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The mediating role of the 5Cs of PYD in the relationship between grit and academic adjustment in Spanish undergraduates

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Introduction: Academic success paves the way for positive youth (and adult) development, leading to short- and long-term positive outcomes. In the case of Spain, research has identified the need to pay closer attention to youth academic performance and well-being. Grit is one of the more consistent predictors of academic adjustment, with possible mediators not yet explored.

Methods: The present study aimed to analyze the mediational role of the 5Cs (i.e., Competence, Confidence, Connection, Caring, and Character) of Positive Youth Development (PYD) on the relationship between the dimensions of grit (i.e., perseverance of effort and consistency of interest) and different academic adjustment indicators (i.e., perceived academic performance, academic stress, and academic boredom), in a sample of Spanish undergraduates (N = 370, 67.2% women, M^{age} = 21.29, SD^{age} = 3.61) using a cross-sectional study design.

Results: Perseverance of effort was associated with higher perceived academic performance and less academic stress, whereas consistency of interest was associated with lower academic boredom. These associations were partially mediated by specific Cs of PYD. Confidence, Competence, and Connection were related to better academic performance, less academic stress, and less academic boredom. Caring had a controversial positive effect on academic stress.

Discussion: These results have implications for practice in the university context, indicating the need to integrate grit (both dimensions) and PYD promotion interventions, as they could have a synergetic effect to foster academic and vocational success in undergraduate samples.

KEYWORDS

grit, positive youth development, academic adjustment, undergraduates, youth

Introduction

The scientific study of grit as character strength associated with positive developmental outcomes has gained considerable interest in psychological research (Duckworth, 2016; Lee and Duckworth, 2023). Recent reviews have provided evidence of the importance of grit as a predictor of academic success in different cultures (Datu et al., 2017; Stoffel and Cain, 2018). Duckworth et al. (2007) defined grit as a trait characterized by perseverance and passion for long-term goals and demonstrated its predictive value for positive outcomes in different domains. The authors argued that the achievement of long-term goals requires not only

aptitudes but also sustained and focused application of these aptitudes over time. A two-factor structure was validated in the study of grit (Duckworth and Quinn, 2009). Grit entails the capacity to maintain both effort and interest in a project that may take a long period of time to be fulfilled. This may distinguish grit from momentary self-control (Duckworth and Gross, 2014). These two different but positively interrelated orientations towards long-term goals were termed as perseverance of effort and consistency of interest (Duckworth et al., 2021). Consistency of interests refers to constantly showing interest toward a challenging goal across time, whereas perseverance of effort entails demonstrating a heightened intensity of persistence even after facing setbacks. In education, perseverance as well as interest in following long-term educational goals are essential.

Credé (2018) and Christopoulou et al. (2018), showed that grit is associated with success and performance in educational settings. Fernández et al. (2020) and Datu (2021) argued that grit was related to positive academic outcomes (e.g., better performance, engagement, self-efficacy, motivation, leadership skills, deliberate practice in optional and required tasks, and academic satisfaction), but also with positive results in career and work outcomes (e.g., elevated levels of retention and teaching effectiveness among teachers, career exploration self-efficacy, work performance incentives, higher business performance among entrepreneurs, work engagement, positive leadership behaviors, and less probability to suffer burnout), with psychological adjustment (e.g., high levels of life satisfaction, psychological well-being, self-esteem, optimism, gratitude, sense of coherence, subjective happiness, prosocial behaviors, lower depression, anxiety and stress, and fewer problematic use of internet), and with physical health (e.g., more frequent physical activity, less food insecurity, less deficits in executive functioning and cognitive failures, and better neurocognitive functioning). Additionally, some ecological benefits have been observed, with grit associated with more pro-environmental awareness and behaviors (Datu and Buenconsejo, 2021).

However, some cultural differences have been observed regarding the importance of the two factors of grit. Thus, in collectivistic cultures compared to individualistic countries, perseverance of effort was found to be a more salient predictor of academic achievement and well-being than interest consistency (Datu et al., 2016; Lam and Zhou, 2022). In an international study with adults from more than one hundred countries located in six continents, the presence of an overall grit factor was supported in individualistic countries but not in collectivistic ones (i.e. Latin America and Asia). Additionally, the study showed that perseverance of effort had stronger relationships with subjective well-being and personality strengths, than consistency of interest (Disabato et al., 2019). In a longitudinal study with samples from Philippines, Japan and Poland, only perseverance of effort was associated with better flourishing and life satisfaction (Datu et al., 2021). Additional examination of the differential roles of the two dimensions is needed in cultures that have not yet been researched.

Grit, psychological well-being and academic outcomes

Some studies have provided evidence for the joint positive effects of grit on psychological well-being and academic outcomes (Huo, 2022). In a sample of high school Filipino students, Datu et al. (2016) concluded that perseverance of effort was associated with both optimal educational and optimal well-being results, concretely with behavioral engagement, emotional engagement, and flourishing. In a study with school students from Hong Kong and Macau, perseverance of effort was linked to better academic engagement in math and science and to more positive emotions (Datu et al., 2023). Light and Nencka (2019) indicated in a U.S. youth sample that high-ability students used to adopt more self-regulated learning practices that exploit their grit, while grit played a compensatory role among low-ability students. Among U.S. undergraduates, Bowman et al. (2015) found that effort perseverance was positively associated with academic adjustment, college grades, academic satisfaction, sense of belonging, and better faculty interactions. In the same study, both effort perseverance and interest consistency were related to less intention to change majors. In two studies with American Medicine residents, higher grit scores were associated with less burnout and greater well-being (Dam et al., 2019; Salles et al., 2014). A similar result was observed with dental students in Saudi Arabia (Al-Zain and Abdulsalam, 2022).

Furthermore, some studies have examined the mechanisms that may explain the achievement outcome associated with grit. In a sample of gifted adolescents in China, grit was linked to higher well-being through higher perceived confidence in career-related activities (Datu et al., 2022). Datu et al. (2019) pointed out that grit was associated with lower depression through its positive association with meaning in life in high school students in the Philippines. In another study, grit was indirectly related to positive emotions through social and emotional learning (Datu and Restubog, 2020). In university students from Turkey, grit (together with hope) was used as a mediator for the relationship between academic encouragement and well-being (Okur et al., 2023). In Sweden, grit was positively associated with high life satisfaction and better harmony in life and this relationship was mediated by the sense of coherence, and authenticity (Vainio and Daukantaitė, 2016). Moreover, in a sample of Korean adults, grit was positively connected with subjective well-being and the relationship was mediated by the basic needs satisfaction of competence and autonomy (Jin and Kim, 2017).

Despite the evidence collected about different indicators of psychological well-being as mediators of the grit effects on academic outcomes, more research is still needed concerning youth samples and examining other indicators of positive psychological adjustment as possible mediators and use of diverse academic outcomes. The model of Positive Youth Development (PYD) arises from a positive perspective of youth mental health (Lerner, 2005) within the Relational Developmental Systems model (Lerner et al., 2018). PYD theory presents a strength-based perspective on young people's transition to adulthood in which positive outcomes emerge as a result of the alignment between personal (i.e., commitment to learning, positive values, positive identity and social competencies) and contextual resources (i.e., social support, constructive use of time, positive expectations, and empowerment) (Benson, 2007; Benson et al., 2006). The five-factor PYD structure has been well-validated in the literature. Lerner et al. (2011) established a 5Cs model of PYD, which differentiates five positive and interrelated indicators that nurture a better psychological well-being, i.e.: Competence (positive self-efficacy in different life domains), Confidence (positive self-worth), Connection (positive relationships with others), Character (positive internalization of social rules, and values) and Caring (sympathy and empathy toward others). Research by Lerner et al. (2014) showed that the satisfaction of the 5Cs was associated with thriving outcomes, named as Contribution to self and to their families, friends and neighbors, and

their community, as well as with less risk behaviors (e.g., less substance use, delinquency and emotional problems). Thus, RDS model states that the positive developmental regulation between external assets, and personal strengths fosters the emergence of PYD, and in turn PYD relates to these positive outcomes in youth (Benson, 2007; Lerner et al., 2018). In the present study, grit is considered a personal strength related to commitment to learning that may nurture PYD. In turn, the PYD is expected to be associated with positive outcomes, such as some indicators of positive academic adjustment. Thus, PYD may play a mediating role between grit and academic adjustment.

The role of PYD as mediator between assets and positive outcomes has been examined in previous literature, such as the works by Årdal et al. (2018), Lopez-Bermudez et al. (2024) and Shek et al. (2022). Only a few studies have connected grit and PYD from an educational perspective. Buenconsejo et al. (2024) conducted a longitudinal study with Filipino adolescents. Using a cross-lagged panel model, the researchers found that grit predicted PYD dimensions but not the other way around. Specifically, perseverance of effort was related to greater Competence, Confidence and Character, whereas interest consistency had negative effects on Competence, and Confidence after a 6-month follow-up. In another longitudinal study with a sample of Filipino adolescents, PYD predicted better school engagement, contribution and mental health, via psychological needs satisfaction (Buenconsejo and Datu, 2024). In the same vein, Kozina et al. (2019) examined the 5Cs of PYD, and academic achievement in a cross-sectional study with a representative sample of 15-year-old adolescents in Slovenia. They demonstrated that confidence and character were positive predictors of math achievement and self-perceived competence. However, connection and caring were negative predictors of math achievement.

To date, no study has examined the interrelations between the two separate factors of grit, the 5Cs of PYD and different indicators of educational adjustment (specifically academic performance, academic stress, and academic boredom), nor have the possible mediational relationships. Likewise, few investigations have explored the relationship between grit and PYD in a sample of emerging adults as past investigations have focused on secondary school students. Given that most studies addressing grit have been developed in the USA and, Asian countries (e.g., China and the Philippines), more research is needed in Europe.

In the case of Spain, some academic results underline the importance of paying close attention to youth academic performance, and well-being. Data from the HBSC study in Spain, in adolescents aged 17–18 years old, showed that more than 70% reported feeling stressed or very stressed, and more than 30% reported suffering psychosomatic problems several times a week (Moreno et al., 2019). Data from the National Institute of Statistics in Spain showed that 74% of high school students and 60% of college students experienced stress related to academic workload (Carina, 2023). In a recent national study with Spanish university students, the results underscored that approximately half of the sample suffered from depressive and anxiety symptoms (Ministerio de Universidades, 2023a). Furthermore, more than a quarter of undergraduates dropped out, and 12.5% changed their degree courses. Dropout rates were especially high among students with lower grades at the time of university entry. Thus, half of the students with an admission grade around 5–5.5 abandoned their degree studies (Ministerio de Universidades, 2023b). Consequently, more research is needed to examine academic adjustment with Spanish undergraduates and their correlates with grit and PYD, which may guide the design of interventions.

The present study: aims and hypotheses

The present study had two aims (1) to examine the associations between grit (perseverance of effort and consistency of interest), PYD (competence, confidence, caring, character, and connection), and academic adjustment (academic performance, academic stress, and academic boredom), and (2) to analyze the mediational role of the 5Cs of PYD on the relationship between the dimensions of grit and different academic adjustment indicators.

Based on previous research, we hypothesized that grit, and especially effort perseverance, will be related to more PYD characteristics and better academic outcomes, following the results by Datu et al. (2016), and Buenconsejo et al. (2024) among Filipino adolescents and by Dam et al. (2019) and Bowman et al. (2015) in American undergraduates. Similarly, we expected positive relationships between PYD dimensions and academic adjustment indicators, as suggested by Kozina et al. (2019). Regarding the separate 5Cs of PYD, some results were hypothesized based on research with other related variables. The dimension of Competence was expected to be related to better academic adjustment and less burnout (Fariborz et al., 2019; Honicke and Broadbent, 2016) because it addresses the perception of self-efficacy in different life domains. Confidence refers to overall self-esteem, what was expected to be linked to better achievement and coping in educational context (Michie et al., 2001; Peixoto and Almeida, 2010). Connection dimension entails social integration within developmental contexts, e.g., academic environment, what was hypothesized to foster a better involvement and positive relationships with peers and professors (Fong Lam et al., 2015). Caring refers to feelings of empathy and sympathy towards others, what could improve social attachments in university but may also have some detrimental mental health consequences (Gomez-Baya et al., 2025). Finally, Character refers to positive social values to foster the respect for social norms and social integration, and was expected to improve the adjustment to academic overall context (Smyth et al., 2015). Furthermore, we expected a mediational role of these 5Cs of PYD between grit and academic adjustment, based on the postulates of RDS model (Lerner et al., 2018). Thus, grit was expected to be related to better academic adjustment through its positive influence on the 5Cs of PYD. Grit was conceived as a personal strength, comprising perseverance of effort and interest consistecy, that may encourage different aspects of psychological well-being (Datu et al., 2021; Jin and Kim, 2017). In turn, these different aspects of positive development would be related to better academic performance and less stress and boredom. As a novel contribution, the present research aimed at exploring the specific paths between the dimensions of grit, the 5Cs of PYD and several academic adjustment indicators (i.e., academic performance, stress and boredom).

Methods

Data collection procedure, and participants

A cross-sectional study was conducted in the spring of 2024. All universities in Andalusia (Spain) agreed to participate in the study. Concerning the sampling procedure, the selection of degree programs and academic years was randomly conducted in each participating university. Different professors from each university

were contacted to share this online questionnaire with their students. A self-report questionnaire was administered online to a sample of university students in Spain who were accepted to participate. The participants required approximately 30 min to complete the questionnaire. The study was conducted in accordance with the Declaration of Helsinki and received previous approval from the Institutional Ethics Board of the University of Huelva on January 10, 2019. The sample provided written consent and did not receive any incentive to participate.

The sample was composed of 370 undergraduates (67.2% women, 31.4% men, and 1.4% non-binary), aged 18–29 (M = 21.29, SD = 3.61). The participants were enrolled at 10 universities in Andalusia (Spain), i.e., University of Almeria, University of Cadiz, University of Cordoba, University of Granada, University of Huelva, University of Jaen, University of Malaga, University of Seville, University Pablo de Olavide (Seville), and Loyola University (Seville and Cordoba). Most participants lived in cities with more than 300,000 inhabitants (38.4%) or between 50,001 and 300,000 (31.1%). In terms of cohabitation, most students lived with their parents (49.5%) or flatmates (30.5%). Furthermore, 54.5% of the participants were single. Nearly two thirds of the sample (65.6%) was studying and not looking for a job. Concerning their academic degrees, 39.7% studied a degree in Law or Social Sciences, 29.6% studied Sciences/Engineering, 19.2% studied Arts and humanities, and 11.5% of the participants were enrolled in a degree of Health Sciences. About half of the participants were enrolled in the first or second academic year, while 42.6% were enrolled in the 3rd course and 7.4% in the 4th or higher academic year.

Instruments

Positive youth development

The PYD short form was created by Geldhof et al. (2014) was administered. This questionnaire was adapted for Spanish by Gomez-Baya et al. (2019) demonstrated excellent internal consistency and factorial validity. This scale is composed of 34 items which were distributed in five subscales, consistently with the 5Cs model of PYD: Competence (6 items referring a positive self-efficacy in different areas, i.e., "I do very well in my class work at university"), Confidence (6 items about positive overall self-worth, i.e., "I am happy with myself most of the time"), Connection (8 items to assess positive relationships with others, i.e., "I receive a lot of encouragement at my university"), Character (8 items, concerning the respect for the norms of society and culture, i.e., "I never do things I know I should not do") and Caring (6 items about sympathy and empathy for others, i.e., "When I see another person who is hurt or upset, I feel sorry for them"). These items have a 5-point Likert-type scale ranging from 1 = "Not at all important" to 5 = "Very important," 1 = "Strongly disagree" to 5 = "Strongly agree," 1 = "Not at all" to 5 = "Very much," or from 1 = "Never or almost never" to 5 = "Always." Mean scores were calculated for each subscale, and the PYD overall score was obtained from the means. The overall scale had excellent internal consistency (α = 0.86, ω = 0.85), and acceptable reliability was detected in the separate subscales (Competence: α = 0.67, ω = 0.69; Confidence: α = 0.74, ω = 0.77; Connection: α = 0.75, ω = 0.75; Character: α = 0.66, ω = 0.66; Caring: α = 0.79, ω = 0.78). These reliability scores > 0.60 were considered acceptable but moderate, based on the conclusions of previous studies (Marôco, 2007; Marôco and Garcia-Marques, 2006).

Grit

The Short Grit Scale (Grit-S) was developed by Duckworth and Quinn (2009) and was adapted to Spanish by Arco-Tirado et al. (2018) was administered. This scale was composed of eight items distributed in two dimensions of four items each, i.e., Consistency of interest (for example, "I have difficulty maintaining my focus on projects that take more than a few months to complete") and Perseverance of effort (for example, "I am a hard worker"). Consistency of interest items followed a five-point Likert scale from 1 = "Very much like me" to 5 = "Not like me at all," while perseverance of effort items had the contrary scale from 1 = "Not like me at all" to 5 = "Very much like me." Mean scores were calculated for each dimension, as well as for the overall scale. Acceptable internal consistency reliability was observed (α = 0.81, ω = 0.82).

Academic adjustment

Three items were used to assess Perceived academic performance ("How is your academic performance?," with five response options: 1 = "Low," 2 = "Sufficient," 3 = "Good," 4 = "Very good" and 5 = "Excellent"), Academic stress ("How much does university overwhelm you?," with four response options: 1 = "Nothing," 2 = "A little," 3 = "Something," and 4 = "A lot") and Academic boredom ("How often do you get bored at university?," with five response options: 1 = "Never," 2 = "Occasionally," 3 = "Sometimes," 4 = "Often," 5 = "Always").

Data analysis design

Descriptive statistics (i.e., mean and standard deviation) of PYD (both the 5Cs and the overall scale), grit (consistency of interest, effort perseverance and overall score) and academic adjustment variables (academic perceived performance, academic stress and academic boredom) were examined. First, bivariate Pearson correlations were examined among the study variables. Second, three stepwise regression analyses were separately conducted to explain academic performance, academic stress and academic boredom. These analyses were carried out with age and gender entering first, grit dimensions entering second and the 5Cs entering third. R-squared and standardized coefficients are reported below. These analyses were performed to identify the dimensions of grit and PYD that were most strongly related to the three academic adjustment outcomes. These analyses were calculated with SPSS 21.0. Fourth, three mediational analyses were tested to examine the mediation of PYD dimensions on the relationship between grit dimensions and each outcome of academic adjustment (see Figure 1). The mediation analyses were performed only for the significant predictors established in the stepwise regression analyses. Indirect effects were examined, as well as total and direct effects. These analyses were conducted with JASP 0.18.3.0.

Results

Descriptive statistics and bivariate correlations

Table 1 shows descriptive statistics (i.e., means and standard deviations) and bivariate correlations among the study variables.

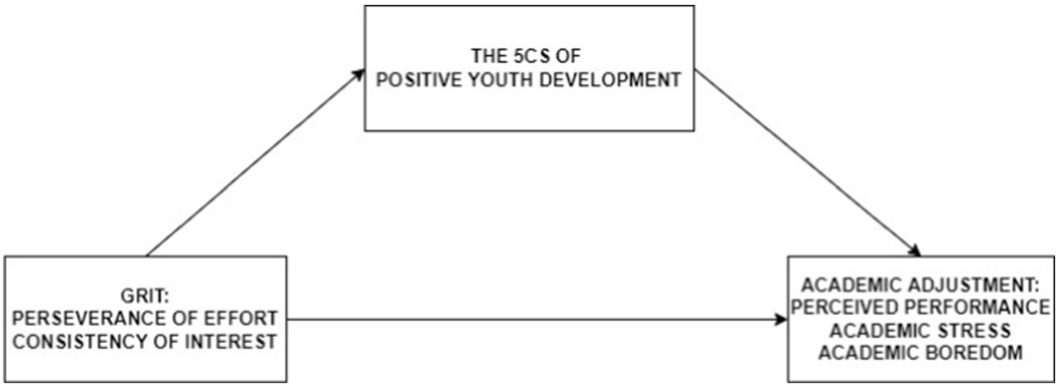

FIGURE 1
General partial mediation model of the relationship between grit dimensions (i.e., perseverance of effort and consistency of interest) and the indicators of academic adjustment (i.e., perceived performance, stress and boredom) through the 5Cs of PYD (i.e., Competence, Confidence, Connection, Character and Caring).

Moderate scores were found in Academic performance and Academic boredom, while high mean score was detected in Academic stress. Concerning PYD dimensions, the highest mean scores were found in Caring and Character, while the lowest one was detected in Competence. With regards to grit, moderate mean scores were found, with the highest value in perseverance of effort. Furthermore, perceived academic performance was positively associated with 5Cs of PYD and both grit dimensions. Academic stress was negatively associated with grit, Character, Confidence, Competence and Connection, while it was positively related to Caring. Academic boredom had negative associations with grit and all the PYD dimensions except Caring. The size of correlations was small to moderate. Furthermore, positive correlations were observed among 5Cs of PYD and grit dimensions. Finally, academic performance was negatively related to stress and boredom, whereas stress and boredom showed a positive correlation.

Stepwise regression analyses

Table 2 presents the results of the three stepwise regression analyses with three indicators of academic adjustment as outcome variables: academic performance, academic stress, and academic boredom. Grit dimensions, 5 Cs of PYD, and the demographic covariates (i.e., gender and age) were used as predictors in all three analyses. Regarding academic performance, gender and age were not significant predictors, while perseverance of effort and Confidence were significant predictors. The regression model explained 15.8% of the variance of Academic performance. Similarly, with regards to academic stress, neither gender nor age were significant predictors, while perseverance of effort and Competence were negative predictors, and caring was a positive predictor. All predictors together explained 12.1% of academic stress variance. Finally, gender and age were significant predictors of academic boredom, such that women and younger students tend to report higher scores in academic boredom. Additionally, academic boredom was predicted also by lower consistency of interest and lower Connection, all predictors together reaching an explained variance of $R^2 = 0.12$. In these three regression analyses, the significant coefficients showed small and moderate effect sizes and reached medium-sized explained variances in each regression equation.

Mediation analyses

Based on the previous stepwise regression analyses, three mediation models were tested in which PYD dimensions that were found to be significant predictors of selected academic adjustment indicators mediated the relationships between a grit dimension and an academic adjustment variable. First, Table 3 and Figure 2 present the results of the mediation analyses of Confidence as a mediator in the relationship between effort perseverance and academic performance. Results showed that the positive relationship between effort perseverance and academic performance was partially mediated by the Confidence dimension of PYD. Thus, higher effort perseverance was associated with better academic performance directly and through a positive relationship of the effort perseverance with the Confidence, which in turn is positively related to better academic performance. The total effect of effort perseverance on academic performance was reduced after including the mediator, and the indirect effect through Confidence was positive. The model explained 14.5% of the variance of academic performance, which indicates a medium-sized effect.

Table 4 and Figure 3 describe the results of the mediation analyses for both Competence and Caring on the relationship between effort perseverance and academic stress. Effort perseverance was negatively associated with academic stress, directly and through its association with Competence and Caring dimensions of PYD. Higher effort perseverance was related to higher Competence, and in turn higher Competence was related to less academic stress. Caring showed a controversial result, since it was positively related to more academic stress. A negative indirect effect was observed through Competence, but a positive one was observed though Caring. Thus, higher effort perseverance was related to less academic stress when it was related to more Competence, but effort perseverance was associated with more academic stress when it was related to more Caring. The model explained 13% of the variance of academic stress, which indicates a medium size effect.

TABLE 1 Descriptive statistics and bivariate correlations: academic adjustment indicators, the 5Cs, and grit dimensions.

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Academic performance	3.34	0.86	1										
2. Academic stress	3.25	0.84	−0.11*	1									
3. Academic boredom	3.31	0.90	−0.13*	0.28***	1								
4. Character	3.87	0.47	0.18**	0.01	−0.10*	1							
5. Competence	2.86	0.66	0.22***	−0.22***	−0.11*	0.24***	1						
6. Confidence	3.68	0.65	0.24***	−0.20***	−0.21***	0.45***	0.56***	1					
7. Caring	4.17	0.59	0.16**	0.18**	−0.06	0.44***	0.01	0.07	1				
8. Connection	3.52	0.63	0.21***	−0.18**	−0.22***	0.41***	0.39***	0.46***	0.17**	1			
9. Interest consistency	3.08	0.70	0.14**	−0.13*	−0.22***	0.20***	0.16**	0.28***	0.01	0.23***	1		
10. Effort perseverance	3.59	0.72	0.36***	−0.25***	−0.18***	0.35***	0.33***	0.38***	0.15**	0.34***	0.51***	1	
11. Overall Grit	3.34	0.62	0.30***	−0.22***	−0.23***	0.32***	0.28***	0.38***	0.09	0.33***	0.86***	0.87***	1

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

TABLE 2 Stepwise regression analyses for the three indicators of academic adjustment (i.e., academic performance, stress and boredom).

Academic performance			Academic stress			Academic boredom		
$F = 16.19$***, $R^2 = 0.158$	*t*	*β*	$F = 9.57$***, $R^2 = 0.121$	*t*	*β*	$F = 11.55$***, $R^2 = 0.118$	*t*	*β*
Gender	−1.57	−0.08	Gender	−1.53	−0.08	Gender	−2.90	−0.15**
Age	1.09	0.05	Age	1.24	0.06	Age	−2.61	−0.13**
Grit: Effort perseverance	5.67	0.30***	Grit: Effort	−3.63	−0.19***	Grit: Interest	−3.20	−0.17**
PYD: Confidence	2.76	0.15**	PYD: Caring	3.25	0.17**	PYD: Connection	−3.97	−0.21***
			PYD: Competence	−2.75	−0.15***			

***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

TABLE 3 Mediation analysis of the role of Confidence as a mediator in the relationship between effort perseverance and academic performance.

	Est	SE	Z	*p*	LLCI	ULCI
Direct effect						
EFF- > PERFO	0.32	0.05	6.07	<0.001	0.21	0.42
Indirect effect						
EFF- > CONF- > PERFO	0.05	0.02	2.22	0.026	0.01	0.09
Total effect						
EFF- > PERFO	0.36	0.05	7.43	<0.001	0.27	0.46
Path coefficients						
CONF- > PERFO	0.12	0.05	2.32	0.021	0.02	0.23
EFF- > PERFO	0.32	0.05	6.07	<0.001	0.21	0.42
EFF- > CONF	0.38	0.05	7.87	<0.001	0.29	0.48

EFF = effort perseverance; PERFO = academic perceived performance; CONF = confidence. R^2 PERFO = 0.145; R^2 CONF = 0.144. LLCI = Lower Level Confidence Interval; ULCI = Upper Level Confidence Interval.

Table 5 and Figure 4 show the results of the mediation analyses for Connection as a mediator of the relationship between interest consistency and ccademic boredom. Higher interest consistency was related to lower academic boredom directly and through a positive relationship with Connection, which in turn was positively related to less academic boredom. The indirect effect was negative, such that the positive association between interest consistency and Connection led to lower academic boredom. The model explained 8.1% of the variance of academic boredom, which indicates a small size effect.

Discussion

The present research aimed to (a) examine the associations between the dimensions of grit, the dimensions of PYD and several indicators of academic adjustment (which included the indicators of perceived academic performance, academic stress and academic boredom), and (b) analyze the mediational role of PYD dimensions on the relationship between dimensions of grit, and indicators of academic adjustment. Concerning the first aim, the results showed that academic performance was positively associated with all dimensions of PYD and both dimensions of grit, while academic stress and academic boredom had negative correlations with the same constructs, with exception of caring being positively associated with academic stress. These results are consistent with our hypotheses, based on previous literature, such as the works by Datu et al. (2016) and Dam et al. (2019), about the associations between grit, well-being, and educational achievement, and the review by Credé (2018) about grit as a predictor of educational success. Interestingly, caring showed a positive association with academic stress. This controversial role of caring is also consistent with the results of Kozina et al. (2019), which examined the academic outcomes of the 5Cs of PYD. Furthermore, grit and PYD showed positive associations, which corroborates the work of Buenconsejo et al. (2024) in Filipino adolescents.

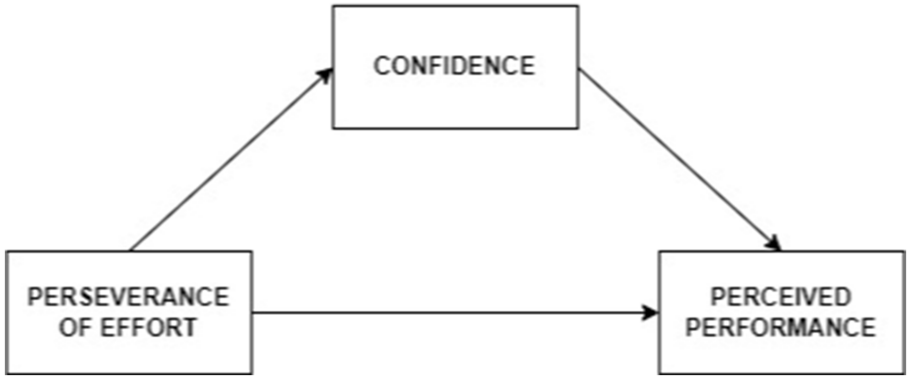

FIGURE 2
Partial mediation of the relationship between perseverance of effort and perceived performance through the Confidence dimension of PYD.

TABLE 4 Multiple mediation analysis of the role of Competence and Caring as mediators in the relationship between effort perseverance and academic stress.

	Est	SE	Z	*p*	LLCI	ULCI
Direct effect						
EFF- > STRESS	−0.24	0.05	−4.50	<0.001	−0.34	−0.13
Indirect effect						
EFF- > COMP- > STRESS	−0.05	0.02	−2.60	0.009	−0.09	−0.01
EFF- > CARI- > STRESS	0.03	0.01	2.43	0.015	0.01	0.06
Total effect						
EFF- > STRESS	−0.25	0.05	−4.98	<0.001	−0.35	−0.15
Residual covariances						
COMP<- > CARI	−0.04	0.05	−0.89	0.375	−0.14	0.05
Path coefficients						
COMP- > STRESS	−0.15	0.05	−2.81	0.005	−0.25	−0.04
CARI- > STRESS	0.21	0.05	4.33	<0.001	0.12	0.31
EFF- > STRESS	−0.24	0.05	−4.50	<0.001	−0.34	−0.13
EFF- > COMP	0.33	0.05	6.77	<0.001	0.24	0.43
EFF- > CARI	0.15	0.05	2.93	0.003	0.05	0.25

EFF = effort perseverance; STRESS = academic stress; COMP = competence; CARI = caring. R^2 STRESS = 0.130, R^2 COMP = 0.111. R^2 = CARI = 0.023.

Regarding the second aim, some mediators were detected. First, the perseverance of effort was positively associated with academic performance, directly and through its positive associating with confidence dimension of PYD. Second, the relationship between effort perseverance and academic stress was negative and was found to be mediated by two PYD dimensions–competence and caring. These mediators presented different effects on academic stress, such that competence was negatively related to academic stress and caring was positively associated with academic stress. Third, consistency of interest was negatively associated with academic boredom directly and through positive association with connection dimension of PYD, which in turn was negatively associated with academic boredom. Concerning effect size of these mediational models, medium explained variance was reached in academic performance and stress, and small explained variance was observed in boredom. These moderate-size effects underline the importance of PYD and the personal strength of grit for academic life, but also suggest the crucial role of other important variables. Following the model by Benson (2007), some external (i.e., expectations from family and professors, empowerment opportunities, participation in constructive activities, and experiences of social support) and internal (i.e., commitment to learning, positive values of learning, social competencies and overall positive self-concept) developmental assets should be added in the analyses to increase explained variance of academic outcomes. The analysis of positive outcomes in youth development, e.g., academic adjustment, requires the joint analysis of both internal and external assets as nutrients to foster PYD. The present work has paid close attention to grit, as an internal asset about commitment to learning, that has been positively related to academic adjustment, through PYD improvement.

Hence, these mediational results indicated that: (a) more effort perseverance was related to higher academic performance and less

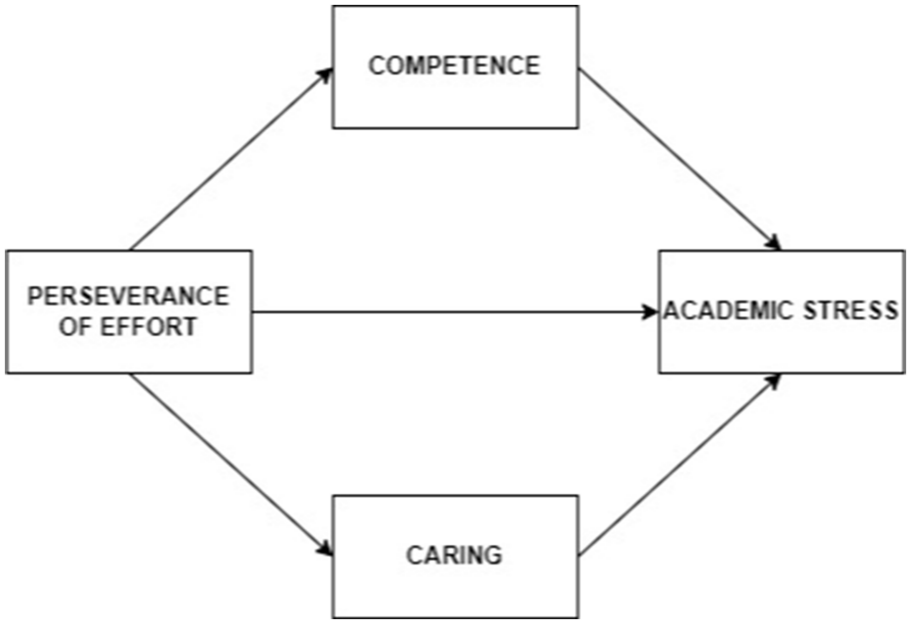

FIGURE 3
Multiple partial mediation of the relationship between perseverance of effort and academic stress through Competence and Caring dimensions of PYD.

TABLE 5 Mediation analysis of the role of Connection as a mediator in the relationship between interest consistency and academic boredom.

	Est	SE	*Z*	*p*	LLCI	ULCI
Direct effect						
INT- > BORE	−0.18	0.05	−3.46	<0.001	−0.28	−0.08
Indirect effect						
INT- > CONN- > BORE	−0.04	0.02	−2.77	0.006	−0.07	−0.01
Total effect						
INT- > BORE	−0.22	0.05	−4.29	<0.001	−0.32	−0.12
Path coefficients						
CONN- > BORE	−0.18	0.05	−3.56	<0.001	−0.29	−0.08
INT- > BORE	−0.18	0.05	−3.46	<0.001	−0.28	−0.08
INT- > CONN	0.23	0.05	4.42	<0.001	0.13	0.33

INT = interest consistency; BORE = academic boredom; CONN = connection. R^2 BORE = 0.081; R^2 CONN = 0.051.

academic stress, while more consistency of interest was related to less academic boredom; (b) confidence and competence mediated this relationship; (c) when effort perseverance was associated with increased caring, it was associated with more academic stress; (d) more interest consistency was related to more connection, and in turn with less academic boredom. These results underline that effort perseverance is the component of grit more strongly related to perceived performance and academic stress, which is consistent with previous literature that compared the effects of each separate dimension of grit, as Disabato et al. (2019). In addition, the findings are aligned with intercultural studies, pointing out the stronger relationship between perseverance of effort and academic adjustment in collectivistic cultures, such as Spain. Effort perseverance was connected to better academic performance and less academic stress, as pointed out Datu et al. (2023), Bowman et al. (2015) and Salles et al. (2014). Consistency of interest played an important role in academic boredom, what may be in line with the conclusions by Bowman et al. (2015) about intention to change the degree. Furthermore, the remarkable relationships between effort perseverance with PYD dimensions of competence, and connection are in line with the conclusions by Buenconsejo et al. (2024). These results can be contextualized within the cultural context, considering how Spain's collective learning culture may shape the association among grit, PYD and academic adjustment. In collectivist societies, it is shown that perseverance of effort is a stronger predictor of academic success as compared to consistency of interest, because of the greater importance of external factors. Thus, family and social support and expectations (Lasarte et al., 2020) are stronger determinants of performance when the students are trying to achieve something, than only the pursuit of their own interests. In this same line, in a collectivist culture, the consistency of interest is more linked to social support and connection to peers and academic context (Azpiazu et al., 2024), in contrast to results from more individualistic cultures, like the USA, where self-drive motivation receives greater focus (Isiksal, 2010).

The present work contributes scientific literature by analyzing the mediating role of different dimensions of PYD in the relationship between the two dimensions of grit and different academic adjustment indicators. These mediational models can be explained within the relational developmental systems model of PYD (Lerner et al., 2018), in which personal strengths, as well as social resources, lead to PYD, and in turn may emerge as contribution to self and others. In the present work, the two dimensions of grit are conceived as a personal strength that fosters PYD, which facilitates contributions to self, such as academic adjustment outcomes.

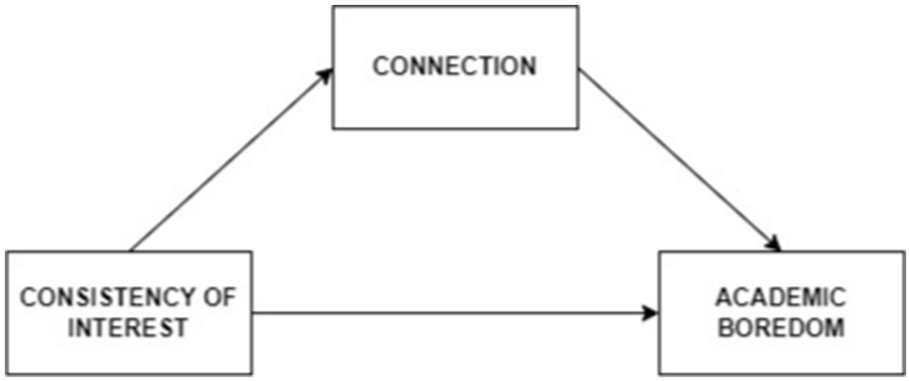

FIGURE 4
Partial mediation of the relationship between consistency of interest and academic boredom through the Connection dimension of PYD.

Each of the mediations deserves a separate understanding within this overall framework. Thus, the mediation of confidence in the relationships between effort perseverance and academic performance, could be explained by the importance of positive self-worth and self-esteem for academic performance and engagement, as already noted by Arshad et al. (2015) and Acosta-Gonzaga (2023). This positive overall self-worth may be nurtured by the tendency to persist in efforts for long-term goals, which produces positive cognitions as argued Datu (2021).

Moreover, in the second mediational model, effort perseverance is also linked to less academic stress through a sense of competence. This result is consistent with studies that showed the associations between academic self-efficacy and academic burnout (Lee et al., 2015) or academic stress (Zajacova et al., 2005). Effort perseverance may foster adaptive emotion regulation (Datu, 2021; Datu and Restubog, 2020), what may foster perceived competence and reduce stress in academic setting. Furthermore, caring had a controversial role in academic stress. Students with increased empathy may suffer emotion contagion from others' stress (Dimberg and Thunberg, 2012) and may try to increase altruistic behaviors to help others (Persson and Kajonius, 2016), what may increase their own academic stress when they do not have the adaptive social and emotional skills for coping (Gomez-Baya et al., 2022; Kalia et al., 2022; Kozina et al., 2021). Thus, perseverance of effort would reduce academic stress when relates to more competence, rather than worrying about and caring for others too much (Kalia, 2021).

Finally, the third mediational model established the mediation of connection in the relationship between interest consistency and academic boredom. When students feel connected to their teachers (Tvedt et al., 2021) or have more relatedness satisfaction (Sulea et al., 2015) they can experience less academic boredom and more academic engagement. Interest consistency may provide more experiences to foster social integration in the university, which in turn increases motivation (Reindl et al., 2022; Vergara-Morales and Del Valle, 2021).

Limitations and future directions

Some limitations should be acknowledged in this study. Because of the study's cross-sectional design, the conclusions can only be based on concurrent associations between the variables. Longitudinal studies are recommended to examine the directionality between grit, PYD, and academic adjustment. In this line, prospective cross-lagged relationships and the examination of the trends in the relationships could be further examined. Moreover, the design of experimental or intervention-based studies should be encouraged to establish more definitive casual links. Furthermore, the use of self-reported questionnaires to collect the data may bias the results because subjective information was collected. Self-report measures may introduce some social desirability bias and subjective inaccuracies. Students' perceptions of their academic stress, performance, and boredom may not always align with objective indicators. Objective measures could be collected for academic adjustment and multiple informants are also recommended. Moreover, some subscales showed moderate reliability, what may limit the conclusions of the study since those items may not collect precise information. Thus, future research should consider incorporating alternative data collection methods, such as official grades records, teacher evaluations, or peer assessments. In addition, the use of mixed-method approaches, including qualitative interviews or classroom observations, could provide deeper insights into the ways grit and PYD manifest in academic settings. Furthermore, the use of a convenient sample may limit the generalizability of the results to other undergraduate samples. Future research may address the examination of representative samples, as well as including youth population not enrolled in universities. Moreover, further cross-cultural examination is needed to compare the role of grit and PYD in the academic adjustment of Higher education students in individualistic and collectivistic cultures. Finally, other variables should be included in future studies. The medium-size effects observed in our analyses suggest the need to examine other variables. Developmental assets, personality traits or mental health outcomes, such as depression or anxiety symptoms, could play an important role in the associations between grit and academic adjustment. Despite these limitations, some implications for practice could be derived.

Practical implications

The medium-sized effects observed in the present work underlined the importance of personal strengths development (i.e.,

grit) and psychological well-being (i.e., PYD) promotion to improve academic success among undergraduate students. Specifically, these results underline the need to design interventions to improve academic adjustment in universities by jointly enhancing grit and PYD. Based on our results, perseverance of effort should be promoted jointly with the PYD dimensions of Confidence to improve academic performance, and with both competence and adaptive Caring to reduce academic stress. Likewise, programs aimed at promoting interest consistency should include activities which foster connection, as connection mediates the association between consistency of interest and academic boredom. In this line, perseverance of effort and consistency of interest, together with the PYD dimensions, might also guide program design to raise students' grades point average or to reduce drop out, as possible correlates of the indicators of academic adjustment examined in the present work (Abreu Alves et al., 2022; Choi, 2005; Sharp et al., 2020).

The work by Santos et al. (2022) gave some key points in teaching grit based on scientific evidence. These authors conducted an intervention program for adolescents enrolled at public schools in North Macedonia. The intervention was composed of a curriculum of five, hour-long consecutive lessons, with a weekly frequency. These lessons were divided into two parts. The first one was focused on the deliberate practice, by identifying stretch goals, seeking feedback, improving concentration and repeating until getting mastery. The second part aimed at motivating students to implement this deliberate practice, by managing student expectancies, addressing academic values and reinforcing positive beliefs to create a virtuous learning cycle.

Along this line, Bashant (2014) reflected about the strategies on fostering perseverance in students: talking about the power of attitude and perseverance; turning the problem into a picture or puzzle; starting with small problems; sharing the "why" before the "what" to inspire the students; placing the students in communities to work together; making it a game; and rewarding hard work and delayed gratification. Hwang and Nam (2021) reviewed some interventions, such as: (a) the Grit Enhancement Program, developed by the US Department of Education, by promoting self-control, growth mindset, learning strategies, and resilience (Shechtman et al., 2013); and (b) the program created by the Association for Supervision and Curriculum Development with six steps, i.e., creating a supportive environment that recognizes people's efforts, self-understanding through grit testing, teaching grit meaning, failure experience, examining the experience of failure, and learning through reflection (Hoerr, 2013). These authors selected some grit promotion strategies, specifically: teaching grit, reflecting on the past failures, promoting a growth mindset, fostering goal setting strategies, enhancing deliberate practice, reducing media overuse, improving emotional regulation skills, and nurturing interest discovery and maintenance.

Jointly with grit promotion in undergraduates, psychological well-being should be protected by following the strength-based perspective proposed by PYD model. The promotion of the 5Cs of PYD (Lerner et al., 2021) could contribute to student well-being and academic adjustment, as suggested by the 4-H Youth Development Programs (Arnold, 2018; Arnold and Gagnon, 2020). The 4-H Thriving Model consists of developing a growth mindset, openness to challenge and discovery, hopeful purpose, prosocial orientation, transcendent awareness, positive emotions and goal setting and management. Thus, the integration of grit intervention within this PYD program could have a synergetic effect to foster academic and later vocational success in undergraduate samples. Universities should create PYD-based mentorship programs (Erdem et al., 2016) to improve students' wellbeing and academic adjustment. These programs could reinforce Confidence, Competence and Connection, which have been found to mediate academic results. Moreover, stress management workshops could be designed specifically for students with heightened levels of Caring, providing them with coping mechanisms to navigate emotional burnout when helping their peers (Greene et al., 2017). The prevention of compassion fatigue in youth samples may be encouraged by providing them with some experiences of positive empathy and psychoeducational practices to foster emotional regulation skills, as concluded by Gomez-Baya et al. (2025).

Conclusion

In conclusion, the present study provides evidence on the associations between the dimensions of grit, the 5Cs of PYD, and various outcomes of academic adjustment. The added value of the study is in depth dimensional analyses providing valuable insight to foster academic adjustment in much needed context (e.g., drop-out rates) and at the same time in grit research underrepresented context, that is Spain. The results have underscored that perseverance of effort was associated with better academic performance and less academic stress, while interest consistency is linked to lower academic boredom. Moreover, this research showed that these associations were partially mediated by specific dimensions of PYD, such that confidence, competence, and connection were related to better academic adjustment. Notably, caring had a controversial effect on academic stress. These results may provide important contributions to practice in order to implement interventions within the higher educational context to promote academic adjustment through encouraging grit, both dimension and PYD, with a focus on competence, confidence and connection.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of University of Huelva (protocol code UHU-1259711 and date of approval: 10 January 2019) for studies involving humans. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

DG-B: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. AK: Conceptualization, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. JB: Conceptualization, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. JM-V: Conceptualization, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing.

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Conflict of interest

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

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Generative AI statement

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

Publisher's note

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