



The Paradox of Metacognitive Regulation in Students: The Discrepancy between Self-Assessment and Behavioral Flexibility in the Learning Process

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Abstract

Introduction: *Metacognitive awareness is a critical factor in academic success, yet the relationship between self-perception of these skills and actual behavioral adaptation remains complex. Understanding how students monitor their own learning is essential for modern pedagogy. Aim:* This study examines the psychometric properties and predictive power of metacognitive components (knowledge and regulation) among 150 Bulgarian students (aged 18–56), primarily from humanities backgrounds. The research focuses on the potential discrepancy between how students evaluate their metacognitive abilities and their actual academic performance. **Methodology:** The Metacognitive Awareness Inventory (MAI) was employed to measure two main dimensions: Knowledge of Cognition (including declarative and procedural knowledge) and Regulation of Cognition (including planning and monitoring). Statistical analyses, including correlation and regression, were used to test the research hypotheses. **Results:** The findings reveal a "metacognitive paradox": while students report high levels of metacognitive regulation, this self-assessment shows a disproportionately weak correlation with their actual behavioral flexibility and academic outcomes. The data suggest that students often overestimate their regulatory capacities, particularly in the sub-processes of monitoring and evaluation. **Conclusion:** The study highlights the need for pedagogical interventions that move beyond theoretical awareness, focusing instead on the practical application of metacognitive strategies to bridge the gap between self-perception and effective learning behavior. These insights are vital for developing adaptive teaching methods in higher education.

Keywords: *metacognitive awareness, metacognitive regulation, behavioral flexibility, self-assessment, academic achievement*

1. Introduction

The formation of metacognitive awareness skills is a key competence in modern education. Lifelong learning, both formal and informal, requires the ability to respond quickly, be flexible, and adapt to rapidly changing situations and environmental demands. Conscious learning is a process that requires decision-making skills, consideration of consequences, and learning from outcomes. These are valuable skills with practical significance, especially during higher education. Acquiring both theoretical and practical knowledge would not be possible without conscious awareness in this process. In the era of digital transformation, when artificial intelligence increasingly enters the daily life of every individual, the ability to recognize and exercise control over cognitive processes remains an extremely valuable skill. The topic is timely as it covers at least several dimensions: on one hand, it belongs to the field of cognitive sciences. Here, executive functions such as self-control and decision-making skills, which develop at an early age, can be highlighted. However, metacognitive awareness can also be understood in the context of interpersonal relationships, since higher levels of such awareness imply skills for creating quality relationships as well as the desire to maintain them over time. Metacognitive awareness can also be considered in terms of an individual's locus of control. An external locus of control is associated with lower levels of self-reflection and less effort to change undesirable outcomes. The internal locus of control, on the other hand, requires reflection and introspection, through which successful strategies can be replicated and unsuccessful ones changed. Metacognitive awareness is considered in two dimensions: metacognitive regulation and metacognitive knowledge. Regulation is related to skills of self-monitoring and choosing appropriate strategies for learning or problem-solving. Metacognitive knowledge includes knowledge of one's own cognitive skills as well as understanding the possibilities and characteristics of situations where these skills can be applied.

Literature Review



The concept of metacognition, defined as "thinking about thinking," is a multidimensional construct comprising knowledge and regulation of cognition (Flavell, 1977). This framework is essential for understanding how students monitor their cognitive processes, particularly in the context of self-regulated learning (Pintrich, 2002; Zimmerman, 2002). Metacognitive awareness involves declarative, procedural, and conditional knowledge, alongside regulatory skills such as planning, monitoring, and evaluation (Schraw & Dennison, 1994; Efklides, 2006).

Empirical research consistently links metacognition to academic success across various domains, including argumentative writing (Ramadhanti & Yanda, 2021), problem-solving (García et al., 2016), and general academic standing (Narang & Saini, 2013; Young & Fry, 2008). Studies have also explored its role in specific educational contexts, such as intelligence-performance relations (Veenman et al., 2006), critical thinking (Ku & Ho, 2010), and online learning environments (Akyol & Garrison, 2011). Recent data from diverse settings, including medical education, further confirm that metacognitive awareness is a strong predictor of performance (Xuan Nguyen et al., 2023).

However, a "metacognitive paradox" often emerges—a discrepancy between students' self-reported abilities and their actual behavioral adaptation. While students may possess high declarative knowledge, they frequently struggle with procedural execution and monitoring (Hacker et al., 2009). This gap is particularly evident during academic transitions (Tuononen et al., 2017) and complex learning tasks (Tuononen et al., 2019), where overconfidence in self-assessment does not translate into flexible strategy adjustment.

While a considerable body of work explores metacognition in Western and Asian university settings, there is a distinct lack of empirical data regarding the metacognitive profiles of students in Central and Eastern European (CEE) nations, particularly those in the Humanities. The present research addresses this theoretical and empirical void by providing a detailed psychometric analysis of MAI data among Bulgarian university students, focusing on the self-regulation efficacy gap.

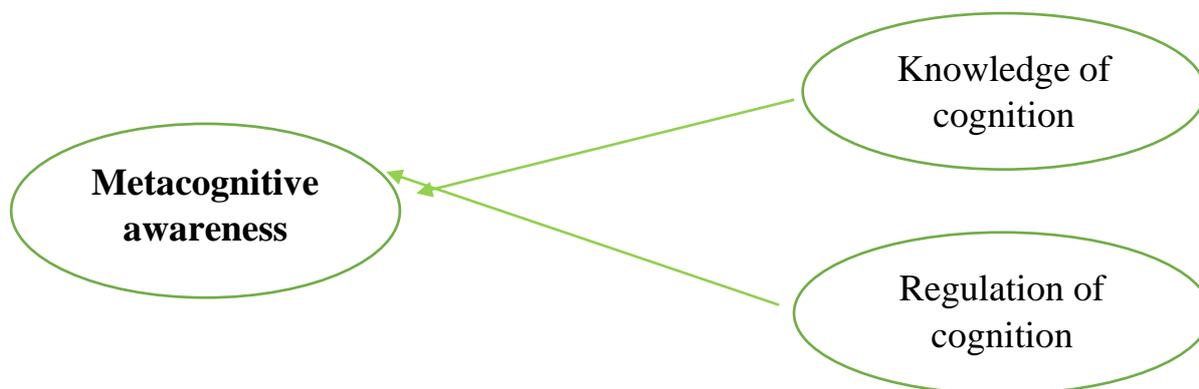


Fig. 1. The framework of the components of metacognitive awareness in the present study

2. Methodology, Materials and Methods

All participants were informed of the study's purpose and guaranteed anonymity and confidentiality. Participation was strictly voluntary, and written informed consent was secured from all individuals before they completed the survey, in compliance with the ethical guidelines of the Serbian Psychological Society for research with human subjects.

The aim and objective of the present study is to assess the levels of metacognitive awareness among Bulgarian students enrolled in undergraduate and graduate programs.

A total of 150 individuals, aged between 18 and 56, participated in the present study. All of them are students in various academic fields. The majority of participants were female (92.7%).

Social and demographic questions

The study included questions regarding gender, age, field of study, and level of education.

For the purpose of the present study, the Metacognitive Awareness Inventory (MAI) by Schraw & Dennison (1994) was used. The inventory consists of 52 statements and employs a dichotomous scale, where respondents select either "yes" or "no" as possible answers. The questionnaire measures metacognitive awareness across two dimensions: 1) Knowledge about Cognition) and 2) Regulation of



Cognition. The first scale consists of three types of cognition: Declarative knowledge (8 items), Procedural knowledge (4 items), and Conditional knowledge (5 items). The second scale consists of subscales such as Planning (7 items), Comprehension Monitoring (7 items), Information Management Strategies (9 items), Debugging Strategies (5 items), and Evaluation (6 items). This instrument is considered sufficiently reliable for investigating the phenomenon of metacognitive awareness. It has been used in numerous studies. Lee (2013) and Mair (2012) examined students' strategy use and understanding through it. In 2013, Amzil & Stine-Morrow studied students' academic achievement as well as their confidence in academic achievement. MAI has also been used to explore how to support students' self-monitoring and problem-solving skills (Lee, Teo, and Bergin, 2009).

The following research questions were formulated:

1. Is there an influence of certain demographic factors on the development of metacognitive awareness skills among the participants?
2. Are there significant differences in the levels of cognitive regulation and cognitive knowledge among the participants?
3. Is there a discrepancy between the different forms of regulation of cognitive processes?

3. Results and Discussion

Preliminary analyses, including the Shapiro-Wilk test for normality and Levene's test for homogeneity of variances, indicated that the assumption of normal distribution was violated in several subscales. Consequently, the data were processed using non-parametric statistics to ensure the robustness of the findings. The Mann-Whitney U test was employed to compare group differences (gender, level of study), and Spearman's rho correlation was utilized to assess the relationships between metacognitive dimensions and self-reported success

Table 1. Presentation of demographic data by gender and individual scales of metacognitive awareness

Test Statistics ^a								
	Declarative_K knowledge	Procedural_K knowledge	Conditional_ Knowledge	Planning	Comprehensi on_Monitorin g	Information_ Management _Strategies	Debugging_S trategies	Evaluation
Mann-Whitney U	748,500	705,000	724,000	667,000	650,000	759,500	754,500	685,500
Wilcoxon W	10478,500	10435,000	10454,000	733,000	716,000	10489,500	820,500	751,500
Z	-,117	-,450	-,307	-,723	-,847	-,037	-,086	-,588
Asymp. Sig. (2-tailed)	,907	,653	,759	,470	,397	,970	,931	,557

a. Grouping Variable: Вашият пол е:

The presented data indicate that gender is not a significant factor influencing the values of each group.

Table 2. Presentation of demographic data by level of education and individual scales of metacognitive awareness

Test Statistics ^a								
	Declarative_K knowledge	Procedural_K knowledge	Conditional_ Knowledge	Planning	Comprehensi on_Monitorin g	Information_ Management _Strategies	Debugging_S trategies	Evaluation
Mann-Whitney U	2110,500	2390,000	2276,000	2301,500	2250,000	2253,500	2238,500	2376,500
Wilcoxon W	7160,500	3665,000	7326,000	7351,500	7300,000	7303,500	7288,500	7426,500
Z	-1,576	-,460	-,938	-,814	-1,023	-1,012	-1,247	-,508
Asymp. Sig. (2-tailed)	,115	,645	,348	,416	,306	,311	,213	,611

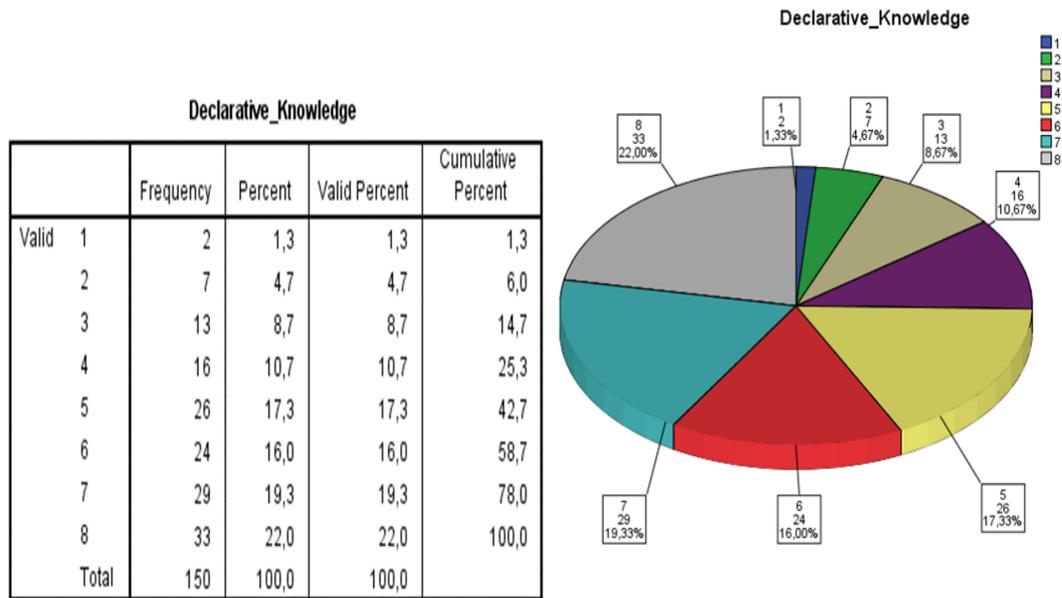
a. Grouping Variable: Към момента вие се обучавате в:

The "education" variable is also a significant factor for the values in each group. A significantly higher percentage of participants are enrolled in undergraduate programs (66.7%), while 33.3% are pursuing a master's degree. Additionally, 76% of all participants come from humanities-related fields.

An analysis of each individual subscale was conducted, and the results are presented in several frequency tables. Regarding the Knowledge about Cognition scale, the data are as follows:

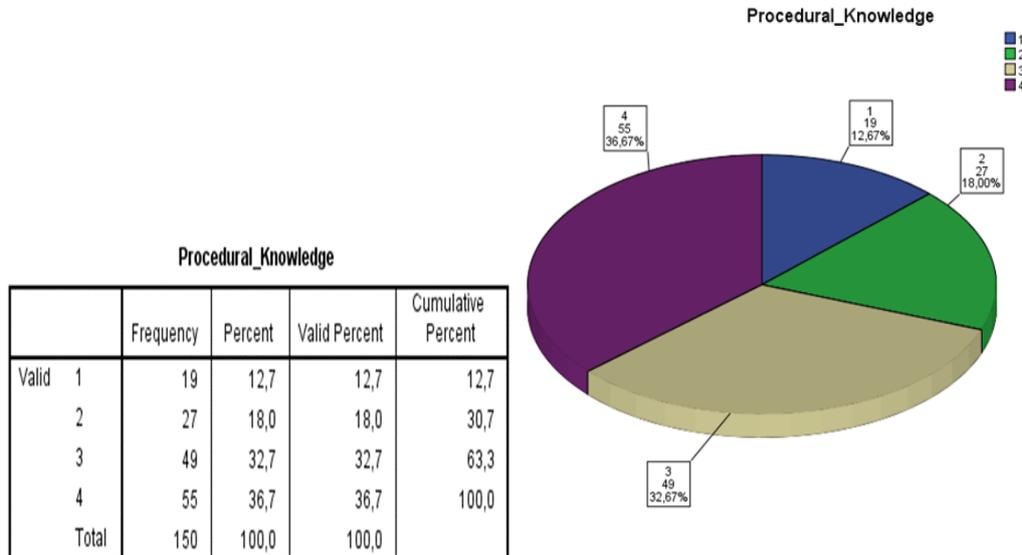


Table 3 and Fig. 1. Distribution by the Declarative Knowledge subscale



The presented data indicate that for the largest percentage of participants (19.33%), learning is easiest and most effective when it is related to a subject of personal interest. On the other hand, 17.33% of respondents believe they can easily memorize information, while only 1.33% report having a clear understanding of their intellectual strengths and weaknesses. These findings suggest the need for further research and practical activities, including training programs, to help learners develop awareness and control over cognitive processes.

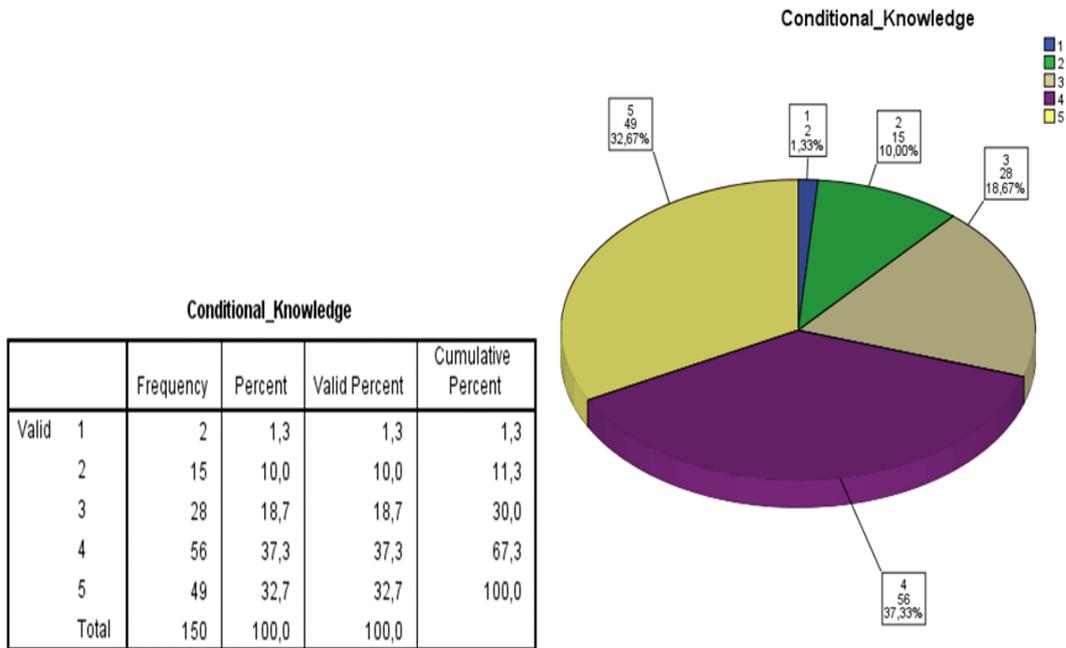
Table 4 and Fig. 2. Distribution by the Procedural Knowledge subscale



36.67% of participants believe they can automatically identify effective learning strategies, while 32.67% of respondents report deliberately using a specific strategy for learning.



Table 5 and Fig. 3. Distribution by the Conditional Knowledge subscale

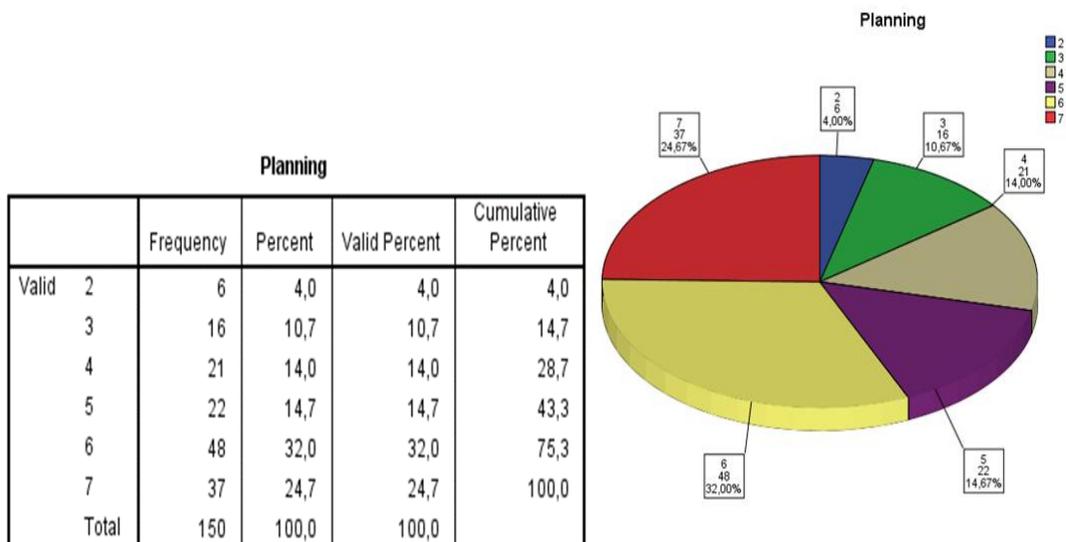


Findings on Knowledge about Cognition

The results reveal a certain contradiction in participants' responses. While many indicate that they do not fully understand their intellectual strengths and weaknesses, they also acknowledge using their strengths to compensate for their weaknesses.

The second focus of this study examines the regulation of cognitive processes using the selected methodology.

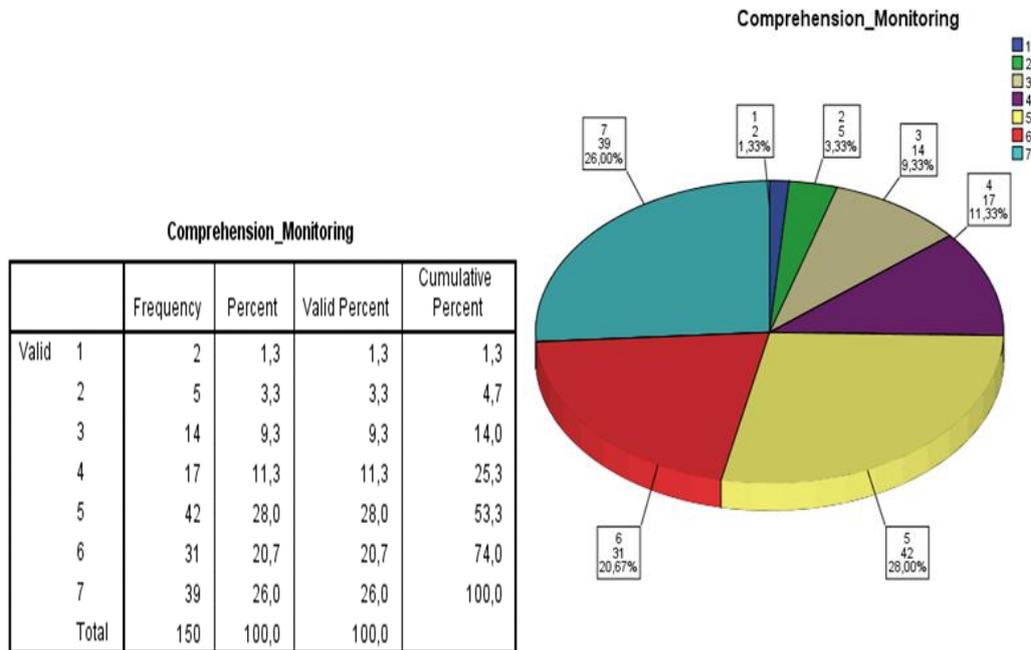
Table 6 and Fig. 4. Distribution by the Planning subscale



The data show that 32% of participants carefully read the instructions for a given text before proceeding with the task. However, only 4% take time to reflect on what they actually need to learn before starting a task.

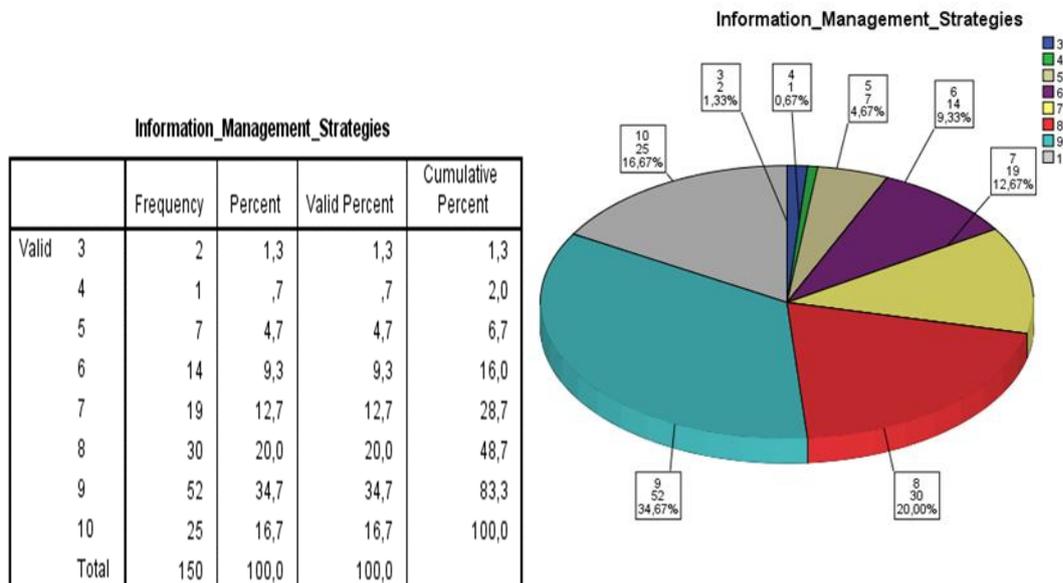


Table 7 and Fig. 5. Distribution by the Comprehension Monitoring subscale



The largest percentage of responses (28%) relates to individuals analyzing the usefulness of what they have learned from each task. This somewhat contradicts the earlier findings, which may be attributed to social desirability bias. Only 1% of respondents indicated that they regularly reflect on whether they have achieved their goals.

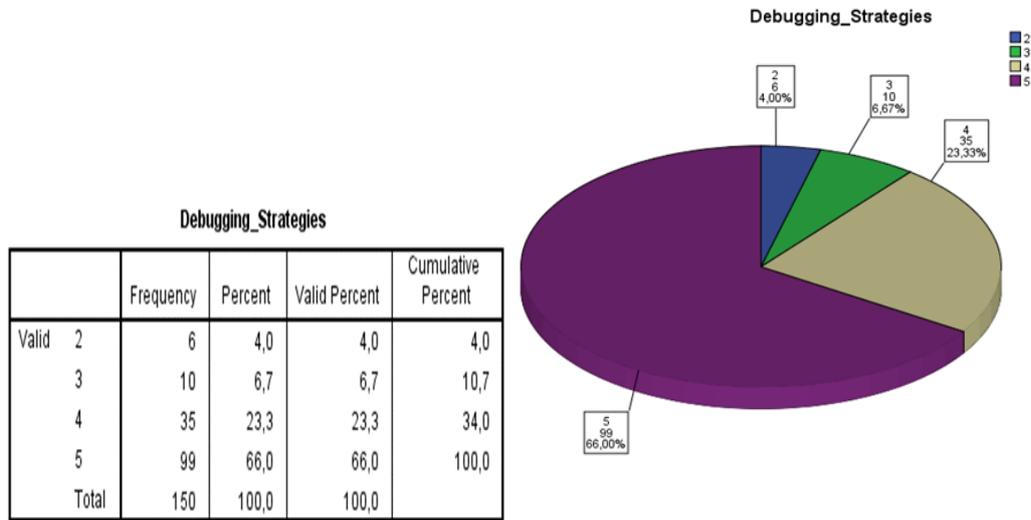
Table 8 and Fig. 6. Distribution by the Information Management Strategies subscale



34.67% of respondents learn by breaking the task into smaller steps, while 20% try to connect new information to what they already know. However, only 0.67% of the respondents create their own methods to make the information more meaningful to them.

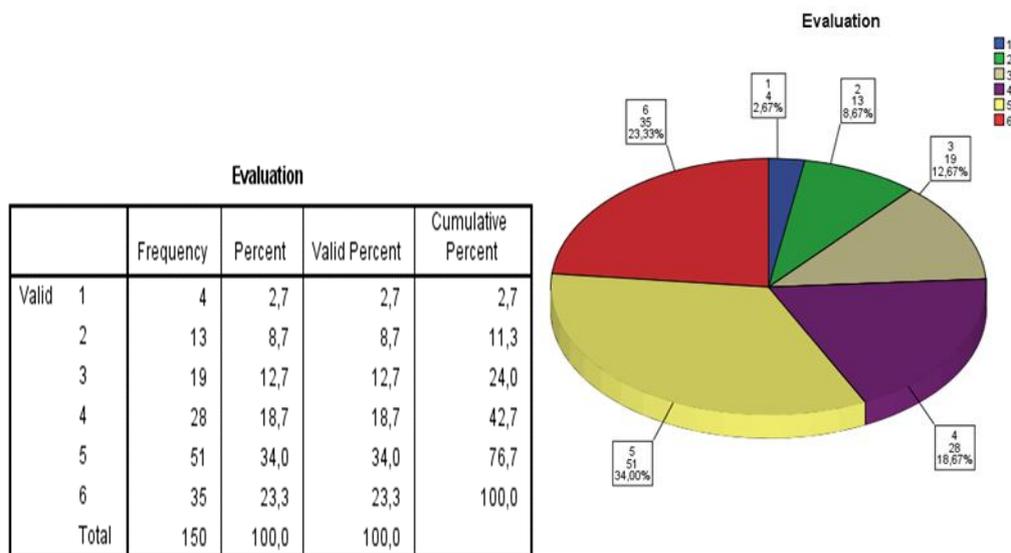


Table 9 and Fig. 7. Distribution by the Debugging Strategies subscale



66% of respondents stop to reread when they encounter difficulties with a task. The next largest group consists of those who go back and try to identify unclear points. Only 4% of the participants change their learning strategies if they fail to complete the task successfully.

Table 10 and Fig. 8. Distribution by the Evaluation subscale



34% of the respondents reconsider whether they have explored all possible options when solving a problem. 23.33% ask themselves whether they have learned what was required in completing the task. Only 2.67% feel confident that they have done an excellent job in solving the problem. A correlation analysis was also conducted, with the data presented in Table 11.



Table 11. Correlation dependencies

		Correlations							
		Declarative_K knowledge	Procedural_K knowledge	Conditional_ Knowledge	Planning	Comprehensi on_Monitorin g	Information_ Management _Strategies	Debugging_S trategies	Evaluation
Declarative_Knowledge	Pearson Correlation	1	,526**	,464**	,351**	,386**	,447**	,225**	,344**
	Sig. (2-tailed)		,000	,000	,000	,000	,000	,006	,000
	N	150	150	150	150	150	150	150	150
Procedural_Knowledge	Pearson Correlation	,526**	1	,495**	,373**	,339**	,396**	,141	,287**
	Sig. (2-tailed)	,000		,000	,000	,000	,000	,085	,000
	N	150	150	150	150	150	150	150	150
Conditional_Knowledge	Pearson Correlation	,464**	,495**	1	,367**	,363**	,369**	,198*	,473**
	Sig. (2-tailed)	,000	,000		,000	,000	,000	,015	,000
	N	150	150	150	150	150	150	150	150
Planning	Pearson Correlation	,351**	,373**	,367**	1	,473**	,198*	,196*	,427**
	Sig. (2-tailed)	,000	,000	,000		,000	,015	,016	,000
	N	150	150	150	150	150	150	150	150
Comprehension_Monitoring	Pearson Correlation	,386**	,339**	,363**	,473**	1	,444**	,355**	,621**
	Sig. (2-tailed)	,000	,000	,000	,000		,000	,000	,000
	N	150	150	150	150	150	150	150	150
Information_Management_Strategies	Pearson Correlation	,447**	,396**	,369**	,198*	,444**	1	,367**	,457**
	Sig. (2-tailed)	,000	,000	,000	,015	,000		,000	,000
	N	150	150	150	150	150	150	150	150
Debugging_Strategies	Pearson Correlation	,225**	,141	,198*	,196*	,355**	,367**	1	,384**
	Sig. (2-tailed)	,006	,085	,015	,016	,000	,000		,000
	N	150	150	150	150	150	150	150	150
Evaluation	Pearson Correlation	,344**	,287**	,473**	,427**	,621**	,457**	,384**	1
	Sig. (2-tailed)	,000	,000	,000	,000	,000	,000	,000	
	N	150	150	150	150	150	150	150	150

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

From the data thus presented, it is clear that there is a moderate correlation between declarative and procedural knowledge and between monitoring and evaluation skills.

4. Conclusion

The findings of this study provide critical insights into the metacognitive profiles of Bulgarian humanities students, confirming the existence of a "metacognitive paradox." The data demonstrate a significant discrepancy between high self-reported awareness and actual behavioral flexibility, suggesting that declarative knowledge of strategies does not guarantee their effective procedural implementation. This gap, as highlighted by Schraw & Dennison (1994) and Flavell (1977), underscores the complexity of developing genuine self-regulation skills. Furthermore, the weak correlation between MAI scores and academic performance aligns with the challenges identified by Hacker et al. (2009) and Tuononen et al. (2019) regarding students' ability to monitor and evaluate their own learning progress in real-time.

By addressing the empirical void in Central and Eastern European educational settings, this research contributes to a broader understanding of metacognitive development. As suggested by Narang & Saini (2013) and Xuan Nguyen et al. (2023), the tendency to overestimate regulatory abilities is a common hurdle that requires targeted pedagogical interventions. To bridge this gap, higher education institutions must shift from abstract instruction to integrated, task-based reflective practices, as advocated by Zimmerman (2002), Pintrich (2002), and Efklides (2006). Ultimately, fostering metacognitive growth is essential for preparing students to navigate the demands of modern education. Future research should continue to explore these dynamics through longitudinal studies to track the evolution of these skills (Young & Fry, 2008).

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