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From traits to grades: How cognitive engagement links personality to academic success among high and low achievers at university

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ABSTRACT

Although previous research has investigated personality traits, cognitive engagement, and academic achievement, few studies have examined these factors among high- and low-achieving students, particularly within specific cultural contexts such as Bangladesh. Considering this gap, the present study inspected these relationships among 306 Bangladeshi university students using the Big Five Personality Inventory and the Motivation and Strategy Use Survey. Using correlation and mediation analyses, the findings revealed that openness, conscientiousness, extraversion, and agreeableness were positively related to academic achievement, whereas neuroticism showed no significant association. Cognitive engagement also demonstrated a significant positive correlation with academic achievement and significantly mediated the relationship between personality traits and academic achievement, except for neuroticism. Furthermore, high achievers scored significantly higher than low achievers in openness, conscientiousness, extraversion, agreeableness, and cognitive engagement. Overall, the results point to the importance of providing students with the necessary support to boost their cognitive engagement and, consequently, improve their academic achievement.

Keywords: personality, cognitive engagement, academic achievement, university high achievers, university low achievers

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1 INTRODUCTION

Academic achievement has always been one of the most widely studied issues in education, and recently it has drawn significant attention from educational institutions as they set goals to enhance educational quality and strengthen students' potential (Bond et al., 2020; Özcan, 2021). Maintaining rigorous standards and ensuring consistent excellence in higher education require the systematic evaluation of students' academic achievement (Kassaw & Demareva, 2023). Since academic achievement reflects the effectiveness of an education system (Abolmaali et al., 2014), researchers and various organisations, such as the Organisation for Economic Co-operation and Development (OECD), have identified that a variety of internal and external factors influence students' progress and achievement, including personality, intelligence, and teacher performance (Fackler & Malmbarg, 2016; Prewett & Whitney, 2021). These factors are mostly classified into motivational, cognitive, and non-cognitive components (Abolmaali et al., 2014). Strong academic performance not only contributes to a student's intellectual growth but also promotes self-esteem, supports mental well-being, reinforces interpersonal skills, and helps them develop a vision for their future (Wu, 2019).

On the other hand, poor academic outcomes are often linked to various psychological distresses, such as substance misuse, criminal activities, and relationship problems (Manganelli et al., 2019). Consequently, scholars have emphasised the need to investigate the factors that distinguish high-achieving students from their lower-performing peers from various perspectives (Chakrabarty & Saha, 2014). Particularly, it is crucial to understand whether personality traits and cognitive engagement, relatively understudied compared to behavioural or emotional engagement, contribute to differences in achievement. Building on this, the present study explored how personality traits and cognitive engagement interact with academic achievement among high- and low-performing students in Bangladesh.

It has previously been documented that students' academic success is not solely shaped by intelligence or effort but is also significantly influenced by their personality traits (Chen & Lai, 2015). Personality refers to an individual's stable characteristics and their ways of thinking, feeling and behaving (Cervone & Pervin, 2022), which emerge from emotional, motivational, and social behaviours that determine individual differences (Costa & McCrae, 2014). Among the numerous theoretical models in psychology, the Five-Factor Model of Personality (FFMP) is widely regarded as the most comprehensive and empirically validated framework for understanding and representing the overall structure of personality (Block, 2010; Keller & Karau, 2013). It reliably assesses personality according to five dimensions: openness, conscientiousness, extraversion, agreeableness, and neuroticism (McCrae & Costa, 1997; Goldberg, 1981). The first FFMP dimension, openness, refers to flexibility, innovativeness, open-mindedness, curiosity, and aesthetic appreciation (McCrae & Costa, 1996; Zimmerman, 2008). The second, conscientiousness, reflects competence, self-discipline, devotion, and achievement orientation (John & Srivastava, 1999). Extraversion is indicated by warmth, assertiveness, sociability, high activity levels, positive emotions, and a tendency to seek excitement (McCrae & Costa, 1997), while agreeableness describes interpersonal traits including trust, honesty, humanity, compliance, humility, and a considerate disposition towards others (John & Naumann, 2007). The final dimension, neuroticism, is characterised by a high level of anxiety, hostility, depression, embarrassment, stress, and impulsive behaviour (McCrae & Costa, 1997).

Empirical evidence has shown that academic achievement at the school (Borghans et al., 2016; Vedel & Poropat, 2017), college (Lei et al., 2011), and university levels (McAbee & Oswald, 2013) is significantly predicted by the FFMP personality traits. For instance, openness to experience has been reported to be positively associated with academic performance among foundation (Seman & Ismail, 2019) and university students (Hayat et al., 2020). Conscientiousness proved to be the strongest predictor of academic success, showing consistent impacts across primary to tertiary education (Meyer et al., 2019; Vedel et al., 2015) and exerting both direct and indirect influences on academic performance via self-efficacy among medical students (Hayat et al., 2020). While openness and conscientiousness consistently show positive associations with academic success, the findings on extraversion are mixed. On the one hand, extraversion has been found to have little or even a negative link to performance, i.e., CGPA (Lechner et al., 2017; Seman & Ismail, 2019). On the other hand, it has been identified as a significant and the strongest predictor of academic performance in collaborative learning environments, such as flipped classrooms (Durak, 2023). Agreeableness has also demonstrated mixed results, sometimes being positively associated with academic achievement (Hayat et al., 2020; Lechner et al., 2017) and at other times showing no significant relationship (Rosander et al., 2011). Neuroticism, by contrast, is consistently linked to poorer academic and non-academic outcomes (Abolmaali et al., 2014; Osamika et al., 2021).

Conceptualised as comprising three dimensions, i.e., behavioural, emotional, and cognitive (Fredricks et al., 2004), academic engagement refers to the degree of attention, interest, effort, and persistence that students exhibit in their learning activities. Research indicates that each dimension individually demonstrates a predictive role in academic performance (Adva, 2016; Fredricks et al., 2004). Of these dimensions, cognitive engagement stands out for its depth and complexity, as it involves students' psychological investment in learning through effortful thinking, problem-solving, and the application of metacognitive strategies (D'Mello et al., 2017; Fredricks et al., 2004). It not only enhances independent thinking ability (Hudson & Fraley, 2015) but also integrates diverse learning processes to foster deeper understanding (Hu & Li, 2017). However, as it operates internally within students' mental processes, it is often described as a covert aspect of learning (Casimiro, 2016). It remains under-researched due to the inherent difficulty of measuring and observing it directly (Barlow et al., 2020). Therefore, it is imperative to study the impact of cognitive engagement on academic achievement independently, rather than as part of a combined analysis of overall academic engagement.

Nonetheless, an increasing amount of evidence supports the significance of cognitive engagement, as it has been linked to effective academic adjustment (van Rooij et al., 2018), proactive help-seeking tendencies (Leenknecht et al., 2019), and improved academic performance (Glapaththi et al., 2019; Khan et al., 2023). In secondary school contexts, higher levels of cognitive engagement are correlated with greater achievement (Pietarinen et al., 2014). Likewise, studies in tertiary education have demonstrated the consistently positive role of cognitive engagement, even in programmes that are not directly aligned with students' main areas of interest (Sukor et al., 2021). Greene and Miller (1996) described cognitive engagement as learners' mental effort and strategic investment in learning through self-regulation and the application of cognitive strategies, including higher-order (deep) and mechanical (shallow) approaches to rote memorisation. Self-regulated learning, in particular, is widely recognised as one of the strongest predictors of academic success (Akbay & Akbay, 2016; Zimmerman & Kitsantas, 2014) and has been found to explain nearly 26% of the variance in academic achievement among Pakistani university students (Malik & Parveen, 2019). In terms of deep strategies, Divjak and Rupel (2022) reported that high-achieving students

often use more advanced learning strategies, such as elaboration, time management, and metacognition. Academic engagement has also been established as a mediating mechanism in the relationship between various psychological variables and academic performance. For example, García-Martínez et al. (2021) revealed that engagement mediates the link between life satisfaction and academic performance. Likewise, Abolmaali et al. (2014) showed that personality traits, including openness and conscientiousness, indirectly influence academic outcomes by affecting engagement. All these findings thus emphasise their practical significance for the present study.

This study is grounded in self-determination theory (Deci & Ryan, 1985). According to this theory, an individual's personality traits and motivations stem from inherent psychological needs and an innate drive for growth, both of which underpin lifelong development and success (Ryan et al., 2008). Consistent with this viewpoint, academic success is closely related to the satisfaction of basic psychological needs, namely autonomy, competence, and relatedness (Welles, 2010). Moreover, Deci and Ryan (1985) explain that the need for relatedness accounts for the internalisation of external goals as personal objectives. When students are deeply engaged in their studies, they are intrinsically motivated to learn and devoted to understanding the learning material (Hanus & Fox, 2015). In essence, satisfying these needs encourages students to become more dedicated and strive for higher levels of achievement. Given that university study demands considerable autonomy, meeting these needs can further motivate students to perform better.

Although numerous studies have examined the effects of personality traits and academic engagement on academic achievement globally, research in the Bangladeshi higher education context remains insufficient. Bangladesh's socio-cultural and educational environment, for instance, resource constraints, large class sizes, and competitive pressures, may provide new evidence on how personality traits and cognitive engagement relate to academic success. While academic engagement has received remarkable attention, the specific role of cognitive engagement, including its potential mediating effect on achievement, has been less explored. Most research also focuses on overall academic achievement, with limited attention to differences between high- and low-achieving students. To address these gaps, this study investigates the combined relationships among personality, cognitive engagement, and academic achievement among Bangladeshi university students. It provides insights into why some students thrive while others struggle, and offers guidance to policymakers, educators, institutions, and students on how to support learning and academic achievement better. In light of this, the present study pursued three objectives: (1) to investigate the associations among the dimensions of personality traits (i.e., openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism), cognitive engagement, and academic achievement; (2) to compare the high and low achievers in terms of their personality traits and cognitive engagement; and (3) to examine the potential mediating role of cognitive engagement on the relationship between personality traits and academic achievement.

2 METHODS

2.1 Design and Participants

This quantitative study employed a cross-sectional, correlational survey design to investigate the relationships among personality traits, cognitive engagement, and academic achievement. The

general rule for calculating the minimum sample size for factor treatment in a survey is to have at least five observations per item (5:1) (Hair et al., 2014). A total of 306 undergraduate students, out of 455, from a Bangladeshi public university were recruited using the purposive sampling technique. Participants met the following inclusion criteria: enrolment in the third or fourth year of study, age between 20 and 27 years, and classification as having either a high academic result (GPA 3.50-4.00) or a low academic result (GPA 2.95 or below) according to the university's grading criteria. Students who were not enrolled in the third or fourth year of study or who had a GPA between 2.95 and 3.50 were excluded from the study. Table 1 presents the demographic profile of the participants of the present study.

Table 1. Demographic profile of the participants.

Categorical Variables	*f*	Percentage
Gender		
Male	168	54.9%
Female	138	45.1%
Age		
21	12	3.9%
22	84	27.5%
23	120	39.2%
24	72	23.5%
25	14	4.6%
26	3	1%
27	1	0.3%
Grade Point Average		
High Achievers = 3.50 to 4.00	153	50%
Low Achievers = 2.95 or below	153	50%
Program		
Psychology	78	25.50%
Geography and environmental science	17	5.60%
Accounting and Information Systems	14	4.60%
Chemistry	38	12.40%
Mathematics	55	18.00%
Botany	23	7.50%
Philosophy	20	6.50%
Zoology	12	3.90%
Computer Science and Engineering	6	2.00%
Physics	8	2.60%
English	18	5.90%
Biochemistry	10	3.30%
Bangla (Bengali Language)	7	2.30%
Academic Year		
Third year	123	40.2%
Fourth year	183	59.8%

2.2 Instruments

Participants responded to a paper-based questionnaire with three sections: the first included demographic items on age, gender, academic programme, academic year, and number of semesters. This section also collected participants' previous-semester GPA, which served as an indicator of academic achievement and thus became the dependent or outcome variable in this study.

The second section assessed participants' personality traits using the Big Five Personality Inventory (BFPI) developed by John and Srivastava (1999). The inventory measures five dimensions: Openness to Experience (10 items), Conscientiousness (9 items), Extraversion (8 items), Agreeableness (9 items), and Neuroticism (8 items). Responses were recorded on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with 16 items reverse-scored according to the scale's instructions. Subscale scores were computed separately based on their total scores. The Cronbach's alpha for each dimension in this study was adequate, i.e., Openness (α = .72), Conscientiousness (α = .79), Extraversion (α = .86), Agreeableness (α = .70), and Neuroticism (α = .85) (see Table 2).

In the third section, cognitive engagement was measured using the Motivation and Strategy Use Survey by Greene and Miller (1996), originally developed in 1993. This scale consists of 41 items representing three dimensions: self-regulated learning (17 items), deep strategy use (11 items), and shallow processing (13 items). Items were rated on a five-point Likert scale from 1 (Never True) to 5 (Very Often True). Negative items were reverse scored as appropriate. In this study, the Cronbach's alpha for the overall scores as well as for three dimensions ranges from .63 to .89 (see Table 2).

2.3 Procedure

Data collection began following ethical approval from the relevant institutional authorities. Participants were selected according to the inclusion criteria, and data were obtained in person using questionnaires. They were informed of the study's purpose, procedures, and confidentiality protocol before providing written informed consent. Brief instructions were given on completing the forms, which took approximately 25-30 minutes. Participants were thanked upon completion.

3 RESULTS

Data were analysed using IBM SPSS version 26.0. Descriptive statistics summarised demographic information, and assumptions assessed normality, linearity, outliers, and multicollinearity. Pearson's correlation analyses and independent-samples t-tests were performed to examine relationships among variables and to compare personality traits, cognitive engagement, and academic achievement across achiever groups. Finally, mediation analyses were conducted using Model 4 of the PROCESS macro (Hayes, 2022) to test the effects of personality traits on academic achievement through cognitive engagement.

Descriptive statistics and the intercorrelations of the variables are summarised in Table 2. Among the five personality dimensions, openness had the highest mean score (M = 36.32, SD = 5.57), whereas neuroticism had the lowest (M = 24.39, SD = 7.20). The mean scores for overall cognitive engagement and academic achievement were 125.62 (SD = 20.99) and 3.07 (SD = .70), respectively.

3.1 Relationships between Personality Traits, Cognitive Engagement, and Academic Achievement

Correlational analyses, presented in Table 2, revealed that academic achievement was positively and significantly associated with openness (r = .18, p < .01), conscientiousness (r = .53, p < .01), extraversion (r = .30, p < .01), and agreeableness (r = .37, p < .01). These results suggest that students who are more open, conscientious, extraverted, and agreeable tend to achieve higher academic results. In contrast, neuroticism showed a negative, non-significant relationship with academic achievement (r = -.01, p = .89*)*. With regard to the overall cognitive engagement scores, the result showed that it is also positively and significantly related with academic achievement (r = .52, p < .01), indicating that students who are more cognitively engaged tend to perform better academically.

3.2 Differences in Personality Traits and Cognitive Engagement between High- and Low-Achieving Students

Table 3 describes the differences in personality traits and overall cognitive engagement between high- and low-achieving students. Significant differences were observed in openness (t = -4.36, df = 304, p < .001), conscientiousness (t = -12.15, df = 304, p < .001), extraversion (t = -6.14, df = 304, p < .001), and agreeableness (t = -7.65, df = 304, p < .001), with high achievers scoring consistently higher than low achievers on these traits. Although neuroticism did not follow the same pattern, high achievers had higher mean scores across all personality dimensions. These results imply that students who are open, conscientious, extraverted, and agreeable are more likely to demonstrate high academic performance.

Regarding cognitive engagement, a significant difference was found between high and low achievers (t = -12.64, df = 304, p < .001). High achievers reported a higher mean score (M = 137.92, SD = 17.64) than low achievers (M = 113.32, SD = 16.38). These findings suggest that students who exhibit higher levels of cognitive engagement are more committed to their studies and are more likely to attain higher academic outcomes.

Table 2. Descriptive statistics and intercorrelations among the variables.

Variable		Cronbach's α	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
Personality														
1	Openness	.72	36.32	5.57	-	.14*	.23**	.15*	-.08	.26**	.22**	.29**	.16**	.18**
2	Conscientiousness	.79	31.80	6.33		-	.35**	.47**	-.24**	.47**	.41**	.35**	.43**	.53**
3	Extraversion	.86	26.35	6.86			-	.25**	-.23**	.27**	.25**	.24**	.19**	.30**
4	Agreeableness	.70	34.19	5.28				-	-.26**	.24**	.18**	.23**	.19**	.37**
5	Neuroticism	.85	24.39	7.20					-	-.07	-.09	-.04	-.04	-.01
Cognitive engagement														
6	Overall	.89	125.62	20.99						-	.79**	.86**	.87**	.52**
7	Self-regulated learning	.63	51.54	8.08							-	.51**	.48**	.33**
8	Deep strategy	.84	34.54	8.01								-	.67**	.49**
9	Shallow processing	.83	39.54	8.97									-	.48**
Academic achievement														
10.	GPA	-	3.07	.70										-

Note. **Correlation is significant at the .01 level (2-tailed).

Table 3. Differences in the dimensions of personality traits and cognitive engagement between high and low achievers.

Variables	High Achievers (n = 153)		Low Achievers (n = 153)		t	df	p
	M_1	SD_1	M_2	SD_2			
1. Openness	37.67	5.05	34.98	5.74	-4.36	304	.00
2. Conscientiousness	35.41	5.02	28.19	5.38	-12.15	304	.00
3. Extraversion	28.62	6.43	24.07	6.52	-6.14	304	.00
4. Agreeableness	36.30	4.94	32.07	4.74	-7.65	304	.00
5. Neuroticism	24.41	7.75	24.37	6.64	-.05	304	.96
6. Cognitive engagement	137.92	17.64	113.32	16.38	-12.64	304	.00

Note. M_1, M_2 = Mean; SD_1, SD_2 = Standard deviation.

3.3 Mediating Effect of Cognitive Engagement on Personality Traits and Academic Achievement

A series of mediation analyses was conducted, with overall cognitive engagement scores as the mediator, as presented in Table 4. In the first mediation analysis, it was found that, although openness did not significantly predict (B = .007, SE = .007, β = .051, p < .322) academic achievement, cognitive engagement significantly and positively predicted (B = .017, SE = .002, β = .505, p < .001) academic achievement. Openness was also significantly associated with cognitive engagement (B = .986, SE = .209, β = .262, p < .001). The indirect effect of openness on academic achievement through cognitive engagement was significant (B = .017, 95% CI [.010, .024]), demonstrating that openness influences academic achievement via cognitive engagement. Further, both conscientiousness (B = .041, SE = .006, β = .369, p < .001) and cognitive engagement (B = .012, SE = .002, β = .345, p < .001) significantly predicted academic achievement. Conscientiousness was also positively related to cognitive engagement (B = 1.561, SE = .168, β = .471, p < .001). The indirect effect was significant (B = .018, 95% CI [.013, .024]), suggesting that cognitive engagement mediated the association between conscientiousness and academic achievement.

Table 4. Mediating effects of cognitive engagement on the relationship between personality traits (openness, conscientiousness, extraversion, agreeableness, neuroticism) and academic achievement.

Relationship	Total Effect	Direct Effect	Indirect Effect	Bootstrap 95% CI		Conclusion
				Lower Bound	Upper Bound	
Openness > Cognitive engagement >Academic achievement	.023 (.001)	.007 (.322)	.017	.010	.024	Significant mediation effect
Conscientiousness > Cognitive engagement >Academic achievement	.059 (.001)	.041 (.001)	.018	.013	.024	Significant mediation effect
Extraversion > Cognitive engagement >Academic achievement	.031 (.001)	.018 (.001)	.013	.008	.018	Significant mediation effect
Agreeableness > Cognitive engagement >Academic achievement	.048 (.001)	.034 (.001)	.014	.008	.021	Significant mediation effect
Neuroticism > Cognitive engagement >Academic achievement	-.001 (.893)	.003 (.606)	-.003	-.009	.003	No significant mediation effect

Note. Values in parentheses indicate *p*-values, and those less than .05 were considered statistically significant.

Correspondingly, extraversion predicted academic achievement both directly ($B = .018$, $SE = .005$, $\beta = .175$, $p < .001$) and indirectly through cognitive engagement ($B = .013$, 95% CI [.008, .018]). The trait was also positively related to cognitive engagement ($B = .829$, $SE = .169$, $\beta = .271$, $p < .001$). A similar pattern was observed for agreeableness, which significantly predicted academic achievement ($B = .034$, $SE = .007$, $\beta = .258$, $p < .001$), was positively related to cognitive

engagement (B = .940, SE = .222, β = .236, p < .001), and showed a significant indirect effect (B = .014, 95% CI [.008, .021]). Finally, neuroticism did not significantly predict academic achievement (B = .003, SE = .005, β = .026, p = .606) and showed no significant association with cognitive engagement (B = -.186, SE = .167, β = -.064, p = .266). The indirect effect (B = –.003, 95% CI [–.009, .003]) was non-significant, indicating that cognitive engagement did not mediate the relationship between neuroticism and academic achievement. In summary, cognitive engagement mediated the effects of openness, conscientiousness, extraversion, and agreeableness on academic achievement, whereas no such effect was found for neuroticism.

4 DISCUSSION

The findings revealed that, among personality traits, openness, conscientiousness, extraversion, and agreeableness were positively associated with academic achievement. In contrast, neuroticism was negatively associated, indicating that openness, conscientiousness, extraversion, and agreeableness are significant influences on academic achievement. These results are consistent with prior research by Vedel et al. (2015) and Meyer et al. (2019), who also reported that these personality traits and academic achievement were positively correlated, but neuroticism showed an inverse relationship. Moreover, in line with this study, Seman and Ismail (2019) observed that students' traits of agreeableness, conscientiousness, and openness were associated with higher academic achievement. The outcomes suggest that personality characteristics substantially impact students' learning outcomes and overall academic achievement.

Additionally, the study found a significant correlation between overall cognitive engagement and academic achievement, demonstrating that students who are more cognitively engaged tend to perform better academically. This result aligns with previous findings by Glapaththi et al. (2019), who established a strong positive relationship between cognitive engagement and students' academic achievement. The consistency between the current findings and Glapaththi et al. (2019) suggests that cognitive engagement is a key predictor of academic performance and may play a crucial role in fostering academic success. This consistency may reflect the influence of comparable cultural factors; for instance, in collectivist cultures, academic motivation is often determined by familial and societal expectations. Methodological similarities, including the use of self-report assessments, undergraduate samples, and analogous measures of academic achievement, may also account for similar findings.

The results also identified significant differences between high and low achievers in personality traits such as openness to experience, conscientiousness, extraversion, and agreeableness, except for neuroticism, in which high achievers reported higher scores. These outcomes support the work of Hayat et al. (2020) and Abolmaali et al. (2014), who noted that conscientiousness, extraversion, and agreeableness are positive predictors of academic performance. Based on Self-Determination Theory (Deci & Ryan, 1985), personality traits may facilitate the satisfaction of basic psychological needs- namely, autonomy, competence, and relatedness- which, in turn, enhance intrinsic motivation and academic success. To illustrate, openness reflects autonomy by promoting curiosity and exploration; conscientiousness corresponds with competence through goal-oriented

behaviours and self-discipline; and extraversion and agreeableness strengthen relatedness by fostering positive social interactions and supportive relationships. These may explain why high achievers showed greater openness, conscientiousness, extraversion, and agreeableness, contributing to their academic success. Additionally, stress and anxiety related to academic demands are common among both high and low achievers, which may account for neuroticism not being observed as a distinguishing factor between the two groups.

Another significant finding of this study was that high achievers showed greater cognitive engagement than low achievers. These results indicate that students with greater cognitive engagement are more likely to be devoted to their studies and tend to achieve higher academic success. Similarly, prior studies have highlighted that high-achieving students frequently employ more advanced learning approaches, including elaboration, effective time management, and metacognitive techniques (Divjak & Rupel, 2022). These strategies enable students to engage more deeply with the material, ultimately enhancing their academic achievement. This underscores the indispensable role of metacognitive awareness, as students who actively monitor and adjust their learning approaches absorb knowledge more efficiently. Therefore, academic achievement relies not only on cognitive skills but also on motivation, self-regulation, and thoughtful engagement.

Furthermore, the results illustrated that cognitive engagement served as a mediating factor in the association between personality traits-namely, openness, conscientiousness, extraversion, and agreeableness- and academic achievement, except for neuroticism. These findings address the study's hypotheses and align with prior work by Abolmaali et al. (2014), who also reported indirect effects of personality on academic performance via engagement. This can be explained by the fact that personality influences achievement not only directly but also indirectly through its impact on how actively and thoughtfully students engage with their academic tasks. In essence, these traits promote academic success by supporting the internalisation of motivation, which is crucial for sustained engagement and achievement.

This study contributes to the growing body of evidence on the psychological contributors to academic achievement in non-Western educational contexts, focusing on Bangladesh. It empirically demonstrates the vital role of personality traits and cognitive engagement in determining students' academic achievement, thereby enriching the literature in educational and cognitive psychology from a culturally relevant perspective. The findings also provide students with a meaningful understanding, emphasising how individual differences in personality and engagement can affect academic outcomes and potentially motivate them to adopt more effective, self-regulated learning strategies. Finally, from the practical standpoint, this study suggests that interventions aimed at enhancing cognitive engagement, particularly for low-achieving students, may boost academic performance by fostering more strategic, goal-oriented, and engaged learning behaviours.

It is also necessary to acknowledge the limitations of this study. First, participants were recruited exclusively from a single public university in Bangladesh, introducing sampling bias and limiting the sample's diversity. Accordingly, the generalisability of the findings to other academic

institutions and cultural contexts is limited. Second, the study employed a quantitative research approach, which focused on a narrow range of information from respondents and did not capture the depth of their experiences. Third, as a cross-sectional study design was employed, data were collected at a single time point, which restricted the ability to examine changes or causal relationships over time. Using longitudinal study designs in future research could provide a more detailed understanding of how personality traits and cognitive engagement influence academic achievement across time. Hence, further research should include several types of academic institutions; for instance, selecting participants from private universities and colleges may improve the generalisability of the results. Furthermore, employing a qualitative or mixed-methods approach could offer deeper insight into the mechanisms underlying the relationships among personality, engagement, and academic achievement.

In conclusion, this study highlights the crucial role of personality and cognitive engagement in enhancing academic achievement among university students. Despite certain limitations, it provides stronger empirical evidence for educators and policymakers on how these factors interact to influence the academic performance of both high- and low-achieving students. The findings advance theoretical models by emphasising the dynamic interplay between relatively stable traits and cognitive engagement as a motivational process. These results also underscore the need for targeted interventions to reinforce cognitive engagement, improve academic outcomes, and minimise achievement disparities between high and low achievers. Future research should address existing limitations and examine additional psychological and contextual factors, including cultural, institutional, and socioeconomic factors, to better understand their impact on student engagement and achievement.

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AUTHOR CONTRIBUTIONS

The first and second authors conceived and designed the study. The first author was responsible for data collection, and data analysis was guided mainly by the third author. All authors contributed to the interpretation of results and writing of the manuscript. All authors reviewed and approved the final version of the manuscript.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

ETHICAL STATEMENT

The Jagannath University Research Ethics Committee approved this study (reference number: 20/2023/JnU ERC). All participants provided informed consent prior to participation.

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