

The relationship between a positive parenting style and chinese adolescents' academic grit: A parallel mediating model

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Abstract

Academic grit is a core quality that has a beneficial effect on students' academic adaptation and development. In the current study, both environmental and personal factors were incorporated into an exploration of the aspects affecting academic grit. A total of 4,034 Chinese adolescents completed the Academic Grit, Positive Parenting Style, Personal Growth Initiative, and Conscientiousness Scales. The results show that there was a positive association between a positive parenting style and adolescents' academic girt. The total effect of a positive parenting style on academic grit was 0.41. The mediating effect of conscientiousness and personal growth initiative accounted for 37% and 51% of the total effect, respectively. This study examined the influences and mechanisms of academic grit, providing a theoretical basis and directional reference for future intervention studies.

Keywords Academic grit · Conscientiousness · Personal growth initiative · Positive parenting style

In recent years, an increasing number of studies has focused on the link between non-cognitive qualities and students' academic performance. In the past decade, the concept of "grit" has attracted wide attention from the academic community and yielded fruitful results (Chen et al., 2018; Duckworth et al., 2007; Lin & Liu, 2017; Rhodes et al., 2016) defined grit as a personal characteristic in which individuals are able to retain enthusiasm and sustain ongoing effort towards achieving a goal. Grit makes a direct contribution to the academic performance of adolescents (Duckworth et al., 2011; He et al., 2021). Moreover, it can promote the academic performance of adolescents by enhancing individual positive emotions (Singh & Jha, 2008), eliminating individual negative emotions (Zhang et al., 2018), allowing for the maintenance of stable attention (Kalia et al., 2018),

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and enhancing individual academic investment (Kalia et al., 2019). With the ongoing analysis of grit in academics, "academic grit", a concept more specific to education, has also attracted the attention of many researchers (Clark & Malecki, 2019; Rusadi et al., 2021).

Academic grit is a positive quality in adolescents. The term refers to the personality traits or skills that an individual displays when pursuing long-term challenging educational goals (Clark & Malecki, 2019). Academic grit plays an indispensable role in the process of daily learning and overcoming academic obstacles. Researchers have shown that academic grit has a crucial influence on the learning process and adolescents' academic achievement (Clark & Malecki, 2019; Zhang & Zhang, 2003) and offers a more accurate explanation of adolescents' academic performance (Clark & Malecki, 2019). However, questions remain as to the factors that influence the formation and development of adolescents' academic grit. Current research is limited to discussing the formation and development of general grit and has not systematically explored the factors affecting that formation and development. This is important for the cultivation and shaping of the quality in adolescents. Thus, the present research investigates the factors influencing academic grit and the mechanisms by which they operate, referencing both the current research on the topic (Clark et



al., 2019; Ting et al., 2022) and ecological theory (Bronfenbrenner, 1994; Huston & Bentley, 2010).

Grit and a positive parenting style

Ecological systems theory argues that individuals' psychological qualities are affected by different ecological systems, in which the family is a microsystems variable closely related to the individual (Darling & Steinberg, 1993). A positive parenting style is the attitude and behavioral tendency that parents exhibit during parenting, primarily reflected in emotional communication and support between parents and children (Darling & Steinberg, 1993; Luo et al., 2016). Perceiving care, support, and encouragement from parents contributes to the formation of positive psychological traits in adolescents (Khaleque, 2013; Rohner et al., 1980). A positive parenting style can enhance adolescents' academic grit. Several studies have found that such a style can drive adolescents to maintain consistent interest in long-term goals, persist longer in learning tasks, and deal well with various difficulties in education settings (Clark et al., 2019; Nikolaus et al., 2019; Zhuang et al., 2016). Studies of general grit have also provided evidence for this. Previous studies have shown that adolescents describing their parenting as democratic (Levy & Steele, 2011) and caring (Ting et al., 2022) had significantly higher levels of grit than those who described their parenting as negative. The question, then, is if there is a positive impact from a positive parenting style on the more specific concept of academic grit. The primary goal of this study was to examine the relationship between positive parenting style and academic grit. Thus, we hypothesized the following.

Hypothesis 1 A positive parenting style is significantly associated with adolescents' academic grit.

Current research on this issue has failed to explore the internal mechanisms operating in the relationship between a positive parenting style and adolescents' academic grit. Therefore, it is essential to carry out an assessment of the mediators acting between a positive parenting style and academic grit. Theoretically, environmental factors can not only directly affect individual development, but also have an indirect effect by influencing its core characteristics. Previous studies have shown that certain individual characteristics can serve as proximal factors acting between environmental elements and individual psychological characteristics such as conscientiousness and personal growth initiative (Chang & Yang, 2016; Fite et al., 2017). These two variables are closely related to the development of adolescent grit and also affected by environmental factors such

as parenting style. However, it is unclear whether these two variables can mediate the relationship between parenting style and academic grit.

The mediating roles of personal growth initiative and conscientiousness

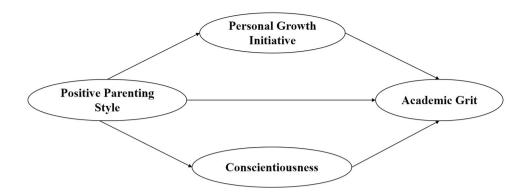
Personal growth initiative refers to individuals' desire to positively and consciously improve themselves during the growth process (Sun et al., 2014). According to selfdetermination theory (Deci & Ryan, 1985; Ryan & Deci, 2000), an individual's intrinsic motivation and persistence depend upon the satisfaction of the following basic needs: autonomy, competence, and relatedness. Previous research has also indicated that personal growth initiative is positively related to general grit (Houston et al., 2021). That is, personal growth initiative may be an important factor in explaining academic grit. If adolescents are self-motivated to pursue self-improvement, they are more likely to develop a stronger ability to face setbacks and achieve higher levels of self-efficacy in the form of effort and persistence. Also, self-determination theory assumes that perceiving support from one's environment meets an individual's need for relatedness, autonomy, and competency (Deci & Ryan, 1985; Ryan & Deci, 2000). Perceiving positive parenting can directly enhance individuals' sense of belonging (Lambert et al., 2013), and this sense of belonging facilitates the transformation of external support into internal motivation, ultimately motivating individuals to achieve their learning goals. Given this, personal growth could be employed as a mediating variable explaining the impact of parenting style on academic grit. Earning respect, acquiring confidence, and perceiving support from parents are beneficial to individuals and may promote their pursuit of academic achievement (Hirata & Kamakura, 2017). Thus, if positive parenting is a significant predictor of academic grit, can personal growth initiative serve as a mediating role between them? This research tested whether personal growth initiative played a mediating role between parenting and academic grit. Based on the above, we assumed the following:

Hypothesis 2 *Personal growth initiative plays a mediating role between positive parenting style and academic grit.*

Conscientiousness refers to the tendency of individuals to be conscious of their own affairs (Huang & Tan, 2008). It is closely related to the parenting style received. As a stable personality factor, conscientiousness is closely related to adolescent grit (Duckworth et al., 2007). Diligence and self-discipline are two basic characteristics of conscientiousness that can effectively motivate adolescents to achieve their learning goals and increase their courage when facing



Fig. 1 The mediating paths of conscientiousness and personal growth initiative



learning difficulties (Vianello et al., 2010). Adolescents' conscientiousness is also influenced by parenting style. Perceiving emotional warmth from parents can enhance their level of conscientiousness. Conversely, a negative parenting style expressed through punishment, rejection, and overinvolvement will hamper the development of adolescents' self-esteem, sense of initiative, and even conscientiousness (Zhang et al., 2019; Zhao et al., 2018). As described above, it is not surprising that conscientiousness is related to academic grit and a positive parenting style. However, it is unclear whether conscientiousness plays a role connecting these two variables. Thus, if positive parenting is a significant predictor of academic grit, can conscientiousness become a mediating role between them? We needed to verify the mediating role of conscientiousness between parenting style and academic grit. Thus, we proposed the following:

Hypothesis 3 *Conscientiousness plays a mediating role between positive parenting style and academic grit.*

In summary, this study explored the relationship between a positive parenting style and adolescents' academic grit and revealed how conscientiousness and personal growth initiative played mediating roles between the two. Conscientiousness and personal growth initiative were essentially different variables established as mediating variables for the following reasons. First, the two concepts have different attributes. Conscientiousness reflects the emotional component of the individual (Li & Ye, 2009). Conversely, personal growth initiative reflects personal cognitive and behavioral components (Sun et al., 2014). Combining them allowed us to take emotion, cognition, and behavior into consideration when exploring the influence of parenting style on academic grit. Second, the two concepts are directed differently. Conscientiousness is a moral emotion by which the individual needs to consider others, and even society. In contrast, personal growth initiative only directs the individual's attention to him or herself. Third, little work has examined the relationship between conscientiousness and personal growth initiative. This study bridges that gap. Therefore, conscientiousness and personal growth initiative were established as parallel variables mediating between a positive parenting style and academic grit. The hypothesized model can be seen in Fig. 1.

Method

Participants

This study was conducted on 4,034 adolescents from the Fujian and Guangdong provinces in China via a cluster sampling method. All surveys were completed in class and administered by a professionally trained teacher. A total of 3,965 questionnaires were returned (indicating a recovery rate of 98%) and questionnaires with more than 20% missing data were excluded from the pretreater analysis. Finally, 3,480 valid questionnaires were obtained, with an effective rate of 86%. The final sample was comprised of 1,727 male (49.6%) and 1,753 female (50.4%) respondents, of whom 929 were seventh graders, 791 eighth graders, 930 eleventh graders, and 830 twelfth graders. This study was approved by the local ethics committee, and we obtained advanced consent from the administrators and teachers of the school. The questionnaires were administered anonymously, and the average response time was between 10 and 20 min. All respondents voluntarily participated in the survey.

Measure

Academic grit The Academic Grit Scale for Middle School Students (AGQMS) was used to measure adolescents' academic grit. This scale was developed based on the basic need for self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000). It includes three dimensions: clear goals, continuous effort, and positive beliefs. The measure contains 16 items, each rated on a five-point Likert-type scale ranging from 1 (greatly disagree) to 5 (greatly agree), with higher scores indicating higher levels of academic grit.



Table 1 Descriptive statistics and correlation of variables

	M	SD	1	2	3	4
1 Academic grit	3.73	0.62	_			
2 Conscientiousness	3.38	0.56	.65***	_		
3 Personal growth initiative	3.70	0.60	.69***	.62***	_	
4 Positive parenting style	2.88	0.55	.37***	.37***	.36***	_
5 Age	14.35	1.62	14***	12***	12***	04**
6 Grade	8.98	1.59	13***	12***	12***	04***
7 Gender	1.50	0.50	01	02	03	01

*Note.****p < .001, **p < .01, *p < .05.

In the present research, the overall Cronbach's α was 0.90, composite reliability 0.92, and retest reliability 0.88. The Cronbach's α for the three dimensions ranged from 0.72 to 0.82, combination reliability from 0.72 to 0.83, and retest reliability from 0.76 to 0.84, indicating that the questionnaire had good reliability. The results of a confirmatory factor analysis (CFA) supported the three-factor structure of the scale, $\chi^2/df=4.36$, RMSEA (90% CI)=0.06[0.06,0.07], CFI=0.94, TLI=0.93, SRMR=0.04. The scores for academic grit positively correlated with the scores for conscientiousness and grit, showing that the scale had good validity.

Positive parenting style The emotional warmth dimension of Egma Minnen av Bardndosna Uppforstran (EMBU) was used to measure the positive parenting style (Yue et al., 1993). The scale consists of two dimensions and 38 items. Each item is rated on a four-point Likert-type scale ranging from 1 (never) to 4 (always), with higher scores indicating a more positive parenting style (Luo et al., 2016). In the current study, the Cronbach's α for this scale was 0.90, suggesting excellent reliability.

Conscientiousness The Conscientiousness Scale in the Chinese version of the NEO-Five Factor Inventory was employed to measure individuals' levels of conscientiousness. It includes 12 items, each rated on a five-point Likert-type scale ranging from 1 (greatly disagree) to 5 (greatly agree), with higher scores indicating higher levels of conscientiousness. For this study, the Cronbach's α of the subscale was 0.80.

Personal growth initiative Participants' levels of personal growth initiative were measured by the second edition of the Personal Growth Initiative Scale (PGI-II) (Xu et al., 2019). The scale includes four dimensions: preparation for change, planning, resource utilization, and active behavior. The scale consists of 16 items. Each item is rated on a five-point Likert-type scale ranging from 1 (greatly disagree) to 5 (greatly agree), with higher scores indicating higher levels

of personal growth initiative. In this study, the Cronbach's α coefficient for the scale was 0.80.

Data analysis

SPSS20.0 was adopted for the descriptive and correlation analyses of the variables. Mplus7.4 was utilized to test the parallel mediating model depicting how conscientiousness and personal growth initiative operate between parenting style and academic grit. To test the parallel mediating model, the robust maximum likelihood estimation was used for the non-parametric percentile bootstrap of deviation correction, with a 95% confidence interval based on 5,000 samples.

Results

Correlation analyses

Table 1 showed the means, standard deviations, and correlations of all study variables. The main variables were correlated with one another. Specifically, academic grit was positively associated with conscientiousness (r=.65, p<.001), personal growth initiative (r=.69, p<.001), and positive parenting style (r=.37, p<.001). Furthermore, positive parenting style was positively correlated with conscientiousness (r=.37, p<.001), and personal growth initiative (r=.36, p<.001) (Zabihi et al., 2019).

Parallel mediation analyses

A structural equation model (SEM) was used to test the parallel mediating model. The observation indexes of each variable used to build the model were as follows. (1) According to the method of project balance, positive parenting style was packed into four packages as a measure. (2) Also based on the method of project balance, conscientiousness was packed into three packages as a measure (Wu & Wen, 2011). (3) Personal growth initiative and academic grit were multidimensional variables whose dimensions could be directly



Table 2 Mediation effects of positive parenting style and consciousness

Path	Estimated	SE	BC(95%)		Proportion of total effects(%)	
	(Standardization)		Lower	Upper		
PPS→C→AG	0.15***	0.02	0.11	0.20	37	
$PPS \rightarrow PGI \rightarrow AG$	0.21***	0.02	0.17	0.26	51	
PPS→AG	0.05***	0.02	0.01	0.10	12	
Total	0.41***	0.03	0.36	0.46		

Note. PPS = Positive Parenting Style, AG = Academic Grit, PGI = Personal Growth Initiative, C = Consciousness.

^{****}*p* < .001, ****p* < .01, **p* < .05

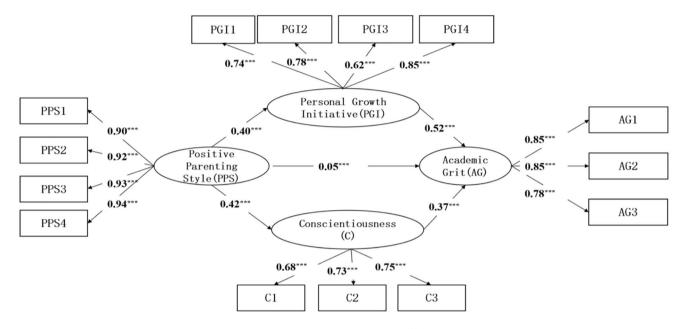


Fig. 2 Results of SEM for the mediating model for positive parenting style and academic grit

Note. Sex and age are used as control variables in the equation, but are not shown in the figure for concise purposes. The figures are standard

resolution, ***p < .001

PPS = Positive Parenting Style, AG = Academic Grit, PGI = Personal Growth Initiative, C = Consciousness.

used as measurement indicators. Confirmatory analysis was used to test whether the observation indexes of each variable were reasonable. The results indicated that the model fit well ($\chi^2/df = 12.33$, RMSEA=0.06[90% CI:0.05,0.06], CFI=0.97, TLI=0.96, SRMR=0.05).

To control for age and grade, the mediating effect was constructed with positive parenting style serving as an independent variable, conscientiousness and personal growth initiative as mediating variables, and academic grit as a dependent variable. A bootstrap algorithm was used to estimate the confidence interval of the mediation effect (Cheung & Lau, 2008; Preacher, 2015). As a result, the mediating effect was determined to be acceptable (χ^2 /df=6.45, influenced by the sample size, RMSEA=0.06[90%CI:0.05,0.06], CFI=0.97, TLI=0.96, SRMR=0.05). Therefore, this study accepted the parallel mediating model.

Figure 2 showed that positive parenting style significantly predicts academic grit(β =0.05, SE=0.02, p<.05); positive parenting style significantly predicted responsibility

conscientiousness ($\beta = 0.42$, SE = 0.03, p < .001) and personal growth initiative ($\beta = 0.40$, SE = 0.03, p < .001); conscientiousness ($\beta = 0.37$, SE = 0.05, p < .001) and personal growth initiative ($\beta = 0.52$, SE = 0.05, p < .001) significantly predicted academic grit. Therefore, there were significant mediating effects of conscientiousness between positive parenting style and academic grit (Estimated = 0.15, SE = 0.02, 95%CI = [0.11, 0.20]). And there were also significant mediating effects of personal growth initiative between positive parenting style and academic grit (Estimated = 0.21, SE = 0.02, 95%CI = [0.17,0.26]). The total effect of positive parenting style on academic grit was 0.41, of which the direct effect was 0.05, accounting for 12% of the total effect. The mediating effect of conscientiousness accounts for 37% of the total effect, and the mediating effect of personal growth initiative accounts for 51% of the total effect.



Discussion

The current study confirmed a significantly positive link between a positive parenting style and academic grit, a conclusion consistent with previous findings. This study further identified the mediating effects of personal growth initiative and conscientiousness on the association between a positive parenting style and academic grit. The results show that personal growth initiative and conscientiousness play mediating roles in the relationship between a positive parenting style and academic grit.

According to the theory of ecological environmental systems (Bronfenbrenner, 1994; Huston & Bentley, 2010), the emergence and development of academic grit may be influenced by both environmental factors and personal characteristics. Parents are the core figures in the microsystem, and parenting style plays a vital role in the development of adolescents' psychological qualities. The results suggest that as an environmental factor, a positive parenting style can positively predict academic grit in adolescents, a conclusion consistent with previous similar studies (Howard et al., 2019; Yang & Liu, 2019). Thus, this hypothesis was validated. The influence of a positive parenting style on academic grit can be explained from the following two perspectives. First, according to ecosystem theory, parents are core members of a microsystem within the greater ecosystem and most closely associated with the physical and mental development of the adolescent (Huston & Bentley, 2010). Specifically, positive parenting style contributes to the development of academic grit in adolescents. Perceiving parents' positive encouragement, respect, love, and support will encourage adolescents to persist in their learning goals and respond positively to difficulties (Howard et al., 2019; Zhuang et al., 2016). Self determination theory suggests that there are three basic needs for individual development (i.e., belonging, autonomy, and competence) that need to be met with support from the environment. Parents who provide a harmonious family atmosphere and friendly parentchild relationship to their children can satisfy their need to belong. The care and assistance provided by parents during their children's development make them more confident when facing problems and more self-efficacious in solving them, satisfying their need for a sense of competence. If parents respect their adolescents' ideas and encourage them to courageously explore their goals, adolescents' autonomous motivation can be enhanced and autonomous needs better met (Ryan & Deci, 2000; Huang et al., 2022; Maralani et al., 2016). Second, positive parenting style can enhance adolescents' willpower and self-control. Conversely, a negative parenting style will weaken these qualities, hindering the development of academic grit (Mo et al., 2019). As a core factor in their environment, parenting style affects the development of adolescents' psychological qualities, both directly and indirectly. In particular, a positive parenting style plays a key role in shaping and improving adolescents' willpower.

Personal growth initiative is strongly related to academic grit. Personal growth initiative represents individual cognitive autonomy and the behavioral autonomy of selfdevelopment. This study found that personal growth initiative can significantly predict academic grit. The stronger the personal growth initiative is, the higher the adolescents' academic grit will be. The influence of personal growth initiative on academic grit can be explained from the following perspectives. First, personal growth initiative reflects individual autonomy in self-development (Xu et al., 2019). Autonomy comes from the satisfaction earned by an individual who makes an autonomous choice, and the acquisition of this autonomy plays a direct role in stimulating his or her internal motivation. With a greater motivation to attain autonomy, an individual's sense of self-growth becomes more active. This can encourage adolescents to form clear development plans and formulate strong academic goals (Deci & Ryan, 1985; Xu et al., 2019). Second, personal growth initiative represents the need for individual self-realization, which emphasizes the individual's desire for self-improvement and self-perfection. The need for selfimprovement encourages individuals to be more proactive in dealing with academic problems such as boredom and setbacks (Chang & Yang, 2016; Ryan & Deci, 2000). Thus, adolescents' academic grit is enhanced by the process.

More importantly, personal growth initiative plays a mediating role between positive parenting style and academic grit. The mediation model helped us understand the development of academic grit in terms of the integration of environmental and personal factors. Positive parenting style can affect academic grit not only directly but also indirectly through personal growth initiative. The relationship between positive parenting style and personal growth initiative and the influence on academic grit have been verified in previous similar studies (Chang & Yang, 2016; Hirata & Kamakura, 2017). Positive parenting supports adolescents' autonomy. Parents who provide warm emotional care and the courage to pursue academic goals help encourage adolescents to respond positively to setbacks (Hirata & Kamakura, 2017). As predicted by self-determination theory (Deci & Ryan, 1985), the satisfaction of the basic psychological need for relatedness (by a positive parenting style) and autonomy (through personal growth initiative) drives individuals to persist in learning for a longer period of time. The sense of belonging that adolescents derive from parental care and support helps transform external motivation into internal motivation, and increased internal autonomy can drive individuals to set academic goals and expend the effort



necessary to achieve them (Chang & Yang, 2016; Whittaker & Robitschek, 2001; Xu et al., 2019).

Conscientiousness also has a significant predictive effect on academic grit. Researchers generally agree that personality is composed of five factors: neuroticism, agreeableness, extroversion, conscientiousness, and openness (Judge & Zapata, 2015), commonly referred to as the Big Five personality traits. Among them, conscientiousness reflects the characteristics of individual diligence, effort, and selfdiscipline (Vianello et al., 2010). This study found that adolescents' conscientiousness can significantly predict academic grit. This can be explained from the perspective of personality characteristics. Among the Big Five personality traits, conscientiousness is the closest to academic grit. Diligence, effort, and focus are the core characteristics of conscientiousness, and can prompt individuals to adhere to long-term goals and stay focused throughout the learning process (Vianello et al., 2010), all of which contribute to the development of outstanding academic grit. Therefore, conscientiousness is a vital personality trait in promoting the development of academic grit.

Importantly, conscientiousness also plays a mediating role between positive parenting style and academic grit. The relationship between parenting style and conscientiousness and its effect on academic grit have been verified in previous similar studies (Fite et al., 2017; Zhang et al., 2019). Parenting style is also a primary way in which adolescents' personalities are shaped, and can inspire ideas about education and strengthen personal conscientiousness. A positive parenting style conveys positive concepts such as respect, support, and trust to children, helping them to embody independence, courage, and effort (Gerhardt et al., 2021; Heaven & Ciarrochi, 2008). These characteristics are the basic components of academic grit, helping individuals adhere to their academic goals and be self-managed and self-disciplined throughout the learning process (Vianello et al., 2010), ultimately promoting the formation of grit.

The present study found that personal growth initiative and conscientiousness are personal factors contributing to the development of academic grit. They not only directly affect academic grit, but also play intermediary roles between it and environmental factors. This parallel mediating model allows us to understand how environmental factors affect academic grit through three pathways: cognition, behavior, and emotion. The relationships connecting parenting style to personal growth initiative and conscientiousness are spatial transmission relationships operating between the environment and individual. This inspired us to consider the path for developing academic grit from the perspective of the environmental-autonomous motivation/personality trait perspective.

Limitations and prospects

Although some important results were obtained by this study, there are certain deficiencies that must be improved. First, this research was cross-sectional, and thus it was difficult to directly reveal causal relationships between variables; moreover, the research couldn't systematically reveal the development of certain characteristics in adolescents. Secondly, this work explored only the parallel mediation role of conscientiousness and personal growth initiative and did not consider the effects of other personality or motivational traits. In this regard, future research should consider further enriching the model of parenting style for use in exploring academic grit in adolescents.

Conclusion

In summary, the current study plays an important role in promoting the evolution of general grit into academic grit, expanding the field of grit research. This study found that positive parenting is positively related to adolescents' academic grit, and conscientiousness and personal growth initiative play mediating roles between them. Consistent with the assumptions of self-determination theory, receiving support, respect, and care from parents can help meet the basic mental needs of adolescents, increasing their courage to face academic setbacks and strengthening their academic grit (Ryan & Deci, 2000; Huang et al., 2022; Maralani et al., 2016). In addition, positive parenting can also strengthen adolescents' academic grit through the establishment of conscientiousness and a personal growth initiative. The relationships among the variables are consistent with the interpretation of the relationships among different systems put forth in environmental ecosystem theory (Bronfenbrenner, 1994; Huston & Bentley, 2010; Jiang et al., 2021). These findings provide effective assistance regarding the development of projects designed to improve academic grit among adolescents. These factors and the "environmental factors-personal factors" interrelationship model revealed the impacts of academic grit on adolescents. We need to consider both aspects when constructing such improvement plans. At the same time, this study also underscores that fact that the cultivation of academic grit in adolescents is a systematic project that should take into account the common roles of different systems within the ecological environment. Researchers should also consider using indirect methods when developing intervention programs, such as employing environmental factors to enhance the core characteristics of the individual, and then indirectly shape individual academic grit through these core characteristics.



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Data availability Due to graduation thesis, data cannot be made publicly available. Investigators may email the corresponding author if they would like to apply for data acces.

Compliance with ethical standards

Conflict of interest I declare that there has no conflict of interest.

Ethics approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and or national research committee (the Academic Ethics Committee of Fujian Normal University, China.) This manuscript has been approved by all authors. We maintain the same order of authors in the submission system as provided in the manuscript

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