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ORIGINAL RESEARCH

Exploring Family Functioning and Adolescent Academic Anxiety: Emotional Stability and Social Support as Mediators

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Purpose: With the intensification of social competition, the phenomenon of academic credential inflation has become increasingly severe, highlighting the growing importance of education. Although existing research has focused on individual factors related to academic anxiety, the roles of family functioning, emotional stability, and social support in alleviating academic anxiety remain underexplored. In particular, these factors may exert different influences across diverse cultural contexts. Given the prevalence of academic anxiety in adolescents, this study examines the role of family functioning as mediated by emotional stability and social support. It aims to provide practitioners with effective intervention strategies.

Patients and Methods: This study conducted a questionnaire survey among 456 college students to assess their family functioning, social support, emotional stability, and academic anxiety. Data were analyzed using SPSS software.

Results: The findings revealed significant negative correlations between family functioning, emotional stability, social support, and academic anxiety. After controlling for demographic variables, emotional stability and social support were found to play a chain mediating role in the relationship between family functioning and academic anxiety.

Conclusion: This study highlights the important role of family functioning in reducing academic anxiety among adolescents, mediated by emotional stability and social support. The findings provide actionable insights for parents and educators to foster a supportive environment that reduces academic stress.

Keywords: academic anxiety, family functioning, emotional stability, social support

Introduction

With the swift advancement of the social economy and the intensification of societal competition, adolescents are facing increasing academic pressure. Academic anxiety (AA) has become one of the widely recognized issues in contemporary society. AA refers to feelings of unease or discomfort that arise during the learning process, typically triggered by internal conflicts. It is a specific form of tension experienced by students.[1] A study conducted on Chinese primary and secondary school students found that 70.03% of the students had experienced AA.[2] AA is closely related to students' mental health and may negatively impact their academic performance.[3] If this state of anxiety is not effectively managed and alleviated in a timely manner, it may lead to a series of mental health issues, such as depression and social difficulties.[4] Consequently, identifying the main factors contributing to adolescents' AA and formulating practical approaches to reduce it are crucial.

As the primary environment for adolescent growth, the adequacy of its functioning may be closely related to adolescents' mental health.[5] Existing research suggests that adolescents with well-functioning families are generally more capable of actively coping with academic challenges, whereas family dysfunction may be associated with increased levels of anxiety in adolescents.[6] Moreover, emotional stability (ES), as an indicator of an individual's ability to regulate emotions, may be associated with alleviating AA. Adolescents with ES tend to handle their emotional reactions more

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effectively, allowing them to remain composed under academic stress and reducing their vulnerability to negative feelings.[7] Simultaneously, social support (SS) is another critical protective factor that can provide adolescents with essential external resources, helping them cope better with academic stress.[8] When adolescents perceive support from family members or other social networks, they tend to adopt more positive coping strategies, which may help alleviate anxiety induced by academic pressure.[9]

Although existing studies have explored the effects of family functioning (FF), ES, and SS on AA, two major limitations remain. First, most research has focused on the direct impact of FF on AA while overlooking potential mediating mechanisms, such as the chain mediation role that ES and SS may play in this relationship. Second, current studies are primarily based on Western cultural contexts, and whether these findings are equally applicable in Eastern cultural settings (eg, China) has yet to be systematically verified. To address these research gaps, this study examines the chain mediation effect of ES and SS in the relationship between FF and adolescent AA. By doing so, it aims to provide practical recommendations for families and offer valuable insights for educators, ultimately helping adolescents better cope with academic challenges and fostering their overall development.

Literature Review

Family Functioning and Academic Anxiety

FF refers to the emotional connections between family members, along with the family's capacity for effective communication, establish rules, and adapt to external environments.[10] Healthy FF are essential for fostering overall wellness and ES in individuals,[5] as it provides both emotional and material support, helping family members better cope with life's negative conflicts.[11] FF primarily includes two dimensions: family cohesion, which refers to the closeness of emotional ties among family members, and family adaptability, which reflects the ability of family members to work together in solving problems.[12]

Research suggests that well-functioning family dynamics may help alleviate AA in adolescents.[13–15] Effective FF is often accompanied by positive communication patterns, which foster understanding and trust among family members. This allows adolescents to freely express their concerns and pressures, thereby reducing AA.[16] In addition, a harmonious parent-child relationship provides adolescents with emotional security, enabling them to focus and engage more in their studies.[17] For instance, Shek, Leung, Li, Dou and Zhu[13] demonstrated that there exists an inverse relationship between FF and adolescents' AA. In contrast, dysfunctional FF—such as a lack of support, poor communication, or frequent family conflicts—can lead adolescents to feel isolated and helpless, potentially exacerbating AA. Family dysfunction may also heighten adolescents' anxiety levels and undermine their self-esteem, further intensifying AA.[6] This is particularly evident in single-parent families or left-behind children, who, due to a lack of adequate support and resources, often face a higher risk of AA.[18] The aforementioned research indicates that FF may not only directly influence adolescents' AA levels but also exert indirect effects through various pathways. Therefore, optimizing FF and strengthening parent-child relationships are of great significance in alleviating AA among adolescents.

The Mediating Role of Emotional Stability

ES reflects an individual's emotional maturity, enabling them to respond appropriately to various situations.[19] In the "Big Five" personality theory, the dimension of "neuroticism" corresponds to ES, both of which effectively capture the degree of an individual's emotional steadiness.[20] Previous research has demonstrated that FF, as an external environmental factor influencing adolescent mental health, is closely related to adolescents' ES.[21,22] A stable family environment provides adolescents with emotional reassurance and safety, while simultaneously enhancing their skills in managing emotions and handling stress through healthy communication patterns and a supportive home atmosphere.[23,24] For instance, the study by Cao and Liu[25] highlighted that well-functioning families create a supportive atmosphere where adolescents are inclined to cultivate strong ES through trust and effective communication among family members. Furthermore, Tehrani, Yamini and Vazsonyi[26] found that constructive parenting approaches within supportive families (such as encouraging open communication, providing emotional support, and setting reasonable expectations) are vital for advancing ES in adolescents.

Enhancing ES not only helps adolescents better manage their emotional responses but also strengthens their psychological resilience and self-efficacy when facing academic pressure.[27] This enables them to maintain a calmer mindset when encountering academic challenges, thereby reducing AA. For example, Shin, Lee, Park, Hong, Song, Yoon and Oh[7] found that adolescents with higher ES are more focused during their studies and less likely to succumb to anxiety under academic pressure, which in turn leads to higher academic achievement. Similarly, Ozanska-Ponikwia, Piechurska-Kuciel and Skalacka[28] investigated how neuroticism relates to success in foreign language acquisition, noting that high neuroticism, indicative of lower ES, is associated with higher levels of anxiety during English as a second language learning, and poorer language performance compared to emotionally stable individuals.

In summary, this study posits that ES functions as an intermediary factor linking FF to adolescents' AA. ES reflects adolescents' ability to psychologically adjust in the face of external pressures, while also illustrating how the family environment influences adolescents' mental health by shaping their emotional regulation mechanisms. Therefore, to effectively prevent and intervene in adolescents' AA, it is crucial to focus on building FF and promoting the development of ES among adolescents.

The Mediating Role of Social Support

SS is defined as the care or practical help that individuals receive from family, friends, and significant others when needed.[29] Existing research indicates that good FF provides continuous SS for adolescents, which is essential to their psychological well-being.[22,30] FF by offering a stable and supportive environment, allows adolescents to receive both emotional support and practical assistance, which not only helps maintain ES but also enhances their ability to cope with academic pressure.[31] An investigation carried out by Gong, Gong, Liu, Yi, Jia, Zhuang, Shu, Huang and Wu[32] demonstrated that when open communication and trust exist among family members, adolescents are more likely to feel SS, which contributes to a stable emotional state. Conversely, adolescents from dysfunctional families often experience less SS, making them more prone to anxiety when faced with stress.[33]

SS plays a crucial role not only in adolescent mental health but also in their anxiety levels when facing academic pressure.[8] Studies have shown that SS can reduce AA by alleviating the pressure adolescents feel.[34] When adolescents perceive support from family, friends, or social networks, they are more likely to develop positive coping strategies, enabling them to effectively manage academic pressure, which may help reduce their levels of AA.[9] For example, Wang and Rameli[8] found that SS mitigates the anxiety caused by academic pressure. Adolescents who feel supported by family and social networks are inclined to implement effective methods for coping to manage academic stress, thereby reducing AA. Moreover, Lei, Wang, Dai, Guo, Xiang and Hu[35] discovered that when adolescents lack confidence in their ability to handle academic challenges, Peer and teacher support equips adolescents with the confidence and strategies to better adapt academically, which in turn helps to ease their AA.

To summarize, this research proposes that SS functions as an intermediary factor connecting FF with adolescents' AA. SS not only reflects the direct impact of the family environment on adolescents' emotional state but also reveals how FF indirectly influences their levels of AA through SS. Therefore, to effectively reduce adolescents' AA, it is essential not only to strengthen FF but also to foster and develop SS systems.

The Chain Mediating Role of Emotional Stability and Social Support

A substantial body of research suggests a positive correlation between ES and SS.[36–38] This implies that emotionally stable individuals are better able to maintain a positive emotional state, making them more likely to perceive and utilize the SS resources around them.[39] This relationship can be explained by the role of ES in enhancing emotional regulation and coping strategies.[40] For instance, Morstead, Rashidi, Zheng, Sin and DeLongis,[41] through a lagged regression analysis, found that over time, ES significantly predicts individuals' perceptions and accessibility to SS—the more emotionally stable the individual, the more SS they perceive. Furthermore, Yu and Hu[42] discovered that emotionally stable individuals are better at regulating their emotions, allowing them to actively make use of available SS resources. ES not only influences individuals' perception of SS but also affects their behavior in seeking support.[43] Emotionally stable individuals are more willing to seek help when facing challenges, while emotionally unstable individuals may avoid seeking support due to fear of rejection.[44] Additionally, individuals with higher ES often possess stronger empathy

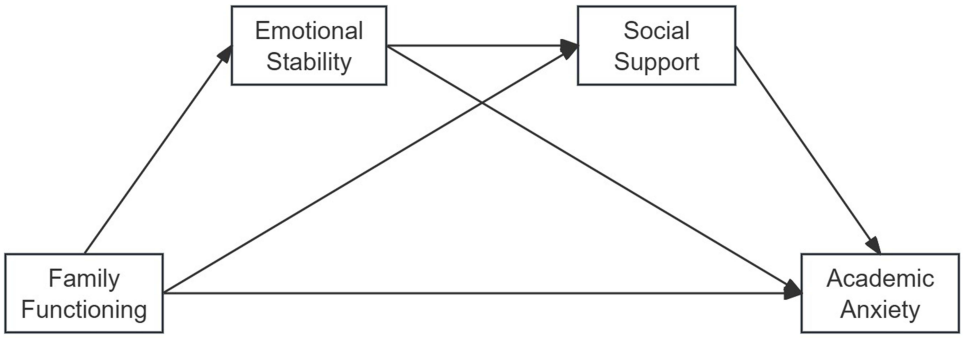

Figure 1 Research Model.

and communication skills, making them more likely to receive support from others and more willing to offer support, thereby strengthening their SS network.[45]

According to the preceding analysis, ES may first enhance adolescents' perception and acquisition of SS, which in turn helps them maintain a more positive psychological state under academic pressure. Identifying this chain mediation pathway offers a new intervention direction for reducing adolescents' AA.

Research Hypotheses

This study examines the impact of FF on adolescents' AA and the chain mediating role of ES and SS. Building upon past empirical findings, we designed a theoretical model, represented in Figure 1, and suggest the following hypotheses: (1) FF is significantly negatively correlated with AA; (2) ES mediates the relationship between FF and AA; (3) SS mediates the relationship between FF and AA; (4) FF affects adolescents' AA through the chain mediating role of ES and SS.

Research Methodology

Sample and Data Collection Procedure

The dataset for this investigation originated from students at BA SUO MIDDLE SCHOOL using an online questionnaire platform (https://www.wjx.cn/). A random sampling method was employed for the distribution and collection of questionnaires. First, the research team coordinated with the teachers of various classes, who then introduced the survey's objectives and importance for the students during class. Subsequently, the teachers randomly selected students from the class to participate in the survey, ensuring the randomness and representativeness of the sample. After this process, the teachers shared the questionnaire link in class group chats, allowing students to voluntarily decide whether to participate in the survey. This random sampling process ensured the representativeness and generalizability of the sample.

A total of 456 samples were collected through an online survey. During the data cleaning process, 108 questionnaires were excluded for the following reasons: more than 20% of the questions were left unanswered, or more than 80% of the responses selected extreme options (such as "completely agree" or "completely disagree"). This response pattern may introduce significant bias in the data, known as the floor or ceiling effect, thereby compromising the accuracy of data analysis.[46] A total of 348 valid responses were obtained. According to the study by Hair Jr, Sarstedt, Hopkins and Kuppelwieser,[47] a minimum sample size of 91 is required to achieve an explanatory power of R^2=0.10 at a 1% significance level. The sample size in this study meets this requirement, ensuring the robustness and reliability of the findings. Data collection for this study took place from July to September 2024, covering both the summer break and the early weeks of the new semester. To minimize the influence of external factors (such as exam pressure) on participants' psychological states, data collection was primarily conducted between July and August. In September, questionnaire distribution was concentrated at the beginning of the academic term to prevent potential emotional fluctuations caused by academic stress from affecting data stability. Detailed demographic data are provided in Table 1.

Table 1 Demographic Characteristics of Participants

Variable	Category	Frequency	Percentage
Gender	Male	190	54.598%
	Female	158	45.402%
Age	12–13 years old	55	15.805%
	14–16 years old	124	35.632%
	17–18 years old	169	48.563%
Grade	7th Grade	23	6.609%
	8th Grade	46	13.218%
	9th Grade	69	19.828%
	10th Grade	39	11.207%
	11th Grade	46	13.218%
	12th Grade	125	35.920%
Only Child Status	Yes	108	31.034%
	No	240	68.966%
Single-Parent Family	Yes	44	12.644%
	No	304	87.356%
Household Location	Rural	234	67.241%
	Urban	114	32.759%
Family Economic Status	Very Poor	6	1.724%
	Poor	33	9.483%
	Average	175	50.287%
	Good	112	32.184%
	Very Good	22	6.322%
Father's Education	Illiterate	20	5.747%
	Primary School	75	21.552%
	Middle School	107	30.747%
	High School	82	23.563%
	College and above	64	18.391%
Mother's Education	Illiterate	46	13.218%
	Primary School	92	26.437%
	Middle School	98	28.161%
	High School	65	18.678%
	College and above	47	13.506%

Measurement Tools

In this study, the initial translation of the instruments was performed by two independent researchers: a content specialist well-versed in both English and Chinese with expertise in educational psychology, and a linguist with advanced skills in Chinese. Subsequently, another set of researchers rendered the English version into Chinese. After comparing the two translations, notable differences were examined and resolved to produce a single, cohesive version. Following this, the consolidated version was trialed with 20 university students in China. Discrepancies or awkward expressions, as compared to the original English, were refined to produce the finalized Chinese version.

Family Functioning Scale

This study employed the "Family Adaptability and Cohesion Evaluation Scales" developed by Dh[12] to assess family functioning. The scale measures family functioning across two dimensions: adaptability and cohesion, consisting of 30 items in total. An example item is, "When there are difficulties, my family members do their best to support each other." The scale uses a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate better family functioning. In this study, the Cronbach's alpha coefficient for the family functioning scale was 0.935, indicating high reliability of the scale. The KMO value of the scale was 0.957, and Bartlett's test of sphericity was significant ($p<0.001$).

Academic Anxiety Scale

This study utilized the "Academic Anxiety Scale" developed by Finch, Cassady and Helsper[48] to assess adolescents' academic anxiety. The scale consists of 11 items, such as "I often worry that my performance in school is not as good as I expect it to be." Responses are rated on a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). The total score of the scale reflects the participants' level of academic anxiety. In this study, the Cronbach's alpha coefficient for the academic anxiety scale was 0.756, indicating good reliability of the scale. The KMO value of the scale was 0.836, and Bartlett's test of sphericity was significant ($p<0.001$).

Emotional Stability Scale

This study used the "Neuroticism Subscale" from the Big Five Personality Scale developed by Costa and McCrae[49] to assess emotional stability. The scale consists of 12 items, such as "I am not a person who worries easily." Items 2, 3, 5, 6, 8, 9, 11, and 12 were reverse scored to create the emotional stability scale. Responses were rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate better emotional stability. In this study, the Cronbach's alpha coefficient for the emotional stability scale was 0.869, indicating high reliability. The KMO value of the scale was 0.911, and Bartlett's test of sphericity was significant ($p<0.001$).

Social Support Scale

This study used the "Perceived Social Support Scale" developed by Blumenthal, Burg, Barefoot, Williams, Haney and Zimet[50] to assess social support. The scale includes three dimensions: support from family, support from friends, and support from others, with a total of 12 items. An example item is, "When I encounter problems, there are people (teachers, classmates, relatives) who will be by my side." Responses are rated on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The total score reflects an individual's perceived level of social support, with higher scores indicating a higher perception of social support. In this study, the Cronbach's alpha coefficient for the social support scale was 0.847, indicating high reliability. The KMO value of the scale was 0.913, and Bartlett's test of sphericity was significant ($p<0.001$).

Statistical Analysis

The data were analyzed using IBM SPSS version 26.0. First, the study's scales underwent an assessment to identify any potential common method bias. Second, Spearman correlation analysis was utilized to investigate the relationships among FF, AA, ES, and SS. Third, mediation analysis was performed using the bootstrap method provided by the SPSS PROCESS macro. Model 6 was selected for the mediation analysis, with FF (X) as the independent variable, ES (M1) and SS (M2) as mediators, and AA (Y) as the dependent variable. Demographic factors such as gender and age were

included as covariates. The statistical significance of the mediators was set at a 95% confidence interval (CI), with 5000 bootstrap samples used.[51] If the bias-corrected Bootstrap 95% CI does not include zero, this indicates a significant mediation effect at the $\alpha = 0.05$ level.[52]

Results

Common Method Bias Test

Since the data used in this study were collected through self-reported measures, there is a possibility of common method bias. The Harman single-factor test was employed to assess this issue. The exploratory factor analysis results identified 14 factors with eigenvalues exceeding 1. The first factor explained 30.489% of the variance, remaining below the critical 40% threshold. This result implies that common method bias does not pose a concern for this study.

Correlation Analysis of Research Variables

Table 2 presents the means (M), standard deviations (SD), and correlations of the study variables. FF ($r=-0.714$, $p<0.01$), ES ($r=-0.620$, $p<0.01$), and SS ($r=-0.656$, $p<0.01$) were all significantly negatively correlated with AA. Additionally, FF was significantly positively correlated with ES ($r=0.744$, $p<0.01$) and SS ($r=0.787$, $p<0.01$). ES was also significantly positively correlated with SS ($r=0.621$, $p<0.01$). Therefore, Hypothesis 1 is supported.

Mediation Effect Analysis

After controlling for demographic variables such as gender, age, grade level, only-child status, single-parent family status, household registration, family economic status, and parents' educational levels, the results of the regression analysis are shown in Table 3. FF significantly positively predicted ES ($\beta=0.296$, $p<0.001$) and SS ($\beta=0.435$, $p<0.001$),

Table 2 Correlation Analysis of Variables

Variable	M	SD	FF	ES	SS	AA
FF	111.629	5.139	1			
ES	42.658	18.826	0.744	1		
SS	62.951	8.742	0.787	0.621	1	
AA	21.934	11.537	−0.714	−0.620	−0.656	1

Abbreviations: FF, family functioning; ES, emotional stability; SS, Social support; AA, Academic anxiety; M, mean; SD, standard deviation.

Table 3 Regression Analysis of Variables in the Chain Mediation Model

Outcome Variable	Predictor Variable	β	SE	T	Bootstrap 95% CI		R^2	F
					LLCI	ULCI		
ES	FF	0.296***	0.018	16.459	0.260	0.331	0.619	54.795
SS	FF	0.435***	0.031	13.924	0.373	0.496	0.635	53.146
	ES	0.144*	0.070	2.036	0.005	0.282		
AA	FF	−0.105***	0.019	−5.636	−0.142	−0.069	0.582	38.941
	ES	−0.157***	0.034	−4.647	−0.224	−0.091		
	SS	−0.095***	0.026	−3.666	−0.147	−0.044		

Note: ***$p < 0.001$; *$p < 0.05$.

Abbreviations: β, standardized regression coefficient; SE, Standard Error; T, t-statistic; Bootstrap 95% CI, Bootstrap 95% Confidence Interval; LLCI, Lower Limit of Confidence Interval; ULCI, Upper Limit of Confidence Interval; R^2, coefficient of determination; F, F-statistic.

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Table 4 Analysis of Chain Mediation Effects

Effect	Pathway	β	Percentage	Bootstrap 95% CI	
				LLCI	ULCI
Total effect	FF → AA	−0.198	100.000%	−0.221	−0.175
Direct effect	FF → AA	−0.105	53.030%	−0.142	−0.069
Indirect effect	FF → ES → AA	−0.047	23.738%	−0.067	−0.027
	FF → SS → AA	−0.042	21.212%	−0.064	−0.018
	FF → ES → SS → AA	−0.004	2.020%	−0.010	−0.000

and ES significantly positively predicted SS (β=0.144, p<0.05). When all variables were included in the regression model, FF (β=−0.105, p<0.001), ES (β=−0.157, p<0.001), and SS (β=0.095, p<0.001) all significantly negatively predicted AA. Therefore, Hypotheses 2 and 3 are supported.

The mediation effects, as shown in Table 4 and Figure 2, indicate that the total effect of FF on AA is −0.198, while the direct effect of FF on AA is −0.105. When ES serves as the mediator, the indirect effect is −0.047, with an effect ratio of 23.738%. When SS acts as the mediator, the indirect effect is −0.042, with an effect ratio of 21.212%. When both ES and SS serve as mediators in the chain mediation model, the indirect effect is −0.004, with an effect ratio of 2.020%. Therefore, Hypothesis 4 is supported.

Discussion

This research delved into the factors impacting adolescents' AA, emphasizing how ES and SS serve as chain mediators in the connection between FF and AA. The research hypotheses were tested using SPSS software, and the results indicated significant correlations between FF, ES, SS, and AA. The results indicate that ES and SS indeed serve as chain mediators between FF and adolescents' AA. A detailed discussion of the findings related to the initial research questions and hypotheses is provided below.

FF is significantly negatively correlated with adolescents' AA. This result aligns with the study by Shek, Leung, Li, Dou and Zhu,[13] which demonstrated that FF has a significant negative impact on AA among Chinese adolescents. Parents who actively support their children, by providing appropriate freedom and guidance, help them cope with academic challenges, which may, in turn, alleviate AA. Well-functioning families foster positive and close emotional connections, providing adolescents with stable emotional support. This support may help reduce their psychological burden when academic pressure increases, thereby alleviating AA.[2] Moreover, in a well-functioning family environment, appropriate parental guidance and support (rather than excessive interference) are associated with increased responsibility and self-

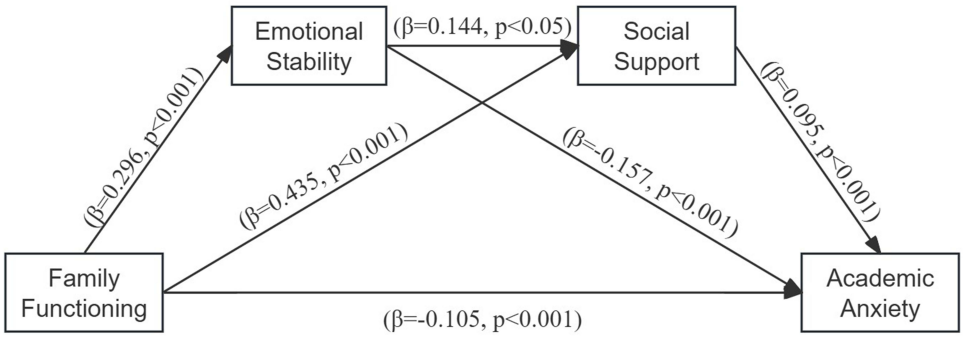

Figure 2 Diagram of the chain mediation model.

management skills in adolescents. This, in turn, helps them build confidence in independently solving academic challenges, potentially enhancing their self-efficacy and reducing AA.[53]

ES functions as a partial mediator linking FF to adolescents' AA. This finding aligns with Ma, Zhang, Zhang and Xu,[14] whose study indicates that well-functioning families are associated with improved cognitive flexibility in adolescents, enabling them to approach academic challenges with greater ES, which may, in turn, reduce AA. Positive FF typically provides emotional support and a sense of security, which is associated with adolescents' improved ability to cope with academic and life challenges. This emotional support may help enhance their ES, which, in turn, is associated with alleviating AA and stress in adolescents.[25] Moreover, a healthy family communication environment allows family members to freely express their emotions and needs. This positive communication atmosphere helps adolescents learn to correctly identify and express the emotions they experience when facing academic difficulties, further alleviating AA by improving ES.[54]

SS functions as an intermediary factor partially mediating the link between FF and adolescents' AA. This result aligns with the study by Newhart,[55] which found a correlation between FF and adolescents' perceived SS, and this SS may be associated with the alleviation of negative emotions such as anxiety. In well-functioning families, there is a high degree of mutual assistance among family members, providing adolescents with greater emotional strength, psychological security, and support.[56] Adolescents raised in such family environments tend to have stronger empathy and social skills, which may enable them to receive greater SS. This, in turn, can help reduce anxiety when facing academic challenges.[57] A well-functioning family environment is associated with the enhancement of adolescents' self-esteem and confidence, which may, in turn, influence their self-efficacy.[21] This intrinsic belief may be associated with adolescents' ability to adopt proactive strategies when coping with academic pressure, such as seeking help and participating in group activities. These behaviors may enable them to gain more SS, further alleviating AA.[57]

ES and SS play a chain mediating role in the relationship between FF and adolescent AA. Specifically, when adolescents perceive a higher level of FF, their ES may improve accordingly. Moreover, ES may be positively associated with their perception of SS.[36] This higher level of SS may be associated with a lower incidence of AA, thereby providing a more comprehensive understanding of the potential relationship between FF and adolescent AA. Emotionally stable individuals are generally able to maintain a positive emotional state and tend to adopt proactive coping strategies. That is, they are more likely to approach challenges with an optimistic mindset and actively seek help when encountering difficulties. As a result, they are also more likely to perceive and utilize available social resources.[39,58] A well-functioning family environment typically serves as a secure emotional base for adolescents, enabling them to develop the ability to effectively manage and regulate their emotions throughout their growth.[22] When adolescents develop strong emotion regulation abilities, they may find it easier to interact with peers and establish mutually beneficial SS networks.[45] Such a SS system may be related to the psychological buffering adolescents receive when facing academic challenges, helping them develop a positive learning attitude and thereby reducing anxiety caused by academic pressure.[8]

However, it is important to note that this study found the chain mediation effect of ES and SS to be relatively weak. Adolescents' AA is not solely influenced by the family environment; it may also be closely related to factors such as the school environment, individual abilities, and societal expectations.[59,60] While ES and SS can alleviate some degree of AA, their effects may be moderated by other external or internal factors, leading to a weaker chain mediation effect.

Furthermore, FF is a multidimensional concept that encompasses various aspects, including parent-child communication, emotional support, and family structure, which may exert differential influences on adolescents' ES and SS.[5] In some cases, even in well-functioning families, emotional support from specific family members or dysfunction in certain aspects may affect adolescents' perceived support, thereby weakening the chain mediation effect. As a result, the observed chain mediation effect may be relatively weak. Future research could incorporate additional relevant variables to further deepen the understanding of the underlying chain mediation mechanisms.

This study primarily focuses on Chinese college students, but the causes and alleviation mechanisms of AA may vary across different cultural contexts. For example, in many Asian cultures, education is highly valued, and the family is often regarded as a crucial factor in a child's growth and success. FF is reflected in parents' expectations for their children's education, active involvement in their learning process, and the provision of a supportive home environment. Such high levels of attention and support can help students cope with academic challenges and reduce AA.[13] However, in

Western cultures, where individualism and self-expression are more emphasized, family support may focus more on fostering children's independence and personal autonomy. Parents may prioritize developing their children's problem-solving skills and self-reliance, which may lead to a different relationship between FF and AA compared to the Chinese cultural context.[61] Additionally, in Western cultures, adolescents may rely more on external SS networks, such as friends and schools, to alleviate AA, making the role of SS in reducing AA more diverse.[62] The mediating role of ES may also differ between cultures. In Chinese culture, emotion regulation and self-control are considered essential personal qualities, whereas in some Western cultures, emotional expression and release are not necessarily viewed as negative traits.[63] Therefore, future cross-cultural research will be valuable in uncovering the influence of cultural factors on the relationships between FF, ES, SS, and AA. Such studies can provide broader and more nuanced guidance for educational practices across different cultural backgrounds.

Impact

This research is designed to investigate how FF, ES, SS, and AA are interrelated in adolescent populations, providing both theoretical foundations and practical guidance for reducing AA among adolescents. As such, this research has both theoretical and practical implications.

Theoretical Impact

Firstly, this study positions FF as a key variable influencing adolescents' AA, offering a new perspective for understanding the family background factors contributing to AA. Previous research has predominantly focused on individual traits or school-related pressures as direct influences on AA, with less attention paid to the family—the primary environment in which adolescents develop—and its profound impact. By examining both the direct and indirect effects of FF, this study clarifies that FF may be associated with AA by providing emotional support and behavioral guidance. Additionally, it may exert an indirect effect by influencing adolescents' psychological traits and SS systems. This finding enhances the theoretical framework surrounding FF against the backdrop of adolescent psychological resilience and underscores the foundational role of a well-functioning family environment in mitigating AA.

Secondly, this study highlights the central role of ES as a mediating variable between FF and AA, further emphasizing the importance of individual psychological traits in coping with academic pressure. ES not only reflects an individual's emotional regulation capacity but is also closely linked to how they manage stress and anxiety. By identifying ES as a mediator between FF and AA, this research provides a new theoretical perspective: the positive impact of FF on adolescents is not only reflected through external support but also through the enhancement of internal psychological resources, such as ES, which indirectly reduces anxiety. This theoretical contribution expands existing emotional regulation models by proposing that ES serves as an important buffering mechanism in managing AA. It also offers a new entry point for future research on the interaction between individual traits and FF.

Moreover, SS, as another critical mediating variable, enriches our understanding of how external resources impact adolescents' AA. This study suggests that SS may not only serve as an external buffer for directly coping with academic pressure but also indirectly enhance adolescents' perception and ability to obtain support through ES. This finding expands the model of SS functions, highlighting that FF may improve the efficiency of SS utilization by fostering individuals' ES. This interaction not only reveals the complex relationships between FF, ES, and SS but also provides a theoretical basis for multi-level interventions targeting adolescent AA.

Finally, the innovative chain mediation model in this study integrates ES and SS, proposing a multi-layered transmission pathway through which FF influences AA. This dynamic transmission mechanism combines internal psychological traits and external support networks, demonstrating how systematic interventions could potentially reduce adolescents' AA. It suggests that interventions aimed at reducing AA should not rely solely on a single factor but should take a coordinated approach, addressing family, individual, and societal dimensions.

Practical Implications

First, implications for adolescents: On one hand, this study emphasizes the importance of FF in promoting ES and SS. Adolescents should recognize the significance of FF and actively engage in positive communication with family

members, such as sharing their learning experiences and feelings with parents to foster positive interactions within the family. On the other hand, the study highlights the chain mediating role of ES and SS between FF and AA. Therefore, adolescents should work on improving their emotional regulation abilities and learn to manage their emotions effectively to better cope with academic pressure. Additionally, when faced with learning difficulties, adolescents should proactively seek help from teachers and peers to experience a higher level of SS, which in turn can reduce AA.

Second, implications for educators: Given the importance of FF, ES, and SS in alleviating AA, educators should encourage students to establish effective communication channels with their family members and foster a supportive atmosphere within the school environment to help students feel supported from multiple sources. Teachers can strengthen home-school collaboration by organizing regular parent-teacher meetings or conducting parent-child activities, collectively focusing on students' mental health. Moreover, considering the critical role of ES, educators should adopt targeted teaching methods for students with weaker emotional management skills, helping them build confidence and enhance their ability to tackle academic challenges. Teachers can provide individualized support or group counseling sessions to help students develop effective emotional regulation techniques. Furthermore, educators should remain attentive to students' mental health and create a positive, healthy learning environment that enables students to better manage AA and improve their learning efficiency.

Finally, implications for parents: This study underscores the role of FF in enhancing adolescents' ES and SS. Parents should actively communicate with their children and create a supportive family environment. They can strengthen the bond between family members through regular family meetings or participating in family activities together. Additionally, by listening to their children's thoughts and providing necessary psychological support, parents can help their children develop healthy emotional regulation mechanisms. When children encounter challenges in their studies that they are unable to resolve independently, parents should encourage them to seek external help. To reduce adolescents' AA, parents should also be mindful of their children's mental health and cultivate a relaxed and pleasant learning atmosphere at home.

Limitations and Future Research Directions

Despite the significant progress made in exploring the relationships between FF, ES, SS, and AA in adolescents, some constraints within this study provide insights into potential directions for upcoming research. First, the data for this study were entirely obtained from self-reporting by participants, which may introduce unavoidable bias. It is recommended that future research utilize a combined approach, incorporating both qualitative and quantitative methodologies. Data collection techniques such as interviews, observations, or technology-based tracking could be used to obtain more precise data. Second, due to the cross-sectional design of this study, determining causal links between variables was not feasible. Future research could consider using a longitudinal design to track the changes and effects of these variables over time. Finally, our study included only Chinese adolescents, so the findings may not be generalizable to adolescents outside China. Future studies should consider conducting studies in other countries to improve the generalizability of the findings.

Conclusion

This study employed a chain mediation model to examine the roles of ES and SS in the relationship between FF and adolescent AA. The findings revealed a significant negative correlation between FF and AA, with ES and SS playing a chain mediating role in this relationship. These results underscore the critical influence of FF, ES, and SS on AA among adolescents. Therefore, in daily life, family members should strengthen communication and emotional support to create a nurturing environment for adolescents. Schools should also provide more opportunities for SS to enhance students' coping abilities in the face of academic pressure. Additionally, future cross-cultural research could further explore how FF, ES, and SS influence AA across different cultural contexts to improve the generalizability and applicability of the findings. In conclusion, this study offers a new perspective on the family-related factors contributing to adolescent AA and provides a theoretical foundation for future interventions and support strategies in the field of adolescent mental health.

Data Sharing Statement

The data that support the findings of this study are available on request from the corresponding author.

Ethics Approval and Consent to Participate

The researchers confirms that all research was performed in accordance with relevant guidelines/regulations applicable when human participants are involved (eg, Declaration of Helsinki or similar). This study was approved by the Ethics Committee of University of Sanya. The participants and their parents or legal guardians, received oral and written information and provided written informed consent before participating in the study.

Disclosure

The authors report no conflicts of interest in this work.

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