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THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS AND SCIENTIFIC PARENTING BEHAVIORS OF INFANT AND TODDLER CAREGIVERS: EVIDENCE FROM YUNNAN PROVINCE, CHINA

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Abstract:
This study analyzed how caregivers' socioeconomic status (SES) affects scientific parenting behaviors. 5,527 infant and toddler caregivers were surveyed. Results revealed significant SES-based differences: lower, lower-middle, and middle strata scored lower than the upper-middle stratum in total scientific parenting ($F=4.192$, $p<0.01$) and material/time provision dimension ($F=4.895$, $p<0.01$). Lower-middle and middle strata underperformed in the interpersonal interaction dimension ($F=3.279$, $p<0.05$), while the lower-middle stratum lagged in the encouragement and companionship dimension ($F=3.227$, $p<0.05$). Family SES positively correlated with total parenting scores and all three dimensions (interpersonal interaction, encouragement, material and time provision), serving as a significant predictor of parenting quality. The findings highlight the need for targeted policies to enhance scientific parenting guidance for disadvantaged families, particularly addressing lower-middle strata's deficits in interactive and emotional support and lower strata's resource limitations. Implementing tiered support programs could optimize early childhood development outcomes.

Keywords: scientific parenting behaviors, infant and toddler caregivers, family socioeconomic status, social stratification, Yunnan Province

1. Introduction

Family is the earliest and most fundamental place for children's socialization, having a substantial impact on their social development. The caregiving behavior of parents is the most critical factor in this process, as it is an essential variable in shaping children's physical, emotional, cognitive, and social development (Matsuyama *et al.*, 2020），

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affecting the quality of parenting and the quality of the population. In April 2019, the General Office of the State Council's "Guiding Opinions on Promoting the Development of Care Services for Infants and Toddlers under 3 Years Old" clearly proposed to "*enhance the scientific parenting capacity of families*" (General Office of the State Council, 2019), which is of great significance for achieving high-quality care for infants and toddlers and improving the quality of the population. On the one hand, Yunnan Province lags in economic development and cultural education, with insufficient capacity for scientific parenting in families. There are issues such as outdated concepts, negative behaviors, and low-quality parenting, especially in rural areas, while there is a high demand from the public for scientific parenting. Therefore, improving the scientific parenting capacity of caregivers is an essential aspect of implementing the "guiding opinions" and responding to the public's demand for improving the quality of "nurturing." On the other hand, although domestic and international studies have examined the relationship between family socioeconomic status and parenting behaviors of caregivers for infants and toddlers, these studies have not focused enough on scientific parenting behaviors. There are only a few domestic studies that have touched on the relationship between single factors, such as parents' education level and family income, with scientific parenting behaviors, and there are very few empirical studies that explore using family socioeconomic status as a comprehensive indicator. The family socioeconomic status of infants and toddlers reflects the resources that their caregivers possess or can access. Discussing the relationship between family socioeconomic status and caregivers' scientific parenting behaviors can effectively depict the current situation and differences in scientific parenting behaviors among caregivers for infants and toddlers from different family socioeconomic statuses in Yunnan Province, as well as how the resources they possess or can access affect their scientific parenting behaviors. Possible methods that may help enhance or mitigate the positive or negative impacts of family socioeconomic status could then be discussed to improve or elevate caregivers' parenting behaviors, and at the same time, provide a reference for policy formulation.

"Scientific parenting" is a product of modernity and is often studied within the "traditional-modern" binary framework. In contrast to the "traditional" approach, which is female-centric and relies on intergenerational transmission of parenting knowledge within the family, the "modern" approach emphasizes the "scientific" method, which is primarily based on parenting knowledge propagated by experts from outside of the family, such as doctors. This knowledge is largely derived from western medicine and psychology (Su *et al.*, 2023). In particular, psychologists such as Freud, Adler, and Rogers have further developed the scientific concept of parenting, contributing to the intensification of the contradiction between western science and religion (Robinson *et al.*, 2004). The new discourse of scientific parenting is provided by neurobiology, endocrinology, and epigenetics. Currently, the academic community mainly discusses family scientific parenting from two perspectives: psychology and sociology. Research from the psychological perspective posits a direct causal relationship between parenting quality and child development outcomes, suggesting that low-quality parenting is the

root of various problems and that mental health, social, and economic issues can be traced back to parent-child relationships. Good or high-quality parenting is key to solving these problems (Berge *et al.*, 2014). This perspective particularly focuses on providing technical support for caregivers, with the quality of care provided to children being directly beneficial to their growth and developmental continuity. Baumrind's typology of parenting styles offers socialization goals and parenting techniques for caregivers to implement scientific parenting behaviors, with the authoritative parenting style becoming the basic principle of family child-rearing (Fadlillah *et al.*, 2022).

Breastfeeding, attachment parenting, gentleness, tolerance, and various behaviors that express parental warmth and affection, such as kissing, verbal and eye contact (Zhao, 2016), as well as other parenting behaviors with high self-efficacy (Prady *et al.*, 2014), are widely regarded by advocates of positive parenting as scientific parenting behaviors that are beneficial to the development of infants and toddlers. They oppose the use of aversive stimuli and punishment for children, as these behaviors are significantly associated with the deterioration of child development (Avezum *et al.*, 2023). For example, there is a significant association between hostile parenting behaviors and the severity of emotional symptoms in boys (Goh Kok Yew *et al.*, 2015). Research emphasizes the cultivation of "scientific motherhood" to raise healthy children (Apple, 2015). Sociological research mainly explores family scientific parenting issues from a cultural perspective, arguing that the parenting models advocated by Baumrind have different effects on child development in Asian and European American families (Wang, 2003). Attachment parenting, breastfeeding, and other practices should consider cultural identity, cultural values (Sieben *et al.*, 2020), and the integration of cultural traditions into infant and toddler care (Gerbedawilson *et al.*, 2012).

The effectiveness of family scientific parenting is crucially linked to its combination with local cultural beliefs and traditions (Lamonica *et al.*, 2023). In other words, it is necessary to critically accept scientific parenting knowledge or concepts and find a balance between them and traditional notions. Most discussions in China on the scientific parenting behaviors of caregivers for infants and toddlers are based on assumptions proposed from a psychological perspective, with relatively weak research quantity and quality. Existing research indicates that the rate of scientific parenting in families with infants and toddlers is low (Xie *et al.*, 2019), parents of infants and toddlers in remote suburban areas have a greater demand for scientific parenting than those in urban areas (Huang, 2020), and there is a high demand for social support in family scientific parenting (Xu *et al.*, 2018). Community-based guidance for parents on scientific parenting can promote the physical development of infants and toddlers (Gao *et al.*, 2003).

At present, the academic community has accumulated many results regarding the relationship between family socioeconomic status and caregiver parenting behaviours. Existing studies mainly explore the relationship between different family socioeconomic statuses and specific parenting behaviours (whether scientific or not), which in turn involve various developmental outcomes related to children's physical, psychological, and social development. Research indicates that mothers with higher socioeconomic

status tend to use more democratic parenting behaviors and can set rules together with their children (Calik *et al.*, 2015). Various indicators of low family socioeconomic status are associated with poor parenting behaviors and outcomes (Berger *et al.*, 2005). For example, there is a significant correlation between parents' socioeconomic status and infants' dental visit behaviors, with the strongest association with tooth decay (Buldur, 2017), and children living with parents of lower socioeconomic status are more likely to suffer from tooth decay due to the authoritarian parenting behaviors adopted by these parents (Kumar *et al.*, 2017). Maternal strict parenting behaviors are related to children's daytime sleep, and mothers of lower socioeconomic status are more likely to use strict parenting behaviors, which are significantly associated with insufficient sleep time and night-waking problems in young children (Kelly *et al.*, 2021). High family socioeconomic status is significantly correlated with the reduction of negative parenting and child behavior problems (Lin *et al.*, 2024), and family economic income has a direct impact on parental parenting burnout (Zhang *et al.*, 2024).

Parental warmth, control, and hostile parenting behaviors vary by socioeconomic status, with mothers of higher socioeconomic status exhibiting more warmth and control, while mothers of lower socioeconomic status showing more hostile coercive behaviors (Toolisa *et al.*, 2010). Some researchers have explored the mediating role of parenting behaviors between family socioeconomic status and child development outcomes: children from families with socioeconomic disadvantages are at risk of inattention, mainly mediated by parenting behaviors (Meng *et al.*, 2024), and maternal sensitivity and strictness in parenting mediate or partially mediate the relationship between family socioeconomic status and children's indifferent behaviors (Mills-Koonce *et al.*, 2016) and other behavior problems (Luo *et al.*, 2019). In families where mothers have lower levels of education and less desirable occupations, there is a significant negative correlation between permissive parenting behaviors and young children's working memory (Gao *et al.*, 2024). Studies have shown that factors such as the education and income of rural parents are significantly related to parenting concepts and skills (Spoth *et al.*, 2010), and family socioeconomic variables affect the quality of parent-child interaction (Glidden *et al.*, 2010). There is a scarcity of research specifically focusing on the relationship between scientific parenting and family socioeconomic status. Only a limited number of studies in China have explored the relationship between the educational level of parents, family income, and scientific parenting behaviors, with the demand for scientific parenting among those with lower maternal education levels being significantly lower than those with higher education (Zhang *et al.*, 2018). Low maternal education level is a risk factor for scientific feeding of infants under one year old, while a high family income level is a protective factor (Xie *et al.*, 2019).

Middle-class families in China tend to adopt a cooperative parenting model, while working-class families lean towards a free-range parenting model, due to the significant differences in economic, social, and cultural capital resources possessed by the upper-middle and working classes (Huang, 2023). The family investment model posits that family socioeconomic status enables caregivers of infants and toddlers to enrich

materials, activities, and learning opportunities for children by providing resources such as time and money, thereby promoting the child's overall positive development (Iruka *et al.*, 2014). Caregivers with a high family socioeconomic status can invest more time, emotion, and material resources in their children, and they are more likely to exhibit scientific behaviors such as affection and respect for their children and involve them more in conversations and learning activities during parenting (Sengonul, 2013). This investment can be specifically manifested in their parenting behaviors. This study focuses on the impact of family socioeconomic status on the scientific parenting behaviors of caregivers of infants and toddlers.

Based on the analysis above, the following research hypotheses are proposed:

Hypothesis 1: Significant differences exist in scientific parenting behaviors among caregivers of infants and toddlers from various family socioeconomic backgrounds.

Hypothesis 2: A significant positive correlation exists between family socioeconomic status and scientific parenting behaviors.

Hypothesis 3: Family socioeconomic status can positively influence the scientific parenting behaviors of caregivers.

2. Materials and Methods

2.1 Data source and sampling technique

The data used in this study is derived from the key project of the Yunnan Province Philosophy and Social Science Planning Project, titled "Research on the Construction of Yunnan's Universal Childcare Service System," and was collected through a questionnaire survey. The self-designed questionnaire consists of three parts: a demographic questionnaire, a family socioeconomic status scale, and an early childhood scientific parenting behavior scale. The early childhood scientific parenting behavior scale primarily assesses the scientific parenting behaviors of family caregivers towards infants and toddlers aged 0-3. The scale was first optimized based on a pre-investigation before conducting the formal survey. The formal survey employed a multi-stage sampling and non-probability sampling method to select the sample. In the first stage, according to the regional division of Yunnan Province, six prefectures (Kunming City, Yuxi City, Honghe Prefecture, Baoshan Region, Xishuangbanna, and Diqing Prefecture) were selected from the central, eastern, southern, and western parts of Yunnan Province. In the second stage, a total of 17 counties and districts under the selected prefectures were randomly selected. In the third stage, a judgment sampling method, a type of non-probability sampling, was used to distribute questionnaires to caregivers of children aged 0-3 in government agencies, enterprises, and institutions, urban areas, and rural towns within these 17 counties and districts.

A total of 5660 questionnaires were collected, with 5527 complete and valid questionnaires selected, resulting in a response rate of 97.7%. Among them, there were 2474 from the central Yunnan region, accounting for 44.8%; 104 from the eastern region, accounting for 1.9%; 1603 from the southern region, accounting for 29.0%; and 1346 from

the western region, accounting for 24.4%; 2622 Han individuals, accounting for 47.4%; 2905 ethnic minorities, accounting for 52.6%; 3457 agricultural household registrations, accounting for 62.5%; 1951 non-agricultural household registrations, accounting for 35.3%; 119 other household registrations, accounting for 2.2%; 3253 nuclear families, accounting for 58.9%; 1669 stem families, accounting for 30.2%; 308 remarried families, accounting for 5.6%; 189 single-parent families, accounting for 3.4%; 108 other types, accounting for 2.0%; 2406 families with one child, accounting for 43.5%; 2760 families with two children, accounting for 49.9%; 301 families with three children, accounting for 5.4%; and 60 families with more than three children, accounting for 1.1%. Before the questionnaire survey, all participants provided informed consent and signed an informed consent form. This project has been approved by the Ethics Committee of Yunnan University and Kunming University.

2.2 Study variable and measurement

2.2.1 Independent variable

In this study, the educational level of parents, the parents' occupations, and the family's annual income were used as three indicators to measure the family's socioeconomic status. The educational level was categorized into six types: primary school or below, junior high school, high school/technical secondary school, junior college, undergraduate, and graduate, with scores assigned from 1 to 6, respectively, with higher scores indicating higher levels of education; in terms of occupational classification, parents' occupations were divided into seven levels: government institutions and public institutions, state-owned and state-controlled enterprises/collective enterprises, private enterprises, Sino-foreign joint ventures/foreign-funded enterprises, self-employed individuals, farmers, and those without an affiliation, with scores assigned from 7 to 1, respectively, with higher scores indicating a higher occupational level; family annual income was divided into eight categories: less than 50,000 yuan, 50,000 to 100,000 yuan (excluding 100,000 yuan), 100,000 to 150,000 yuan (excluding 150,000 yuan), 150,000 to 200,000 yuan (excluding 200,000 yuan), 200,000 to 300,000 yuan (excluding 300,000 yuan), 300,000 to 400,000 yuan (excluding 400,000 yuan), 400,000 to 500,000 yuan (excluding 500,000 yuan), and 500,000 yuan or more, with scores assigned from 1 to 8, respectively, with higher scores indicating higher family annual income. Referring to the research by Liu *et al.* (2019), factor analysis was used to calculate the family socioeconomic status score. The three indicators were converted into standard scores, and principal component analysis was applied to obtain a principal factor with an eigenvalue greater than 1 (KMO=0.671, P=0.000), explaining 63.366% of the variation. The factor loadings for the three items of caregiver education level, caregiver occupation, and family annual income were 0.670, 0.644, and 0.587, respectively. The family socioeconomic status score was calculated using these weights, with the total score ranging from 1 to 13 points, indicating the level of family economic status. Additionally, the family socioeconomic status score was stratified, with scores of 4 and below considered lower class, 5 to 6 as lower-middle class, 7 to 9 as middle class, 10 to 11 as upper-middle class, and 12 to 13 as upper class.

The specific situations of parents' education level, parents' occupations, and family annual income are shown in the table below. The education level of parents is mostly concentrated in junior high school, high school/technical secondary school, junior college, and undergraduate, accounting for 26.5%, 18.3%, 19.1%, and 25.3% respectively; in terms of parents' occupations, government and public institutions account for 17.3%, farming families account for 33.9%, and those without an affiliation account for 18.0%; the proportion of family annual income below 50,000 yuan reaches 45.0%, 50,000 to 100,000 yuan accounts for 30.3%, and 100,000 to 150,000 yuan accounts for 12.1%, with the proportions of other annual income types being relatively low (See Table 1).

Table 1: Basic situation of the three indicators of the caregiver's family socioeconomic status (n=5527)

Item	Item	Frequency	Percentage	Valid percentage	Cumulative percentage
Education Level	Primary School and Below	531	9.6	9.6	9.6
	Junior High School	1464	26.5	26.5	36.1
	High School/Technical Secondary School	1014	18.3	18.3	54.4
	Junior College	1053	19.1	19.1	73.5
	Undergraduate	1399	25.3	25.3	98.8
	Graduate	66	1.2	1.2	100.0
Occupation	Government/ Public Institutions	955	17.3	17.3	17.3
	State-Owned and State-Controlled Enterprises/Collective Enterprises	327	5.9	5.9	23.2
	Private Enterprises	533	9.6	9.6	32.8
	Sino-Foreign Joint Ventures/Wholly Foreign-Owned Enterprises	12	0.2	0.2	33.1
	Self-Employed	488	8.8	8.8	41.9
	Agricultural Households	1872	33.9	33.9	75.8
	No Affiliation	1340	24.2	24.2	100.0
Annual Family Income	Below 50,000 Yuan	2488	45.0	45.0	45.0
	50,000 to 100,000 Yuan (excluding 100,000)	1676	30.3	30.3	75.3
	100,000 to 150,000 Yuan (excluding 150,000)	670	12.1	12.1	87.5
	150,000 to 200,000 Yuan (excluding 200,000)	362	6.5	6.5	94.0
	200,000 to 300,000 Yuan (excluding 300,000)	208	3.8	3.8	97.8
	300,000 to 400,000 Yuan (excluding 400,000)	52	0.9	0.9	98.7
	400,000 to 500,000 Yuan (excluding 500,000)	31	0.6	0.6	99.3
	500,000 Yuan and above	40	0.7	0.7	100.0

2.2.2 Dependent variable

This paper used a self-designed Early Childhood Scientific Parenting Behavior Scale to measure the scientific parenting behaviors of caregivers for infants and toddlers aged 0-3. Based on existing research, an initial scale with 12 items was established, using a 5-point scoring system, which was: cannot answer = 1, never have = 2, occasionally have = 3, often have = 4, always have = 5. To ensure the internal consistency of the scale, before conducting exploratory factor analysis, the internal consistency reliability of the scale was tested using Cronbach's α coefficient with 480 data points from the pre-investigation. The initial total scale's Cronbach's α was 0.973. Among the 12 items, the item "looking into the child's eyes, kissing, touching, hugging the child" was deleted, and Cronbach's α value remained 0.973 after its removal, thus, the item was removed, leaving 11 items in the scale. Exploratory factor analysis was conducted, and the KMO and Bartlett's test of sphericity were performed on the total scale, with KMO = 0.964 and P = 0.000, indicating that factor analysis was appropriate. The initial 12 items were divided into 3 dimensions, and a total of 3 factors were extracted through factor analysis, with a cumulative explained variance of 83.940%. The presumed dimension 1 is effective positive contact and guidance, including items 2, 6, and 8; dimension 2 is providing positive parenting conditions, including items 3, 4, 5, and 7; dimension 3 is providing social interaction, including items 9, 10, 11, and 12. However, after factor analysis of the total scale, factor 1 included items 9, 10, 11, 8, and 12; factor 2 included items 2, 3, 4, 8, 7, 6, and 5; factor 3 included items 4, 7, 6, 5, and 12. See Table 2. According to the component matrix, items 9, 10, and 11 are categorized into dimension 1, named as providing opportunities for social interaction; items 2, 3, 4, and 8 are categorized into dimension 2, named as providing encouragement and companionship; items 7, 6, 5, and 12 are categorized into dimension 3, named as providing materials and time.

Table 2: Rotated component matrix

Item	Component		
	1	2	3
10. Encourage children to play and interact with peers	0.822		
9. Take children to visit relatives, family gatherings, and holiday activities	0.777		
11. Take children outdoors, to parks, children's playgrounds, etc.	0.770		
3. Provide appropriate charts, pictures, picture books, and picture books for children, and read and recognize them together with children		0.763	
2. Speak gently to children, make them laugh, tell stories, count, etc., patiently listen to children, and encourage them to listen and speak more		0.752	
4. Play games with children, such as peekaboo, nursery rhymes, building blocks, identifying objects, pretending to imitate, etc.		0.693	0.485
8. Encourage children to serve themselves, such as guiding children to wash their hands, dress and undress, practice organizing their belongings, toys, etc.	0.565	0.615	
7. Provide hygienic and safe items for children to chew, touch, grasp, pass, hit, stack, assemble, disassemble, and draw		0.415	0.743
6. Guide children in physical activities, such as limb movement, prone, lifting head, rolling, crawling, standing, walking, running, and jumping		0.440	0.730
5. Provide nursery rhymes, songs, etc., for children and help them feel and express rhythm, beat, etc.		0.542	0.659
12. Spend at least 30 minutes a day with children, such as playing games together, exercising, or reading (looking at) picture books	0.592		0.607

After formal administration, the reliability and validity of the scale were calculated, with Cronbach's α at 0.966; KMO=0.962, P=0.000, which is suitable for factor analysis, and a total of 1 factor was extracted, with a cumulative explained variance of 74.565%. It can be seen that the self-designed total scale has good reliability and validity. The specific reliability and validity tests for the three subscales are shown in the table below (see Table 3). The scoring method for the scale is the sum of the scores of each item on a 5-point scale, with higher scores indicating more scientific parenting behaviors and lower scores indicating fewer scientific parenting behaviors. The subscale scores are the sum of the scores on a 5-point scale for each item, with higher scores indicating more scientific parenting behaviors in that dimension, and vice versa, lower scores.

Table 3: Reliability and validity testing of items for the three dimensions

Dimension	Item	Cronbach's α	KMO and Bartlett's test
Dimension 1: Providing social interaction opportunities	9	0.950	0.776（0.000）
	10		
	11		
Dimension 2: Providing encouragement and companionship	2	0.929	0.857（0.000）
	3		
	4		
	8		
Dimension 3: Providing materials and time	5	0.919	0.849（0.000）
	6		
	7		
	12		

2.2.3 Control variable

The control variables in this study include the demographic characteristics of the caregivers, such as the region where the caregiver is located, ethnicity, household registration type, family type, and the number of children in the household.

2.3 Statistical method

SPSS 23.0 was used for statistical analysis. Descriptive statistics were employed to present the socioeconomic status and stratification of infant and toddler families, as well as the basic situation of family scientific parenting. One-way ANOVA was used to explore the differences in scientific parenting behaviors among caregivers of different family socioeconomic statuses. Correlation analysis and linear regression were used to discuss the relationship between family socioeconomic status and the scientific parenting behaviors of caregivers for infants and toddlers. A difference is considered statistically significant at $P < 0.05$.

3. Results

3. Family socioeconomic status and caregivers' scientific parenting behaviors

The socioeconomic status of infants' and toddlers' families depends on their parents. By scoring and stratifying the education level of the children's parents, occupational stratification, and family annual income, there are 176 individuals in the lower layer, accounting for 3.2%, 2766 in the lower-middle layer, accounting for 50.0%, 2380 in the middle layer, accounting for 43.1%, 189 in the upper-middle layer, accounting for 3.4%, and 16 in the upper layer, accounting for 0.3%. The total score of the family scientific parenting scale is 42.685±9.960, with a maximum value of 55.00 and a minimum value of 11.00; the score for dimension 1, positive interpersonal interaction, is 11.723±2.838, with a maximum value of 15.00 and a minimum value of 3.00; the score for dimension 2, positive contact and encouragement, is 15.602±3.859, with a maximum value of 20.00 and a minimum value of 4.00; the score for dimension 3, providing positive parenting conditions and guidance, is 15.361±3.808, with a maximum value of 20.00 and a minimum value of 4.00 (See Table 4).

3.1 Scientific parenting behaviors of caregivers from different family socioeconomic statuses

From Table 4, it can be seen that the scores of caregivers in different strata on the total family scientific parenting scale from high to low are ordered as upper-middle, upper, lower, middle, and lower-middle; the scores for dimension 1, providing opportunities for interpersonal interaction, from high to low are ordered as upper-middle, upper, lower, middle, and lower-middle; the scores for dimension 2, from high to low are ordered as upper, upper-middle, lower, middle, and lower-middle; the scores for dimension 3, from high to low are ordered as upper-middle, upper, lower, middle, and lower-middle.

Table 4: Descriptive statistics of scientific parenting behaviors by different socioeconomic status stratification (M±SD)

Dimension	Socioeconomic status stratification	n	M±SD
Scientific parenting behavior total scale	Lower	176	43.267±9.452
	Lower-middle	2766	42.435±9.761
	Middle	2380	42.707±10.262
	Upper-middle	189	45.402±8.976
	Upper	16	44.063±10.792
	Total	**5527**	**42.685±9.960**
Dimension 1: Providing social interaction opportunities	Lower	176	11.830±2.735
	Lower-middle	2766	11.651±2.801
	Middle	2380	11.742±2.898
	Upper-middle	189	12.392±2.619
	Upper	16	12.188±3.038
	Total	**5527**	**11.723±2.838**
Dimension 2: Providing	Lower	176	15.790±3.527
	Lower-middle	2766	15.537±3.802

encouragement and companionship	Middle	2380	15.584±3.977
	Upper-middle	189	16.550±3.349
	Upper	16	16.063±3.785
	Total	**5527**	**15.602±3.859**
Dimension 3: Providing materials and time	Lower	176	15.648±3.539
	Lower-middle	2766	15.247±3.734
	Middle	2380	15.382±3.920
	Upper-middle	189	16.460±3.511
	Upper	16	15.813±4.151
	Total	**5527**	**15.361±3.808**

3.2 Comparison of family scientific parenting behaviors among caregivers from different family socioeconomic statuses

After using one-way ANOVA to compare the scores of scientific parenting behavior among caregivers from different family socioeconomic status strata, it was found that the differences in the total scores of scientific parenting behavior and each subscale across different strata were statistically significant, thus validating Hypothesis 1 (See Table 5). Specifically, the differences in family scientific parenting behavior between the lower and upper-middle strata (P<0.05), the lower-middle and upper-middle strata (P<0.001), and the middle and upper-middle strata (P<0.001) were statistically significant. In terms of Dimension 1, providing opportunities for interpersonal interaction, the differences between the lower-middle and upper-middle strata (P<0.01) and the middle and upper-middle strata (P<0.01) were statistically significant. In terms of Dimension 2, providing encouragement and companionship, the difference between the lower-middle strata (P<0.001) and the upper-middle strata was statistically significant. In terms of Dimension 3, providing materials and time, the differences between the lower and upper-middle strata (P<0.05), the lower-middle and upper-middle strata (P<0.001), and the middle and upper-middle strata (P<0.001) were statistically significant (See Table 6).

Table 5: One-way ANOVA of scientific parenting behaviors of caregivers from different stratified families (M±SD)

Dimension	Item	Sum of Squares	df	Mean Square	F	P
Scientific parenting behavior total scale	Between groups	1659.466	4	414.866	4.192	0.002
	Within groups	546517.490	5522	98.971		
	Total	548176.956	5526			
Dimension 1: Providing social Interaction opportunities	Between groups	105.178	4	26.294	3.270	0.011
	Within groups	44407.066	5522	8.042		
	Total	44512.244	5526			
Dimension 2: Providing encouragement and companionship	Between groups	191.917	4	47.979	3.227	0.012
	Within groups	82106.789	5522	14.869		
	Total	82298.706	5526			
Dimension 3: Providing materials and time	Between groups	283.131	4	70.783	4.895	0.001
	Within groups	79857.484	5522	14.462		
	Total	80140.616	5526			

Table 6: Multiple comparisons of scientific parenting behaviors among caregivers from different stratified families

Dependent variable	(I) Stratum	(J) Stratum	Mean difference (I-J)	Standard error	Significance
Total scale	Lower	Upper-middle	-2.135	1.042	0.041*
	Lower-middle	Upper-middle	-2.967	0.748	0.000***
	Middle	Upper-middle	-2.695	0.752	0.000***
Dimension 1: Providing social interaction opportunities	Lower-middle	Upper-middle	-0.741	0.213	0.001***
	Middle	Upper-middle	-0.650	0.214	0.002**
Dimension 2: Providing encouragement and companionship	Lower-middle	Upper-middle	-1.013	0.290	0.000***
Dimension 3: Providing materials and time	Lower	Upper-middle	-0.813	0.398	0.041*
	Lower-middle	Upper-middle	-1.213	0.286	0.000***
	Middle	Upper-middle	-1.079	0.287	0.000***

3.4 The relationship between family socioeconomic status and scientific parenting behaviors

3.4.1 Correlation analysis between family Socioeconomic status and scientific parenting behaviors

A correlation analysis was conducted between the scores of family socioeconomic status and the total scores of family scientific parenting behavior and its subscales. The results revealed a significant positive correlation, indicating that the higher the family's socioeconomic status, the higher the scores on the total family scientific parenting behavior scale and its subscales, thus validating Hypothesis 2 (See Table 7).

Table 7: Correlation matrix of family socioeconomic status and scientific parenting behavior (r)

Item	Family socioeconomic status score	Scientific parenting behavior total scale	Dimension 1	Dimension 2	Dimension 3
Family Socioeconomic status score	1				
Scientific parenting behavior total scale	0.047**	1			
Dimension 1: Providing social interaction opportunities	0.045**	0.917**	1		
Dimension 2: Providing encouragement and companionship	0.038**	0.960**	0.824**	1	
Dimension 3: Providing materials and time	0.050**	0.959**	0.820**	0.884**	1

3.4.2 The impact of family socioeconomic status on scientific parenting behaviors

Using the scores of the family socioeconomic status scale as the explanatory variable, and the total scores of scientific parenting behavior, as well as the scores of dimensions 1, 2, and 3 as the dependent variables, while controlling for demographic characteristics such as the caregiver's region, ethnicity, household registration type, family type, and the number of children in the household, separate univariate linear regressions were conducted. The results showed that all three regression models were significant (all $P<0.01$), indicating that family socioeconomic status significantly and positively predicts the total scores of early scientific parenting behavior and the scores of the three subscales. That is, the higher the family socioeconomic status, the more likely caregivers are to adopt scientific parenting behaviors, thus validating Hypothesis 3. Specifically, caregivers with higher family economic status are more likely to use practices that promote positive interpersonal interactions for infants and toddlers, provide more companionship and encouragement, and offer them materials and time. However, the explanatory power of family socioeconomic status on the dependent variables' variation is relatively weak, with R^2 values of 0.012, 0.010, 0.011, and 0.013, respectively. See Table 8.

Table 8: Regression analysis of family socioeconomic status on scientific parenting behavior

Dependent variable	Independent variable	Item	Unstandardized coefficient		Standardized coefficient	*t*	*Sig.*	*VIF*
			B	Standard error	*β*			
Total score of scientific parenting behavior		(Constant)	40.392	1.135		35.590	0.000***	
	Explanatory variable	Family socioeconomic status	0.242	0.095	0.035	2.549	0.011*	1.029
	Control variables	Region	-0.149	0.108	-0.019	-1.385	0.166	1.045
		Ethnicity	-0.626	0.276	-0.031	-2.271	0.023*	1.068
		Household Registration type	1.409	0.258	0.075	5.458	0.000***	1.059
		Family type	-0.434	0.150	-0.039	-2.888	0.004**	1.009
		Number of children in the family	0.277	0.203	0.018	1.360	0.174	1.028
		R				0.110		
		R^2				0.012		
		F				11.282		
		P				0.000		
Dimension 1		(Constant)	10.915	0.324		33.714	0.000***	
	Explanatory variable	Family socioeconomic status	0.071	0.027	0.036	2.617	0.009**	1.029
	Control variables	Region	-0.045	0.031	-0.020	-1.466	0.143	1.045
		Ethnicity	-0.127	0.079	-0.022	-1.618	0.106	1.068
		Household Registration type	0.351	0.074	0.066	4.762	0.000***	1.059
		Family type	-0.114	0.043	-0.036	-2.666	0.008**	1.009
		Number of children in the family	0.126	0.058	0.030	2.178	0.029*	1.028
		R				0.100		
		R^2				0.010		
		F				9.223		
		P				0.000		
Dimension 2		(Constant)	14.803	0.440		33.644	0.000***	
	Explanatory variable	Family socioeconomic status	0.074	0.037	0.027	1.999	0.046*	1.029
	Control variables	Region	-0.046	0.042	-0.015	-1.106	0.269	1.045
		Ethnicity	-0.293	0.107	-0.038	-2.743	0.006**	1.068
		Household Registration type	0.485	0.100	0.067	4.849	0.000***	1.059
		Family type	-0.175	0.058	-0.040	-2.997	0.003**	1.009
		Number of children in the family	0.179	0.079	0.031	2.270	0.023*	1.028
		R				0.105		
		R^2				0.011		
		F				10.284		
		P				0.000		
Dimension 3		(Constant)	14.674	0.434		33.824	0.000***	
	Explanatory variable	Family socioeconomic status	0.098	0.036	0.036	2.688	0.007**	1.029
	Control variables	Region	-0.058	0.041	-0.019	-1.409	0.159	1.045
		Ethnicity	-0.206	0.105	-0.027	-1.952	0.051	1.068
		Household Registration type	0.573	0.099	0.080	5.806	0.000***	1.059
		Family type	-0.145	0.057	-0.034	-2.526	0.012*	1.009
		Number of children in the family	-0.068	0.079	-0.012	-0.869	0.385	1.029
		R				0.112		
		R^2				0.013		
		F				11.786		
		P				0.000		

3.5 Robustness test

Using the stratification of family socioeconomic status as the independent variable and the total score of the scientific parenting behavior scale, as well as the scores of dimensions 1, 2, and 3 as the dependent variables, while excluding control variables, linear regression analysis was conducted to examine the robustness of the model. The analysis using optimal scaling regression revealed that the coefficients in the robustness test were consistent in sign with the regression model, and the significance of the independent variable remained unchanged. The stratification of family socioeconomic status has a significant predictive effect on scientific parenting behavior (See Table 9). It can be seen that the results of this study are robust and reliable.

Table 9: Optimal scaling regression of family socioeconomic status stratification on scientific parenting behavior

Independent Variable	Dependent Variable	Beta	Standard Error Estimated by Bootstrap (1000)	R^2	Adjusted R^2	F	P
Stratum	Total Scale	0.066	0.015	0.004	0.004	18.840	0.000***
	Dimension 1	0.064	0.014	0.004	0.004	20.679	0.000***
	Dimension 2	0.066	0.018	0.004	0.004	12.875	0.000***
	Dimension 3	0.069	0.014	0.005	0.005	23.674	0.000***

4. Discussion

4.1 Significant differences in scientific parenting behaviors among caregivers from different family socioeconomic status strata

The results indicate that there are significant differences in scientific parenting behaviors among caregivers from different family socioeconomic status strata. In terms of overall scientific parenting behavior, caregivers from the lower, lower-middle, and middle strata use scientific parenting behaviors less frequently than those from the upper-middle strata. Regarding dimension 1, caregivers from the lower-middle and middle strata provide fewer opportunities for interpersonal interaction for their children compared to those from the upper-middle strata. In dimension 2, caregivers from the lower-middle strata offer less companionship and encouragement to their children than those from the upper-middle strata. In dimension 3, caregivers from the lower, lower-middle, and middle strata are less likely to provide appropriate materials and spend less time with their children compared to those from the upper-middle strata. It can be observed that the upper-middle stratum appears to be a dividing line, with significant differences in scientific parenting behaviors between this stratum and the ones below it. Caregivers from the upper-middle stratum more frequently employ scientific parenting behaviors, which is consistent with existing research that shows significant variations in family parenting styles, depending on the caregivers' family socioeconomic status (Huang, 2023). High family income is a protective factor for scientific parenting during infancy (Xie *et al.*, 2019). In Yunnan Province, the annual income of the upper-middle stratum is

over 200,000 yuan (Hurun Research Institute, 2018). Caregivers in this stratum not only have a certain economic foundation but also value spiritual life quality and place great emphasis on their children's education. Due to their higher levels of education, they have more opportunities to cross national borders or receive western-style education in their studies and careers, and they have the chance to learn a vast amount of modern scientific parenting theories and techniques in daily life, they are more likely to consciously control negative parenting behaviors in their lives. Caregivers from strata below the upper-middle stratum also come into contact with parenting theories and methods through the Internet and other means, but these methods may not always be correct and may be fragmented and unsystematic. Regardless of the stratum, caregivers need to critically accept parenting theories or techniques, compare this knowledge with their parenting practices, and then weigh the pros and cons and actual situations to find suitable scientific parenting behaviors. Caregivers from middle, lower-middle, and lower socioeconomic strata, circumscribed by educational attainment, occupational constraints, and household income limitations, demonstrate reduced agency in critically evaluating and adapting contemporary parenting approaches, while concurrently encountering heightened caregiving stressors associated with resource scarcity (Finegood *et al.*, 2017).

4.2 Family socioeconomic status positively predicts scientific parenting behaviors of caregivers for infants and toddlers

The results show that a significant positive correlation exists between family socioeconomic status and the scientific parenting behavior of caregivers for infants and toddlers. Specifically, the higher the family socioeconomic status of the caregiver, the more scientific parenting behaviors they exhibit. They can provide more opportunities for interpersonal interactions for infants and toddlers, offer more encouragement and companionship, and invest more in terms of time and materials. After controlling for the caregiver's region, ethnicity, household registration type, family type, and the number of children in the household, family socioeconomic status positively predicts the caregiver's scientific parenting behavior, meaning that a high family socioeconomic status can predict a greater amount of scientific parenting behaviors. This further confirms the "social capital" theory, which suggests that the resources one has due to one's position in the social structure can influence individual behavior. Stratification differences equate to resource differences; the higher the family's socioeconomic status, the more resources caregivers have, and the easier it is for them to access and practice reliable scientific parenting behaviors. They can provide more parenting support, for example, these caregivers are more capable and willing to purchase housing in high-quality communities, buy various high-quality materials, or take early education courses for infants and toddlers. In addition to investing sufficient money, they also spend time providing children with more high-quality companionship. Caregivers with low family socioeconomic status provide relatively less favorable family environments for their children (Xi *et al.*, 2024). For caregivers in the middle and lower strata, they must invest in more immediate family needs (Sengonul, 2013). It is not easy to provide effective

opportunities, encouragement, and high-quality companionship for infants and toddlers. Lower strata families may also lack educational awareness or consciousness of participating in children's development, often resorting to negative parenting behaviors.

5. Implications

The positive impact of family socioeconomic status on the scientific parenting behavior of caregivers for infants and toddlers suggests that continuously improving the socioeconomic status of caregivers should be an essential way to enhance their scientific parenting behaviors as society develops. However, the phenomenon of social stratification is present in all societies, including China, where families in the upper-middle and higher strata can provide better education and development opportunities for their children, thus maintaining their competitive edge in society. Caregivers with lower family socioeconomic status, due to a lack of resources, are more likely to face various problems and pressures in their children's education, making upward mobility difficult, which inevitably leads to a vicious cycle. Changing family socioeconomic status in the short term is not an easy task. Nevertheless, it is widely accepted that investment in early education is highly beneficial for child development. For instance, existing research indicates that helping caregivers adopt positive parenting behaviors (Lin *et al.*, 2024) or providing authoritative parenting strategies (Luo *et al.*, 2019) may reduce children's problematic behaviors. The study's results indirectly suggest that improving caregivers' early parenting behaviors could be a strategy to address the widening inequalities caused by family socioeconomic status. The following policy implications can be drawn.

Firstly, evidence-based parenting guidance services should be strengthened through supportive policy interventions, which would optimize caregivers' nurturing behaviors for infants and toddlers while meeting families' developmental needs. Specifically, relevant departments should introduce policies to reduce family work pressure and increase the time caregivers spend interacting with their children; enhance family education on scientific parenting to foster an environment conducive to it; and introduce policies to guide families in promoting reasonable exercise and time spent in nature for infants and toddlers.

Secondly, standardized parenting guidelines should be developed alongside systematic science popularization efforts to enhance public understanding of early childhood development. For example, policy should support the development of evidence-based parenting manuals and standardized assessment tools, while establishing mechanisms to provide professional in-home guidance from childcare institutions or social organizations for families requiring additional support.

Thirdly, local communities should establish science-backed parenting centers as part of expanded service facilities to more effectively serve families, especially by providing specific community learning platforms for disadvantaged families, enabling them to acquire correct parenting behaviors and enhance their ability to discern the vast

amount of parenting information available online. Cultivate caregivers from lower socioeconomic backgrounds to become leaders in changing parenting behaviors and lead their peers and communities to transform existing parenting cultures (Okafor *et al.*, 2014).

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Conflict of Interest Statement
The author declares that there are no conflicts of interest regarding the publication of this paper.

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