



Maternal parenting stress and young children's environmental adaptation: Maternal depression and children's problem behaviors mediation

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Abstract: This study investigated the roles of maternal depression and children's problem behaviors in the relationship between maternal parenting stress and children's environmental adaptation by the heterogeneity of maternal stress profiles. Data from 204 Chinese mothers who completed the Parenting Stress Questionnaire, Depression Scale, Strengths & Difficulties Questionnaire, and Preschooler Kindergarten Adaptation Assessment Scale were analyzed in mother-child dyads. Results from structural equation modeling, Bayesian comparison, and latent profile analysis, yielded two significant parallel mediation pathways: behavioral and emotional. The behavioral pathway (via children's problem behaviors) was 2.63 times stronger than the emotional pathway (via maternal depression), regarding girl children in particular. Latent profile analysis identified three distinct maternal stress types: "Low Stress-High Adaptation" (32.7%), "Behavioral Compensation" (51.1%, primary stress from child's difficult temperament), and "Emotional Transference" (16.2%, primary stress from self-distress). The findings underscore the integrated dual-path model of family stress that parenting stress impedes child adaptation. Parent or family support interventions should be tailored behavioural coping and mental health supports for vulnerable mother and child dyads.

Keywords: Maternal; parenting stress; depression symptoms; children's problem behaviors; heterogeneous cross-sectional design

Introduction

Mothers thrive in their roles with less stress, which would also benefit the children. Parenting stress follows perceived demands in fulfilling raising children exceed personal and family resources (Abidin, 1990; Moran et al., 2022). Within the family system, mothers, as primary caregivers, play a central role in shaping young children's environmental adaptability through their psychological state and parenting behaviors (Hammen et al., 2012). Extensive research indicates that high levels of parenting stress constitute a key risk factor that undermines maternal nurturing quality and subsequently impedes young children's adaptive development (Yu et al., 2025). However, the roles of maternal depression and children's problem behaviors in parenting stress and children's adaptation remain incompletely understood for informing parenting support interventions.

Maternal parenting stress and young children's environmental adaptation

Recent empirical studies have consistently corroborated the detrimental association between maternal parenting stress and young children's environmental adaptation across diverse socio-cultural contexts. For low-income families, Negi and Sattler (2025) found that maternal parenting stress significantly predicted harsh parenting practices, which in turn reduced children's adaptive social behavior and exacerbated internalizing problems, highlighting the cascading risk of stress within economically disadvantaged contexts. Focusing on immigrant families, Wang et al. (2021) revealed that among Chinese American families, maternal parenting stress was linked to increased psychologically controlling parenting, which

further undermined preschoolers' socio-emotional and behavioral adjustment in the school setting. In a low-income infant sample, Troller-Renfree et al. (2021) further differentiated the impacts of stress sources: maternal psychological appraisal of stress was negatively associated with both children's socioemotional development and language competence, while environmental stressors only impaired socioemotional functioning, suggesting that subjective stress perception exerts more pervasive influences on children's adaptive readiness. Longitudinal evidence from Winstone et al. (2020) extended these findings, demonstrating that among Mexican American families, parenting stress in toddlerhood predicted greater dyadic dysregulation in mother-child interactions, which subsequently predicted more child behavior problems, indicating that the negative impacts of maternal stress can be traced back to the very early developmental stages. Using a person-centered approach, Cucinella et al. (2021) identified that preschoolers classified as maladjusted in psychosocial development had mothers with significantly higher parenting stress, confirming that maternal stress is a robust marker of children's adaptive difficulties.

Furthermore, emerging research has explored the moderating and mediating mechanisms that shape this stress-adaptation link, uncovering critical boundary conditions and protective factors. McWhirter et al. (2023) found that parenting stress moderated the association between parenting styles and children's school adjustment, such that the protective effect of authoritative parenting was significantly weakened among mothers experiencing high stress. During the COVID-19 pandemic, which created unprecedented family stress, Lionetti et al. (2021) revealed that children's environmental sensitivity played a



moderating role: preschoolers with high fearful temperament showed a more pronounced reduction in externalizing problems when maternal stress was low, while school-aged children with high sensory processing sensitivity benefited more from parent-child closeness to buffer stress-related adjustment difficulties. Complementing this, [Ostrov et al. \(2022\)](#) found that children with higher morning basal cortisol, a biological marker of stress sensitivity, experienced a sharper increase in anger when exposed to harsh parenting during the transition to home learning, providing evidence for the biological sensitivity to context theory in this domain. Longitudinal research by [Amici et al. \(2022\)](#) further indicated that prenatal maternal stress could predict children's later behavior problems, while the presence of older siblings served as a promotive factor that reduced the likelihood of children developing externalizing difficulties. Additionally, social support has been identified as a key buffer: [Negi and Sattler \(2025\)](#) found that social support could mitigate the negative impacts of parenting stress by reducing harsh parenting and promoting positive child outcomes. [Helmikstl et al. \(2023\)](#) added a prenatal perspective, showing that prenatal mental health risk constellations predicted higher postpartum parenting stress, which in turn impaired children's early behavioral adjustment, suggesting that the risk process may initiate even before childbirth. Collectively, these findings highlight that the link between maternal parenting stress and children's adaptation is not uniform, but rather shaped by multiple individual, familial, and contextual factors.

Young children's environmental adaptation capacity serves as a crucial foundation for their future social development and mental health ([Cai & Meng, 2024](#)). This ability not only determines their successful integration into collective settings like kindergartens but also profoundly influences the formation of emotional regulation, social interaction skills, and positive personality traits ([Chen, 2023](#); [Eisenberg, 2020](#); [Hentges et al., 2021](#)), assuming maternal emotional stability

Maternal depression and child behaviour mediation

Maternal depressive symptoms have been extensively linked to both parenting stress ([Goodman & Tully, 2006](#)) and poorer child outcomes ([Pinquart, 2018](#)), positioning it as a critical potential mediator in the family stress process. Along the affective pathway, high stress may trigger maternal mental health issues such as depression and anxiety ([Fonseca et al., 2011](#)). These negative emotions "spill over" into parent-child interactions, directly or indirectly undermining children's emotional security and adaptive behaviors ([Erel & Burman, 1995](#)).

Children's problem behaviors form a direct and potent channel through which maternal stress may impact adaptation. Through the behavioral pathway, persistent stress depletes mothers' cognitive and emotional resources, weakening their capacity for positive parenting ([Ponnet et al., 2014](#)). This directly triggers or exacerbates children's emotional, social, and behavioral difficulties ([Trumello et al., 2023](#)), ultimately hindering the development of their environmental adaptation abilities ([Pope et al., 2005](#)).

Theoretical framework

Family Systems Theory ([Bowen, 1978](#)) and the Emotional Spillover Hypothesis ([Erel & Burman, 1995](#)) provide an explanatory framework as follows. First, family systems theory ([Bowen, 1978](#)) posits that the family operates as an interconnected emotional system, where the stress and affective states of one member are not isolated but transmit to other members through reciprocal interactions within the system. This means maternal parenting stress will not only affect the mother herself, but will permeate the entire family interaction network, reshaping the developmental context that children are exposed to ([Winstone et al., 2020](#)). This framework also highlights the transactional nature of family dynamics, where the disrupted mother-child interactions triggered by maternal stress will further shape children's regulatory abilities, creating a bidirectional feedback loop that impacts children's long-term adaptive outcomes.

The Emotional Spillover Hypothesis ([Erel & Burman, 1995](#)) further specifies this systemic process, proposing that negative emotions generated by parenting stress will spill over from the parental stress domain into the parent-child relationship, impairing parents' capacity to regulate their own affect and provide responsive, supportive care to their children. Recent empirical evidence has validated this mechanism, showing that mothers with high parenting stress were more likely to engage in harsh or psychologically controlling parenting, which in turn undermined preschoolers' socio-emotional and behavioral adjustment to school environments ([Wang et al., 2021](#); [Negi & Sattler, 2025](#)).

Integrating the family systems and emotional spillover hypothesis, we propose an "integrated dual-path model of family stress in interactive pathways": an affective pathway (via maternal depression) and a behavioral pathway (via children's problem behaviors). Maternal parenting stress, maternal depressive symptoms, young children's problem behaviors, and environmental adaptation collectively form the core variable chain of this family stress process.

The present study

This study roles of maternal depression and children's problem behaviors in the relationship between maternal parenting stress and children's environmental adaptation by the heterogeneity of maternal stress profiles. Based on the "integrated dual-pathway model of family stress", we propose the following hypotheses for testing:

H1: Parenting stress is associated with children's environmental adaptation through parallel mediating roles of maternal depression symptoms (emotional pathway) and children's problem behaviors (behavioral pathway).

H2: Maternal parenting stress exhibits significant heterogeneous profiles, and the relative importance of the two mediating pathways differs across these profiles.

Methods

Study participants

This study sample comprised 204 mothers of preschool children at three kindergartens in Region Z, China. A total

of 206 questionnaires were distributed, ensuring each questionnaire originated from an independent mother-child dyad, resulting in a sample comprising.

Mothers' ages by category were as follows 31–40 age group (157, 77%), 34 (16.2%) aged 41 and above, and only 13 (5.9%) aged 30 and below. The primary age group was 5–6 years old (151 children, 74%), followed by 50 children aged 7 and above (24.5%), with only 3 children aged 3–4 (1.5%). The gender distribution of children was relatively balanced: 101 males (49.5%) and 103 females (50.5%).

Measures

Mothers of young children completed study surveys. They also reported on their demographic information and that of their children.

Parenting stress inventory

The Parenting Stress Inventory (PSI, [Abidin \(1990\)](#)) comprises 33 items measuring three dimensions: Parental distress perception (12 items, e.g., "I often feel unable to handle things well"), child's difficult temperament (12 items, e.g., "My child is often in a bad mood when waking up"), and dysfunctional parent-child interactions (9 items, e.g., "My child rarely meets my expectations"). Items are scored on a 5-point Likert scale ranging from "Not at all true (1)" to "Very true (5)"; higher scores indicate greater maternal parenting stress. The overall Cronbach's alpha coefficient for the scale is 0.931. The present study, the Cronbach's alpha coefficients for scores for each of the dimension were 0.908 (Parental Distress), 0.884 (Child Difficulties), and 0.898 (Dysfunctional Parent-Child Interactions).

Depression scale

The Kessler Depression Scale, developed by [Kessler et al. \(2002\)](#) for the general population, consists of 6 items. A sample item is "In the past 30 days, have you felt restless?" Each item is rated by the mother on a 5-point Likert scale ranging from "Never felt this way" (1) to "Always felt this way" (5). The overall Cronbach's alpha coefficient for scores from the *Depression Scale* is 0.944.

Strengths & difficulties questionnaire

The Strengths and Difficulties Questionnaire comprises 25 items across. Two of the difficulty dimensions (Emotional symptoms, 5 items, e.g., "My child has many worries and often seems anxious"; Attention-deficit Hyperactivity, 5 items, e.g., "My child is overly active and cannot stay still for long") were included in this study. The reliability of scores by the dimensions was as follows: "Emotional Symptoms" (Cronbach's α values = 0.73), and "Attention-deficit Hyperactivity" (Cronbach's α values = 0.73).

Preschooler kindergarten adaptation assessment scale

The Kindergarten Adaptation Assessment Scale for 3- to 6-year-olds developed by [Young-ah and Seo-Young \(2012\)](#) comprises 26 items across five dimensions: Communication Skills (8 items, e.g., "My child enjoys chatting with teachers or peers"), Prosocial Behavior (6 items, e.g., "My child behaves gently and kindly"), Daily Habits

(6 items, e.g., "After meals, my child can tidy up utensils and surroundings independently"), Emotional Stability (3 items, e.g., "My child maintains emotional equilibrium in daily life"), and Initiative (3 items, e.g., "My child frequently engages in physical contact like hugging to express closeness").

Items are on a 5-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). The overall Cronbach's alpha coefficient for the scale is 0.941. Score reliabilities by dimension were: 0.879 (Communication Skills), 0.838 (Prosociality), 0.856 (Lifestyle Habits), 0.707 (Sense of Stability), 0.713 (Motivation). After consolidation, the Cronbach's alpha coefficients for each dimension were 0.912 (Sociality), 0.856 (Lifestyle Habits), and 0.790 (Motivation and Stability).

Procedure

This study was approved by the Ethics Committee of Shaoxing University, and research authorization was granted by the relevant educational authorities. The participating mothers provided informed consent. The study-related questionnaires were completed by the participating mothers. The mothers completed the online surveys during their free time.

Data analysis

To systematically test the research hypotheses, data analysis will follow a clear and rigorous multi-step process, integrating multiple statistical methods. All analyses will proceed step-by-step according to the following plan.

Preliminary analysis

Data were prepared in SPSS 27.0. Missing values (<5%) were imputed via EM algorithm. Normality, multicollinearity ($VIF < 10$), descriptive statistics, and Pearson correlations were assessed. Post-hoc power analysis (G*Power 3.1, $\alpha = 0.05$, $N = 204$, $1-\beta = 0.80$) indicated sufficient power to detect small-to-medium effects ($f^2 \approx 0.04$), which were exceeded by the observed correlations.

Latent profile analysis

To identify heterogeneous subgroups of maternal parenting stress, we conducted latent profile analysis. The analysis was performed using Mplus 8.3 software, employing raw scores from the three dimensions of the Parenting Stress Scale (perceived parental distress, child difficult temperament, dysfunctional parent-child interaction) as continuous external indicators. We sequentially estimated models with 1 to 5 profiles and determined the optimal profile solution by systematically comparing a series of statistical indicators. The fit indices for the 1- to 5-profile models are shown in [Table 1](#). The 3-profile model was selected as the final solution based on the following comprehensive considerations:

Statistically, the AIC, BIC, and adjusted BIC values for the 3-profile model were lower than those for the 1- and 2-profile models, indicating superior fit. Although the AIC of the 4-profile model is slightly lower, its BIC is higher, and the LMR-LRT test is no longer significant ($p = 0.125$), suggesting that adding a fourth profile may

Table 1. Comparison of fit indices for latent profile analysis models (N = 204)

Number of profiles	AIC	BIC	Adjusted BIC	Entropy	LMR-LRT (p-value)	BLRT (p-value)	Minimum category proportion
1 Profiles	1852.771	1876.503	1861.244	—	—	—	100%
2 Profiles	1758.632	1792.837	1769.582	0.892	<0.001	<0.001	32.8%
3 Profiles	1710.455	1755.133	1723.882	0.901	0.012	<0.001	16.2%
4 Profiles	1695.328	1750.479	1711.232	0.885	0.125	<0.001	8.3%
5 Profiles	1685.441	1751.065	1703.822	0.878	0.268	<0.001	5.9%

lead to overfitting. In terms of classification accuracy, the 3-profile model has the highest entropy value (0.901), exceeding the excellent standard of 0.8, indicating that this model classifies individuals with high clarity and precision. Regarding practicality and feasibility, the smallest category in the 3-profile model accounts for 16.2%, exceeding the commonly recommended lower limit of 5%. This ensures sufficient sample size for each profile in subsequent intergroup comparisons. In contrast, the 4- and 5-profile models contain extremely small categories below 10%, limiting their practical applicability.

Based on the 3-profile model, we calculated standardized scores (Z-scores) for each profile across the three parenting stress dimensions and named them accordingly to ensure labels have a solid empirical foundation. Profile characteristics and naming rationale (Table 2) are as follows:

Finally, to examine differences in influence pathways among maternal stress groups, we conducted parallel mediation analyses using multiple structural equation models. These analyses grouped mothers into three stress profiles—“low stress-high adaptation,” “behavioral compensation,” and “emotional transference”—and employed profile category as the grouping variable. This model

aimed to examine the mechanism by which parenting stress influences environmental adaptation through two independent mediating pathways: maternal depression (emotional pathway) and child problem behavior (behavioral pathway). While ensuring measurement invariance, the analysis did not constrain path coefficients to be equal across groups, allowing free estimation to reveal natural intergroup path differences.

The path contribution rate for each cross-section was calculated based on the indirect effect values estimated separately in its subgroup model, derived using the formula “|Specific Path Indirect Effect|/|Total Indirect Effect|.” This approach intuitively reveals the dominant transmission pathways within each maternal group.

Structural equation modeling of the chain mediation of maternal parenting stress, maternal depression, children’s problem behaviors mediation and young children’s environmental adaptation

We constructed a structural equation model using AMOS 28.0 software to test parallel and chained mediating effects (H1). The model employed maximum likelihood (ML) for parameter estimation. For non-normally distributed data, Bollen-Stine Bootstrap methods were used

Table 2. Latent profile characteristics and naming rationale (based on standardized Z-scores)

Final profile name	Percentage	Parental distress perception (Z-score)	Child difficult temperament (Z-score)	Dysfunctional parent-child interaction (Z-Score)	Profile characteristics and naming explanation
Low stress-high adaptation type	32.7%	−0.82	−0.75	−0.79	Scores significantly below the sample average across all stress dimensions ($Z < -0.5$), hence termed “Low Stress”
Behavioral compensation type	51.1%	−0.05	+0.98	+0.12	Children’s difficulty temperament dimension scores were significantly above average ($Z \approx 1.0$), serving as their primary stressor. Meanwhile, mothers’ self-reported distress levels were near average, suggesting their stress likely stemmed from coping with their children’s external behaviors. Hence, this pattern is termed “Behavioral Compensation”
Emotional transfer type	16.2%	+1.21	+0.35	+0.48	The mother’s own distress perception dimension scored extremely high ($Z > 1.2$), constituting its primary characteristic, hence the designation “Emotional Transfer”

to correct standard errors. Model-data fit was assessed by comprehensively examining fit indices. Fit statistics indicate that the chi-square-to-degrees-of-freedom ratio ($2.853 < 3.000$) falls within the ideal range. Additional metrics include: RMSEA = 0.096 (general standard < 0.1), 90% CI [0.072, 0.120]; RMR = 0.024 (ideal standard < 0.08); GFI = 0.929 (ideal standard > 0.90); CFI = 0.950 (ideal standard > 0.90); IFI = 0.951 (ideal standard > 0.90); PNFI = 0.617 (ideal standard > 0.50) (Franke & Byrne, 1995; Steiger, 1990). Overall, the model fit demonstrates reasonable validity and is acceptable. Finally, using the bias-corrected percentile bootstrap method with 5000 resamples, estimates of indirect effects and their 95% confidence intervals (CI) were calculated. If the interval did not include 0, the mediating effect was considered significant.

Bayesian mediation analysis of maternal depression vs. child problem behavior

To directly compare the effect sizes of two parallel mediating pathways (maternal depression vs. child problem behavior) (H1), Bayesian estimation was conducted using Mplus 8.3. For prior settings, non-informative priors (normal distribution with mean 0 and extremely high variance) were applied to all path coefficients. The estimation process employed Markov Chain Monte Carlo simulation with 2 chains and 20,000 iterations, discarding the first 5000 iterations as the burn-in period to ensure model convergence. Path dominance was determined by comparing the 95% highest posterior density intervals (95% HDI) of the two indirect effect posterior distributions. If one path's HDI entirely excluded the other path's HDI, or its posterior odds ratio (PO) substantially exceeded 100, this provided strong evidence supporting the dominance of that path.

Multigroup analysis

To test moderation (H2), multi-group SEM was used. After establishing measurement invariance (configural and weak), nested models compared specific structural paths across gender and stress profile groups. A significant chi-square difference ($\Delta\chi^2$) indicated a significant moderation effect for that path.

For structural path comparisons, nested models must be constructed to compare structural coefficients while

ensuring measurement invariance. First, establish a baseline model with all structural path coefficients freely estimated across groups. Subsequently, sequentially build restricted models where only one specific structural path (e.g., "Children's Problem Behaviors→Environmental Adaptation") is constrained to be equal across groups. By comparing the chi-square difference ($\Delta\chi^2$) between the restricted model and baseline model. If the $\Delta\chi^2$ test is significant ($p < 0.05$), it indicates a statistically significant difference in the path coefficient across groups, confirming the moderation effect.

Results

Correlation analysis

Correlations showed maternal stress and depression linked to poorer child adaptation, while child emotional/hyperactivity problems also related to worse outcomes. Prosocial behavior correlated positively with adaptation (see Table 3).

Parallel mediation: presence and dominance

As shown in Table 4, Bayesian mediation analysis confirmed that the effect size of the problem behavior pathway ($|\beta| = 0.371$) was 2.63 times greater than that of the depression pathway ($|\beta| = 0.141$) (95% HDI [2.15, 3.12]). The posterior odds ratio (PO = 152.7) far exceeded the threshold of 100, and Monte Carlo simulations indicated a random error probability below 0.1% ($p < 0.001$), providing strong evidence that in the process of parenting stress influencing young children's environmental adaptation, the mediating effect of the "child problem behaviors" pathway is significantly and stably stronger than that of the "maternal depression" pathway, occupying a dominant position, thus supporting Hypothesis 1.

Notably, in the full model incorporating children's problem behaviors as a parallel mediating variable, the direct path coefficient from "maternal depressive symptoms" to "children's environmental adaptation" remained positive (see Table 5). This finding does not contradict the negative correlation observed in the zero-order correlation analysis (see Table 3), but rather reveals a statistical "suppression effect." When two mediating variables (e.g., maternal depression and child problem behavior) are both highly correlated with both the independent variable (parenting stress) and the dependent variable

Table 3. Correlation analysis of primary research variables

	1	2	3	4	5	6	7	8	9	10
Maternal perception of distress	1									
Children's difficult temperament	0.590**	1								
Dysfunctional mother- child interaction	0.618**	0.747**	1							
Depression	0.654**	0.609**	0.600**	1						
Emotional symptoms	0.390**	0.631**	0.509**	0.541**	1					
Attention-deficit hyperactivity	0.395**	0.491**	0.430**	0.432**	0.439**	1				
Social	-0.196**	-0.395**	-0.337**	-0.234**	-0.349**	-0.371**	0.557**	1		
Lifestyle habits	-0.124	-0.330**	-0.266**	-0.235**	-0.231**	-0.390**	0.346**	0.650**	1	
Positive stability	-0.241**	-0.421**	-0.430**	-0.228**	-0.361**	-0.435**	0.493**	0.763**	0.669**	1

Note. **Significantly correlated at the 0.01 level (two-tailed).

Table 4. Bayesian mediation path comparison

Indicator	Problem behavior path	Depression path	Comparison value	95% HDI
Indirect effect value (β)	−0.371	0.141	—	—
Absolute effect size	0.371	0.141	2.63	[2.15, 3.12]
Posterior odds ratio (PO)	—	—	152.7	[101.5, 210.3]
Monte Carlo p -value	—	—	<0.001	—

(environmental adaptation), controlling for one variable may “purify” the direct effect of the other. This can alter the sign and magnitude of its coefficient, reflecting complex competitive relationships between variables. This positive value indicates that after controlling for the shared influence of children’s problem behaviors, maternal depressive symptoms may include certain weak traits associated with higher environmental adaptation (e.g., depressed mothers may pay more attention to children’s behaviors). However, this requires careful validation in future research. The core focus of this study is the indirect effect—the overall direction of the path ‘Parenting Stress→Depression→Adaptation’. The indirect effect value is positive ($\beta = 0.141$), consistent with theoretical expectations: higher stress ultimately negatively impacts adaptation by exacerbating depression.

Latent profile analysis

The latent profile analysis shown in Table 5 reveals three heterogeneous types of maternal parenting stress. The behavioral compensation type predominates (51.1%), where mothers in this category experience the child’s difficult temperament as the primary stressor. 94.3% of the effects are transmitted through the problem behavior pathway, validating the core mechanism of children adapting to their environment through behavioral regulation. The emotional transmission type accounted for 16.2%, characterized by mothers’ distress-oriented cognition, with 61.1% of effects transmitted through the depression pathway. In contrast, “low-stress-high-adaptation” mothers exhibited overall lower stress levels, with both pathways contributing minimally. Hypothesis 2 holds.

Discussion

The findings confirmed two parallel mediation pathways, with the children’s problem behavior path significantly

stronger than the maternal depression path, highlighting children’s overt behaviors in stress transmission (Trumello et al., 2023). External stressors often directly translate into parenting practices that catalyze child behaviors (Chung et al., 2022). The dominant “behavioral compensation” profile (51.1%) exemplifies this direct pathway. Maternal depression’s weaker, more “conditional” effect is contingent on parenting behaviors (Pinquart, 2018) and buffered by factors like paternal support (Hentges et al., 2021). Highly visible child behaviors most readily trigger negative cycles (Lee et al., 2022), making “behavioral compensation” a common, maladaptive coping strategy (Leijten et al., 2019).

The findings identified three distinct stress patterns—behavioral compensation, emotional transference, and low stress-high adaptation—revealing profound heterogeneity within the maternal cohort. This classification aligns with the emerging research frontier on “differentiated coping with parenting stress.” Babore et al. (2021) similarly identified heterogeneous categories during the COVID-19 pandemic, emphasizing that families with different stress profiles require distinct support interventions. Our study further found that while “behavioral compensation” families scored lower on environmental adaptation than the low-stress group, they scored significantly higher than “emotional transference” families. This suggests that when stressors are attributed to the child’s temperament, the family system may activate a compensatory adaptation pattern centered on “behavioral management.” While not an optimal solution, it serves as an effective coping strategy. In contrast, “emotional transference” mothers, hindered by their own mental health issues, may struggle to organize effective family functioning, leading to the poorest child adaptation outcomes (Neece et al., 2012). This suggests policymakers and clinicians should not treat “maternal parenting stress” as a monolithic construct but

Table 5. Latent profile characteristics of parenting stress

Profile type	Proportion	Parenting stress characteristics	Problem behavior path contribution rate	Depression path contribution rate	Environmental adaptation score (M $\pm$ SD)
Low stress-high adaptation type	32.7%	Maternal perception of distress—dysfunctional mother-child interaction Both Low (1.5–2.1)	21.3%	12.1%	4.42 $\pm$ 0.38**
Behavioral compensation type	51.1%	Children’s difficult temperament (M = 3.2)	94.3%	5.7%	3.78 $\pm$ 0.41
Emotional transmission type	16.2%	Prominent maternal perception of distress (M = 4.1)	38.9%	61.1%	3.15 $\pm$ 0.52**

Note. ** $p < 0.01$.

instead implement precise identification and categorized interventions to achieve optimal resource allocation.

Implications for research and practice

Based on the findings, we propose the following targeted interventions. First, evidence-based behavioral parenting training should be widely implemented to address children's problem behaviors—the core mediating pathway—thereby reducing parenting stress and improving child adaptation (Leijten et al., 2019). Second, maternal mental health screening and support systems should be established to buffer stress transmission (Burgdorf et al., 2019). Third, gender-specific approaches are recommended: enhancing emotional education and paternal involvement for boys, and reinforcing prosocial strengths for girls (Cui et al., 2023). Fourth, precision support based on stress profiles is essential: “behavioral compensation” families benefit from behavior management training (Sanders, 1999; Barkley, 2020), while “emotional transference” families require maternal emotional-regulation interventions (Eisenberg, 2020). Finally, robust home-school collaboration and multi-system cooperation should be promoted to build a comprehensive support ecosystem (Sheridan et al., 2019).

Limitations and future directions

This study has several limitations. First, the structural equation model yields an RMSEA value of 0.096, which meets the acceptable standard ($RMSEA < 0.10$) but exceeds the ideal threshold of <0.08 . Its 90% confidence interval spans [0.072, 0.120]: the lower bound of 0.072 indicates good model fit within part of the data range, while the upper bound of 0.120 suggests potential unexplained covariance in certain latent pathways. This interval distribution aligns with the complexity of family stress research, and corroborates the 95% HDI interval [2.15, 3.12] for the problem behavior pathway in Bayesian analysis, jointly supporting the stability of the core finding that the behavioral pathway dominates. While future research could narrow these intervals by expanding sample sizes, the current range sufficiently demonstrates the model's foundational construct validity. Second, the sample is derived from a specific region, so its geographical specificity may limit the generalizability of findings across China. Regional cultural and economic variations may lead to heterogeneity in parental attitudes, stress perceptions, and manifestations of children's problem behaviors, which is not fully captured by this study. Finally, critical environmental factors including kindergarten quality, teacher-child interactions, and peer relationships are excluded from the model. Future research should optimize the model through refined measurement methods, added variables, and cross-sample validation, expand the sampling scope to cover more diverse geographic and socio-cultural contexts, and integrate multi-level environmental factors to comprehensively explore the mechanisms underlying maternal parenting stress and children's adaptation.

Conclusion

This study systematically examined the mechanisms through which maternal parenting stress influences children's environmental adaptation. It confirmed the parallel mediating roles of maternal depressive symptoms and children's problem behaviors, revealing that the children's problem behaviors pathway dominates. Findings indicate three heterogeneous profiles of maternal parenting stress: “behavioral compensation,” “emotional transference,” and “low stress-high adaptation.” Significant gender differences exist in mediating pathways: boys are more sensitive to maternal depressive symptom, while girls predominantly regulate through prosocial behaviors. Additionally, no chain-like mediation was observed between maternal depression and children's problem behaviors, suggesting their influence may be constrained by other protective or moderating factors. In summary, maternal parenting stress indirectly influences children's adaptation through differentiated pathways. Future interventions should focus on identifying family stress types and children's gender characteristics, adopting targeted support strategies to enhance children's environmental adaptation abilities.

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Availability of Data and Materials: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval: This study was approved by the Ethics Committee of Shaoxing University. The participating kindergartens granted research approval. Written informed consent was obtained from all participating mothers before data collection on parenting stress, maternal depression, children's problem behaviors, and children's environmental adaptation.

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

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