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Emotional competence and problem behavior of left-behind preschool children—the roles of self-regulation and authoritative grandparenting styles

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Introduction: When parents migrate to other cities for work, their children who are left behind show a high prevalence of behavioral problems, which affect social function. Although previous studies have found that emotional competence significantly predicts problem behavior, little is known about the mechanism(s) through which self-regulation and authoritative grandparenting styles affect emotional competence and problem behavior. This study examined the associations between emotional competence and problem behavior of preschoolers and the mediating role of self-regulation and the moderating role of authoritative grandparenting styles.

Methods: Participants included 449 left-behind preschool children (46.3% girls, mean age = 53.65 months). Grandparents reported their parenting styles with children and teachers reported children's problem behavior. Children's emotional competence and self-regulation were completed one-on-one by trained research assistants, following a standard protocol.

Results: The results revealed that children's emotional competence is negatively related to problem behavior. Self-regulation partially mediates the effects of emotional competence on problem behavior. Authoritative grandparenting styles moderated the relationship between emotional competence and problem behavior in children, but not the relationship between self-regulation and problem behavior. Significantly, authoritative grandparenting styles enhanced the promoting effect of emotional competence and reduced children's problem behavior.

Discussion: Our findings underscore the importance of intrinsic elements of child self-regulation, as well as adopting more authoritative parenting behaviors in their daily interaction with children, on developing stronger emotional competence and reducing problem behavior in preschoolers.

KEYWORDS

emotional competence, problem behavior, self-regulation, authoritative grandparenting styles, left-behind preschool children

1 Introduction

With the rapid development of China's economy and the acceleration of urbanization, a large number of farmers migrate to other cities for employment to improve their family's economic situation. However, due to various pressures, they are compelled to leave their children in rural families, thereby generating a group of left-behind children. Left-behind children refer to minors who are severed from their parents' care for a long time due to the migration of both or one of their parents (Xiong et al., 2024). According to the 2023 Rural

Education Development Report, the number of left-behind children in China dropped to 9.02 million in 2022 compared with a drop of 22 million in 2012. However, the number of left-behind children is still large, and the problems are still formidable. Moreover, existing studies have found that left-behind children exhibit more problem behaviors than their non-left-behind peers, and left-behind children have more learning difficulties and behavioral issues, such as aggression, resistance, hyperactivity, and destructive tendencies (Tan et al., 2023). The realistic problems of left-behind children in their development are still prominent, and their problem behaviors are still one of the most important contents of current research.

Existing studies have shown that there are many factors, —such as father involvement (Torres et al., 2014; Qiao et al., 2024), personal traits (Tan et al., 2023), parenting styles (Haslam et al., 2020), teacher–child relationship (Bulotsky-Shearer et al., 2020), parenting stress (Mak et al., 2020), and digital media (Sundqvist et al., 2020)—that affect the problem behavior of left-behind children. Although existing research results have provided the foundational base for improving the care system for left-behind children, the study of problem behavior should pay attention to both external environmental factors and internal psychological factors. Currently, the research on left-behind children mainly focuses on the external environmental factors to reduce problem behavior, ignoring the role of their internal positive psychological qualities. Therefore, the primary purpose of this study is to comprehensively investigate the influence of emotional competence on the problem behavior of left-behind children. Children's emotional competence is not only related to various positive outcomes, such as good social relationships, academic success, good behavior habits, and wellbeing (Hachem et al., 2022). It has also been linked to problem behavior, such as bullying behavior and withdrawal behavior (Calzada et al., 2024; You et al., 2023). The development of emotional competence helps children understand and express their emotions, understand others' emotions, enhance their adaptability, and reduce the probability of problem behavior. Therefore, this study proposes Hypothesis 1 that emotional competence has an important influence on problem behavior.

Hypothesis 2 aims is to explore the influence mechanism of emotional competence on problem behavior. Self-regulation is the ability of individuals to monitor and regulate their cognition, emotions, and behaviors to achieve goals and adapt to changing circumstances, including cognitive regulation, emotional regulation, and behavioral regulation (Housman et al., 2023). The development of self-regulation is influenced by physiological, cognitive, social, and emotional/motivational factors and their interactions (Karreman et al., 2006). Children with good emotional competence can control their emotional fluctuations and behavioral impulses, internalize various environmental demands, and social rules and are more likely to concentrate on and adjust their problem behaviors at school. In addition, children with high emotional competence can control the intensity, sensitivity, tolerance, and external expression of emotional responses, promote the development of self-regulation ability, and then affect their behavior. Therefore, this study proposes the second hypothesis that the emotional competence of left-behind children can affect their problem behavior through self-regulation.

In addition, for the left-behind children as a special group, external environmental factors, such as the authoritative grandparenting styles, are also crucial to their development and have an important impact on emotional competence and problem behavior. Existing studies have shown that there is a significant relationship between authoritative parenting styles and obsession, psychosis, shyness in adolescents, and loneliness (Shideh and Shima, 2016). The parenting style of the grandparents determines how grandparents influence the mental health growth of children. If the grandparents have established close relationships with the children, adopting authoritative parenting styles will promote the children's mental health and behavioral development. Otherwise, it will hinder children's mental health and behavioral development. In addition, grandparents with authoritative parenting reflect on the children's psychological needs and provide effective guidance. At the same time, authoritative parenting is beneficial to reducing children's loneliness and enhancing children's ability for self-psychological reconstruction (Uji et al., 2014). The concern shown by the grandparents in authoritative parenting conveys more love, encouragement, and appreciation to the child helps the child develop positive emotions and courage in the face of setbacks, and reduces the appearance of problem behaviors, such as depression and anxiety (Sun et al., 2024). Therefore, the third purpose of this study is to explore the influence of authoritative grandparenting styles on children's emotional competence and problem behavior, self-regulation, and problem behavior. It is believed that an authoritative grandparenting style can moderate the relationship between left-behind children's emotional competence and problem behavior (the comprehensive model is shown in Figure 1).

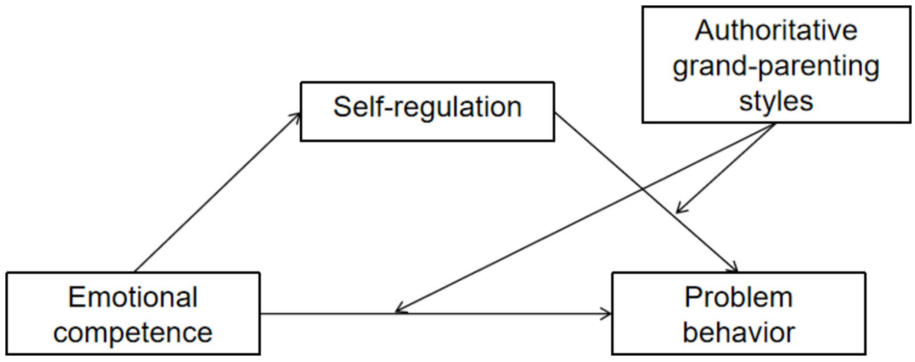

FIGURE 1
The comprehensive model.

2 Literature review and theoretical hypothesis

2.1 Emotional competence and problem behavior of left-behind children

The problem behavior of children refers to the violation of the socially acceptable normal norms and moral standards of young children, as well as immature behaviors in social adaptation, such as physical aggression, verbal rudeness, Internet addiction, hyperactivity, and non-observance of discipline (Eisenberg et al., 2001). The early problem behavior of children is easy to evolve into antisocial behavior and eventually leads to criminal behavior. The problem behavior of left-behind children in rural areas is affected by social, school, family, and individual factors, and one of the most important internal factors is emotional competence.

Emotional competence refers to children's ability to recognize and comprehend their own and others' emotions, and adjust and control their own emotions on this basis, which profoundly impacts on children's social development, personal achievement, and physical and mental development (Saarni, 1997). Emotional competence is the core of young children's emotional communication and maintenance of positive peer interactions, developing throughout childhood (Rojas and Abenavoli, 2021).

Preschool education is a critical period in developing young children's emotional competence, which can help children cope with challenges, build social relationships, maintain mental health, and adapt to various social environments. Children with higher emotional competence can acquire different emotional experiences, master relevant emotional management skills, and exhibit superior social skills, which enables them to use emotional motivation in positive emotions to complete specific tasks, explore, and learn, thus reducing the occurrence of problem behavior. Conversely, children with lesser emotional abilities are inclined toward aggression and impulsivity, rather than using problem-solving skills to analyze situations. Existing studies have shown that children's emotional competence is related to their executive function, and children with better emotional competence often show better inhibitory control, flexibility, and problem-solving abilities, which can reduce the occurrence of aggressive behaviors and reduce the probability of disputes with peers (Li et al., 2020). Thus, we propose the first hypothesis:

> *H1*: Emotional competence will negatively impact the problem behavior of left-behind children.

2.2 The mediating role of self-regulation

Emotional competence not only directly affects the problem behavior but also indirectly affects the problem behavior through the individual's internal factors, such as self-regulation. Existing studies have shown that children's emotions are related to self-regulation and social temperament and can predict the development of children's behaviors (Jang and Hong, 2022). Self-regulation refers to a person's ability to plan, examine, evaluate, and control their behavior to effectively respond to environmental demands in various contexts, involving regulation of the intensity, frequency, and duration of verbal and behavioral activities (Housman et al., 2023; Jang and Hong, 2022).

Children with high emotional competence have a high level of self-regulation, can express emotions correctly; understand others' emotions; properly deal with emotions, inhibit, activate, and control their own emotions and physiological responses; and then predict their behavior to a particular event (Rojas and Abenavoli, 2021; Lin et al., 2019). Children with high levels of emotional competence have higher levels of empathy and positive emotional perspective thinking and understand social norms through social interaction and observation. In addition, children also actively participate in appropriate self-regulation activities, such as self-soothing, and organized motor behavior (Housman et al., 2023). Preschool children with high emotional competence can detect, identify, and understand their own or others' emotions. On this basis, children may regulate, control, and adequately express emotion, which can enable children to interact better with others and reduce the occurrence of problem behaviors, such as anxiety and depression (Jang and Hong, 2022). Thus, we propose the second hypothesis:

> *H2*: Self-regulation will mediate the relationship between emotional competence and problem behavior.

2.3 The moderating role of authoritative grandparenting styles

Family is the primary unit of children's education, and the way of family upbringing plays a vital role in children's education and career development. Family parenting style is the relatively stable behavior pattern shown by grandparents or parents in the process of raising children, which incorporates not only the stable parenting behavior of grandparents or parents but also the emotional expression and emotional transmission between grandparents or parents and children (Masud et al., 2019; Sahithya et al., 2019). According to the direction of emotion and behavior, family parenting styles can be divided into positive parenting and negative parenting (Mak et al., 2020; Tian et al., 2024). As the left-behind children in rural areas cannot live with both parents and their grandparents most of the time, these children cannot get the normal companionship and education of their parents, which makes them in a vulnerable situations in many aspects of their growth environment. At this time, the parenting style of grandparents is fundamental requisite, and the parenting support provided by grandparents becomes the core component of family support. In particular, authoritative grandparenting styles are an important emotional resource for children, which can directly improve children's cognition and mood through interaction, role model effect, and behavior monitoring. By providing care, guidance, and support for children, authoritative grandparenting styles can effectively facilitate their social development and influence children's emotional development, enhance children's ability to express emotions, and foster their capacity to regulate their thoughts and emotional responses. Regarding emotional direction, the positive parenting style manifests as the establishment of a warm emotional relationship between grandparents and children. Regarding behavioral direction, it manifests as the grandparents often adopting positive and supportive behaviors for children. Authoritative grandparenting styles can provide children with a good emotional environment and create a positive emotional activity chain, enhancing children's ability to perceive and comprehend their own emotions and those of others.

This, in turn, enables them to express emotions appropriately and manage their internal emotional states and external emotional expressions, ultimately facilitating the development and refinement of their emotional competence (Haslam et al., 2020; Bhide et al., 2019).

Authoritative grandparenting styles make grandparents willing to spend more time and energy accompanying children, fostering deeper emotional investments and instilling trust, encouragement, and meticulous care. Grandparents also actively participate in the upbringing of children, take care of them, and effectively detect, identify, and accept their emotional reactions with their children. Communicating more effectively with grandchildren, and guiding children to think about their emotional experience can form a more positive perspective and a correct emotional understanding, improve children's self-regulation ability, and reduce their anger, depression, anxiety, and other problem behavior (Yorgason et al., 2011). Authoritative grandparents guide children to cope with various problems in life and learn more effectively, enhance children's coping ability and problem-solving abilities, promote children to have a more positive emotional state, and can nurture them more healthily. Existing research shows that authoritative grandparenting styles make children more adaptable and beneficial to children's psychological and behavioral development (Lussier et al., 2002; Ruiz and Silverstein, 2007). Authoritative grandparenting styles can meet children's physical and psychological needs in time. Through effective interaction with grandchildren, children can get social support and a good emotional state, which is conducive to improving the positive influence of emotional ability on self-regulation, to reduce children's problem behavior. As a buffer for family social pressure, authoritative grandparenting styles can reduce grandchildren's depression levels and reduce grandchildren's peer problems and general behavior problems (Liu, 2019). Existing research suggests that child–caregiver relationships influence children's emotional performance at all stages. Children gain the ability to express their emotions through observational attachment frameworks and develop emotional competence and self-regulation in a good interactive relationship with caregivers (Profe and Wild, 2015). When grandparents adopt positive parenting styles, children are more likely to feel secure and confident, and are more able to self-regulate with ease, reducing problem behaviors such as anxiety (Mortazavizadeh et al., 2022). Thus, we propose the third hypothesis:

> *H3*: Authoritative grandparenting styles will positively moderate the relationship between self-regulation and problem behavior, emotional competence, and problem behavior.

3 Method

3.1 Participants

In this study, a total sample of 449 Chinese preschool children (mean age = 53.65 months; girls = 208; boys = 241) participated. Children were recruited from eight preschools which were randomly selected from the list provided by the local education agency in Guangxi province. The participating schools are typical preschools in China. The children were selected from 16 classes that maintained the average teacher–child ratio of 1:16. Notably, 32 teachers were involved in the sampling classes; their age is mainly distributed between 23 and 42 years old (SD = 6.76) and their average work experience at schools was 4.86 years (SD =1.69, min = 2 years, max = 42 years). The majority of the teachers (71.15%), hold an education level of secondary school or lower, and all are female, exhibiting no significant differences in terms of age, descent, ethnicity, or sex. 97.5% of the children are maintained by their grandparents, and the average monthly family income is 855.88 RMB (SD = 999.94, min = −255 RMB, max = 41666.7 RMB). Parents were aged from 20 to 45 years (SD = 4.694), with 82.9% engaged in non-technical occupations and 17.1% in technical work. The highest level of education of parents varied as follows: no vocational education (23.5%), junior middle school (60.3%), senior middle school (16.2%). The description statistics of left-behind children, are shown in Table 1.

3.2 Procedure

Parents and teachers who participated in the survey were sent a package which included a consent form and the survey questionnaires. Upon consenting to be part of the research, parents filled out a survey providing demographic details such as their children's sex, their parents' profession, and the family's yearly income. The left-behind children's grandparents filled out the questionnaire on the parenting style. Digital questionnaires assessing a structured questionnaires problem behavior of left-behind children were sent to the teachers before the visit. A trained observer was arranged in a quiet room in each preschool following a standard protocol. The observer carried out the evaluation of the children's emotional competence and self-regulation during two episodes of 15 min each during individual assessments. Before individual assessments, every research assistant dedicated a brief period to engage with the child, aiding in their acclimatization to the evaluator. Upon finishing the evaluations, children received a book as a gift of gratitude for their participation. Active informed consent was obtained from teachers and parents of all the included children.

3.3 Measures

3.3.1 Authoritative grandparenting styles

The parenting style questionnaire (PSDQ) was developed by Robinson et al. (1995). The original version contains 62 subitems, and the simple version contains 26 subitems. This study was simplified, using the 5-point Likert scale (1–5 indicates from "never" to "always"). The questionnaire was revised in Chinese by Wu et al. (2002) and confirmed the cross-cultural consistency of its structure in the Chinese and American subject groups. There are two dimensions of upbringing: authoritative parenting style and authoritarian parenting

TABLE 1 Sample demographics of left-behind children.

Age (months)	Average age (months)	Median	SD	*N*
36–48	42.44	43.00	4.59	127
49–60	54.67	54.00	4.70	104
48–60	54.43	55.00	4.88	119
61–72	66.16	65.00	4.31	100

SD, standard deviation.

style. This study estimated only the authoritative parenting style, including three specific parenting behaviors: warmth/acceptance dimension, such as "I praise the child when the child is good"; reasoning/induction, such as "I reason to the child when the child is not"; democratic participation, such as "I allow the child to participate in the formulation of family rules." In this study, the reliability ($\alpha = 0.839$) is good. The questionnaire is filled out by the main grandparents of the left-behind children.

3.3.2 Emotional competence

Children's emotional competence was measured by the emotional competence subscale of the Asia–Pacific Early Childhood Development Scale Short Version (Rao et al., 2019). This subscale consisted of seven dimensions tapping the extent to which the child exhibits signs of respecting elders, seeking help, identifying emotions, resolving conflicts, empathy, and polite behavior. There are two atlases in each dimension. According to the content of the pictures, the corresponding situational questions are answered. The total score of each dimension is between 2 and 5 points, (e.g., "Ask for help," provide pictures 1: A little girl accidentally cut her finger, asking "This little girl has a broken hand, who should she ask for help?" and provide photo album 2: a little girl in the street cannot find her mother, asked "this little friend lost in the street cannot find her mother, who should she find help?") Each answer has two options, if the child can only answer "one," we need to ask one more time "who else can she turn to for help?" Each correct answer earns 1 point, while an incorrect response yields 0, with a maximum total of 5 points per dimension. Scores are averaged across dimensions, with higher scores indicating better emotional competence and the children were measured one-on-one by the tester (α =0.829). Previous studies have provided evidence for satisfactory psychometric properties of EAPECDS (Zhang et al., 2017).

3.3.3 Self-regulation

To measure left-behind children's self-regulation, the Head-Toes-Knees-Shoulders task (McClelland et al., 2007) was used. During the test, children first demonstrate four verbal commands (e.g., touch your knees and touch your shoulders) and then respond in opposition to the original command (e.g., touch the shoulders when being told to touch the knees). The task includes 30 items. The child receives a score of 0 when giving an incorrect response, a score of 1 when giving a self-corrected incorrect response, or a score of 2 when they give a correct response. Different executive function skills are required in the HTKS task, including working memory, cognitive flexibility, and inhibitory control ($\alpha = 0.984$). This task has been used successfully in the Chinese context (Zhan and Yang, 2020).

3.3.4 Problem behavior

Teachers reported on problem behavior using the Conduct Problems subscale of the Devereux Early Childhood Assessment (DECA) for Preschoolers, Second Edition (LeBuffe and Naglieri, 2013), because the left-behind children's parents are not around their children for a long time, so preschool is the second important place for children's daily life. Teachers and left-behind children have more opportunities to get along face-to-face. DECA-P2 is a 16-item measure rated on a 5-5-point Likert scale: 1 = never; 3 = occasionally; and 5 = very frequently. A sample item is "Damage to or damage to the property?" (α =0.828). This task is a commonly used tool for the measurement of inhibitory function in China, so it has demonstrated its culture (Ji et al., 2015).

3.4 Analyses

All analyses were conducted by using standardized variables to a mean of 0.00 and a standard deviation (SD) of 1.00, corrected for age, and excluded outliers (±3 SDs). Statistical Package for the Social Sciences (SPSS version 22.0) was used to analyze the data's descriptive statistics, correlation, and analysis of variance (ANOVA). Under the premise of no common method deviation, Mplus version 8.3 was used to analyze the mediating effect and moderated mediation effect of the data. The program can analyze a complex mediating effect model containing multiple mediating variables and control variables. It also can output three mediating effect indicators, including the total effect, direct effect, and indirect effect. The bootstrap method was adopted to verify the mediating effect (Alfons et al., 2022). Two thousand samples were selected in the bootstrap analysis with a 95% confidence interval (CI), and were analyzed the roles of self-regulation and authoritative grandparenting Styles on emotional competence and problem behavior.

4 Results

4.1 Common method deviation test

To avoid the common method bias, the Harman single-factor method was used to test the common method bias of various variables before the analysis in the study. Statistical results showed that: seven factors with eigenvalues greater than 1 were obtained by unrotated principal component factor analysis. The first factor explained 26.93% of the variation, lower than the critical value of 40%.

4.2 Descriptive statistics

Means, standard deviations, and correlation coefficients of each variable and demographic variable are presented in Tables 1, 2 ($N = 448$). Overall, the warmth/acceptance dimension was significantly and positively correlated with reasoning/induction and democratic participation. Emotional competence was significantly and positively correlated with self-regulation but significantly and negatively correlated with problem behavior. The results of the difference test showed that there were no sex and age differences in warmth/acceptance dimension (sex: $F = 0.591$, $p > 0.05$, $t = -1.682$; age: $F = 1.168$, $p > 0.05$), reasoning/induction (sex: $F = 5.602$, $p > 0.05$, $t = -1.195$; age: $F = 1.292$, $p > 0.05$), democratic participation (sex: $F = 0.678$, $p > 0.05$, $t = -0.627$; age: $F = 0.986$, $p > 0.05$), emotional competence (sex: $F = 1.662$, $p > 0.05$, $t = 0{,}853$; age: $F = 0.871$, $p > 0.05$), self-regulation (sex: $F = 0.695$, $p > 0.05$, $t = 0.405$; age: $F = 1.119$, $p > 0.05$), and problem behavior (sex: $F = 0.339$, $p > 0.05$, $t = 0.612$; age: $F = 0.817$, $p > 0.05$).

4.3 Test of the intermediary effect model

The results showed that the fitting index of the model is $\chi^2/df = 2.65$, comparative fit index (CFI) = 0.973, Tucker–Lewis Index (TLI) = 0.906, and standardized root mean square residual (SRMR) = 0.034. According to the Structural Equation Modeling, shown in Table 3, emotional competence had a significant and negative impact on problem behavior [$\beta = -0.384$, $p < 0.01$, bootstrap

CI = (−0.530, −0.255)]. The direct effect of emotional competence on self-regulation was significant [$\beta = 1.057$, $p < 0.01$, bootstrap CI = (0.764, 1.316)], self-regulation significantly negatively predicted problem behavior [$\beta = -0.384$, $p < 0.01$, bootstrap CI = (−0.530, −0.255)], and the indirect effect of self-regulation was significant [$\beta = -0.137$, $p < 0.01$, bootstrap CI = (−0.202, −0.087)]. The effect size of the mediating effect, that is, the contribution rate of mediation effect in self-regulation as the ratio of indirect effect to total effect, was about 25.9%. Therefore, self-regulation played a partial mediating role in the link between emotional competence and problem behavior.

4.4 Test of the moderated mediation model

To further investigate whether parenting styles mediate between emotional competence (as the predictor) and problem behavior (as the mediator), sex and age are controlled for their effects on problem behavior, and Macro-Model 8 was selected to test the moderated mediation effect. Only warmth/acceptance dimension and reasoning/induction entered the model, and democratic participation did not enter the model (Table 4).

4.4.1 The moderated mediation of warmth/acceptance dimension

The fitting index of the model is $\chi^2/df = 3.41$ (the model is overall acceptable), RMSEA = 0.019, CFI = 0.961, TLI = 0.787, and SRMR = 0.033. The results (as shown in Table 4) showed that the predictive effect of emotional competence on problem behavior was not significant [bootstrap CI = (−0.371, 0.569), $p > 0.05$], and the 95% CI of the bootstrap test include 0. Emotional competence had a significant positive predictive effect on self-regulation [$\beta = 1.754$, $p < 0.01$, bootstrap CI = (0.694,2.813)]. Self-regulation had a significant negative predictive effect on problem behavior [$\beta = -0.132$, $p < 0.01$, bootstrap CI = (−0.182, −0.083)]. Warmth/acceptance dimension had a significant positive predictive effect on self-regulation [$\beta = 0.451$, $p < 0.05$, bootstrap CI = (0.048, 0.854)] and problem behavior [$\beta = 0.235$, $p < 0.05$, bootstrap CI = (0.055, 0.414)]. Moreover, the interaction effect of emotional competence and warmth/acceptance dimension negatively predicted problem behavior [$\beta = -0.020$, $p < 0.01$, bootstrap CI = (−0.039, −0.002)], not significant on self-regulation [bootstrap CI = (−0.068, 0.017), $p > 0.05$], and the 95% CI of the bootstrap test include 0. Thus, the warmth/acceptance dimension moderated the link of emotional competence and problem behavior.

To explore the moderating effect of the warmth/acceptance dimension, the scores for warmth/acceptance dimension were divided into three conditions: high, medium, and low. According to the simple slope test, as the level of warmth/acceptance dimension increases [from the scores of warmth/acceptance dimension was low level (LOWY) to the scores of warmth/acceptance dimension was medium level (MEDY) to the scores of warmth/acceptance dimension was higher level (HIGY)], the negative effect of emotional competence on problem behavior gradually increase. In the LOWY state, an increase in emotional competence leads to a decrease in problem behavior to a large extent (simple slope = −0.235, $t = -2.705$, $p < 0.01$). As the level of the regulatory variable increases, the negative effect of emotional competence on problem behavior becomes weaker in the MEDY state (simple slope = −0.232, $t = -2.754$, $p < 0.01$), and which may be further weakened in the HIGY state, but not significant (simple slope = 0.079, $t = 0.040$, $p > 0.05$). That is to say, the warmth/acceptance dimension strengthens the original negative relationship between emotional competence and problem behavior. This indicates that the warmth/acceptance dimension was especially beneficial to problem behavior. The interactions are presented in Figure 2.

4.4.2 The moderated mediation of reasoning/induction

According to the Structural Equation Modeling, the fitting index of the model is $\chi^2/df = 3.23$, RMSEA = 0.014, CFI = 0.965, TLI = 0.805, and SRMR = 0.033. The results (as shown in Table 4) showed that the predictive effect of emotional competence on problem behavior was not significant [bootstrap CI = (−0.244, 0.878), $p > 0.05$], reasoning/induction on self-regulation was not significant [bootstrap CI = (−0.382, 1.230), $p > 0.05$], and the 95% CI of the bootstrap test include 0. Emotional competence had a significant positive predictive effect on self-regulation [$\beta = 1.752$, $p < 0.01$, bootstrap CI = (0.490, 3.015)]. Self-regulation had a significant negative predictive effect on problem behavior [$\beta = -0.130$, $p < 0.01$, bootstrap CI = (−0.178, −0.083)]. Reasoning/induction had a significant positive predictive effect on problem behavior [$\beta = 0.414$, $p < 0.05$, bootstrap CI = (0.037,

TABLE 2 Descriptives, within-level, and between-level correlations of the observed variables.

	1	2	3	4	5	6	7	8	*M*	SD
1. Warmth/acceptance dimension									24.54	0.302
2. Reasoning/induction	0.684**								14.50	0.174
3. Democratic participation	0.576**	0.559**							11.84	0.212
4. Emotional competence	−0.077	−0.030	0.017						22.62	0.758
5. Problem behavior	0.027	−0.015	−0.019	−0.323**					9.13	0.223
6. Self-regulation	0.039	−0.025	0.002	0.322**	−0.331**				30.01	0.356
7. Child sex[a]	0.081	0.057	0.030	−0.040	−0.029	−0.045			1.49	0.024
8. Child age	−0.097	−0.012	−0.051	0.005	0.016	0.120*	−0.0307		53.65	0.481
9. Family monthly income	0.007	−0.033	−0.073	−0.078	0.063	−0.085	−0.038	−0.006	861.0	48.48

SD, standard deviation. [a]1 = girl. **Significant correlation at the level of 0.01 (bilateral); *Significant correlation at the level of 0.05 (bilateral).

TABLE 3 Results of the direct-effect tests.

Route	β	SE	t	95% CI	
				Lower	Upper
Emotional competence→Problem behavior	−0.129	0.024	−5.497**	−0.175	−0.083
Emotional competence→Self-regulation	1.057	0.142	7.436**	0.764	1.316
Self-regulation→Problem behavior	−0.384	0.070	−5.491**	−0.530	−0.255
Total specific indirect effect	−0.137	0.029	−4.635**	−0.202	−0.087
Total effect	−0.521	0.066	−7.940**	−0.649	−0.396

CI, confidence interval; SE, standard error. **Significant correlation at the level of 0.01 (bilateral).

0.791)]. Moreover, the interaction effect of emotional competence and warmth/acceptance dimension showed a significantly positive effect on problem behavior [$\beta = -0050$, $p < 0.05$, bootstrap CI = (−0.087, −0.013)], not significant on self-regulation [bootstrap CI = (−0.128, 0.040), $p > 0.05$], and the 95% CI of the bootstrap test include 0. Thus, the reasoning/induction moderated the link between emotional competence and problem behavior.

According to the simple slope test, as the level of reasoning/induction changes (from LOWY to MEDY to HIGY), the negative effect of emotional competence and problem behavior gradually increases. In the LOWY state, an increase in emotional competence leads to a decrease in problem behavior to a large extent (simple slope = −0.234, $t = -2.379$, $p < 0.05$). As the level of the regulatory variable increases, the negative effect of emotional competence on problem behavior becomes weaker in the MEDY state (simple slope = −0.228, $t = -2.454$, $p < 0.05$) and may be further weakened in the HIGY state, but was not significant (simple slope = 0.267, t = 0.997, $p > 0.05$). This suggests that reasoning/induction significantly strengthened emotional competence's advantage in externalizing behavior problems. The interactions are presented in Figure 3.

5 Discussion

The current study constructed a mediation model with regulation, which examined the relationship between emotional competence and problem behavior among 3–6-year-old left-behind preschoolers and the mediation role of self-regulation. Furthermore, it investigated the moderated mediation role of grandparenting styles. We discussed the findings in the context of Chinese preschools.

5.1 The relationship between emotional competence and problem behavior

Results from the present study indicated that emotional competence was low-to-moderate and negatively associated with children's problem behavior, which is consistent with Hypothesis 1 and previous studies, which proved a low-to-moderate and negative correlation pattern between emotional component and problem behavior (Vahedi et al., 2012). Another study showed an overall correlation between behavioral problems and emotional competence of medium effect size (Hukkelberg et al., 2019). This result might be accounted for several reasons. First, factors affecting preschool child problem behavior are complex; various studies have indicated the association between cumulative adversity present in the family or school context and the outcomes of behavioral problems among children. For example, the impact of social vulnerability, chronic adversity, maternal depression (Martineli et al., 2018), and teacher–child conflict (Zatto and Hoglund, 2022). Another study revealed the stability of behavior problems and cognitive ability among children aged 1–9 years and concurrent associations between externalizing and internalizing problems (Zhang et al., 2023). Thus, the factors contributing to children's problem behavior are derived both outside and inside, which is also one of the reasons why the effect of emotional competence on problem behavior is low-to-moderate related. Second, emotional competence has a positive boost in reducing problem behavior. Children gradually form a stable self-emotional competence by expressing themselves, regulating their emotions, and accepting the opinions of others, and this also key to inhibiting the emergence of problem behavior. A meta-analysis was based on 48 studies, as children increased their emotional competence and reduced their problem behavior (Murano et al., 2020). Another meta-analysis further showed that stable emotional competence had long-term implications, including reducing high school dropouts, criminal involvement, mental health service use, increasing employability, college attendance, and safer sexual behaviors (Taylor et al., 2017). Our findings suggest that it is essential to focus on the positive impact of emotional competence on problem behavior, especially in the early development of children's emotional competence.

5.2 The mediation role of self-regulation

The present study found that self-regulation partially mediates the influence of emotional competence on problem behavior. Significantly, emotional competence can directly and negatively predict problem behavior or indirectly through self-regulation. Hypothesis 2 was confirmed. This result confirms a prior study by Campbell et al. (2016), who reviewed the relationships between social competence, emotional competence, behavior problems, and self-regulation. They indicated that young children's self-regulation skills are core competencies for developing social–emotional skills and reducing problem behavior. As emotional regulation is a vital aspect of emotional competence. When the intensity or duration of emotion is "too much" or "too little" to meet the goals and expectations of the child and/or social partners, emotion regulation is needed (Housman, 2017). Moreover, self-regulation acts as the ability to control and manage emotions, cognition, and behavior, which is closely related to emotional competence since children use emotional competence skills to regulate themselves (Saarni, 1997; Diamond, 2006). That is, emotion regulation is also a core component of

TABLE 4 Results of the moderated mediation tests.

Route	β	SE	t	95% CI	
				Lower	Upper
Model 1 (warmth/acceptance dimension)					
Emotional competence→Self-regulation	1.754	0.541	3.243**	0.694	2.813
Emotional competence→Problem behavior	0.099	0.240	0.413	−0.371	0.569
Self-regulation→Problem behavior	−0.132	0.025	−5.241**	−0.182	−0.083
Warmth/acceptance dimension→Self-regulation	0.451	0.205	2.196*	0.048	0.854
Warmth/acceptance dimension→Problem Behavior	0.235	0.091	2.565*	0.055	0.414
Emotional competence *Warmth/acceptance dimension→Self-regulation	−0.025	0.022	−1.162	−0.068	0.017
Emotional competence*Warmth/acceptance dimension→Problem behavior	−0.020	0.010	−2.151*	−0.039	−0.002
Model 2 (reasoning/induction)					
Emotional competence→Self-regulation	1.752	0.644	2.721*	0.490	3.015
Emotional competence→Problem behavior	0.317	0.286	1.107	−0.244	0.878
Self-regulation→Problem behavior	−0.130	0.024	−5.352**	−0.178	−0.083
Reasoning/induction→Self-regulation	0.424	0.411	1.032	−0.382	1.230
Reasoning/induction→Problem behavior	0.414	0.192	2.154*	0.037	0.791
Emotional competence *Reasoning/induction→Self-regulation	−0.044	0.043	−1.030	−0.128	0.040
Emotional competence *Reasoning/induction→Problem Behavior	−0050	0.019	−2.626*	−0.087	−0.013

CI, confidence interval. **Significant correlation at the level of 0.01 (bilateral); *Significant correlation at the level of 0.05 (bilateral).

self-regulation (Murray et al., 2015). Studies have shown that a child with good emotional self-regulation can acknowledge a strong emotion and choose a way to respond with the least negative consequences, achieve stable social competence, and to reduce problem behavior (Campbell et al., 2016). However, children with poor emotional competence and self-regulation appear to not only have more difficulty transitioning to school but also have an increased risk for low academic achievement, emotional and problem behavior, peer rejection, and school dropout (Denham, 2006). Therefore, emotional competence and self-regulation often work together, and this role cannot be ignored. We need to grasp the interactive relationship to promote early childhood social development, thus reducing the probability of problem behavior. The findings in the current study further showed that self-regulation also plays a significant role in mediating emotional competence and problem behavior during early childhood.

5.3 The moderated mediation role of authoritative grandparenting styles

The results also indicated that positive grandparenting moderates the impact of emotional competence on problem behavior but not the relationship between self-regulation and problem behavior. Significantly, the parenting style of grandparents' warmth/acceptance dimension and reasoning/induction enhanced the negative prediction effect of emotional ability on problem behavior. Warmth/acceptance dimension and reasoning/induction are the authoritative parenting type. The results were less consistent with Hypothesis 3 because democratic participation was not included in the model. The possible reason is the cultural characteristics of China, where the democratic atmosphere is less mentioned in Chinese families and replaced by affectionate strictness. Strict-affectionate parenting represents a culture-specific subtype of parenting in Chinese culture (Zhang et al., 2017). In rural China, middle-aged adults often migrate to cities to seek job opportunities, and their older parents voluntarily involve themselves in grandchild care and receive remittances from their migrated children (Shen and Yang, 2022). Because these caregivers tend to be economically disadvantaged, often living in poverty, with minority grandparents experiencing the most significant economic vulnerability (Kelley et al., 2011), they pay less attention to the democratic atmosphere of their families compared with the urban grandparents, which may be the main reason why the democratic participation is not prominent in these families.

Moreover, our findings are consistent with the understanding that the authoritative parenting style is flexible and warm; caregivers always treat their children as individuals and prefer to prepare children rather than controlling them (Wang et al., 2024). Our results supported the hypotheses derived from the Attachment Theory that a flexible and warm grandparent parenting style creates an attachment behavior, which is instinctive and will be activated by any conditions that appear to threaten the achievement of proximity (Bowlby, 1979). It also asks the grandparents to have great abilities to adjust their teaching methods according to their children and environment. The result also supported the "meta-emotion philosophy" notion that caregivers' regulation of their own emotions contributes significantly to their socialization of children's emotion regulation skills (Katz et al., 2012). Grandparents with an authoritative parenting style provide a good emotional environment for children and create a positive emotional activity chain. In equal communication and interaction with their grandparents, children get a lot of emotional experience, comprehend their own emotions and those of others more effectively, appropriately express emotions,

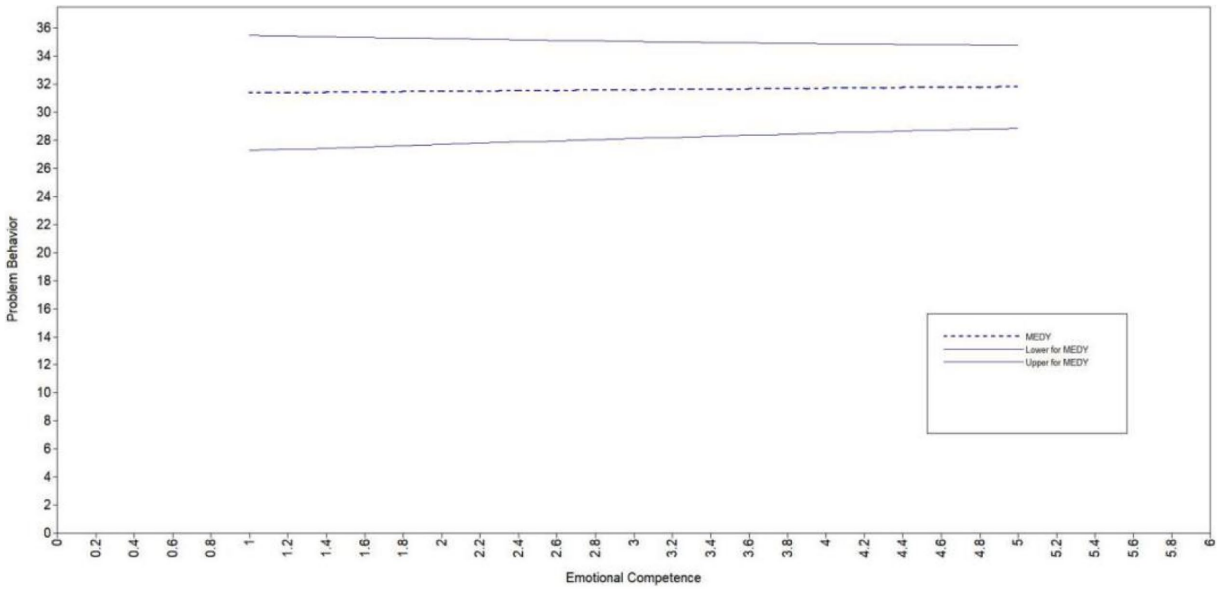

FIGURE 2
Moderating effect of warmth/acceptance dimension. LOWY, the scores of warmth/acceptance dimension was low level; MEDY, the scores of warmth/acceptance dimension was medium level; HIGY, the scores of warmth/acceptance dimension was higher level.

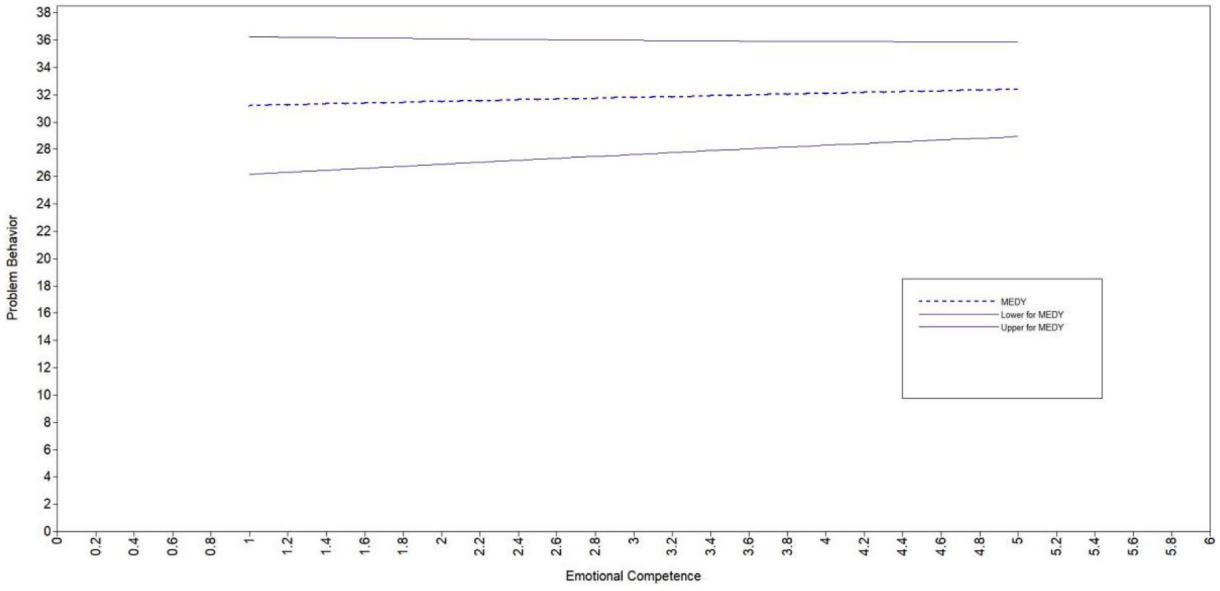

FIGURE 3
Moderating effect of reasoning/Induction. LOWY, the scores of Reasoning/Induction dimension was low level; MEDY, the scores of Reasoning/Induction dimension was medium level; HIGY, the scores of Reasoning/Induction dimension was higher level.

and manage their internal emotional experience and external emotional behavior. Consequently, this facilitates the development and enhancement of their emotional competence. While children have various psychological needs, such as safety, care, respect, and self-actualization, they will get a positive emotional experience. Parents who tend to prevent misbehavior instead of punishing them after misbehavior have fewer disputes with children, and the probability of problematic behaviors will be reduced.

The findings are crucial for left-behind children. Our result supports the establishment of a warm and flexible authoritative parenting style, thereby encouraging them establishing a friendly relationship with their children. We also provide a peer-like way to persuade their children to follow the rules by reasoning the rules, analyzing the consequences of misconduct, establishing their good behavior, and building positive interpersonal relationships. This, in turn, mitigates the risk of problem behavior.

6 Limitations, implications, and conclusions

Several limitations of the present study should be acknowledged. First, this study collected samples from Guangxi, a province in China, which limited the generalizability to other regions. We also noted that participants were all separated from their parents and maintained by their grandparents or relatives. Therefore, these findings may not apply to non-left-behind children. Future research can collect samples across different geographic locations, both urban and rural regions, and compare the urban and rural ordinary preschool children to further confirm the rationality and stability of the model. Second, using a teacher-reported measure of problem behavior instead of a clinical diagnosis is another limitation of this study. Future research can consider more fully triangulating measures, collecting student reports, and observing measures of problem behavior. Finally, this study used cross-sectional designs, which could not reveal the causality and direction of the relationship between emotional competence and problem behavior. Future research with longitudinal designs can improve this line of research.

This study confirmed that authoritative grandparenting styles had an essential impact on left-behind children's psychological growth. Emotional competence could predict problem behaviors, and self-regulation acted as a mediator while the authoritative grandparenting style moderated the connection between emotional competence and problem behavior. The findings of the present work contribute significantly to the general mental health research literature. They are meaningful for developing intervention and prevention services aimed at promoting child mental health.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Academic Committee of China National Academy of Educational Sciences. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin. Written informed consent was obtained from the minor(s)' legal guardian/next of kin for the publication of any potentially identifiable images or data included in this article.

Author contributions

LL: Conceptualization, Data curation, Writing – original draft. SJ: Investigation, Methodology, Supervision, Writing – original draft. QH: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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