

Exploring the Relationship Between Aggressive Behavior, Family Parenting Styles, and Self-Esteem Among Only-Child College Students in China: A Cross-Sectional Study

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Background: The prevalence of aggressive behavior among adolescents in higher education settings, particularly within the unique context of China's one-child policy, has become an increasingly significant issue. This study aims to elucidate the interplay between aggressive behaviors, parenting styles, and self-esteem among college students who are only children.

Methods: Conducted as a cross-sectional study from September 2022 to September 2023, the research involved a sample of students from four higher education institutions in Anhui Province, employing a convenience sampling method stratified by year of study and academic major. A total of 5,700 college students participated, with 5,431 valid responses obtained, resulting in a 95.28% validity rate. The average age of the participants was 19.16 ± 1.1 years, with 50.19% male and 49.81% female. The Buss-Perry Aggression Questionnaire (BPAQ), a revised Chinese version of the short Egan's Memories of Parents' Education (s-EMBU) questionnaire, and the French version of the Rosenberg Self-Esteem Scale (R-SES) were utilized to assess levels of aggression, parental styles, and self-esteem, respectively. Data were analyzed using SPSS26.0 and SPSS PROCESS Macro.

Results: The findings revealed that only children exhibited significantly higher levels of physical aggression (19.26 ± 5.33 vs 18.41 ± 4.87 , $p < 0.001$) and hostility (18.64 ± 5.68 vs 18.30 ± 5.33 , $p = 0.046$) compared to their non-only child peers. Regression analysis showed that both paternal ($\beta = 0.670$, $p = 0.004$) and maternal rejection ($\beta = 1.095$, $p < 0.001$) positively predicted aggressive behavior, while self-esteem negatively correlated with aggression ($\beta = -0.375$, $p < 0.001$). Mediation analysis indicated that self-esteem partially mediated the relationship between parental rejection and aggression, accounting for 6.90% and 6.54% of the variance in paternal and maternal rejection, respectively. This suggests that self-esteem nurturing may be a potential strategy to reduce aggression among only-child college students.

Conclusion: The study concludes that nurturing self-esteem among only-child college students in China may be a pivotal strategy in curbing aggressive behaviors, underscoring the necessity to comprehend the intricate relationship between parenting styles, self-esteem, and aggression. The insights gained from this research are instrumental in enhancing social cohesion by addressing the distinctive needs of this demographic.

Keywords: aggressive behavior, only-child, parenting styles, self-esteem, Chinese college students

Introduction

Aggressive behaviour among adolescents has become a significant concern in higher education and psychology, influenced by societal changes and shifts in educational settings.¹ This behaviour can take various forms, including

physical acts like hitting or kicking, verbal aggression such as name-calling, and relational aggression aimed at damaging interpersonal relationships.² Notably, research indicates that 34.0% of Lebanese adolescents display moderate levels of aggression, while 31.9% exhibit high levels.³ Similarly, a study on Chinese adolescents aged 12 to 18 revealed an overall aggression prevalence of 25.0% within the surveyed cohort.⁴

Only children, as a distinct social group, grow up in a notably different family structure compared to those with siblings. In China, where the one-child policy was enforced until 2015, only children face unique challenges and opportunities.⁵ There is a pervasive belief in Chinese society that only children are more likely to exhibit selfish, insecure, and immature behaviors compared to those with siblings.⁶ Research indicates that only children may be at an elevated risk of engaging in violent crimes later in life and exhibit more problematic behaviors compared to those with siblings.⁷⁻⁹ For instance, a study on a sample of 1,200 university students in Xinxiang City, Henan Province, found that only - child university students showed higher levels of physical aggression compared to those with siblings.¹⁰ Although aggressive behavior is not exclusive to only children, the unique family dynamics and limited sibling interactions within this group may contribute to its relatively higher prevalence. Investigating the characteristics of aggressive behavior among only children can thus deepen our understanding of their behavioral patterns and psychological needs.

Adolescent aggressive behaviors are influenced by a multitude of factors, including family dynamics, emotional intelligence, and personal values. Understanding the impact of family functionality on these behaviors is, therefore, of utmost importance.¹¹ Parental approaches in child-rearing significantly shape the development of only children, with attitudes, strategies, and expectations having lasting effects on behaviour and personality.¹²

Theoretical Frameworks

Family Systems Theory

This theory posits that the family is an interconnected unit, where each member's behavior affects and is affected by others.¹³ In the context of only - child families, the absence of siblings can lead to a more concentrated focus of parental attention, which may in turn influence the child's behavior.¹⁴ For example, over - involvement by parents, as predicted by Family Systems Theory, could potentially lead to over - dependence or, conversely, rebellion in the only child, manifesting as aggressive behavior.⁸

Attachment Theory

This theory emphasizes the significance of the early emotional bond between a child and their primary caregiver. Secure attachments are associated with positive social and emotional development, while insecure attachments can lead to various behavioral problems.¹⁵ In families with only children, the quality of attachment to parents may be particularly critical due to the absence of a sibling support system.¹⁶ Insecure attachment styles, such as anxious-avoidant or anxious-ambivalent attachment, may heighten the likelihood of aggressive behavior in only children.

Literature Review

A comprehensive review of the existing literature reveals a complex relationship between parenting styles, self - esteem, and aggressive behavior among only children. Multiple studies have explored the impact of parenting styles on adolescent aggression. A study on 4,576 adolescents in Shanghai used a cross - sectional research method and found a correlation between paternal rejection, maternal over - protection, and depressive symptoms in only - child families, a relationship not observed in families with multiple children.¹⁷ Another study of a sample of 530 adolescents and young adults, using a cross-sectional online questionnaire, found that parental emotional warmth was associated with reduced aggression. This effect was mediated by traits such as Machiavellianism and psychopathy and was consistent across age groups.¹⁸ A comprehensive review of the literature has clearly established an association between parenting styles and childhood aggression. Authoritative parenting has been linked to positive outcomes, while authoritarian or permissive styles are associated with negative behaviors in children.¹⁹ A study on 2060 Spanish high school students using a combination of survey and observation methods identified that punitive parental discipline, such as physical punishment and psychological aggression, significantly mediates the relationship between parenting styles and aggressive behavior in children, highlighting the role of psychological factors in shaping a child's behavior.²⁰

Self - esteem, a fundamental aspect of psychological development, is of great significance for psychosocial adjustment and is a central focus in behavioral and social science research. Each year, numerous studies are conducted by psychology experts and scholars to explore this concept.^{21,22} For only children, they often receive excessive attention, which can both impede social development and foster early psychological maturity and high self - esteem.²³ A cross - sectional historical study on Chinese adolescents from 1996 to 2019 found that only children showed a more significant increase in self - esteem compared to non - only children.²⁴ Understanding self-esteem is essential for examining the connection between parenting styles and aggressive behavior, highlighting the need to nurture a child's self-worth to encourage positive behavioral outcomes.²⁵ For example, a study with a sample of 425 adolescents (129 males and 296 females, aged 14 to 19 years) recruited from various schools in central Italy (including humanistic, artistic, and professional schools) found that self-esteem mediates the impact of parental emotional availability on aggressive tendencies.²⁶ Another study on 730 high school students (aged 15–19) from 23 schools in five municipalities in Yogyakarta, Indonesia, found that self-esteem links maternal-child attachment and aggression, with insecure and anxious attachments increasing aggression and decreasing self-esteem.²⁷ A three - year longitudinal study in China on 2407 adolescents demonstrated that parental phubbing positively predicted adolescents' reactive aggression, with self - esteem mediating this association.²⁸

Research Hypothesis

In the present investigation, we aim to explore the potential mediating role of self - esteem in the relationship between parenting strategies and aggressive tendencies among Chinese only children. We propose two main hypotheses (Figure 1):

H1. Self - esteem is likely to have a significant mediating effect on the relationship between parenting styles and the expression of aggression.

H2. The degree of this mediation may vary depending on whether the parenting is paternal or maternal.

This research is intended to deepen our understanding of the underlying mechanisms, with the ultimate goal of creating nurturing and supportive environments for the healthy development of only children, thereby contributing to the improvement of a more harmonious social structure.

Methods

Study Design and Participants

This study, conducted from September 2022 to September 2023, aimed to investigate aggressive behaviors among college students in the southern region of Anhui Province. Surveys were administered in person at four higher education institutions, comprising two vocational colleges and two undergraduate colleges. A convenience sampling method was employed, with classes stratified by academic year and major. Selected class clusters were surveyed to ensure representation across various academic levels and disciplines. Prior to participation, students provided informed consent, which outlined the study's purpose, procedures, potential risks (eg, discomfort while answering sensitive questions), and benefits (eg, contributing to the understanding of college student mental health). Participation was voluntary, and students were free to withdraw at any time without penalty. The survey was conducted anonymously, and responses were kept

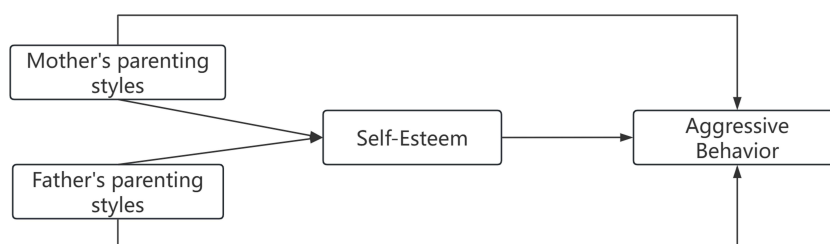


Figure 1 Hypothetical Model of the research.

confidential to safeguard participants' privacy. The study adhered to the Declaration of Helsinki and received ethical approval from the ethics committee of Wannan Medical College (Ethics approval number: 2022AH051208).

The sample size was calculated based on several parameters. A maximum allowable error of 0.1p, a significance level α of 0.05, and a $U_{\alpha/2}$ value of 1.96 were used. A review of existing literature indicated that the prevalence of reported aggressive behaviors among Chinese college students is approximately 13%.²⁹ Using a specific formula, $N = \frac{U_{\alpha/2}^2 P(1-P)}{\delta^2}$, the necessary sample size was initially determined to be 2600 individuals. Due to the cluster sampling method, which can introduce a design effect, the sample size was increased by 50% to 5200 individuals. To further accommodate sampling error (at a ratio of 1:1.5) and potential invalid responses (ranging from 10% to 20%), the sample size was expanded to 5700 individuals. In total, 5431 valid responses were received from the 5700 questionnaires distributed, resulting in an impressive recovery rate of 95.28%.

Measurements

Buss-Perry Aggression

The Buss-Perry Aggression Questionnaire (BPAQ) is a well-established instrument for the assessment of aggressive behaviours, originally developed by Buss and Perry.³⁰ The version utilised in this study was the original English version, which evaluates four dimensions of aggression: physical aggression (items 2, 5, 8, 11, 13, 16, 22, 25, 29), verbal aggression (items 4, 6, 14, 21, 27), anger (items 1, 9, 12, 18, 19, 23, 28), and hostility (items 1, 9, 12, 18, 19, 23, 28). The questionnaire consists of 29 items, with each item rated on a 5-point Likert scale ranging from 1 (not applicable) to 5 (fully applicable). It is notable that items 9 and 16 are reverse-scored, with the purpose of improving the accuracy of the results. The total score range is from 29 to 145, with a higher score indicating a greater tendency towards aggression. Subscale and overall scores are calculated by summing the scores of the corresponding items. The reliability of the BPAQ in this study was high, with a Cronbach's α coefficient of 0.887.

Parenting Style

The study employed the revised Chinese version of the short Egan's Memories of Parents' Education (s-EMBU) questionnaire, developed by Jiang Jiang and et.al. to assess participants' self-reported perceptions of their fathers' and mothers' parenting approaches.³¹ The questionnaire comprises 42 items, with 21 items dedicated to each parent's style. Scoring is conducted using a 4-point Likert scale, ranging from 1 ("never") to 4 ("always"). The items are grouped into three main dimensions: rejection (items 1, 4, 7, 12, 14, and 19), emotional warmth (items 2, 6, 9, 11, 13, 17, and 21), and overprotection (items 3, 5, 8, 10, 15, 16, 18, and 20, with item 15 being reverse-scored). The total score range for each dimension is from 7 to 28. Higher scores in rejection and overprotection indicate higher levels of these dimensions, while higher scores in emotional warmth suggest more positive parenting. Subscale scores are calculated by summing the scores of the corresponding items. In the present study, Cronbach's α coefficients for fathers' parenting dimensions were 0.817 for Rejection, 0.882 for Emotional Warmth, and 0.669 for Overprotection. For mothers, the coefficients were 0.814, 0.882, and 0.687, respectively. These results demonstrate the questionnaire's reliability and internal consistency in assessing various parenting styles.

Self-Esteem

The Rosenberg Self-Esteem Scale (R-SES) is a widely recognised instrument for assessing an individual's perception of their own worth, as defined by Rosenberg in 1965.³² The version utilised in this study was the Chinese adaptation, which was translated and revised by Ji Yifu and Yu Xin in 1993.³³ This scale evaluates self-esteem through 10 items, designed to capture both positive and negative self-perceptions. The items are rated on a 4-point Likert scale, ranging from 1 ("strongly disagree") to 4 ("strongly agree"). It is notable that items 3, 5, 9, and 10 are reverse-scored, with the purpose of enhancing the accuracy of the results. The total score range is from 10 to 40 points, with higher scores indicating higher levels of self-esteem. The composite score is calculated by summing the scores of all items, providing a direct assessment of one's positive or negative feelings about themselves. In this study, the R-SES demonstrated strong internal consistency, with a Cronbach's α coefficient of 0.809.

Statistical Analysis

The dataset was meticulously organized and analyzed using SPSS 26.0 software. Quantitative variables were described using descriptive statistics presented as the mean and standard deviation (mean \pm SD), and statistical inference was conducted using t-tests or single-factor analysis of variance (ANOVA). Categorical data were represented as frequencies and percentages (n (%)), with group comparisons performed using the chi-square test. Building on this foundation, the complex interrelationships among parenting styles, self-esteem, and aggressive behaviors were thoroughly examined through zero-order correlation analysis and stepwise regression analysis. For variables that showed statistical significance within the regression framework, mediation analysis was conducted using the SPSS PROCESS macro to explore the mediating role of self-esteem among only-child college students in the relationship between parenting styles and aggressive behaviors. A p-value of less than 0.05 was considered to indicate statistical significance.

Result

Study Population and Demographics

A total of 5,700 college students participated in the research. Following the removal of invalid questionnaires, 5,431 valid responses were obtained, resulting in a 95.28% validity rate. The average age of the participants was 19.16 ± 1.1 years. Among the 5431 students, 2726 (50.19%) were male and 2705 (49.81%) were female. Additionally, 1575 (29%) students were the only child in their families, while 3856 (71%) students had siblings. Table 1 presents a comparison of important statistics and distinctions between only-child and non-only-child. Notably, only children display elevated levels of aggressive behaviour, specifically in physical aggression and hostility, with statistically significant differences ($p < 0.05$). Furthermore, in terms of parenting styles, only children report significantly higher levels of perceived rejection and overprotection from both their fathers and mothers when compared to non-only children. Nevertheless, no significant discrepancy was observed in self-esteem scores between the two groups ($p = 0.483$).

Demographic Influences on Only Child University Students' Behavioral and Parenting Scores

In terms of aggressive behavior, male students exhibited a higher level of physical aggression (19.68 ± 5.61) compared to female students (18.55 ± 4.74). Students residing in County/Town regions demonstrated the highest levels of physical aggression (19.83 ± 5.12), while those in County/Town (12.50 ± 3.11) also showed higher levels of verbal aggression than their counterparts in City areas (11.83 ± 3.36). Additionally, freshmen exhibited the highest levels of hostility (19.17 ± 5.86). Males scored higher in the domains of "Father's rejection", "Father's over-protection", and "Mother's rejection" compared to females. Conversely, they scored lower in the domain of "Mother's emotional warmth." In terms of

Table 1 Comparative Analysis of Scores on Diverse Scales Among University Students Categorized as Only Children and Non-Only Children

Characteristics	Only Children	Non-Only Children	t	P
Aggressive Behavior (BPAQ scores)	64.60 \pm 15.72	62.99 \pm 14.61	3.497	0.000
Physical Aggression	19.26 \pm 5.33	18.41 \pm 4.87	5.439	0.000
Verbal Aggression	12.14 \pm 3.21	11.96 \pm 3.17	1.844	0.065
Anger	15.45 \pm 4.30	15.25 \pm 4.14	1.611	0.107
Hostility	18.64 \pm 5.68	18.30 \pm 5.33	1.997	0.046
Parenting style (s-EMBU-C sores)	87.77 \pm 12.96	85.47 \pm 12.14	6.201	0.000
Father's rejection	8.67 \pm 2.91	8.24 \pm 2.70	4.973	0.000
Father's emotional warmth	17.74 \pm 4.35	17.50 \pm 4.03	1.930	0.054
Father's over-protection	13.86 \pm 3.11	13.50 \pm 2.98	3.921	0.000
Mother's rejection	8.68 \pm 2.96	8.33 \pm 2.70	4.011	0.000
Mother's emotional warmth	19.27 \pm 4.88	18.93 \pm 4.55	2.380	0.017
Mother's over-protection	14.27 \pm 3.27	13.85 \pm 3.12	4.362	0.000
Self-Esteem (SES sores)	27.48 \pm 4.04	27.56 \pm 3.83	-0.702	0.483

“Father’s emotional warmth” and “Mother’s emotional warmth”, there was a consistent decrease in scores from urban areas to county/town regions and then to rural areas ($p = 0.007$ and 0.005). Males scored significantly higher than females in SES scores, other details are described in [Table 2](#).

Aggression, Parenting and Self-Esteem in Only Children

After controlling for variables such as gender, place of birth, and years of study, a zero-order correlation analysis was conducted on the aggressive behaviours of only children, along with their parents’ child-rearing styles and self-esteem. The results presented in [Table 3](#) demonstrate that, with the exception of Verbal Aggression, which does not exhibit a correlation with the emotional warmth of fathers and mothers, there is also no link between fathers’ and mothers’ over-protection and the S-EMBU-C scores or SES scores. However, all other variables exhibit significant correlations. The BPAQ scores and its various dimensions are negatively associated with the emotional warmth of fathers, mothers and SES scores, while all other correlations are positive.

Predicting Aggression in Only Children: Parenting and Self-Esteem

[Table 4](#) presents the results of the regression analysis conducted on the behaviour of university students who are only children revealed several significant findings. In both the unadjusted (Model 1) and adjusted (Model 2) models, it is evident that father’s rejection is a strong predictor of higher aggressive behaviour scores, showing a significant positive correlation ($\beta=0.663$, $p=0.005$ in Model 1; $\beta=0.670$, $p=0.004$ in Model 2). Similarly, mother’s rejection also emerges as a significant predictor, correlating with increased aggressive behaviour scores in both models ($\beta=1.098$, $p=0.000$ in Model 1; $\beta=1.095$, $p=0.000$ in Model 2). Furthermore, there is a significant positive relationship between self-esteem and aggressive behaviour. This indicates that individuals with higher self-esteem tend to exhibit lower levels of aggressive behaviour ($\beta=-0.379$, $p=0.000$ in Model 1; $\beta=-0.375$, $p=0.000$ in Model 2).

Mediation of Self-Esteem

Building upon our previous analyses, we have developed a theoretical pathway model that illuminates the potential connections between parental rejection, self-esteem, and aggressive behaviour. Our findings indicate that both paternal and maternal rejection indirectly influence aggressive behaviour through the intermediary role of self-esteem. Of particular interest are the pathways mediated by self-esteem, which account for a certain portion of the overall relationship between parental rejection and aggressive behaviour. These pathways explain 6.90% and 6.54% of the variance in paternal and maternal rejection, respectively ([Figure 2](#)). This model provides a comprehensive insight into the complex mechanisms that may underlie the manifestation of aggressive behaviour in only-child university students.

Discussion

Globally, the prevalence of violent and bullying behaviors among youths, characterized by intentional harm, has given rise to significant social concerns. These behaviors present significant challenges to public health and education. They involve deliberate acts of harm through verbal, instrumental, or physical means, often driven by resentment or harmful intentions and manifesting in various forms of aggression.³⁴ This study sought to examine the interplay between aggressive behavior, family parenting styles, and self-esteem among Chinese only-child college students, with a particular focus on the mediating role of self-esteem between parenting styles and aggression. While previous research has concentrated on the adverse effects, this study adopts a constructive psychological stance by exploring how parenting styles impact aggression via self-esteem. The findings are pivotal for comprehending the pivotal mediating function of self-esteem, contributing to a more nuanced understanding of the complex relationship between family upbringing and aggressive tendencies. The illuminating results and implications of this study can be summarized as follows.

The study findings indicate that the mean score for aggressive behaviors among only-child college students in Anhui Province, China, is 64.60 ± 15.72 . It is noteworthy that BPAQ assessments indicate a significantly higher incidence of pronounced aggression, particularly physical aggression and hostility, among these students compared to their non-only-child peers. This finding is consistent with prior research that has documented elevated aggression levels among sole-offspring university students in China.³⁵ Within the traditional Confucian context of China,³⁶ parents of only children

Table 2 Comparison of Scores on Various Variables Among Only Child University Students Based on Different Demographic Characteristics

Characteristics	N	BPAQ Scores	Physical Aggression	Verbal Aggression	Anger	Hostility	s-EMBU-C scores	Father's Rejection	Father's Emotional Warmth	Father's over-Protection	Mother's Rejection	Mother's emotional Warmth	Mother's over-Protection	SES Sores
Gender														
Male	989	64.87 ±15.90	19.68±5.61	12.13±3.25	15.35 ±4.36	18.60 ±5.60	88.17 ±13.7	8.94±2.98	17.62±4.24	14.01±3.12	8.84±3.02	19.01±4.78	14.38±3.3	27.66 ±4.04
Female	586	64.15 ±15.42	18.55±4.74	12.15±3.15	15.62 ±4.2	18.70 ±5.82	87.09 ±11.58	8.21±2.74	17.95±4.53	13.59±3.1	8.41±2.84	19.7±5.01	14.08±3.21	27.17 ±4.03
t		0.871	4.250	-0.128	-1.204	-0.350	1.675	4.918	-1.446	2.568	2.825	-2.703	1.763	2.327
P		0.384	0.000	0.898	0.229	0.270	0.094	0.000	0.148	0.010	0.005	0.007	0.078	0.020
Place of birth														
City	630	64.10 ±15.91	19.09±5.49 ^a	11.83±3.36 ^a	15.44 ±4.36	18.53 ±5.79	88.37 ±13.20	8.61±2.95	18.01±4.39 ^a	13.85±3.18	8.62±2.97	19.61±4.83 ^a	14.34±3.34	27.64 ±3.91
County/Town	491	65.60 ±15.61	19.83±5.12 ^b	12.50±3.11 ^b	15.59 ±4.30	18.65 ±5.54	87.77 ±12.41	8.63±2.95	17.82±4.38 ^{ab}	13.81±3.20	8.76±3.08	19.29±4.95 ^{ab}	14.22±3.32	27.45 ±4.11
Rural Area	454	64.22 ±15.55	18.88±5.27 ^a	12.18 ±3.06 ^{ab}	15.45 ±4.30	18.77 ±5.67	86.93 ±13.18	8.79±2.83	17.29±4.24 ^b	13.91±2.93	8.66±2.79	18.77±4.82 ^b	14.23±3.11	27.28 ±4.14
F		1.444	4.344	6.069	0.447	0.225	1.633	0.564	3.713	0.110	0.308	3.964	0.237	1.110
P		0.236	0.013	0.002	0.640	0.798	0.196	0.569	0.025	0.896	0.735	0.019	0.789	0.330
Years of study														
Freshman	665	64.95 ±16.03	19.25±5.34	12.15±3.18	15.53 ±4.34	19.17 ±5.86 ^a	88.22 ±13.07	8.76±2.95	17.71±4.59	14.02±3.27	8.81±3.11	19.27±5.12	14.44±3.39	27.43 ±4.32
Sophomore	608	63.88 ±14.86	19.14±5.09	12.03±2.99	15.46 ±4.08	18.18 ±5.32 ^b	87.23 ±12.93	8.56±2.78	17.71±4.31	13.71±2.97	8.55±2.74	19.23±4.86	14.09±3.17	27.61 ±3.93
Junior	302	65.29 ±16.68	19.53±5.75	12.33±3.67	15.26 ±4.64	18.39 ±5.89 ^b	87.86 ±12.77	8.68±3.10	17.89±3.87	13.77±3.04	8.65±3.04	19.35±4.35	14.26±3.20	27.31 ±3.60
F		1.104	0.548	0.915	0.403	5.220	0.932	0.773	0.216	1.703	1.196	0.065	1.859	0.592
P		0.332	0.578	0.401	0.669	0.006	0.394	0.462	0.806	0.182	0.303	0.937	0.156	0.553

Notes: Values with the same letter (eg, a) do not differ significantly from each other. Values with different letters (eg, a vs b) are significantly different.

Table 3 Correlation Analysis Among Aggressive Behavior, Parenting Styles, and Self-Esteem Among Only Child University Students

Characteristics	Physical Aggression	Verbal Aggression	Anger	Hostility	BPAQ Scores	Father's Rejection	Father's Emotional Warmth	Father's over-Protection	Mother's Rejection	Mother's Emotional Warmth	Mother's over-Protection	s-EMBU-C sores	SES Sores
Physical Aggression	1												
Verbal Aggression	0.599*	1											
Anger	0.700*	0.62*	1										
Hostility	0.639*	0.543*	0.665*	1									
BPAQ scores	0.851*	0.737*	0.852*	0.845*	1								
Father's rejection	0.292*	0.211*	0.304*	0.327*	0.366*	1							
Father's emotional warmth	-0.092*	0.007	-0.092*	-0.156*	-0.163*	-0.298*	1						
Father's over-protection	0.194*	0.173*	0.213*	0.278*	0.255*	0.526*	0.014	1					
Mother's rejection	0.319*	0.204*	0.319*	0.334*	0.386*	0.786*	-0.23*	0.448*	1				
Mother's emotional warmth	-0.118*	0.009	-0.129*	-0.177*	-0.199*	-0.344*	0.875*	-0.055*	-0.368*	1			
Mother's over-protection	0.214	0.177*	0.216*	0.309*	0.275*	0.439*	0.001	0.813*	0.526*	-0.057*	1		
s-EMBU-C sores	0.176*	0.200*	0.175*	0.186*	0.182*	0.413*	0.592*	0.689*	0.419*	0.537*	0.684*	1	
SES sores	-0.109*	-0.104*	-0.153*	-0.217*	-0.195*	-0.207*	0.246*	-0.162*	-0.205*	0.272*	-0.183*	0.015	1

Notes: *P<0.05.

Table 4 Regression Analysis Predicting Aggressive Behavior From Parenting Styles, and Self-Esteem Among Only Child University Students

Characteristics	Model 1					Model 2				
	β	SE	95% CI	t	P	β	SE	95% CI	t	P
Father's rejection	0.663	0.234	(0.204, 1.121)	2.834	0.005	0.670	0.235	(0.209, 1.132)	2.847	0.004
Father's emotional warmth	-0.194	0.184	(-0.554, 0.166)	-1.059	0.290	-0.193	0.184	(-0.554, 0.168)	-1.048	0.295
Father's over-protection	0.081	0.225	(-0.360, 0.523)	0.360	0.719	0.084	0.225	(-0.358, 0.526)	0.374	0.709
Mother's rejection	1.098	0.236	(0.635, 1.561)	4.649	0.000	1.095	0.237	(0.630, 1.560)	4.621	0.000
Mother's emotional warmth	-0.004	0.169	(-0.335, 0.326)	-0.026	0.979	-0.008	0.169	(-0.341, 0.324)	-0.048	0.962
Mother's over-protection	0.395	0.213	(-0.023, 0.813)	1.852	0.064	0.395	0.213	(-0.024, 0.813)	1.849	0.065
Self-Esteem	-0.379	0.094	(-0.563, -0.194)	-4.031	0.000	-0.375	0.095	(-0.560, -0.190)	-3.968	0.000

Notes: Model 1: Unadjusted; Model 2 Adjusted for gender, place of birthage and years of study.

often hold higher aspirations for their offspring, which may inadvertently lead to behavioral challenges. Such challenges may arise from premature pressures for accelerated development or an excessive focus of parental attention and protection. Consequently, being an only child frequently involves intensified parental investment and potentially excessive guardianship, both of which may contribute to the emergence of aggressive behaviors.

Furthermore, the present investigation serves to reinforce the understanding of gender disparities in the manifestation of aggressive behaviors, specifically indicating that male students exhibit a heightened level of physical aggression (19.68 ± 5.61) in comparison to their female counterparts (18.55 ± 4.74). This finding is consistent with previous research indicating that male adolescents may exhibit a greater proclivity for externalizing behaviors, particularly aggression, in comparison to females.³⁷ The study, conducted in Ankara, Turkey, revealed gender-specific patterns in aggressive behaviors, with boys exhibiting a greater inclination toward physical and verbal aggression, while girls demonstrated a greater vulnerability to feelings of isolation and verbal victimization.³⁸

The development of self-identity and self-esteem during adolescence is profoundly influenced by the parenting styles adopted by parents or guardians.³⁹ This study sheds light on how different parenting strategies impact the self-esteem of adolescents. Our results highlight that parental warmth is a key element in nurturing self-esteem. Adolescents who receive affection, understanding, and encouragement from their parents tend to exhibit higher levels of self-esteem. In contrast, parental rejection and overprotection are linked to lower self-esteem, which is in line with the existing literature on the adverse effects of authoritarian and neglectful parenting approaches.^{40,41} Our research further demonstrates that rejection from both fathers and mothers is strongly associated with diminished self-esteem, emphasizing the importance of emotional support from both parents. In single-child families, heightened levels of rejection can create a detrimental environment that fosters a sense of inadequacy and isolation, hindering the development of robust self-esteem. These findings are supported by meta-analytic studies that show authoritative parenting—marked by warmth, responsiveness, and reasonable expectations—enhances self-esteem. On the other hand, strict control or a lack of parental involvement,

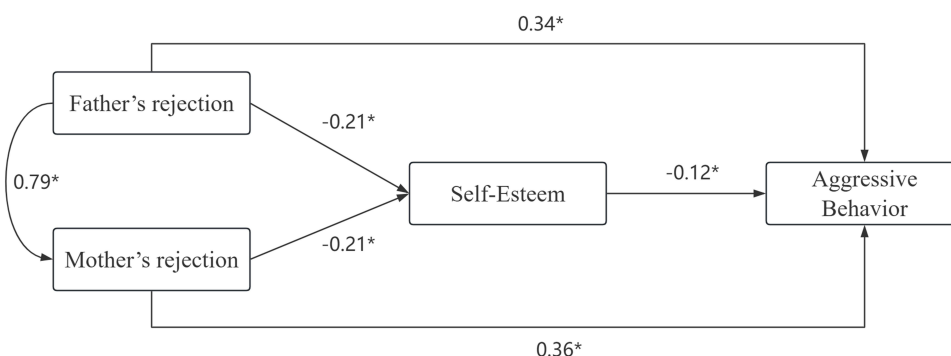


Figure 2 Path model illustrating mediation via self-esteem in the association between father's rejection, mother's rejection, and aggressive behavior (* $p < 0.05$).

characteristic of authoritarian and neglectful parenting, is associated with reduced self-esteem levels.⁴² The implications of these findings underscore the importance of adopting a balanced parenting approach that fosters the positive development of adolescents' self-esteem.

The prevailing belief, which has persisted for an extended period, is that low self-esteem is a catalyst for a range of antisocial behaviors, including violent actions.^{43–45} Specifically, adolescents with low self-esteem are more likely to receive negative feedback and become desensitized to positive reinforcement, which renders them vulnerable to maladaptive behaviors such as aggression.⁴⁶ Nevertheless, this hypothesis is currently being reexamined in light of new theories and research findings that suggest a potential correlation between high self-esteem and violent behavior.⁴⁷ Aggression, as an inherently risky behavior, requires considerable courage to maintain. This is often exemplified by the traits of bravery and self-confidence that are typical among individuals with high self-esteem. Consequently, these individuals generally demonstrate a higher propensity for aggression, whereas those with low self-esteem tend to avoid aggressive actions due to a fear of failure.⁴⁸ This perspective is supported by studies conducted by Bushman et al⁴⁹, Thomaes et al⁵⁰ and Duan et al,⁵¹ among others. In the context of our findings, it is noteworthy that lower self-esteem among only children is significantly associated with higher scores of aggressive behaviors. This phenomenon can be attributed to a combination of factors, including overprotective parenting styles and high expectations that may stifle independence and autonomy, leading to frustration and subsequent aggression as a coping mechanism.^{52,53} Additionally, the lack of sibling interaction, which is crucial for developing social skills and conflict resolution, may contribute to self-centeredness and difficulties in managing emotions, further exacerbating aggressive tendencies.^{14,54} Thus, our study highlights the importance of addressing the psychological well-being of only children and fostering supportive environments that promote healthy self-esteem and interpersonal relationships.

Prior research underscores the strong correlation between the development of aggressive behaviors and the quality of communication with parents.⁵⁵ Specifically, effective parental communication fosters a sense of security and encourages open interactions with others throughout life. Conversely, individuals who experience high levels of insecurity may find it challenging to channel their anger constructively, thereby increasing their likelihood of engaging in aggressive behaviors.⁵⁶ By recognizing these dynamics, interventions can be tailored to strengthen parent-adolescent communication and promote healthier coping mechanisms. The underlying factors linking parenting styles and aggressive behaviors may potentially stem from hormonal influences, particularly testosterone and cortisol. According to Fong et al,⁵⁷ individuals with low baseline cortisol levels are more susceptible to developing behavioral difficulties within challenging family environments, reinforcing the concept of vulnerability in the diathesis-stress paradigm. Additionally, research by Pascual-Sagastizabal et al⁵⁸ indicates that heightened testosterone levels are correlated with an increased tendency towards physical aggression in boys whose mothers exhibit authoritarian parenting styles. Furthermore, this hormone moderates the relationship between authoritarian parenting by fathers and physical aggression in girls, demonstrating significant effects across both moderate and high levels of testosterone.

Path analysis revealed a significant and consistent mediating effect of self-esteem in the relationship between parental rejection and aggressive tendencies among singleton children. Specifically, parental rejection had a negative effect on adolescent aggressive behavior by lowering self-esteem. Our results are consistent with the broader literature emphasizing the importance of self-esteem in behavioral regulation, aggression can be controlled through some indirect ways.^{27,59,60} The absence of siblings leaves these children with limited avenues for social interaction, exacerbating feelings of powerlessness when faced with rejection. As sociometer theory posits,⁶¹ lowered self-esteem can intensify aggressive responses, as children may struggle to find alternative means of establishing control and social validation. The meaning maintenance model⁶² further supports our findings, suggesting that threatened self-esteem can drive individuals, particularly singleton children, to seek compensatory affirmation through aggressive actions. This underscores the importance of self-esteem as a critical mediating factor in the development of aggressive behavior following parental rejection.

Considering the mechanisms underlying these relationships, specific parenting practices play a crucial role in shaping adolescents' self-esteem and subsequent aggressive behaviors. For instance, authoritative parenting, characterized by warmth and reasonable expectations, fosters secure attachment and a sense of competence in adolescents. This secure base enables them to develop healthy self-esteem, which, in turn, serves as a protective factor against aggressive

behaviors. In contrast, authoritarian parenting, marked by strict control and low responsiveness, can lead to feelings of inadequacy and diminished self-esteem. Adolescents in such environments may resort to aggression as a maladaptive coping mechanism to compensate for their perceived deficiencies. Similarly, neglectful parenting, which lacks emotional support and involvement, renders adolescents vulnerable to low self-esteem and increases the likelihood of engaging in antisocial behaviors. These findings underscore the necessity for interventions that target parenting practices to promote a balanced and supportive environment, thereby enhancing adolescents' self-esteem and reducing aggressive tendencies.

In light of these findings, interventions aimed at strengthening self-esteem present a strategic approach to prevent the escalation of aggressive behavior among singleton children. By fostering a strong sense of self-worth, we can help mitigate the adverse effects of parental rejection and promote healthier social and emotional development. Additionally, efforts to improve parenting practices, such as promoting authoritative parenting and reducing overprotective or authoritarian behaviors, can contribute to a more supportive environment for adolescents' psychological well-being.

Strengths and Limitations

This study offers several strengths. First, it provides a comprehensive examination of the interplay between parenting styles, self-esteem, and aggressive behavior among Chinese only-child college students, a population that has received limited attention in prior research. The use of validated instruments, such as the Buss-Perry Aggression Questionnaire and the Rosenberg Self-Esteem Scale, ensures the reliability and validity of the measurements. Additionally, the study's focus on the mediating role of self-esteem offers novel insights into the mechanisms underlying the relationship between parenting styles and aggression.

However, several limitations should be acknowledged. The cross-sectional design precludes the possibility of drawing causal inferences from the observed relationships. Future longitudinal studies could provide a more robust examination of the causal pathways between parenting styles, self-esteem, and aggressive behavior. Secondly, the reliance on self-reported data may introduce bias, as participants may not accurately report their behaviors or perceptions due to social desirability or recall bias. The incorporation of objective measures or multiple informants could enhance the validity of the findings. Third, although the sample size was substantial, the study was conducted with a convenience sample from specific higher education institutions in Anhui Province, which may not be representative of the broader population of Chinese college students. A more diverse and representative sample would enhance the generalizability of the findings. Lastly, the study's scope was limited by the failure to account for a range of potential confounding variables and broader family dynamics that could significantly influence the relationships between parenting styles, aggressive behavior, and self-esteem. The exclusion of factors such as socioeconomic status, cultural beliefs, school environment, sibling relationships, extended family influences, and other psychological factors like emotional intelligence or coping strategies may have limited the comprehensiveness of the findings. Future research should consider incorporating these elements to facilitate a more profound and comprehensive understanding of the intricate dynamics at play.

Practical Significance and Future Implications

The findings of this study have important practical implications. They highlight the critical role of parenting styles and self-esteem in shaping aggressive behaviors among only-child college students. By identifying the mediating effect of self-esteem, the study suggests that interventions aimed at improving self-esteem could be effective in reducing aggressive behaviors. Specifically, promoting authoritative parenting styles, which are characterized by warmth, understanding, and reasonable expectations, may foster higher self-esteem and healthier social interactions among adolescents. Additionally, the findings underscore the need for targeted interventions to address the unique challenges faced by only-child families, such as reducing parental rejection and overprotection. For future research, the study's limitations offer several directions. Longitudinal studies are needed to establish causal relationships between.

Conclusion

In summary, our study highlights the pivotal mediating role of self-esteem in the association between parenting approaches and aggressive behaviour in Chinese college students from only-child backgrounds. To translate these findings into practical applications, the following recommendations are put forward: the implementation of school-

based initiatives (eg emotional intelligence training and peer support networks), the augmentation of counselling services at universities, and the introduction of policy measures aimed at promoting family well-being and mental health.

Data Sharing Statement

The datasets generated or analyzed in this study are available from the corresponding author upon request, provided the request is reasonable and justifiable.

Ethical Approval and Participant Consent

This research was granted ethical approval by the Wannan Medical College Ethics Committee under the reference number LL-2022AH051208. All student participants provided their informed consent by signing the consent forms.

Consent for Publication

All contributing authors have reviewed and endorsed the final manuscript, and they collectively agree to its publication in this journal.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors hereby declare that there are no competing interests or potential conflicts of interest regarding the publication of this research.

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