Armonk, NY, USA) [38]. Harman’s single-factor test was adopted to screen for common method bias [39]. The procedure extracted 24 factors (eigenvalues > 1), explaining 61.87% of the overall variance. The primary factor contributed to 18.47% of this variance. Since it did not reach the 50% critical limit, severe common method bias was ruled out. To further assess the potential issue of common method bias, a confirmatory factor analysis (CFA) was conducted to test for common method bias by loading all self-reported items onto a single latent factor. The results indicated poor overall model fit (χ^2/df = 3.00, CFI = 0.60, GFI = 0.69, AGFI = 0.67, NFI = 0.50, RMSEA = 0.05). Although the RMSEA value was acceptable, the low CFI, NFI, GFI, and AGFI values suggest that the single-factor model does not adequately account for the data variance. These findings indicate that common method bias is unlikely to be a serious concern in this study.

Subsequently, collinearity diagnostics were executed to ensure predictor independence (interpersonal disturbance, resilience, and self-esteem). All generated tolerance values exceeded 0.10, and Variance Inflation Factors (VIF) ranged between 1.000 and 1.720, sitting comfortably beneath the maximum threshold of 5 [40]. These metrics verify the absence of disruptive multicollinearity, underscoring the reliability of the derived statistical models.

Finally, Pearson correlations were assessed to outline the connections among key variables. Structural Equation Modelling (SEM) was employed to test the hypothesised paths via bootstrapping (with 5000 samples). To investigate the successive intervening roles of resilience and self-esteem within the association of interpersonal disturbance and psychological security, the study utilized Model 6 from the PROCESS macro

by Hayes (Version 3.3; Andrew F. Hayes, University of Calgary, Calgary, AB, Canada) [38]. Indirect effects were estimated via a bias-corrected bootstrapping technique (5000 resamples), with mediation deemed significant when the 95% CI excluded zero. Additionally, standardized path coefficients (β), standard errors (SE), and T-values were reported to evaluate the significance of the estimates.

For completeness, descriptive statistics are reported using the mean and standard deviation ($M \pm SD$). The p value reflects the likelihood of observing the obtained results under the assumption that the null hypothesis is true, with a conventional threshold of $p < 0.05$ used to indicate statistical significance.

3 Results

3.1 Correlation and Descriptive Analysis

Table 1 summarizes the Pearson correlation coefficients outlining the interconnections among the principal constructs. The analytical output reveals that interpersonal disturbance is inversely tied to resilience, self-esteem, and psychological security. In contrast, resilience and self-esteem displayed a reciprocal positive linkage, while both constructs were also positively associated with psychological security. Across the board, all tested relationships among the study variables reached statistical significance ($p < 0.01$).

Table 1: Descriptive analyses and correlations of main variables.

Main Variables	Skewness	Kurtosis	Mean	SD	1	2	3	4
1. Interpersonal Disturbance	0.12	-0.81	9.05	5.48	1	-	-	-
2. Resilience	0.08	-0.11	3.38	0.59	-0.498**	1	-	-
3. Self-Esteem	-0.06	-0.15	27.91	5.54	-0.492**	0.608**	1	-
4. Psychological Security	-0.17	-0.45	3.34	0.81	-0.684**	0.560**	0.569**	1

Note. ** $p < 0.01$. Abbreviations: SD, standard deviation.

3.2 The Mediating Effect of Resilience

First, the mediating path of resilience on the relationship between interpersonal disturbance and psychological security was examined. After controlling for demographic variables, the path analysis results (see Table 2) showed that interpersonal disturbance significantly and negatively predicted resilience ($\beta = -0.481$, 95%CI $[-0.537, -0.424]$, $p < 0.001$). This means that more severe interpersonal disturbance corresponds to lower resilience. Meanwhile, resilience significantly and positively predicted psychological security ($\beta = 0.210$, 95%CI $[0.147, 0.274]$, $p < 0.001$), indicating that resilience is an important positive indicator predicting an individual's psychological security. This model explained 24.7% of the variance in resilience ($R^2 = 0.247$).

The result of mediation effect indicated that the specific mediation effect of interpersonal disturbance in predicting psychological security via resilience was significant ($\beta = -0.101$, 95%CI $[-0.134, -0.068]$, $p < 0.001$). This path suggests that interpersonal disturbance indirectly predicts a decline in psychological security through reduced resilience. Therefore, the data supported H1, H2, H3, and H4.

Table 2: Path analysis results of serial mediation model.

Effects	Path	β	T	SE	95% CI
Direct Effects	H1: ID $\rightarrow$ PS	-0.493	17.584***	0.028	$[-0.548, -0.438]$
	H2: ID $\rightarrow$ Resilience	-0.481	16.671***	0.029	$[-0.537, -0.424]$
	H3: Resilience $\rightarrow$ PS	0.210	6.533***	0.032	$[0.147, 0.274]$

Table 2: Cont.

	Path	β	T	SE	95% CI
Direct Effects	H5: ID $\rightarrow$ Self-esteem	-0.254	8.172***	0.031	[-0.314, -0.193]
	H6: Self-esteem $\rightarrow$ PS	0.230	7.110***	0.032	[0.166, 0.293]
	H8: Resilience $\rightarrow$ Self-esteem	0.472	14.867***	0.034	[0.405, 0.538]
Indirect Effects	H4: ID $\rightarrow$ Resilience $\rightarrow$ PS	-0.101	5.966***	0.017	[-0.134, -0.068]
	H7: ID $\rightarrow$ Self-esteem $\rightarrow$ PS	-0.058	5.148***	0.011	[-0.080, -0.036]
	H9: ID $\rightarrow$ Resilience $\rightarrow$				
	Self-esteem $\rightarrow$ PS	-0.052	6.119***	0.009	[-0.069, -0.035]

Note. *** $p < 0.001$. Abbreviations: ID, interpersonal disturbance; PS, psychological security; CI, confidence interval; SE, standard error.

3.3 The Mediation Effect of Self-Esteem

Second, the mediating path of self-esteem was analysed. The results (see Table 2) showed that interpersonal disturbance significantly and negatively predicted self-esteem ($\beta = -0.254$, 95%CI [-0.314, -0.193], $p < 0.001$), indicating that a negative interpersonal environment effectively predicts a decline in self-evaluation. Simultaneously, self-esteem significantly and positively predicted psychological security ($\beta = 0.229$, $p < 0.001$), suggesting that higher levels of self-esteem are associated with a stronger sense of psychological security. In this path, the model explained 41.1% of the variance in self-esteem ($R^2 = 0.411$).

The mediation test results indicated that the specific mediation effect of interpersonal disturbance in predicting psychological security via self-esteem was significant ($\beta = -0.058$, 95%CI [-0.080, -0.036], $p < 0.001$). This suggests that interpersonal disturbance also exerts an indirect predictive effect on psychological security through the mediating variable of self-esteem. Accordingly, H5, H6, and H7 were verified.

3.4 The Serial Mediation Effect of Resilience and Self-Esteem

Finally, this study also examined the serial mediation path of resilience and self-esteem. The full-model path analysis (see Table 2) showed that the direct predictive effect of interpersonal disturbance on psychological security was significant ($\beta = -0.493$, 95%CI [-0.548, -0.438], $p < 0.001$), indicating the presence of a partial mediation effect. Within the serial path, resilience significantly and positively predicted self-esteem ($\beta = 0.472$, 95%CI [0.405, 0.538], $p < 0.001$), verifying that high resilience is the foundation for high self-esteem among individuals.

Bootstrap analysis results showed that the serial mediation effect of interpersonal disturbance in predicting psychological security sequentially through resilience and self-esteem was significant ($\beta = -0.052$, 95%CI [-0.069, -0.035], $p < 0.001$). In summary, the predictive relationship between interpersonal disturbance and psychological security comprises three indirect pathways: the individual mediation effect of resilience; the individual mediation effect of self-esteem; and the serial mediation effect of resilience and self-esteem.

Overall, the serial mediation model explained 59.6% of the variance in psychological security ($R^2 = 0.596$), indicating that the model in this study adequately explains the variation in psychological security among left-behind children. The total indirect effect was -0.211, accounting for 29.97% of the total effect. This further confirms that interpersonal disturbance not only directly and negatively predicts psychological security but also indirectly predicts it through the serial mediation process of resilience and self-esteem. Therefore, H8 and H9 were fully supported. The results are presented in more detail in Tables 2 and 3.

Table 3: Decomposition of total, direct, and indirect effects.

Path	Effect	SE	95%CI	Relative Mediation	
Total Effect: ID → PS	−0.704	0.020	[−0.704, −0.665]	100%	-
Direct Effect: ID → PS	−0.493	0.028	[−0.548, −0.438]	70.03%	-
Total Indirect Effect: ID → PS	−0.211	0.019	[−0.249, −0.174]	29.97%	100%
Path 1: ID → Resilience → PS	−0.101	0.017	[−0.134, −0.068]	14.35%	47.87%
Path 2: ID → Self-esteem → PS	−0.058	0.011	[−0.080, −0.036]	8.24%	27.49%
Path 3: ID → Resilience → Self-esteem → PS	−0.052	0.009	[−0.069, −0.035]	7.39%	24.64%

Note. Abbreviations: ID, interpersonal disturbance; PS, psychological security; CI, confidence interval; SE, standard error.

4 Discussion

This study examined the relationships between interpersonal disturbance, resilience, self-esteem, and psychological security among left-behind children (LBC) in grades 4 to 7 in an economically disadvantaged border region of Guangxi province. Based on the Conservation of Resources (COR) Theory [15] and Sociometer Theory [23], the findings suggest that interpersonal disturbance is not only negatively linked to psychological security directly but also indirectly through the independent and serial mediating roles of resilience and self-esteem. Instead of merely repeating previous models, these findings explain a specific psychological chain reaction wherein negative school environments may worsen existing vulnerabilities in LBC, particularly in the context of prolonged parental absence and the resource shortages typical of border regions.

4.1 Interpersonal Disturbance and Psychological Security

In the current study, we first found that the level of interpersonal disturbance experienced by left-behind children (LBC) was significantly and negatively correlated with their psychological security, thereby supporting H1. This result is partially consistent with previous research on peer rejection and psychological adaptation [8,9]. These findings corroborate the perspective of Sociometer Theory [23], suggesting that in the absence of parental emotional support, interpersonal relationships within the school environment become the primary source for LBC to establish their self-worth and coping capacity [24]. Severe interpersonal disturbances (e.g., exclusion or bullying) not only weaken the social support networks of LBC [25] but also heighten their sense of uncontrollability and threat regarding their environment [18], which is thus closely associated with the lower psychological security experienced by these children.

4.2 The Mediation Effect of Resilience and Self-Esteem

First, the results of the present study supported our hypothesis, indicating that resilience could mediate the relationship between interpersonal disturbance and psychological security. This result supports the “loss spiral of resources” hypothesis of the Conservation of Resources (COR) Theory [15] and is consistent with Xiao et al. [41]. Previous studies indicate that continuous stress from interpersonal disturbances (such as bullying or rejection) forces individuals to constantly invest in coping resources [42]. For LBC in grades 4 to 7, the absence of a family support system leaves them with relatively scarce psychological resources [43,44]. When the environmental stress of interpersonal disturbance exceeds the individual’s coping capacity, resilience, as a core psychological resource, is depleted through long-term “coping consumption” [17,45]. As Masten [14] emphasised, resilience also depends on the availability of environmental resources. Therefore, when negative interpersonal events weaken external support, LBC experience a reduced ability to recover from adversity, which in turn leads to a significantly heightened

perception of environmental unpredictability and threat [7,21], thus lowering their sense of psychological security.

Second, align with our hypothesis, we revealed that self-esteem emerged as another distinct mechanism bridging interpersonal disturbance and psychological security. This extends Sociometer Theory [23] beyond its conventional focus on self-evaluation by demonstrating its downstream association with foundational security. To be specific, the findings indicate that interpersonal disturbance is negatively associated with self-esteem, which in turn relates to lower psychological security. The possible reason for this is that for individuals in late childhood and early adolescence, the establishment of self-worth is highly dependent on social feedback within the school environment [24]. For LBC, exclusion or conflict is not only perceived as social frustration but also internalised as a perception of low relational value [26]. Due to the lack of sufficient parental emotional support or guidance, this can easily induce negative self-evaluations [30]. Consequently, low self-esteem's function as an "anxiety buffer" [46] is weakened, exposing individuals to excessive worry about interpersonal threats, thereby significantly lowering their psychological security and inducing anxiety [31].

Third, the analysis supports the proposed cascade model, revealing a sequential mediation where higher interpersonal disturbance is tied to lower resilience, which is subsequently associated with decreased self-esteem, corresponding to reduced psychological security. This pathway reveals a sequential effect of external environmental stress transforming into internal psychological states, which follows the developmental logic that "competence adaptation precedes self-evaluation" [47]. In practical terms, when LBC encounter social hostility, it initially correlates with depleted resilience, accompanied by feelings of powerlessness and frustration. Given that adequate resilience is a prerequisite for fostering high self-esteem [43,48], this ongoing experience of "coping failure" is linked to difficulties in cultivating a positive self-concept [35]. Left without familial reassurance, emotionally vulnerable children with depleted resilience are prone to internalising peer rejection as a personal flaw, which is associated with deeper self-negation [49,50]. Thus, the model illustrates how lower adaptive capacity corresponds to poorer self-evaluation, with this dual psychological deficit relating to a significant loss of psychological security [3].

Ultimately, this study indicates that interpersonal disturbance functions as a persistent and cumulative risk factor for LBC, extending beyond temporary social awkwardness. It is consistently linked to poorer psychological adaptation by initiating a continuous depletion of resilience, which relates to lower self-esteem, translating to vulnerabilities in their foundational sense of security. To address this detrimental pattern and support the mental well-being of this demographic, practical interventions should expand beyond improving school climates. Instead, systematically equipping LBC with better resilience and reinforcing their self-worth should be prioritised as key therapeutic entry points.

4.3 Practical Implications for Rural and Border Area Interventions

Considering the profound challenges faced by LBC in border regions, these findings offer critical practical implications. Since interpersonal disturbance is a primary trigger for resource depletion, educational policies and school interventions must prioritise the cultivation of an inclusive campus climate. Interventions should move beyond punitive measures for bullying, actively incorporating peer-support programmes and socio-emotional learning (SEL) tailored for LBC to compensate for the lack of familial support. Furthermore, because resilience and self-esteem mediate this negative impact, interventions should focus on capacity building. Training rural boarding school teachers in trauma-informed care can help them act as surrogate attachment figures, guiding LBC to positively reframe social setbacks and break the cycle of psychological vulnerability.

4.4 Limitations and Future Directions

Although this study has made certain progress in theoretical construction and empirical analysis, there are several limitations that need to be improved in future research.

Cross-sectional nature of the research design: This study explored the relationships among the variables based on cross-sectional data. Although a serial mediation model was constructed based on theoretical logic, strict causal relationships cannot be established. Future research should adopt a longitudinal tracking design, particularly by conducting multi-wave measurements at the children's critical transition point from primary to junior high school, to dynamically capture the interactions and developmental trajectories of the variables.

Limitations of the sample: The research participants were concentrated mainly on left-behind children (LBC) in grades 4 to 7 in a specific border region, so the representativeness of the sample may be limited by the level of economic development. Future research could expand the sampling scope to cover LBC in regions with different levels of economic development and include non-LBC as a control group to disentangle the "left-behind effect" from the "grade effect".

Reliance on single-source measurement: This study relied primarily on self-report questionnaires, which may be subject to common method bias and social desirability effects. Future research could introduce multi-informant assessments (e.g., teacher ratings, peer nominations) or employ Ecological Momentary Assessment (EMA) techniques to enhance the ecological validity of the data.

Complexity of mechanisms: This study focused on the mediation effects of individuals' internal psychological resources (resilience, self-esteem) but did not consider the moderating roles of external environmental factors, such as specific school climates or teacher-student relationships. Future research could integrate person-environment interaction models to examine how external contexts shape the protective factors of resilience and self-esteem in mitigating risk transmission.

5 Conclusions

In summary, the present study provides evidence that interpersonal disturbance is linked to lower psychological security among left-behind children (LBC) in grades 4–7. This association operates through both the independent and sequential mediating roles of resilience and self-esteem, supporting a cumulative pathway from interpersonal risk to internal psychological vulnerability. Together, these findings underscore the importance of supportive interpersonal environments and suggest that interventions aimed at strengthening resilience and sustaining self-esteem may help buffer the adverse psychological effects of interpersonal disturbance.

Acknowledgement: We would like to express our gratitude to Guangxi Minzu Normal University for supporting this research.

Funding Statement: This research was funded by funding of the Special Foundation of Degree and Postgraduate Education of Guangxi Minzu Normal University, grant number (3950020402).

Author Contributions: The authors confirm contribution to the paper as follows: Conceptualization, Methodology, Data curation: Yazhou Huang and Xing Yi; Study conception and design: Yazhou Huang and Xiaoyun Huang; Analysis and interpretation of results: Yazhou Huang, Xing Yi and Xiaoyun Huang; Draft manuscript preparation: Ruoya Li; Review and editing, Supervision: Yazhou Huang, Xing Yi, Xiaoyun Huang and Ruoya Li. All authors reviewed and approved the final version of the manuscript.

Availability of Data and Materials: Data is available upon reasonable request.

Ethics Approval: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Academic Ethics Committee of Guangxi Minzu Normal University (Approval number: GXMZNU-2022-LL—SC-001). This work has obtained approval from school management, assent from the children, and informed consent from their guardians.

Conflicts of Interest: The authors declare no conflicts of interest.

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