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Improving the prediction and understanding of academic success: The role of personality facets and academic engagement☆

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ABSTRACT

In predicting academic success and adopting a broader view of the factors involved, personality and, recently, *academic engagement* have emerged as relevant constructs. This study examined the predictive ability of the *Five-Factor Model* (domains and facets; Big Five Questionnaire) for *academic achievement* and *engagement* (Spanish Version Student Utrecht Work Engagement Scale) and the mediating role of *engagement* in the relationship between personality and *achievement*. Results obtained in a sample of 611 Spanish adolescents show that (1) *Conscientiousness* (domains and facets) have positive direct and indirect effects on *academic achievement* through *engagement* and (2) *Openness* shows only indirect effects; its facets display a pattern of opposing, unequal effects. These results do not vary by sex and underline the importance of examining more specific personality *traits* than those defined by the basic dimensions to increase the understanding of the relationships between personality and *academic achievement* and, with it, the ability to design strategies to improve it.

Mejorando la predicción y comprensión del éxito académico: el rol de las facetas de personalidad y el compromiso académico

Palabras clave:
Modelo cinco grandes
Rendimiento académico
Adolescentes
Predictores no-cognitivos

RESUMEN

A la hora de predecir el éxito académico y adoptar una visión más amplia de los factores implicados, la *personalidad* y, recientemente, el *compromiso académico* han emergido como constructos relevantes. Este estudio examina la capacidad predictiva del *Modelo de los Cinco Grandes* (dominios y facetas, BFQ) respecto al *rendimiento* y *compromiso académico*, así como el papel mediador del *compromiso* en la relación entre personalidad y *rendimiento*. Los resultados obtenidos en una muestra de 611 adolescentes españoles muestran que (1) *Responsabilidad* (dominios y facetas) tiene efectos positivos directos e indirectos en el *rendimiento académico* a través del *compromiso* mientras (2) *Apertura* sólo muestra efectos indirectos y sus facetas presentan un patrón de efectos opuestos y desiguales. Estos resultados no varían por sexo y subrayan la importancia de examinar *rasgos de personalidad* más específicos que los definidos por las dimensiones básicas para aumentar la comprensión de las relaciones entre personalidad y *rendimiento académico* y, con ello, la capacidad de diseñar estrategias que incrementen.

Introduction

In recent decades there has been an increasing emphasis worldwide on academic success: governments have recognized that students need a high level of achievement succeed in an increasingly competitive global marketplace (Haines & Mueller, 2013). Accordingly, interest has increased in identifying the variables related to academic success: since achieving greater understanding in this regard could be beneficial in reducing the high rates of academic failure (Morales-Vives et al., 2020). Although these rates

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have diminished slightly in recent years, Spain continues to be the second country in the European Union with the worst school dropout rates (16%), far from the goals established by the European Union (10%) (Millán, 2021).

While many predictors of academic success have been studied, no source of variance appears to be as strong as a student's individual qualities (Bergold & Steinmayr, 2018). Intelligence, a facilitator of understanding and learning (Ackerman et al., 2011), has been considered the single most important predictor of *academic achievement* (Von Stumm & Furnham, 2012). However, since it rarely explains more than 25% of achievement variance (Bergold & Steinmayr, 2018), other non-cognitive predictors (Vedel & Poropat, 2017) such as personality dispositions have begun to be examined. The underlying rationale involves: (1) the importance of personality factors in predicting socially valued behavior; and (2) the recognition of personality as a component of an individual's willingness to perform (Poropat, 2009).

Research conducted on adolescents provides evidence of the relationship between the *Five-Factor Model* (FFM) and *academic achievement* (Bergold & Steinmayr, 2018; Dumfart & Neubauer, 2016; Israel et al., 2019; Meyer et al., 2019; Morales-Vives et al., 2020; Tetzner et al., 2020). Most of those studies found that *conscientiousness* is the greatest predictor of *academic achievement*: organized, self-disciplined, and responsible adolescents exhibit greater goal-oriented behavior and perform better academically (McCrae & Costa, 1997; Roberts et al., 2009). The moderate association found with *openness* (Bergold & Steinmayr, 2018; Dumfart & Neubauer, 2016; Morales-Vives et al., 2020) could be explained by the intellectual component of this dimension, which reflects curiosity and focus on learning (Von Stumm et al., 2011). Its greater social submissiveness would orient the agreeableness person towards *academic achievement* as the socially accepted value in this setting (Clark & Schroth, 2010; Komarraju et al., 2011), justifying the modest association found with this domain (Dumfart & Neubauer, 2016). Extraverts' sociability could facilitate learning via help-seeking from peers and teachers (Bidjerano & Dai, 2007), although the preference for an active social life could be a barrier to academic success. The contradictory character of both influences could explain the lower association of *extraversion* with *academic achievement* and, even, the positive sense of such association in primary education and negative in secondary and tertiary education (Bernard, 2010; Israel et al., 2019). Even more complex appears to be the association with *neuroticism* (Vedel & Poropat, 2017): individuals high on this dimension focus on avoiding failure and getting good grades (Komarraju & Karau, 2005), while their high levels of anxiety make them feel discouraged about school (Clark & Schroth, 2010).

Although limited, existing results suggest that facets are often stronger predictors of academic performance than personality domains (De Vries et al., 2011; Vedel et al., 2015) and that goal orientation and self-control (*conscientiousness*) are the most relevant (Bergold & Steinmayr, 2018; Vedel et al., 2015).

Academic success would include a positive attitude toward studies, reflecting a student's involvement, participation, or concentration (Jiménez-Morales & López-Zafra, 2009). Therefore, a broader view of academic success would consider the concept of *academic engagement* (Schaufeli et al., 2002). *Academic engagement* has been conceptualized as the motivational state the student experiences concerning the academic activity, involving high energy and concentration levels, persistence, a strong desire to strive in studies, and a feeling of identification with them (Salanova et al., 2005). It could be a potential response to problems of achievement, motivation and school dropout by promoting learning and achievement as it plays an important role in the interest and enjoyment that students show in their studies (Medrano et al., 2015). In addition, evaluating *engagement* allows to assess the quality of the student's learning experience and decide about resource provision, course content, and delivery (Coates, 2007). Thus, it is necessary to identify the factors that determine whether a student is engaged in their studies and the consequences of such *engagement* (Ouweneel et al., 2011; Salmela-Aro et al., 2009).

Most of the research conducted so far, focusing on *engagement* as a predictor of *academic achievement* (Casuso-Holgado et al., 2013; Serrano & Andreu, 2016) suggests that engaged students obtain better academic results because they strive to solve challenges; minimize their frustration, feel greater satisfaction, are more energetic, and perform better on tasks (Collie et al., 2017; Parra, 2010).

Personality is also a relevant *academic engagement* predictor: it influences the way individuals interpret their environment and actively search for self-regulatory strategies or approaches toward adapting to different demands successfully (Zecca et al., 2015). Although not free of inconsistencies, results to date (Abolmaali et al., 2014; Qureshi et al., 2016; Mesurado et al., 2018; Rashedi et al., 2015; Sulea et al., 2015) show that high aspirations, persistence, planning, and goal orientation (*conscientiousness)* are associated with greater *academic engagement*. Furthermore, being open to ideas, being creative, having abstract thinking ability (*openness*) as well as being collaborative, compliant, and altruistic (*agreeableness*) may be relevant to *academic engagement* (Qureshi et al., 2016; Sulea et al., 2015). Also, favoring a positive and satisfying relationship with studies, having good communication skills, and characteristics such as emotional stability (low *neuroticism*), enthusiasm, optimism, and assertiveness (*extraversion*) lead to greater *academic engagement* (Ariani, 2015; Mesurado et al., 2018). To our knowledge, only one study (Cilliers et al., 2018) has explored the association between *academic engagement* and personality facets. The results show that achievement orientation (*conscientiousness*) is a significant predictor of *engagement.*

Exploring mediating factors between personality and *academic achievement* could clarify the processes by which personality affects educational outcomes (Ackerman et al., 2011). In this regard, *engagement* is a potential mechanism by which personality dimensions could influence *academic achievement*. A previous study carried out by Abolmaali et al. (2014) has examined this objective and have shown that *engagement* mediates the relationship between *openness* and *conscientiousness* and *academic achievement.*

Finally, females outperform males in *academic achievement* and *engagement* (Lam et al., 2012; Voyer & Voyer, 2014). In addition, adolescent females score higher than males on personality dimensions (*openness* and *conscientiousness*) that facilitate *academic achievement*, at least at school (De Bolle et al., 2015). Although, recent studies have suggested a possible modulating role for sex in the relationship between personality and *academic achievement*, results in this sense have been inconsistent (Janošević & Petrović, 2019; Kuśnierz et al., 2020).

In light of the above, this study examined two main objectives in the adolescent population: (1) the predictive ability of the FFM (domains and facets) for *academic achievement* and *engagement*; and (2) the possible mediating role of *engagement* in the relationship between personality and achievement. As an additional objective, the sex invariance of mediation outcomes was explored.

Method

Participants

The sample comprised 611 Spanish adolescents (303 females and 308 males), from 14 to 18 years old (M = 15.49, SD = 1.00), in 3rd (40.9%) and 4th (32.9%) grades of high school and the 1 st year of A-levels (26.2%).

Instruments

Big Five Questionnaire (BFQ) (Caprara et al., 1993; Spanish version of Bermudez, 1995) measures the *FFM*. It includes 132 items rated on a five-point Likert scale: 1 = totally disagree to 5 = totally agree. *Energy/Extraversion* includes *dominance* (ability to assert oneself, stand out, and influence others) and *dynamism* (energy and enthusiasm). *Agreeableness* subsumes *cooperativeness* (ability to cooperate and listen to others) and *politeness* (affability, trust, and openness to others). *Conscientiousness* incorporates *perseverance* (persistence and tenacity) and *scrupulousness* (reliability, meticulousness, and desire for order). *Emotional stability* comprises *impulse control* (control one's behavior) and *emotion control* (control of emotional states in a given situation). *Openness* subsumes *openness to experience* (openness to different values, styles, and lifestyles) and *openness to culture* (interest in staying informed, reading, and acquiring new knowledge). Alpha coefficients for the scales ranged from .74 to .88 (Table 1).

Student Utrecht Work Engagement Scale (UWES-S-9) (Benevides-Pereira et al., 2009) evaluates *academic engagement* through nine items based on a seven-point Likert scale, ranging from 0 = never to 6 = always. Based on its unidimensional structure (Serrano et al., 2019), the instrument allows for a global score that showed satisfactory reliability (alpha = .91).

Arithmetic mean (range 1 to 10) of the grades obtained in the first and second academic evaluations, provided by the school's headteacher, assesses the *academic achievement* criterion.

Procedure

Fifteen public and private high schools in the Valencian Community, Spain, were randomly selected and informed about the research. Four of these schools showed their interest and a personal interview was arranged to explain the study characteristics and to confirm their participation. Both the school boards and participants provided informed consent. The questionnaires were administered in groups in the third quarter of the academic year and completed on a paper-and-pencil survey under the supervision of a researcher during a group tutorial session of 45 minutes. The research received approval from the University's Committee on Ethics of Human Research.

Data analyses

The missing data were completed following the instructions provided by the authors of each instrument. The participants who did not complete ≥20% of the items or had no valid responses were removed.

Descriptive statistics (means and standard deviations), reliability coefficients, Average Variance Extracted (AVE), Variance Inflation Factors (VIF), and bivariate correlational were calculated using SPSS 23 and FACTOR (Lorenzo-Seva & Ferrando, 2006). Structural equation models (SEMs) with EQS 6.1 (Bentler & Wu, 2002) tested whether *academic engagement* mediated the relationship between the FFM (dimensions and facets) and *academic achievement*. SEMs were computed with the total score for each personality trait (domain or facet), *academic engagement* as a latent variable composed of UWES-S-9 items, and *academic achievement* as the average of the two evaluations.

Various fit indices were calculated to evaluate the goodness-of-fit of the models (Jackson et al., 2009) (acceptable criteria level in parentheses following Hair et al., 1999): comparative fit index (CFI > .90), non-normed fit index (NNFI > .90), incremental fit index (IFI > .90), root mean square error of approximation (RMSEA < .08; 90% confidence interval [CI]), the standardized root mean square residual (SRMR) and the root mean-square residual (RMSR) (lower values indicate better model fit). Given the deviation from normality of the data (Mardia's normalized coefficient higher than 3.00), a robust version of the maximum likelihood estimator (ML) was used.

Variable selection and mediating effect

A general model (GM) with personality traits as exogenous variables and *academic engagement* and *achievement* as endogenous variables was computed to calculate the mediating effect. The general model was examined and *personality traits* that showed non-significant paths with *engagement* and *achievement* were removed. Then, the general model with direct effects between personality traits and *engagement or academic achievement* was recalculated (GMr). Next, a restricted model (RM) without previous significant direct paths between personality traits and *achievement* was computed. Finally, the χ^2 difference of both models was compared. Also, the indirect effect was calculated to achieve a complete view of the mediating effect (MacKinnon, 2008). Subsequently, a multi-group analysis to explore differences in the mediating role of *academic engagement* according to sex was performed.

Results

Descriptive and correlation analysis

Descriptive statistics, alpha of Cronbach, McDonald Omega, Composite Reliability, AVE of the studied variables and VIFs for personality traits predicting *engagement* and *achievement* are presented in Table 1. Correlations among the variables are shown in Table 2. *Academic engagement* correlated positively with *achievement.* All basic personality dispositions were positively related to *academic engagement* and achievement (except *emotional stability*). Both *facets* of *conscientiousness*, *openness,* and *agreeableness* as well as *dynamism* and *impulse control* were associated with both criteria. *Dominance* was only related to *academic achievement* and no significant association was found between *emotion control* and *academic engagement* and *achievement*. Moreover, none of the domains or facets showed an elevated value indicating noncritical collinearity problems.

Mediation analysis

Domains. An initial general model (GM-D) was computed. *Extraversion*, *agreeableness*, and *emotional stability* did not show significant paths with neither *academic engagement* or *achievement* (Table 3) and *openness* did not show significant path with *achievement* (Table 3) resulting in poor adjustment (Table 4). The new general model (GMr-D), with correlations between *conscientiousness* and *openness* added, showed adequate fit indexes (Figure 1, Table 4). Only *conscientiousness* retained significant beta values with *academic achievement*, indicating a total mediating effect of *engagement* for *openness*. A restricted model (RM-D) with a previous significant direct path between *conscientiousness* and *academic achievement* constraints set to zero was computed. The fit indexes of RM-D showed a good adjustment and the difference between GMr-D and RM-D was statistically significant $\Delta S\text{-}B\chi^2_{(1)} = 37.12$, $p < .05$, indicating the appropriateness of GMr-D. Finally, the indirect effects of *conscientiousness* (beta = .09, $p \leq .01$) and *Openness* (beta = .06, $p \leq .01$) on *achievement* through *engagement* were statistically significant.

*Facets***.** A general model (GM-F) was calculated. As Table 3 shows, *perseverance*, *scrupulousness*, *openness to culture*, and *openness to experience* remained statistically significant related to *engagement* and *academic achievement*; the result showed poor fit indexes (Table 4). Thus, the model (GMr-F) was recalculated with only

Table 1
Descriptive statistics, reliability coefficients and AVEs of the variables, and VIFs for personality traits

	M	*SD*	α[a]	Ω[b]	CR[c]	AVE[d]	VIF[e]
1. Energy/Extraversion	77.04	10.83	.81	.77	.84	.19	1.22 (1.21)
1.1. Dynamism	41.62	6.53	.75	.70	.81	.27	1.92 (1.93)
1.2 Dominance	35.42	6.40	.72	.67	.79	.26	1.41 (1.41)
2. Agreeableness	88.97	10.21	.84	.85	.87	.23	1.30 (1.30)
2.1. Politeness	44.58	5.60	.74	.76	.83	.31	1.83 (1.82)
2.2. Cooperativeness	44.38	5.73	.74	.75	.81	.28	2.21 (2.11)
3. Conscientiousness	80.49	11.09	.84	.83	.87	.23	1.43 (1.45)
3.1. Perseverance	41.50	5.99	.74	.70	.84	.34	2.04 (2.21)
3.2. Scrupulousness	39.00	6.57	.76	.77	.82	.30	1.66 (1.70)
4. Emotional Stability	67.00	12.84	.86	.82	.88	.25	1.10 (1.07)
4.1. Emotion control	34.60	6.89	.74	.67	.84	.33	1.72 (1.73)
4.2. Impulse control	32.39	7.70	.83	.79	.87	.36	1.85 (1.86)
5. Openness	77.03	12.12	.84	.79	.87	.22	1.36 (1.35)
5.1. Openness to experience	41.44	6.11	.79	.70	.86	.38	1.75 (1.75)
5.2. Openness to culture	35.60	7.90	.73	.72	.80	.26	1.45 (1.45)
6. Academic engagement	24.06	11.51	.91	.68	.93	.59	
7. Academic achievement	6.16	1.69					

[a] α = Cronbach alpha; [b] Ω = McDonald Omega; [c] CR = Composite Reliability; [d] AVE = Average Variance Extracted; [e] VIF = Variance Inflation Factors of domains predicting engagement and (achievement) and Variance Inflation Factors of facets predicting engagement and (achievement).

Table 2
Correlations between the variables

	1	1.1	1.2	2	2.1	2.2	3	3.1	3.2	4	4.1	4.2	5	5.1	5.2	6
1. Energy																
1.1 Dynamism	.84***															
1.2 Dominance	.83***	.40***														
2. Agreeableness	.21***	.43***	-.08*													
2.1. Cooperativeness	.21***	.43***	-.09*	.90***												
2.2. Politeness	.17***	.34***	-.06	.90***	.62***											
3. Conscientiousness	.30***	.38***	.13**	.42***	.42***	.39***										
3.1. Scrupulousness	.18***	.24***	.06	.35***	.35***	.28***	.89***									
3.2. Perseverance	.36***	.44***	.17***	.39***	.38***	.32***	.87**	.56***								
4. Emotional Stability	-.11**	-.07	-.12**	.08	-.03	.17***	.18***	.05	.27***							
4.1. Impulse control	-.20***	-.13***	-.20***	.14***	.03	.23***	.21***	.15***	.23***	.89***						
4.2. Emotion control	.01	.02	.00	-.02	-.08*	.06	.09*	-.07	.25***	.87***	.55***					
5. Openness	.34***	.38***	.18***	.38***	.37***	.32***	.41***	.35***	.38***	.03	.10*	-.05				
5.1. Openness to culture	.24***	.23***	.16***	.24***	.22***	.20***	.33***	.29***	.30***	.07	.15***	-.04	.90***			
5.2. Openness to experience	.37***	.46***	.15***	.45***	.44***	.37***	.39***	.32***	.37***	-.03	-.01	-.05	.82***	.49***		
6. Academic engagement	.19***	.26***	.05	.27***	.25***	.24***	.44***	.37***	.40***	.10*	.13**	.04	.32***	.30***	.25**	
7. Academic achievement	.15***	.15***	.10*	.17***	.19***	.11**	.41***	.36***	.36***	.07	.10*	.02	.22***	.25***	.11**	.30***

*** $p < .001$. ** $p < .01$. * $p < .05$.

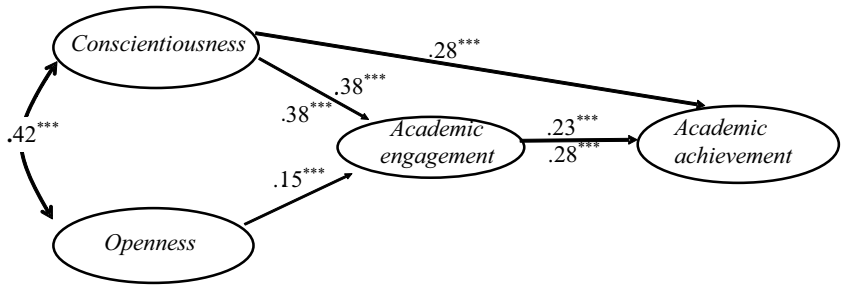

Figure 1. Standardized solution for the recalculated general model (GMr-D, upper values) and restricted model (RM-D, downwards values) for personality domains.

these four facets, which added the correlations between them; it showed adequate fit indexes (Figure 2, Table 4). Again, a restricted model (RM-F) with previous significant direct paths between *perseverance*, *scrupulousness*, *openness to culture*, and *openness to experience* and *academic achievement* constraints set to zero was computed. The fit indexes of RM-F showed a good adjustment, and the difference between GMr-F and RM-F was statistically significant (ΔS-B$\chi^2_{(4)} = 53.93$, $p < .05$) indicating the appropriateness of GMr-F. In GMr-F model, all direct effects on *academic achievement* remained significant. Also, the indirect effect was calculated only for those facets that showed a significant path with *engagement*: *perseverance* (beta = .04, $p \leq .01$), *scrupulousness* (beta = .05, $p \leq .01$), and *openness to culture* (beta = .04, $p \leq .01$).

Sex differences

To evaluate whether the mediating role of *engagement* varied by sex, a multi-group analysis based on two groups (males and females) was conducted. The fit indexes of the estimated model served as a baseline for comparison with different types of invariances. Thus, the path coefficients relating personality and *academic engagement* to *academic achievement*, *academic engagement* to *aca-*

Table 3
Standardized and unstandardized betas and standard errors of five factor domains and its facets on academic engagement (A.E) and academic achievement (A.A). Percentage of variance explained in italics

Domains as exogenous					Facets as exogenous				
GM-D	D.V	*B*	*SE*	*ß*	GM-F	D.V	*B*	*SE*	*ß*
Energy/Extraversion	A.E	.02	.05	.02	Dynamism	A.E	.13	.05	.13
Agreeableness		.06	.06	.05	Dominance		-.07	.05	-.07
Conscientiousness		.44	.06	.34***	Politeness		.08	.05	.08
Emotional Stability		.03	.05	.02	Cooperativeness		-.06	.05	-.06
Openness		.20	.06	.15**	Perseverance		.25	.06	.24***
				20.7	Scrupulousness		.20	.06	.19***
Energy/Extraversion	A.A.	.04	.04	.04	Emotion control		-.03	.06	-.03
Agreeableness		-.07	.04	-.07	Impulse control		.03	.06	.03
Conscientiousness		.30	.05	.31***	Openness to experience		-.05	.05	-.04
Emotional Stability		.05	.04	.05	Openness to culture		.20	.06	.19***
Openness		.04	.04	.04					19.1
A.E.		.11	.04	.14	Dynamism	A.A	-.03	.04	-.03
				16.3	Dominance		.11	.04	.11
GMr –D	**D.V.**	***B***	***SE***	***ß***	Politeness		-.06	.04	-.06
Conscientiousness	A.E.	.41	.05	.38***	Cooperativeness		.05	.04	.05
Openness		.16	.05	15***	Perseverance		.14	.04	.16***
					Scrupulousness		.14	.05	.15**
				21.8	Emotion control		.00	.04	.01
Conscientiousness	A.A.	.28	.04	.28***	Impulse control		.07	.04	.07
Openness		–	–	–	Openness to experience		-.14	.04	-.15**
A.E.		.21	.04	.23***	Openness to culture		.14	.05	.15**
					A.E.		.20	.05	.22***
				19.0					20.4
RM-D	**D.V.**	***B***	***SE***	***ß***	**GMr -F**	**D.V**	***B***	***SE***	***ß***
Conscientiousness	A.E.	.42	.05	38***	Scrupulousness	A.E	.20	.06	.19***
Openness		.16	.05	.15***	Perseverance		.27	.06	.25***
					Openness to culture		.19	.05	.18***
				23.3					23.0
Conscientiousness	A.A.			0[a]	Scrupulousness	A.A	.15	.05	.18***
Openness				0a	Perseverance		.18	.05	.15***
A.E.		.35	.05	.38***	Openness to culture		.16	.05	.16***
					Openness to experience		-.15	.04	-.15***
					A.E.		.19	.05	.20***
				14.4					21.5

[a] constrain to 0.
Note. D.V. dependent variable; A.E. academic engagement; A.A. academic achievement.
*** $p < .001$. ** $p < .01$. * $p < .05$.

Table 4
Chi-square, degree of freedom and fit indexes for general model (GM), general model recalculated (GMr), and restricted model (RM) with personality domains (D) and personality facets (F) as exogenous variables. Unconstrained versions are indicated with U, complete constrained version with C, partial constrained version with CI in multi-group analysis

Model	S-Bχ^2	*df*	S-Bχ^2/*df*	RCFI	IFI	RNNFI	RMSEA [90% CI]	SRMR	RMSR
GM-D	473.14	79	5.99	.88	.88	.84	.092[.084-.100]	.074	.130
GMr-D	162.76	37	4.40	.96	.96	.92	.076[.064-.088]	.084	.103
RM-D	199.88	38	5.26	.95	.95	.90	.085[.074-.097]	.054	.109
GMr-D_U	196.57	74	2.66	.96	.96	.92	.075[.062-.088]	.052	.113
GMr-D_C	223.54	86	2.60	.95	.96	.93	.074[.062-.086]	.073	.165
GMr-D_{CI}	209.45	84	1.49	.96	.96	.93	.071[.059-.083]	.056	.126
GM-F	983.07	140	7.02	.81	.81	.74	.101[.095-.107]	.133	.172
GMr-F	180.82	53	3.41	.96	.96	.93	.064[.054-.074]	.070	.092
RM-F	234.75	57	4.12	.95	.95	.91	.073[.063-.082]	.073	.099
GMr-F_U	234.63	106	2.21	.96	.96	.93	.045[.038-.053]	.050	.104
GMr-F_C	257.22	122	2.11	.96	.96	.94	. 061[.051-.072]	.067	.143
GMr-F_{CI}	246.38	120	2.10	.96	.96	.94	.060[.049-.070]	.061	.128

demic achievement, and personality to *academic achievement* (Figure 1, Figure 2) and saturation of UWES's items were compared.

Domains. Two different versions of RM-D were calculated. First, the unconstrained model (RM-D_U, with no constrains) showed good adjustment. Then, the differences between this model and GMr-D_C (with betas values and item's saturation of UWES constrained by sex) were calculated. In the GMr-D_C, the constrains of item 1 and item 6 were significant. So, a model without these constrains relaxed (GMr-D_{CI}) was recalculated. Thus, the difference between GMr-D_{CI} and GMr-D_U was not significant (ΔS-B$\chi^2_{(10)} = 12.88, p > .05$). Consequently, item 1 saturation (males, .68, females, .53) and item 6 (males, .62, females, .76) were different between sexes.

Facets. The unconstrained model showed good adjustment (GMr-F_U). Again, items 1 and 6 constrains had to be relaxed and the model GMr-F_C was recalculated (GMr-F_{CI}). After that, the differences between GMr-F_{CI} and GMr-F_U were not significant (ΔS-B$\chi^2_{(14)} = 11.75, p > .05$). So, item 1 (males, .69, females, .55) and item 6 (males, .62, females, .74) showed differences between sexes. Thus, the two mediation models appeared plausible for both males and females.

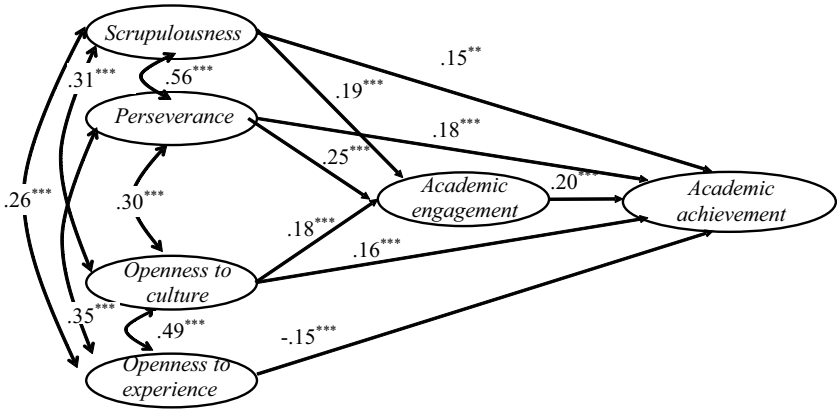

Figure 2. Standardized solution for the recalculated general model for personality facets (GMr-F). $^{**}p < .001$. $^{**}p < .01$.

Discussion

The first aim was to examine the predictive ability of the FFM (domains and facets) for *academic achievement* and *engagement*. The bivariate results were consistent with those obtained regarding *academic achievement* (Israel et al., 2019; Tetzner et al., 2020) and partially support findings related to *engagement* (Rashedi et al., 2015; Sulea et al., 2015). Adolescents who are organized and responsible, open to ideas and different values and lifestyles, collaborative and affable, enthusiastic, and can control their behavior, achieve higher academic success (*achievement* and *engagement*). Consistent with the argument that an extrovert's characteristics facilitate interaction with peers and teachers, leading to greater student *engagement* (Ariani, 2015), the two facets of *extraversion* showed a homogeneous relationship pattern with this criterion. Likewise, the absence of an association between *control of emotions* and *dominance* facets and *academic achievement* (as opposed to the positive relationship shown by the other facets of *emotional stability* and *extraversion*) is in line with the argument that the features integrated into those traits produce different results for academic success (Bernard, 2010; Clark & Schroth, 2010; Israel et al., 2019).

In line with other studies (Casuso-Holgado et al., 2013; Serrano & Andreu, 2016), *academic engagement* was positively related to *academic achievement*. As expected, students who are more involved and concentrated on academic tasks, with higher energy levels, and willingness to invest efforts and persistence despite difficulties that may arise, attain better *academic achievement*.

As reflected in the previous literature, the results showed that both the domains and the facets of *conscientiousness* and *openness* were relevant in predicting both *academic achievement* (Bergold & Steinmayr, 2018; Herrera et al., 2020; Meyer et al., 2019; Morales-Vives et al., 2020; Vedel et al., 2015) and *engagement* (Abolmaali et al., 2014; Cilliers et al., 2018; Mesurado et al., 2018). It is also noteworthy the different predictive performance of *openness to experience* facet when the prediction model includes *conscientiousness*. When this last personality characteristic was also contemplated, *openness to experience* was no longer a significant predictor of *engagement* and negatively predicted *achievement*. Previous studies (O'Connor & Paunonen, 2007) have evidenced that the relationship between *openness to experience* and *academic achievement* is inconsistent. They found substantial variation in the magnitude of the effect sizes, which suggests that one or more variables could be responsible for determining where *openness to experience* exerts influence on *academic achievement*.

The results support that the moderate association typically found between *openness* and both *academic achievement* and *engagement* is due to the interest in staying informed, reading, and acquiring new knowledge that characterizes the facet of *openness to culture* included in this domain (Von Stumm et al., 2011). By contrast, the data obtained show that openness to different values, styles, and ways of life seems to lead the subject's attention in a direction doubly disadvantageous to academic success: it does not increase *engagement*, and it is a detriment to *academic achievement*. Undoubtedly, the presence in the same domain of characteristics with such disparate performance in their relationship with academic success hinders the replication of research results and complicates the advancement of knowledge in this field.

The decrease in the association between *openness* and *academic achievement* found at higher academic levels (Poropat, 2009; Vedel & Poropat, 2017) could also be explained, at least in part, by the disparate performance of the components included in this personality domain. The disposition toward novelty and experimentation (*openness to experience*) can favor achievement in primary school, where children experience a new environment that is different from the family context they previously knew. However, for adolescents, the school environment is no longer strange, and also adolescence is a time characterized by active searching, exploring, and valuing alternatives until an identity is established (Gaete, 2015). The interest in exploring new styles and ways of life may negatively interfere with *academic achievement* if adolescents dedicate time and effort to that goal at the expense of studying.

Finally, the analysis of the mediating role of *engagement* in the relationship between personality and *academic achievement* was not modulated by sex. It again reflected the disparate pattern of the *openness* facets. The positive effect of *openness to culture*, and that of the two facets of *conscientiousness (perseverance and scrupulousness*) was partially mediated by *engagement*. In contrast, the negative effect of openness to experience on *academic achievement* was direct.

It is unsurprising that students who are more organized, meticulous, persistent, tenacious in executing tasks, and have greater intellectual curiosity achieve better academic results. However, students attain such academic results partly because their personality profile favors an enduring cognitive-affective state of active involvement and well-being that leads them into active school life (Casuso-Holgado et al., 2013). These mediation outcomes support an intrinsic motivation–based explanation for the positive relationship of *Conscientiousness* and the intellect component of the *openness* domain with *academic achievement* (Komarraju et al., 2009).

Therefore, these findings support the importance of promoting *engagement* not only as a relevant academic success criterion in itself, but also as a means to improve *academic achievement*. For this purpose, it would be relevant that teaching practices and/or educational intervention contemplate strategies that facilitate and

promote motivational and social antecedents of *engagement* as self-efficacy, task value, mastery goal orientation and parent's and teacher's support (Phan, 2014; Phan & Ngu, 2014a, 2014b; Reeve & Lee, 2014; Wang & Eccles, 2013). Some of such strategies would include positive feedback and encouragement, emphasis on mastery and self-improvement, opportunities for autonomous learning, setting clear objectives, clarification of the utility and potential future relevance of a subject/matter, developing supportive relationships with students, praising their effort, and providing them with opportunities to interact with each other (Alrashidi et al., 2016; Parpala et al., 2013; Sakurai & Pyhältö, 2018).

In addition, research in personality and clinical science provides evidence that personality traits can be changed through a bottom-up process in which key ingredients are personality states or material manifestations of traits (Bleidorn et al., 2019). Personality is more malleable in childhood and adolescence than adulthood (Roberts & Del Vecchio, 2000). Thus, teachers could cultivate the *perseverance, scrupulousness,* and *openness to culture* traits in the classroom through different educational practices, such as teaching their students self-regulation skills, goal setting, and progress monitoring (Dweck et al., 2014; Farrington et al., 2012; Mammadov et al., 2018). Teaching content such that students can make successful connections to their life experiences and areas of interest (Mammadov et al., 2018) could even attract the attention of students with high *openness to experience*.

In summary, the examination of more specific traits embedded in the basic personality dimensions as well as possible processes involved in the relationship between personality and academic success are strengths of the present study with theoretical and practical implications. The results obtained contribute to increase the understanding of the relationships between personality, academic engagement, and achievement, and may be useful for the design and development of interventions aimed at improving adolescents' academic success. However, certain limitations deserve consideration. First, this study was based on cross-sectional data. Therefore, it would be desirable that future longitudinal studies explore in depth the precise nature of the causal relationships involved. On the other hand, the examination of alternative educational levels to secondary school, the use of an instrument that encompasses a wider range of facets than those included in the BFQ, and the exploration of other sources of information (such as teachers and family members) as opposed to the exclusive use of self-reports would allow obtaining relevant information regarding the generalization of the results obtained.

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