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UNDERSTANDING METACOGNITIVE SKILLS THROUGH SELF-EFFICACY AND PERSONALITY TRAITS AMONG COLLEGE STUDENTS

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Abstract

Effective learning and academic self-regulation are largely dependent on metacognitive skills, but there are significant differences in students' abilities to control cognitive processes. This difference may be explained by motivational beliefs and personality traits. The study adopted a quantitative cross-sectional design and involved 360 college students from both public and private institutions. Standardized self-report measures were used to test the academic self-efficacy, Big Five personality traits, and metacognitive skills. Correlation and multiple regression analyses were performed to analyze the data. The metacognitive skills were greatly and positively predicted by academic self-efficacy. Extraversion and openness to experience were positively related to metacognitive skills, whereas neuroticism was negatively related to them. There was no significant predictor of conscientiousness and agreeableness. The personality traits and the metacognitive skills were partially mediated by self-efficacy.

The results not only revealed a connection between motivational and dispositional factors but also showed that these factors play a joint role in metacognitive development and support interventions that increase self-efficacy to facilitate self-regulated learning.

Keywords: *Metacognitive skills; Academic self-efficacy; Personality traits; Big Five personality model; College students; Self-regulated learning*

Introduction

The issue in higher education is that successful learning is increasingly dependent on the student's ability to actively control their own cognitive process rather than merely accumulate knowledge of the subject. The concept of metacognition, as the understanding and control over thinking, allows learners to plan an educational process, track their comprehension, and assess their results, thus facilitating academic performance and lifelong learning (Efklides, 2019; Panadero et al., 2022). Students with a high level of metacognitive skills are more involved in learning activities, do not give up, and get higher grades (Kleka, 2024).

Although the process of metacognitive development is important, it is not automatic. Students can have a problem in applying effective learning strategies or reflecting on the way their cognitive processes work and this may restrict academic performance. This is because previous studies have indicated that motivational and dispositional factors, as opposed to instructional exposure can shape metacognition (Dignath and Veenman, 2021). Self-efficacy and personality traits have been found to be the most potent of these factors.

Self-efficacy is people’s perceptions of how they can arrange and implement actions necessary to achieve desired academic outcomes (Bandura, 1997). Students with high self-efficacy tend to continue engaging in demanding tasks, apply adaptive learning strategies, and control their cognition accordingly (Zimmerman, 2013). Recent empirical data prove that self-efficacy is a good predictor of metacognitive awareness and self-regulated learning in an educational setting (Al-Harthy et al., 2019; Kleka, 2024).

In addition to motivational beliefs, personality traits influence students' approach to learning activities, emotional regulation, and cognitive involvement. Studies based on the Big Five personality framework have shown that openness to experience and extraversion are associated with reflective thinking and cognitive flexibility, and neuroticism is related to anxiety and poor self-regulation (Zhang et al., 2020; Soto et al., 2021; Ramírez-Arellano et al., 2024). Nonetheless, empirical studies exploring the synergistic effect of self-efficacy and personality traits on metacognitive abilities are scarce, especially in growing educational

settings. To fill this gap, the current study examines the roles of self-efficacy and Big Five personality traits in predicting metacognitive skills among college students.

Literature Review

The skills of metacognition entail learners' ability to plan, monitor, and assess their own cognition as they learn. Skills are core to self-regulated learning and academic achievement, especially in higher education, where learner autonomy is required (Efklides, 2019; Panadero et al., 2022). Nevertheless, there is a significant difference among students in their metacognitive strategies, suggesting the influence of psychological factors.

Self-efficacy is one of the most powerful motivational beliefs that is linked to metacognitive engagement. Socially, students who believe in a high self-efficacy are more inclined to approach learning activities with confidence, continue to work in cases of difficulty, and use adaptive strategies (Bandura, 1997; Zimmerman, 2013). These actions are very much consistent with metacognitive regulation, such as strategic planning and reflective evaluation.

Recent studies provide strong empirical evidence of this relationship. Research indicates that metacognitive awareness, strategic learning behaviors, and academic persistence are positively correlated with self-efficacy (Al-Harthy et al., 2019; Kleka, 2024). Resting on this evidence, the hypothesis is as follows:

H1: There is a positive and significant impact of self-efficacy on the metacognitive skills of college students.

Personality characteristics are comparatively consistent ways of thinking, feeling, and acting on ideas that determine the interaction of students with the learning activities. This has been a well-received model of personality and the relationship between the five factors and the learning and cognition process (McCrae and Costa, 2008).

The openness to experience is associated with curiosity, intellectual flexibility, and readiness to engage with new ideas, facilitating reflective thinking and metacognitive control (Zhang et al., 2020; Azevedo et al., 2022). Conscientiousness is organization and goal orientation that are theoretically associated with planning and monitoring learning activities. Extraversion can also help promote metacognitive involvement through active involvement and cognitive elaboration in social learning situations (Ramiz et al., 2024).

Conversely, neuroticism is correlated with emotional instability and anxiety, which could affect the attention process and hamper the efficient regulation of cognition (Soto et al., 2021). Agreeableness in metacognition is less clear, as current research shows mixed effects across educational settings (Dasigan et al., 2024). Based on this literature, the following hypotheses are developed:

H2: Personality characteristic influences metacognitive skills in a positive and significant way.

Adaptive learning and performance have metacognitive skills, which are the ability of people to plan, monitor, and regulate their cognitive functions. Even though metacognition has long been understood as a skill that can be trained and developed over the course of experience, an emerging body of literature indicates that people differ in their metacognitive inclinations. In this light, personality traits are a significant dispositional basis that can affect how people approach cognitive monitoring and control.

This dispositional view is supported by recent empirical studies. Research findings in educational and professional settings suggest that personality features are strongly connected to metacognitive awareness and regulation, whereas adaptive traits are positively correlated with them, whereas maladaptive traits show mixed associations or negative relations (e.g., Khaliq, 2025). Such results indicate that people take their consistent cognitive orientations to work, which shape how they manage their thoughts over time. Notably, the research has gone beyond student samples, suggesting that the links between personality and metacognition are applicable to continued learning and performance in adult and organizational contexts.

Moreover, theory and fairly new evidence indicate that personality traits are significant factors influencing metacognitive abilities. Personality traits should positively and significantly impact metacognitive functioning by providing a dispositional basis for cognitive regulation. Based on that, the hypothesis is as

follows:
H3: Personality Traits positively and significantly influence metacognitive skills.
The interaction of motivational beliefs and long-lasting personal traits determines the learning outcomes. The Social Cognitive Theory focuses on the fact that a combination of beliefs, traits, and behaviors affects academic functioning (Bandura, 1986). Although personality traits can reflect students' predisposition to certain learning tendencies, self-efficacy establishes the confidence level and perseverance in applying metacognitive strategies.
Although self-efficacy and personality traits have been discussed separately, recent studies indicate that their combination is crucial to self-controlled learning and metacognitive development (Panadero et al., 2022; Ramírez-Arellano et al., 2024). In order to fill this gap, the hypothesis is as follows:
H4: Self-efficacy mediates the relationship between Personality Traits and Metacognitive skills of college students.

Methodology

Instrumentation

The Metacognitive Awareness Inventory (MAI) (Schraw and Dennison, 1994) was used to measure metacognitive skills, knowledge, and control of cognition. The MAI has been extensively tested in the field of higher education and has shown good internal consistency in the current research (=.924).
A scale based on the Social Cognitive Theory (Bandura, 1997) was used to measure academic self-efficacy by assessing students' confidence in handling academic activities and demands. This study demonstrated that the scale was highly reliable (=.902), as in previous studies (Al-Harthy et al., 2019).
A personality inventory was used to measure personality traits in terms of openness, conscientiousness, extraversion, agreeableness, and neuroticism, and this measure was provided as the Five-Factor Model (McCrae and Costa, 2008). The tool showed a good internal consistency (α =.736), which is consistent with the previous results (Soto et al., 2021).

Results

Table 1. Measurement and Structural Model Assessment

Construct	Cronbach's Alpha	CR)	AVE	HTMT	R^2
Metacognition Skills	0.924	0.966	0.691	0.850	0.710
Personality Traits	0.736	0.957	0.556	0.850	
Self-Efficacy	0.902	0.946	0.659	0.847	0.625

The findings show that the measurement and structural models meet all recommended quality standards. All constructs exhibit good internal consistency, with Cronbach's alpha estimates between 0.736 and 0.924 and composite reliability estimates above 0.70, which is above the recommended range of 0.70. Convergent validity is achieved because the means of the variance extracted (AVE) of all constructs are more than 0.50, which implies that all constructs respond to more than half of the variance in their indicators. There is also support for discriminant validity, with the highest heterotrait-monotrait (HTMT) ratios of 0.847 to 0.850, which are below the conservative 0.90 cutoff, indicating that the constructs are empirically different. Moreover, the structural model had moderate to strong explanatory power (71.5% and 62.50%, respectively). Taken together, these results provide a rather strong indication of the adequacy of the proposed measurement and structural models and their appropriateness for hypothesis testing and theoretical interpretation.

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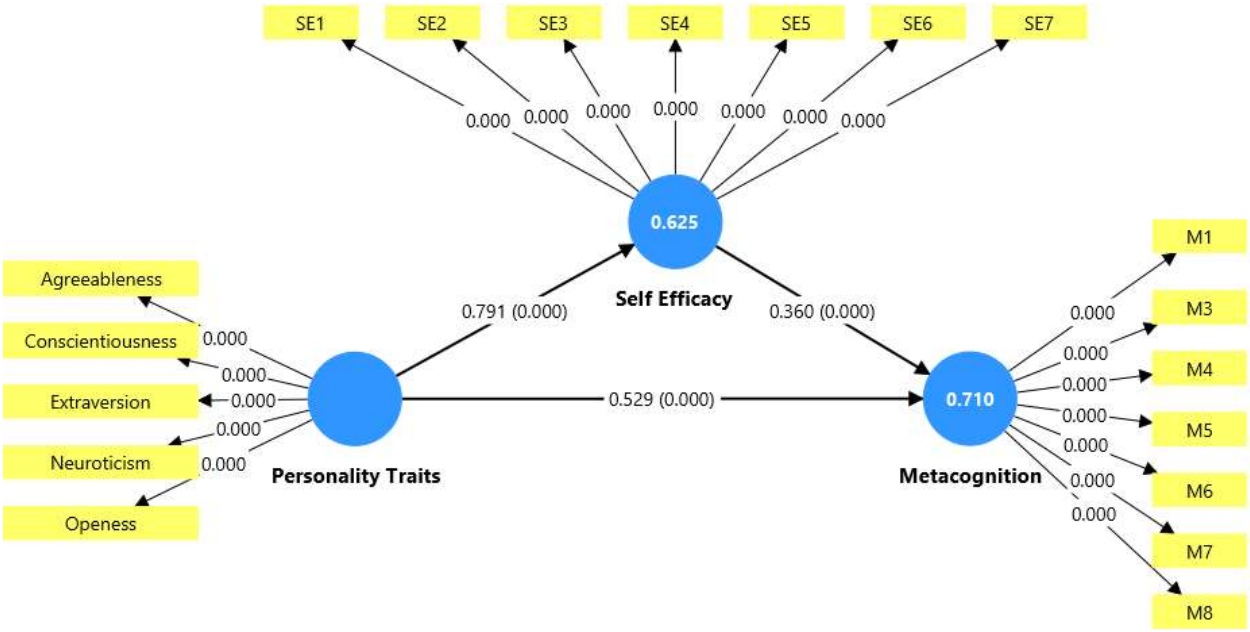

Figure 1. PlS Path Analysis

Table 2. Direct and Indirect Effects with Hypothesis Testing Results

	B	t-value	p-value	95% CI (Lower–Upper)	Conclusion
PT→ MS	0.529	9.86	0.000	[0.419, 0.631]	Accepted
PT→ SE	0.791	37.182	0.000	[0.746, 0.830]	Accepted
SE→ MS	0.360	6.381	0.000	[0.245, 0.468]	Accepted
PT → SE→ MS	0.285	6.09	0.000	[0.184, 0.389]	Accepted

PT: Personality Traits, SE: Self-Efficacy, MS: Metacognition Skills
Significance level: α = 0.05 (two-tailed)

Table 2 presents the structural model's outcomes, including both direct and indirect effects. There exists a positive correlation between personality traits and metacognition (= 0.529, p < .001), which means that dispositional aspects of personality and metacognitive performance of individuals are substantively related to each other. This observation is in line with organizational behavior studies, which show that personality traits that remain stable determine the manner in which individuals are able to control, observe, and contemplate the nature of their cognitive processes in a workplace or learning environment (Sitzmann and Johnson, 2012). Self-efficacy is also closely connected with personality traits (= 0.791, p < .001), which confirms previous results indicating that long-term individual differences are the central source of efficacy belief development (Dasigan et al., 2024).

In turn, self-efficacy demonstrates a positive correlation with metacognition (0.360, p < .001), which is in accordance with studies that locate efficacy beliefs as a transitional factor in self-regulatory procedures and adaptive performance (Vancouver et al., 2014; Halmo et al., 2024). In addition to these direct associations, there is a statistically significant (p < .001) indirect effect of personality factors on metacognition through self-efficacy (.285), with a confidence interval that does not include zero. This trend aligns with the views of mediation-based perspectives of management research that highlight motivational beliefs to be the most important explanatory pathways between distal traits and cognitive and behavioral consequences (Sitzmann and Johnson, 2012).

Notably, the direct correlation between personality traits and metacognition remains important even in the presence of self-efficacy in the model, implying partial mediation. All these results highlighted self-efficacy as a key, yet not the sole, process by which personality traits can be converted into metacognitive products in organizational and educational settings.

Discussion

This paper has explored the correlation between personality traits and metacognition and evaluated the mediating effect of self-efficacy. The results facilitate the proposed model and show that dispositional and motivational factors have a combined effect on metacognitive functioning. The skills of metacognition were found to be positively linked to personality traits, indicating that the concept of metacognitive regulation is not only situational and skill-dependent but also partly rooted in stable individual differences. This observation is in line with the current research finding that persistent personality traits can shape the manner in which people plan, track, and control their mind processes (Sitzmann and Johnson, 2012). Metacognition, therefore, seems to be incorporated in a larger mechanism of dispositions.

Self-efficacy and personality traits were also found to be closely correlated, supporting the view that efficacy beliefs reflect more profound personality organization. Painterly, related to persistence and emotional stability, these traits can strengthen self-efficacy through how people perceive challenges and estimate their abilities (Dasigan et al., 2024). On its part, self-efficacy was positively correlated with metacognition, highlighting that it is a proximal motivational mechanism that supports the control of cognitions. Persons with a higher level of efficacy are believed to plan, continue, and reflect on cognitive strategies more carefully, according to self-regulation frameworks (Vancouver et al., 2014).

The mediation analysis showed the partial mediation. Although self-efficacy played a significant role in explaining the relationship between personality traits and metacognition, the direct effect of personality traits was also significant. This implies a two-way process through which personality affects metacognitive functioning; indirectly through efficacy beliefs and directly through dispositional tendencies.

Limitations and Future Research Directions

There are several constraints to note. To begin with, the cross-sectional design does not allow one to make causal inferences on the relations between personality characteristics, self-efficacy, and metacognitive abilities. Second, self-report measures were also used to gather

data; they are susceptible to common method bias and the social desirability effect. Third, the sample was confined to college students in a narrow institutional setting, and this could limit the extrapolation of the results to other stages of education or even other cultural environments. Lastly, the research focused on overall personality dimensions; no specific trait facets or situational aspects were analyzed.

The longitudinal or experimental designs used in future studies should aim to provide clearer causal relations and to lead to the development of trajectories of metacognitive skills. The inclusion of metacognition measures based on behavior or performance would enhance validity and reduce reliance on self-report data. In other cultures and educational settings, the studies are also encouraged to improve generalization. Also, future research can consider certain aspects of personality or investigate instructional and environmental moderators that affect the relationship between self-efficacy and personality traits and metacognitive development.

Conclusion

This research offers empirical data indicating that metacognitive skills in college students are determined by both dispositional and motivational factors. Personality factors directly affect metacognitive functioning and, indirectly, via academic self-efficacy, so the consideration of both stable individual variation and malleable beliefs regarding the self-regulated learning process is essential. They are relevant to the literature because they significantly explain the combined influence of personality and self-efficacy on metacognitive development and provide practical implications of interventions that will promote effective learning in higher education.

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