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EXPLORING THE RELATIONSHIP BETWEEN MENTAL HEALTH AND METACOGNITION AMONG MEDICAL STUDENTS: IMPLICATIONS FOR EDUCATIONAL PRACTICE*

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ABSTRACT

According to leading theories of successful learning, students are active participants in the process and regulate their learning, meaning they take responsibility and manage this process. The aim of this study is to assess learning approaches and the use of metacognitive strategies and their significance in relation to the mental health of students training to become healthcare professionals. The State Metacognitive Inventory (SMI) was used to assess students' metacognitive processes, and the Mental Health Inventory (MHI) to evaluate their mental health. The study included 363 medical students from Novi Sad, comprising 34 males and 329 females, aged 18 to 29 years. Among the students, moderate levels of anxiety and depressive symptoms were observed, with mean scores indicating a mid-range level on the scales. Reported symptoms included feelings of nervousness, worry, tension, sadness, and worthlessness, while students simultaneously demonstrated relatively high behavioural control. Metacognitive strategies exhibited only weak loadings on mental health indicators, suggesting that moderate levels of strategy use were weakly related to psychological symptoms. This association may be viewed as an indication rather than a causal effect, given the study design. These findings point to the potential importance of further strengthening metacognitive awareness and regulatory strategies.

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The results emphasize the importance of systematically integrating metacognitive training into higher education and developing structured programs that enhance both academic competencies and students' mental health. Institutional support and preventive interventions are crucial for reducing psychological distress and improving overall mental well-being among students. These findings further underscore that fostering metacognitive skills may serve as a supportive resource in coping with stress and emotional challenges in demanding academic environments and highlight the necessity of embedding such strategies in educational practice.

Keywords:
metacognitive learning strategies, institutional prevention programs, youth mental health.

INTRODUCTION

Research on self-regulated learning among students has attracted considerable scholarly attention for two primary reasons. First, self-regulated learning has been consistently demonstrated as an effective strategy for enhancing academic achievement (Zimmerman, 2002). Students who proactively set goals, plan, and implement effective learning strategies are better equipped to monitor and evaluate their progress toward achieving these goals. Second, metacognition—commonly defined as "thinking about thinking"—plays a crucial role in developing the capacity to reflect on and regulate cognitive processes (Boekaerts, 1999). Despite its central importance for fostering clinical judgment, metacognitive skills are seldom formally assessed, and students are rarely explicitly taught how to cultivate them.

In Vojvodina and other areas in Serbia, medical students show higher rates of depressive symptoms and other emotional difficulties compared to peers in other academic fields, including elevated psychological distress and even suicidal ideation (Backović, 2013; Knežević et al., 2012; Lečić-Toševski et al., 2021; Miletić et al., 2015). These findings highlight the importance of addressing metacognitive and motivational factors in medical and healthcare education. It is important to note, however, that the literature presents mixed findings regarding the impact of metacognitive skills on students' mental health. While some studies suggest positive effects (e.g., improved stress management and academic resilience), other research indicates that fostering metacognitive awareness does not necessarily yield measurable improvements in mental well-being or academic performance (Musullulu et al., 2025).

Metacognition is closely related to mental health, as the capacity to monitor and regulate one's cognitive and emotional processes constitutes a central mechanism in

managing stress and broader psychological demands. Students with more developed metacognitive skills are better at managing intrusive thoughts, regulating emotional reactions, and applying adaptive coping strategies, which is associated with lower anxiety, less distress, and better overall well-being. For this reason, examining the relationship between metacognition and mental health provides meaningful insight into how students navigate academic pressures and maintain psychological functioning (Beş et al., 2023; Stanton et al., 2021). Accordingly, the present study aims to investigate metacognitive states, awareness, and motivational learning strategies among students preparing for careers in healthcare professions and related fields.

Metacognition and Its Importance in Education

Metacognition is a key predictor of student achievement, enabling individuals to adapt to challenges and problem-solving tasks (Ata & Abdelwahid, 2019). Related concepts include metacognitive awareness, metacognitive knowledge, metacognitive skills, metacognitive experience, metamemory, self-regulation, self-management, and self-control (El Madani et al., 2024; Masoodi, 2018; Pan & Rivers, 2023; Pereles et al., 2024; Schraw, 1998; Veenman & Beishuizen, 2004).

Contemporary research highlights that metacognition functions as a multidimensional construct encompassing both knowledge about cognition and the regulation of cognitive processes. Recent studies have demonstrated that promoting metacognitive awareness and self-regulatory strategies enhances learners' motivation, critical thinking, and performance across educational contexts. In particular, the integration of metacognitive training within higher education curricula—especially in health and medical education—has been associated with improved academic engagement and psychological resilience (Akamatsu et al., 2019). For clarity, metacognition can be divided into two main components: metacognitive knowledge, which involves awareness of cognitive processes and strategies, and regulation of knowledge, which encompasses planning, monitoring, and evaluating one's learning (Stephanou & Mpiontini, 2017). This study focuses on both components, as they are essential for helping students critically approach information, effectively apply cognitive strategies, and enhance learning outcomes (Vučeljić & Čabrilo, 2008). Metacognition thus supports students in regulating their learning processes and optimising the use of learning techniques and strategies.

The educational process is continuously evolving under the influence of technology, scientific advancements, societal changes, and other factors, which makes proactive adaptation in education essential. One promising approach to enhancing learning outcomes is encouraging students to monitor and regulate their own learning processes. This approach, known as Self-Regulated Learning (SRL), refers to students' ability to plan, monitor, and evaluate their learning while selecting the most effective strategies and methods to achieve academic goals. Research demonstrates the benefits of SRL in diverse educational contexts. For instance, ElSayad (2024) shows that metacognitive self-regulation, a key component of SRL, mediates students' learning perceptions and outcomes in blended learning environments. Pereles et al. (2024) demonstrate that active use of metacognitive strategies within SRL enhances critical thinking in online learning settings. Reviews such as Gambo & Shakir (2021) emphasize the role of SRL in technology-enhanced environments. Importantly, Khosravi et al. (2023) specifically examined domain-specific writing self-efficacy, assessing students' confidence in completing various writing tasks, rather than general self-efficacy. Their findings show that explicit instruction in these domain-specific metacognitive strategies within flipped classrooms improves both students' writing performance and their confidence in performing writing tasks, highlighting the practical impact of targeted SRL interventions. Collectively, these studies underscore the importance of fostering SRL to empower students to actively control their learning, adapt to diverse educational formats, and enhance both academic achievement and psychological resilience.

Metacognitive Learning Strategies

Learning strategies refer to the application of cognitive operations (elaboration, creating knowledge structures, repetition, highlighting, making outlines and notes, etc.). They represent methods by which students manage their learning process, based on knowledge of personal traits and abilities, as well as knowledge of educational tasks that students must complete, skills in acquiring, connecting, and applying new knowledge, previous knowledge, and understanding the purpose and useful value of new knowledge. Learning strategies are considered essential and very useful for effective learning and knowledge acquisition (Olop et al., 2024; Ruiz-Martín et al., 2024). By using learning strategies, individuals control and direct their cognitive processes (Pintrich, 2002). Self-control is one of the important concepts for

the learning process. Berk (2007) links self-regulation with self-awareness, noting that awareness of the self as a separate, autonomous entity provides the foundation for developing self-control – the ability to inhibit impulses and direct behaviour in socially appropriate ways. Self-control represents self-initiated regulation of behaviour based on acquired knowledge of the environment. Adopting self-control initiates a long process of developing self-regulation (Pinjatela, 2012). Self-regulated learning, defined by socio-cognitive researchers as a process in which learners develop and apply their cognitive and metacognitive abilities to achieve academic success, involves a) setting learning goals, b) planning in advance, c) monitoring and regulating cognition, motivation, and behaviour, d) evaluating learning processes and outcomes, and e) using feedback from previous experiences to improve future learning (Zimmerman, 2002). Today, there are many learning strategies, and different authors use various classification systems for clarity. Some authors classify learning strategies as either direct or indirect: direct strategies include cognitive, memory, and compensation strategies, while indirect strategies encompass metacognitive, affective, and social strategies (Oxford, 2003; Zhang & Li, 2022) On the other hand, other authors classify learning strategies into control strategies (which include metacognitive and motivation regulation strategies) and cognitive strategies (Umemoto, 2013). Among the various classifications, three main types of learning strategies are repeated: cognitive, metacognitive, and resource-management strategies (de Boer et al., 2018; Hemmler & Ifenthaler, 2024; Olop et al., 2024; Pintrich et al., 1993; Youssef & Alibraheim, 2025). Metacognitive strategies greatly facilitate and regulate self-awareness (de Boer et al., 2018; Hemmler & Ifenthaler, 2024). Their use involves monitoring and regulating one's learning process, including applying cognitive strategies that are more challenging to teach. Metacognitive strategies enhance individual memory and information processing, improving and nurturing overall behaviour in the learning process, such as effort, persistence, and engagement (Akamatsu et al., 2019; Stanton et al., 2021). They also contribute to greater student activity and independence through planning for monitoring or evaluating learning success (Chamot & O'Malley, 1996; Halmo et al., 2024). The use of these learning strategies encourages students to discover, discuss, think, compare, and predict, as well as to guide and stimulate other learners in the process of knowledge acquisition. In this sense, these strategies involve activating skills based on abilities for discussing, recognizing different relationships, evaluating

evidence and authority, drawing conclusions, and accurate reasoning (Rivas, et al., 2022).

Many studies address the complexity of the interrelationships between metacognition and motivational-emotional self-regulation, as well as the processes through which they influence learning. According to Bandura's theory of self-efficacy (Bandura, 1997), successful students possess a well-developed sense of self-efficacy and believe that success depends on factors they can regulate, such as effort and the application of learning strategies. These students demonstrate greater persistence when facing difficulties and employ a broader range of strategies, which in turn supports the acquisition of metacognitive knowledge related to the regulation and application of strategies. Possessing metamemory knowledge about the most effective way to remember and acquire information, without regulatory metacognitive skills, will hinder the transfer of knowledge in a given context (Drigas et al., 2022). Many studies emphasize the importance of perceiving control over one's learning, where a sense of self-efficacy is achieved – representing the level of self-confidence in one's ability to manage specific tasks, influencing thinking, behaviour, and motivation (Bandura, 1993, 1997, 2013; Halmo & Ifenthaler, 2024; Hanif & Arianto, 2024). Awareness and belief in self-efficacy play a key role in self-regulating motivation (Hanif & Arianto, 2024; Pérez-González, 2022). Specifically, self-efficacy is the foundation of motivation and achievement (Pérez-González, 2022). The teacher or professor is the one who can influence students motivation and thus their success. Also, the role of the professor significantly affects students› psychological needs, forming a range of psychological mechanisms that act as behaviour regulators for competence, autonomy, and relatedness (Deci & Ryan, 2014). Motivation is also influenced by emotional experiences, which are directly or indirectly related to student achievement, satisfaction, physical and mental health, learning strategies, cognitive resources, self-directed learning, quality of teacher-student interactions, concentration, information processing, storage, retrieval, learning – all of which affect academic achievement (Mega et al., 2014; Pekrun et al., 2011).

Youth Mental Health and Educational Institution

Mental health refers to a state of well-being in which individuals cope with stressors, work productively, and contribute to society (Davis & Hadwin, 2021; WHO, 2016). Mental health is also defined as a state subject to changes due to biological and

social factors, enabling individuals to achieve a satisfactory synthesis of potentially conflicting, instinctive drives, form and maintain harmonious relationships with others, and participate in constructive changes in their social and physical environment (Bertolote, 2008). In Keyes' dual-continua model, (Keyes, 2002) mental illness and mental health do not exist as opposite ends of a single continuum but rather as separate, correlated dimensions suggesting that mental health is a distinct state. It includes both hedonic, or positive feelings defined as emotional well-being, and eudemonic, or positive functioning defined as psychological and social well-being. In summary, mental health is how individuals perceive and assess their affective states and psychological and social functioning. Defining mental health is vital for understanding overall human well-being (Davis & Hadwin, 2021).

Ensuring the best conditions for the development and maintenance of young people's mental health is the shared responsibility of families, schools, societies, and other contextual factors. It is important to create individual, environmental, and social conditions that foster the development and strengthening of skills necessary for optimal mental functioning. Protective factors, such as high self-esteem and resilience, contribute to positive mental health outcomes, while risk factors, such as negative life events and chronic stress, can undermine them (Johnston et al., 2023; Olsson & Kennedy, 2010). In recent years, there has been a growing body of research on adolescent and youth mental health, reflecting increased recognition of its importance in both public health and education (Patel et al., 2007). It is also essential to recognize that mental health difficulties may have diverse origins — biological, social, or environmental — and can affect individuals across different stages of development, from adolescence through adulthood.

Young people face numerous challenges, both internal and external, including increased responsibilities, making it important to focus on their mental health (Davis & Hardvin, 2019). Research on mental health issues in student populations has shown that students often experience stress, anxiety and depression symptoms (Gull et al., 2024). Factors contributing to these issues include academic pressures, social factors, and environmental influences (Campbell et al., 2022). Psychological distress is a crucial issue that needs to be addressed to improve student mental health and academic performance (Carranza Esteban et al., 2022).

METHOD

Study Objectives. This research was designed to examine the metacognition and mental health of students at the Faculty of Medicine. The findings offer a clearer understanding of the quality of students' learning processes, the metacognitive strategies they apply, as well as the ways in which they monitor and adjust their learning. They also shed light on key aspects of students' mental health. Such insights provide a valuable basis for planning how educational institutions can more effectively shape their support systems and interventions aimed at promoting student well-being and improving learning outcomes.

Previous research has consistently shown that medical students face a higher risk of mental health issues, including depression, anxiety, and burnout, due to the unique stressors associated with medical education (Backović, 2013; Knežević et al., 2012; Lečić-Toševski et al., 2021; Ristić-Ignjatović et al., 2013). For instance, a systematic review and meta-analysis by Rotenstein et al. (2016) estimated the global prevalence of depression symptoms among medical students at 27.2%, with suicidal ideation at 11.1%. Similarly, a global survey by Wilkinson (2023) highlighted that medical students are more likely to experience a broad range of mental health problems, including depression symptoms, anxiety symptoms, burnout, and anorexic tendencies. Additionally, some recent studies suggest that medical students may experience greater emotional exhaustion even when symptoms of psychopathology are less pronounced (Carrard et al., 2025). On the other hand, other research has reported that medical students do not have an increased mental health risk compared with students from other academic disciplines (Olsson & Keneddy, 2025).

Most studies indicate that medical students face an increased risk of mental health difficulties; however, findings across the literature are not entirely consistent. These mixed results highlight the need for a more nuanced understanding of medical students' mental health, taking into account factors such as emotional exhaustion, burnout, and discipline-specific stressors, rather than assuming uniformly higher vulnerability across all mental health outcomes. Within this context, the current study aimed to provide insight into the quality of student learning, the strategies employed, monitoring and correction processes, and specific aspects of mental health among medical students in Novi Sad. The primary objective was to investigate the mental health of students training to become healthcare professionals, alongside the learning strategies they use and how these strategies relate to mental health

outcomes. By focusing on this population, the study addresses a particularly vulnerable group and underscores the importance of understanding the interplay between metacognition and mental well-being in medical education.

The planned research was conducted as a cross-sectional study during 2023 using a sample of students at the Faculty of Medicine at the University of Novi Sad. Participants were recruited by distributing an online questionnaire via Google Forms platform, shared on student groups.

The sample consisted of 363 medical students from the Faculty of Medicine, University of Novi Sad, aged 18 to 29 years (M=21.51, SD=1.95). Most participants were female (90.6%), which is consistent with the gender distribution of this academic field. Students' grade point (variable reflected students' self-reported current GPA based on their academic performance at the time of data collection) averages ranged from 6.00 to 10.00 (M=8.36, SD=0.65). Regarding study year, 31.1% were in the first year, 12.4% in the second, 19.0% in the third, 27.5% in the fourth, 5.2% in the fifth, and 1.9% in the sixth year. Additionally, 9.4% of students were students with a repeated study year.

Variables and Instruments

In this research, State Metacognitive Inventory (SMI) was used to assess metacognitive strategies, learning and motivational strategies, and Mental Health Inventory (MHI) to assess students' mental health.

1. SMI (State Metacognitive Inventory) (O'Neil & Abedi, 1996) is a self-report questionnaire that measures an individual's current awareness and control over their cognitive processes. The inventory consists of subscales that tap into different aspects of metacognition: a) *Planning*: This subscale assesses the participant's self-reported strategies for planning and approaching the task; b) *Self-checking*: This subscale measures the participant's reported use of monitoring strategies to evaluate their understanding and progress during the task; c) *Cognitive strategy*: This subscale assesses the participant's self-reported use of specific cognitive strategies to complete the task effectively; d) *Awareness*: This subscale measures the participant's self-reported awareness of their current knowledge and understanding of the task.

The SMI uses a 5-point Likert-scale format, where participants rate the frequency or level of agreement with each statement. Scores on each subscale and the total inventory can then be analysed to provide insights into participants' state

of metacognition during the experiment. Higher scores on the SMI indicate better metacognitive strategies.

2. MHI (Mental Health Inventory) (Veit & Ware, 1983) is a self-report questionnaire used to assess overall mental well-being and identify potential mental health issues. It consists of 38 items that use a 6-point Likert scale format. Respondents rate how often they experience certain feelings or behaviours. The test takes approximately 5-10 minutes to administer. The MHI provides subscale scores for key domains of mental health, including: a) *Anxiety symptoms*: This subscale measures feelings of nervousness, worry, and apprehension; b) *Depression symptoms*: This subscale measures feelings of sadness, hopelessness, and worthlessness; c) *Behavioural Control*: This subscale measures a person's ability to manage their emotions and impulses; d) *Positive Affect:* This subscale measures feelings of happiness, joy, and contentment.

Scores on each subscale and the total inventory can then be analysed to provide insights into participants' mental health. In accordance with standard MHI scoring guidelines, all subscales were reverse-coded where necessary so that higher scores reflect better mental health (i.e., lower anxiety symptoms and depression symptoms and higher behavioural control and positive affect). The total MHI score was calculated as the sum of these reverse-coded subscale scores, providing a global indicator of overall mental well-being.

Statistical Analysis. The analyses were conducted using the IBM SPSS Statistics (Version 29) software program (IBM, 2022) Statistical analyses included descriptive analyses, normality assumptions testing including Skewness, Kurtosis and Shapiro-Wilk, reliability testing, Spearman rank-order correlations for testing variables' correlation, Mann-Whitney U for testing the significance of between-group differences, and canonical correlation analysis based on Spearman rank-order correlations for testing the relationship between the two sets of variables.

RESULTS

The descriptive statistics for the Mental Health Inventory (MHI) and its subscales, along with the State Metacognitive Inventory (SMI) and its subscales, are presented in Table 1. Scores on the MHI indicated a moderate level of mental health, and the SMI scores demonstrated generally high metacognitive abilities among participants. The assumption of normality was not met for all collected variables from the MHI (psychological well-being, psychological distress, anxiety symptoms, depression symptoms) and the SMI (monitoring, regulation, behavioural control), so we used nonparametric statistical analysis. All subscales demonstrated acceptable internal reliability, as indicated by Cronbach's alpha values ranging from .79 to .94.

TABLE 1. Descriptive statistics

	Min	*Max*	*Mean*	*SD*	*Skewness*	*Kurtosis*	*Shapiro-Wilk*	*p*	*α*
Mental Health Inventory	5.56	97.78	62.94	18.84	-0.675	-0.184	0.96	< .001	0.944
Anxiety subscale	0.00	100.00	53.83	23.37	-0.476	-0.505	0.96	< .001	0.883
Depression subscale	0.00	100.00	58.76	22.48	-0.448	-0.547	0.97	< .001	0.869
Behaviour Control subscale	0.00	100.00	72.24	21.83	-1.038	.528	0.90	< .001	0.790
Positive Affect subscale	5.00	100.00	65.67	19.34	-0.742	0.030	0.94	< .001	0.863
State Metacognitive Inventory	1.95	4.00	3.19	0.50	-0.281	-0.693	0.97	< .001	0.902
Awareness	1.20	4.00	3.16	0.60	-0.335	-0.592	0.95	< .001	0.754
Cognitive strategy	1.40	4.00	3.11	0.60	-0.307	-0.578	0.96	< .001	0.693
Planning	1.60	4.00	3.20	0.59	-0.437	-0.627	0.95	< .001	0.698
Self-checking	1.60	4.00	3.30	0.50	-0.593	-0.214	0.95	< .001	0.603

A series of Mann-Whitney U tests was conducted to examine differences in mental health and metacognition variables across selected demographic groups, while Spearman correlations were used to explore associations among these variables.

TABLE 2. Sociodemographic differences and correlations

	Sex				Age		Study year		Grade		Repeating year			
	Male n= 34 M(SD)	*Female n= 329 M(SD)*	*U*	*p*	*ρ*	*p*	*ρ*	*P*	*ρ*	*p*	*No n= 329 M(SD)*	*Yes n= 34 M(SD)*	*U*	*p*
Mental Health Inventory	68.98 (18.01)	62.32 (18.84)	6847.00	**.03**	**-0.10**	**.05**	0.005	.932	-0.08	.014	63.99 (18.57)	52.84 (18.77)	**7542.50**	**< .001**
Anxiety subscale	57.79 (24)	53.42 (23.3)	6252.50	.26	**-0.15**	**.00**	-0.04	.452	-0.08	.15	55.31 (22.85)	39.56 (23.78)	**7653.00**	**< .001**
Depression subscale	67.3 (22.32)	57.87 (22.34)	7134.50	**.00**	-0.09	.08	0.028	.596	-0.04	.54	60.1 (22.14)	45.74 (21.89)	**7588.50**	**< .001**
Behaviour Control subscale	78.97 (19.53)	71.54 (21.96)	6835.00	**.03**	**-0.10**	**.05**	0.007	.902	-0.10	.08	73.33 (21.49)	61.62 (22.52)	**7460.50**	**< .001**
Positive Affect subscale	70.15 (16.44)	65.2 (19.57)	6340.50	.20	-0.09	.11	-0.026	.622	-0.07	.20	66.3 (19.34)	59.56 (18.48)	**6839.50**	**.03**
State Metacognitive Inventory	3.23 (0.55)	3.19 (0.5)	5626.50	.73	0.06	.28	0.08	.135	**0.15**	**.01**	3.21 (0.5)	3.01 (0.55)	**6646.50**	**.03**
Awareness	3.16 (0.62)	3.16 (0.6)	5398.00	.96	0.02	.67	0.047	.376	**0.16**	**.00**	3.18 (0.59)	2.94 (0.62)	**6690.50**	**.03**
Cognitive strategy	3.21 (0.59)	3.11 (0.6)	5993.50	.32	**0.11**	**.04**	0.111	.037	**0.11**	**.05**	3.14 (0.59)	2.91 (0.64)	**6549.00**	**.04**
Planning	3.22 (0.6)	3.2 (0.59)	5502.50	.90	0.07	.16	0.079	.137	**0.14**	**.02**	3.22 (0.58)	3.01 (0.66)	6435.50	.08
Self-checking	3.32 (0.53)	3.29 (0.49)	5596.50	.77	-0.00	.87	0.054	.312	**0.12**	**.04**	3.31 (0.49)	3.18 (0.54)	6190.00	.18

Mann-Whitney U tests (Table 2) revealed a significant difference in total MHI scores between males and females, with females reporting lower mental health. Similarly, females reported significantly higher depression symptoms, but higher behaviour control. No significant gender differences were observed for Anxiety, Positive Affect, or for any SMI subscales (Awareness, Cognitive Strategy, Planning, Self-Checking).

Spearman rank-order correlations showed weak negative and generally nonsignificant associations between age and study year with the measured variables. The only notable association was a slight negative correlation between Mental Health Inventory scores and study year (ρ=–.10, p=.05), suggesting a minor decrease in perceived mental health as students advanced through their studies. No meaningful correlations were observed between mental health or metacognition scores and grade.

Mann-Whitney U tests comparing students who repeated an academic year with those who did not revealed significantly lower scores among students who repeated an academic year on Mental Health Inventory, Anxiety symptoms, Depression symptoms, Behaviour Control, and Positive Affect subscales. Students who repeated an academic year also scored lower on the SMI total score and on Awareness and Cognitive Strategy, while no significant differences were found for Planning and Self-Checking.

A canonical correlation analysis was conducted to examine the relationship between Mental Health Inventory subscales (Anxiety symptoms, Depression symptoms, Behaviour Control, Positive Affect) and State Metacognitive Inventory subscales (Awareness, Cognitive Strategy, Planning, Self-Checking).

TABLE 3. Canonical Correlations

	R	*R²*	*Wilks Statistic*	*F*	*Num D.F*	*Denom D.F.*	*p*
1	0,216	0,049	0,933	1,556	16	1082,12	,042
2	0,114	0,013	0,978	0,862	9	864,12	,559
3	0,080	0,006	0,991	0,779	4	712,00	,539
4	0,048	0,002	0,998	0,839	1	357,00	,360

Table 3 summarises the canonical correlations. The first canonical correlation (*Rc*=0.229, R^2=0.055) was found to be significant (*Wilks' Lambda*=0.933, *F*(16, 16000)=1.556, *p*=.042), indicating a significant but small positive relationship between the Mental Health Inventory subscales and State Metacognitive Inventory subscales. Although the canonical correlation coefficient was reported, the canonical

function accounted for only approximately 5% of the variance, indicating a minimal shared association between the constructs and warranting cautious interpretation. The remaining canonical correlations were not found to be statistically significant (p>.05).

TABLE 4. Loadings and cross-loadings

Predictor variables	*Loadings*	*Cross-loadings*	*Criteria variables*	*Loadings*	*Cross-loadings*
Awareness	-0,908	-0,196	Anxiety subscale	-0,805	-0,174
Cognitive strategy	-0,831	-0,179	Depression subscale	-0,392	-0,085
Planning	-0,845	-0,182	Behaviour Control subscale	-0,184	-0,040
Self-checking	-0,846	-0,183	Positive Affect subscale	-0,846	-0,113

Table 4 presents the loadings for each variable on the first pair of canonical variants. For a set of Metacognitive Inventory subscales (predictor variables), all variables have high negative loadings (Awareness: -0.908, Cognitive Strategy: -0.831, Planning: -0.845, Self-Checking: -0.846). This suggests that higher scores on these variables are associated with lower values on the first canonical variant. However, none of the variables have high correlation with the first canonical variant of the criteria set. For the Set of Mental Health Inventory subscales (criterion variables), all variables have negative loadings on the first canonical varia nt (Anxiety symptoms: -0.805, Depression symptoms: -0.392, Behaviour Control: -0.184, Positive Affect: -0.846). This suggests that higher scores on these mental health subscales are associated with a lower value on the first canonical variate. Importantly, none of the variables showed strong cross-loadings, indicating that the canonical function explains only a small portion of shared variance and should be interpreted cautiously.

TABLE 5. Spearman's Correlations

	1	2	3	4	5	6	7	8	9	10
Mental Health Inventory (1)	—									
Anxiety subscale (2)	0.88 ***	—								
Depression subscale (3)	0.89 ***	0.82***	—							
Behaviour Control subscale (4)	0.89 ***	0.70***	0.77***	—						
Positive Affect subscale (5)	0.79***	0.58***	0.55***	0.64***	—					
State Metacognitive Inventory (6)	0.13*	0.09	0.10	0.13*	0.10	—				
Awareness (7)	0.18***	0.15**	0.15**	0.17**	0.14**	0.90***	—			
Cognitive strategy (8)	0.09	0.05	0.06	0.10*	0.09	0.90***	0.73***	—		
Planning (9)	0.06	0.02	0.04	0.07	0.03	0.89***	0.73***	0.76***	—	
Self-checking (10)	0.12*	0.10	0.13*	0.12*	0.08	0.83***	0.71***	0.66***	0.63***	—

Note. * p < .05, ** p < .01, *** p < .001

Spearman rank-order correlations revealed a strong positive and significant correlation between the Mental Health Inventory and all of its subscales, as well as high intercorrelations among the subscales, confirming internal consistency. The same results were found within the State Metacognitive Inventory and its subcomponents. Correlations between MHI and SMI variables were found to be positive but weak, suggesting that better mental health is related to slightly higher levels of metacognitive strategies, but that they are still largely independent constructs.

DISCUSSION

The results of our study indicated a moderate level of anxiety symptoms among students, suggesting poorer mental health, as students frequently experience nervousness, worry, and apprehension. Similarly, on the depression symptoms subscale, results revealed a moderate level of depressive symptoms among students, who reported feelings of sadness, hopelessness, and worthlessness, indicating worse health outcomes in the context of depression symptoms. These findings align with previous research demonstrating a significant prevalence of depression symptoms

among students (Anbesaw et al., 2023; Eisenberg et al., 2007; Ibrahim et al., 2013; Li et al., 2025; Zhai et al., 2025), which negatively affects their academic performance and overall functioning. According to Ibrahim et al. (2013), the prevalence of depression symptoms among university students worldwide ranges from 10% to over 40%, depending on the population and methodological criteria used. Academic pressure, transition to university life, and limited coping resources are major contributing factors to students' vulnerability to depression symptoms.

Although descriptive analyses suggest elevated symptomatology, the mean scores in the present sample were close to the scale midpoint. Therefore, characterizing these levels as "high" should be interpreted with caution. A more precise interpretation would consider them indicative of moderate symptom severity, in line with international findings, rather than truly elevated or clinically significant. Future research could examine whether mean scores differ significantly from the scale midpoint to allow for a more accurate classification of symptom severity.

Although students demonstrated relatively high behavioural control, they simultaneously reported elevated anxiety and depressive symptoms. This suggests that functional self-regulation may coexist with psychological distress. Therefore, relying solely on overall mental health scores may obscure important symptom-specific vulnerabilities. These findings highlight the importance of designing preventive and support programs that specifically target anxiety and depression symptoms, rather than focusing only on general well-being.

Measurements from previous studies report elevated scores of depressive and anxiety symptoms (Anbesaw et al., 2023; Aşıcı & Mesier, 2020; Eisenberg et al., 2007; Ibrahim et al., 2013; Siqueira et al., 2020; Spitzer et al., 1999). Our findings confirm that despite moderate use of metacognitive strategies, students still experience significant mental health challenges, highlighting the need to strengthen metacognitive awareness and regulation strategies.

Examination of the literature indicates that an individual's capacity for metacognitive reflection—thinking about one's own thinking—is a key factor for successful learning and mental health prevention (Beş et al., 2023; Eisenberg et al., 2007; Siqueira et al., 2020; Yelgeç & Dağyar, 2022). The school environment plays a significant role in fostering the development of metacognitive strategies among students, which directly impacts their academic performance and mental health. Enhancing awareness of cognitive processes contributes to better emotional

regulation, reduced stress, and greater resilience in facing academic challenges (Jalok & Idris, 2020; Prihandoko et al., 2024).

The theoretical rationale for examining the link between mental health and metacognition lies in the role of metacognitive awareness and regulation in managing psychological demands. Students who can recognize and manage their thoughts and emotions tend to cope better with stress, while difficulties in these skills are associated with higher anxiety, rumination, and emotional dysregulation. This framework helps explain why metacognitive functioning may impact mental health in high-pressure academic settings, such as medical education. Furthermore, the interpretation of these findings should take into account the broader context of mental health among young people in Serbia. Recent national and regional research highlights rising psychological vulnerability, characterized by heightened stress exposure, academic overload, and limited access to mental health resources. These contextual factors are likely to influence the symptom patterns observed in the present sample, underscoring the importance of institutionally supported preventive interventions.

There is a significant correlation between anxiety and depression symptoms, which greatly impacts the quality of young people's daily lives. Mental disorders among students are common, with major depressive disorder and generalized anxiety disorder being the most frequent (Auerbach et al., 2018). Prolonged stress poses a severe threat to students' health, leading to deterioration in personal health, increased substance abuse, lower academic achievement, and medical errors (Auerbach et al., 2018; Hernández-Fuentes, 2024; Pérez-Jorge et al., 2025). Therefore, implementing preventive interventions for students is essential to mitigate mental health decline, highlighting the need to train students in appropriate metacognitive strategies.

In the educational context, metacognitive strategies include learning planning, monitoring one's understanding, and evaluating and adapting learning methods. Educational institutions play a multifaceted role: teachers not only transmit knowledge but also model ways of thinking and reflection (Wang, 2023; Zimmerman, 2002). Implementation of methods such as explicit instruction of learning strategies, guided reflection, maintaining learning journals, and providing feedback that encourages metacognitive thinking can foster the development of metacognition within the school setting.

In our sample, female students reported higher depressive symptoms than male students, suggesting a possible greater vulnerability among women in this population. However, no statistically significant difference was found in anxiety symptoms levels between male and female students. This aligns with international findings indicating that female students exhibit higher rates of depression symptoms, anxiety symptoms, somatic complaints, and psychological distress, whereas male students are more prone to alcohol abuse and less likely to seek professional help (Farhane-Medina, 2022; Li et al., 2021; Oswalt et al., 2020). Gender-sensitive interventions interventions are therefore crucial for improving student mental health outcomes.

Pearson correlations examining relationships between age, mental health, and metacognitive variables revealed weak negative correlations between age and Mental Health Inventory (MHI) subscales (anxiety symptoms, depression symptoms, behaviour control), suggesting slightly better mental health in younger students, though other factors such as socioeconomic status and environment may play a larger role. No significant correlations were found between year of study and MHI or SMI subscales, consistent with previous research (Rivas et al., 2022; Temircan, 2023). These findings suggest that interventions targeting metacognitive skills should begin early in university education to support mental health.

A study from Serbia indicates that a considerable proportion of medical students in Serbia – approximately 15% – meet the criteria for being at high risk of burnout. It also identifies several significant risk factors, including age, frequency of alcohol consumption, and the use of sedatives. These findings are relevant for the present research, as they highlight variables that may influence students' mental health and point to potential pathways through which metacognitive capacities could either provide a protective effect or be associated with these outcomes (Ilić & Ilić, 2024).

Ristić-Ignjatović et al. (2013) conducted a longitudinal study (2002–2012) showing that the majority of medical students in Serbia do not exhibit pronounced depressive symptoms, although a notable minority presents mild to moderate levels of depression. Their findings also highlight clear gender differences, with female students consistently reporting higher levels of depressive symptomatology. These results provide a valuable baseline for understanding the mental health status of medical students in Serbia and are particularly relevant for examining potential associations between metacognitive processes and depressive symptoms in the present research.

Correlations between academic grades and mental health/metacognitive variables showed a significant negative correlation with behaviour control, indicating that higher-achieving students may have lower self-regulation in some domains, consistent with previous studies (Veenman & Beishuizen, 2004). Students who employ metacognitive strategies, including planning, self-monitoring, and strategic awareness, demonstrate better emotional well-being and stability (Grafton & Bo, 2010; Ibrahim et al., 2013). These results suggest a potential protective role of metacognitive strategies for student mental health while achieving academic success.

Overall, these findings emphasize the importance of systematically integrating metacognitive training into higher education curricula and underscore the need for institutions – particularly within the Serbian context – to develop structured, evidence-based programs that simultaneously foster academic competencies and promote psychological well-being.

CONCLUSION

The objective of this study was to examine the mental health of students preparing for careers in healthcare, alongside the learning strategies they employ and the role these strategies play in predicting mental health outcomes. In the context of medical education, where students frequently experience elevated levels of stress and academic pressure, understanding metacognitive strategies is essential for enhancing their mental health. Metacognition, defined as the awareness and regulation of one's cognitive processes, may enable students to more effectively manage their learning and stress responses, thereby potentially mitigating the risk of mental health disorders such as anxiety and depression symptoms. Furthermore, this study highlights the critical role of educational institutions – both schools and universities – in fostering metacognitive skills through dedicated programs and activities that facilitate the development of effective learning management habits.

The findings underscore the necessity for enhanced support systems for students, including the integration of metacognitive strategies within educational curricula, to promote mental well-being and alleviate the adverse effects of stress. The high prevalence of stress exposure among medical students and its potentially severe consequences for mental health necessitate the implementation of preventive measures and timely support services. Moreover, these findings are in line with

international research, reinforcing the broader relevance of the observed patterns while simultaneously highlighting cultural factors specific to the Serbian context that may shape attitudes toward mental health and help-seeking.

The data also point to the need for further comprehensive investigations into metacognition, student mental health, and the role of educational institutions. Notably, the impact of preferred learning styles on academic achievement and self-regulation remains insufficiently understood. Future research should explore how various dimensions of academic performance – including grades and overall success – interact with mental health outcomes to elucidate potential causal pathways.

Additionally, examining students' attitudes towards help-seeking behaviours within the local context is imperative. The school environment plays a pivotal role in shaping the emotional, social, and academic development of children and adolescents and serves as a critical platform for the prevention of mental health disorders such as depression and anxiety symptoms, as well as risky behaviours, including substance abuse. Effective school-based prevention requires an integrated approach encompassing educational, psychological, and social interventions.

Further inquiry into the relationship between learning styles, metacognitive strategies, academic outcomes, and mental health could yield valuable insights for enhancing pedagogical practices. Such investigations could inform the design of interventions aimed at optimizing students' learning methods and mental health simultaneously. This study offers several implications for pedagogical practice in higher education settings. Metacognitive strategies – such as planning, self-monitoring, and evaluation of one's cognitive and behavioural processes – have been associated with more favourable mental health outcomes. Educational institutions can cultivate these competencies by embedding metacognitive skill development into instructional processes, encouraging reflective practices, and promoting students' self-regulation and emotional awareness.

Our findings show that younger students, particularly those in their first year, reported slightly better mental health in some dimensions, this difference was relatively small and appears consistent with research suggesting that mental health challenges remain relatively stable throughout medical education. First-year students may face unique adjustment demands, yet psychological pressures persist across all stages of study. Therefore, preventive initiatives and metacognitive support should be introduced early and maintained throughout the academic program, ensuring continuous development of resilience, emotional regulation, and adaptive

coping strategies rather than concentrating support solely at the point of entry into university.

Given their frequent interactions with students, educators are uniquely positioned to identify early signs of stress, anxiety symptoms, or trauma and provide initial support. Consequently, educational institutions should play a central role in trauma recognition and in facilitating access to appropriate mental health resources.

Taken together, these results suggest that although the relationship between metacognitive strategies and mental health is modest, it remains theoretically meaningful and practically relevant. Understanding how students regulate both their cognitive and emotional processes provides important insight into the ways they cope with demanding academic environments. By contextualizing these findings within the broader trends in student mental health in Serbia, this study contributes to a more nuanced perspective on the challenges faced by medical students and the potential avenues for institutional support.

Beyond being sites of academic learning, educational institutions constitute environments where interpersonal relationships, identity formation, and a sense of belonging develop. Enhancing teacher awareness regarding the specific challenges students encounter – such as concentration difficulties, impaired self-regulation of learning processes, and challenges in peer and authority relationships – is crucial for supporting academic success and mental well-being.

Finally, establishing a systemic and multidisciplinary support network involving collaboration among mental health professionals, social services, and educational stakeholders represents a promising model for comprehensive student support.

Limitations

This study has several limitations that should be considered when interpreting the results. First, the Cronbach's alpha values for some scales were relatively low, indicating limited internal consistency for certain questionnaires and potentially reduced reliability of the corresponding results. Second, the sample was not evenly distributed across key demographic characteristics: groups differed in terms of gender and whether students had repeated a study year, which may affect the generalizability of the findings. Third, participants were not asked about prior mental health history or recent stressors, which may have influenced their responses

and limits the ability to fully contextualize the results. Fourth, a key limitation is the temporal misalignment between situational metacognition measures and mental health assessments, making it difficult to draw conclusions about the relationship between these variables. Finally, the cross-sectional design prevents any causal inferences between variables.

These limitations highlight the need for caution in interpreting the findings and underscore the importance of future research with larger, more balanced samples, more reliable measurement instruments, and inclusion of participants' prior mental health and contextual stressors.

Ethical approvals. The implementation of this study was approved by the Ethics Committees of Medical faculty University of Novi Sad. Participation was voluntary. All participants consented and were informed of the study's objectives before accessing the questionnaire. Anonymity and confidentiality of data were guaranteed.

REFERENCES

- Akamatsu, D., Nakaya, M., & Koizumi, R. (2019). Effects of metacognitive strategies on the self-regulated learning process: The mediating effects of self-efficacy. *Behavioral Sciences, 9*(12), 128. DOI: 10.3390/bs9120128
- Anbesaw, T., Zenebe, Y., Necho, M., Gebresellassie, M., Segon, T., & Kebede, F. (2023). Prevalence of depression among students at Ethiopian universities and associated factors: A systematic review and meta-analysis. *PLOS ONE, 18*(10), Article e0288597. DOI: 10.1371/journal.pone.0288597
- Aşıcı, E., & Mesiar, R. (2020). New constructions of triangular norms and triangular conorms on an arbitrary bounded lattice. *International Journal of General Systems, 49*(2), 143–160. DOI: 10.1080/03081079.2020.1713550
- Ata, A. A., & Abdelwahid, A. E. (2019). Nursing students' metacognitive thinking and goal orientation as predictors of academic motivation. *American Journal of Nursing Research,* 7(5), 793–801.
- Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., Cuijpers, P., & WHO WMH-ICS Collaborators (2018). The WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *Journal of Abnormal Psychology, 127*(7), 623–638. DOI: 10.1037/abn0000362
- Backović, D. V. (2013). Stress and mental health among medical students. *Psychiatria Danubina, 25*(1), 175–180. https://www.psychiatria-danubina.com/UserDocsImages/pdf/dnb_vol24_no2/dnb_vol24_no2_175.pdf
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist, 28*(2), 117–148. DOI: 10.1207/s15326985ep2802_3
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.
- Bandura, A. (2013). On the functional properties of perceived self-efficacy revisited. *Journal of Management, 39*(1), 9–44. DOI: 10.1177/0149206311410606
- Berk, L. E. (2007). *Development through the lifespan* (6th Ed.). Pearson Education.
- Beş, F., Akbulut, Y., & Öner-Öztürk, M. (2023). An empirical investigation of the associations between metacognition, mindfulness, experiential avoidance, depression, and anxiety. *BMC Psychology, 11*, Article 281. DOI: 10.1186/s40359-023-01336-7
- Boekaerts, M. (1999). Self-regulated learning: Where we are today. *International Journal of Educational Research, 31*(6), 445–457. DOI: 10.1016/S0883-0355(99)00014-2
- Campbell, F., Blank, L., Cantrell, A., Baxter, S., Beecham, J., Brumfitt, S., & Goyder, E. (2022). Factors that influence mental health of university and college students in the UK: A systematic review. *BMC Public Health, 22*, Article 1778. DOI: 10.1186/s12889-022-13943-x
- Carranza Esteban, R. F., Mamani-Benito, O., Caycho-Rodríguez, T., Lingán-Huamán, S. K., & Ruiz Mamani, P. G. (2022). Psychological distress, anxiety, and academic self-efficacy as predictors of study satisfaction among Peruvian university students during the COVID-19 pandemic. *Frontiers in Psychology, 13*, Article 809230. DOI: 10.3389/fpsyg.2022.809230
- Carrard, V., Bourquin, C., Berney, S., Bart, P. A., Bodenmann, P., & Berney, A. (2025). Comparison of mental health and burnout between medical and nonmedical students. *PLoS One*, *20*(10), e0328145.
- Chamot, A. U., & O'Malley, J. M. (1996). The cognitive academic language learning approach: A model for linguistically diverse classrooms. *The Elementary School Journal, 96*(3), 259–273. DOI: 10.1086/461827
- Davis, S. K., & Hadwin, A. F. (2021). Exploring differences in psychological well-being and self-regulated learning in university student success. *Frontline Learning Research, 9*(1), 30–43. DOI: 10.14786/flr.v9i1.581

- de Boer, H., Donker, A. S., Kostons, D. D. N. M., & van der Werf, G. P. C. (2018). Long-term effects of metacognitive strategy instruction on student academic performance: A meta-analysis. *Educational Research Review, 24*, 98–115. DOI: 10.1016/j.edurev.2018.03.002
- Deci, E. L., & Ryan, R. M. (2014). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press.
- Drigas, A., Mitsea, E., & Skianis, C. (2022). Metamemory: Metacognitive strategies for improved memory operations and the role of VR and mobiles. *Behavioral Sciences*, *12*(11), 450.
- Eisenberg, D., Gollust, S. E., Golberstein, E., & Hefner, J. L. (2007). Help-seeking and access to mental health care in a university student population. *Medical Care, 45*(7), 594–601. DOI: 10.1097/MLR.0b013e31803bb4c1
- El Madani, E. M., Larouz, M., Fagroud, M., Saadallah, Z., & Barebzi, J. (2024). Exploring the interplay of metacognitive awareness and reading proficiency: A study among Moroccan university EFL students. *Journal of English Language Teaching and Linguistics, 9*(2), 1–15.
- ElSayad, G. (2024). Drivers of undergraduate students' learning perceptions in the blended learning environment: The mediation role of metacognitive self-regulation. *Education and Information Technologies, 29*, 15737–15760. DOI: 10.1007/s10639-024-12466-9
- Farhane-Medina, N. Z., Luque, B., Tabernero, C. & Castillo-Mayén, R. (2022). Factors associated with gender and sex differences in depression, anxiety and substance abuse disorder. *SAGE Open, 12*(3). DOI: 10.1177/00368504221135469
- Gambo, Y., & Shakir, M. Z. (2021). Review on self-regulated learning in smart learning environment. *Smart Learning Environments, 8*, Article 12. DOI: 10.1186/s40561-021-00157-8
- Grafton, S. T., & Bo, L. (2010). Cognitive control and metacognitive awareness: Do they shape academic achievement in university students? *Frontiers in Psychology, 16*, Article 1633996. DOI: 10.3389/fpsyg.2025.1633996
- Gull, M., Bilund, L., & Nilsson, S. (2024). A comprehensive review of psychosocial, academic, and psychological issues among university students. *Indian Journal of Public Health Research & Development, 15*(3), 123–135. DOI: 10.1177/09727531241306571
- Halmo, S. M., Yamini, K. A., & Stanton, J. D. (2024). Metacognition and self-efficacy in action: How first-year students monitor and use self-coaching to move past metacognitive discomfort during problem solving. *CBE—Life Sciences Education, 23*(13). DOI: 10.1187/cbe.23-08-0158
- Hanif, M., & Arianto, F. (2024). Combining flipped with case-based learning for creative thinking: A bibliometric analysis. In *2024 6th International Workshop on Artificial Intelligence and Education (WAIE)* (pp. 289–293). IEEE. DOI: 10.1109/WAIE60057.2024.00059
- Hemmler, Y. M., & Ifenthaler, D. (2024). Self-regulated learning strategies in continuing education: A systematic review and meta-analysis. *Educational Research Review, 45*, Article 100629. DOI: 10.1016/j.edurev.2024.100629
- Hernandez-Fuentes, G. A., Romero-Michel, J. C., Guzmán-Sandoval, V. M., Diaz-Martinez, J., Delgado-Enciso, O. G., Garcia-Perez, R. R., Godínez-Medina, M., Zamora-Barajas, V., Hilerio-Lopez, A. G., Ceja-Espiritu, G., ... & Delgado-Enciso, I. (2024). Substance use and mental health in emerging adult university students before, during, and after the COVID-19 pandemic in Mexico: A comparative study. Diseases, 12(12), Article 303. DOI: 10.3390/healthbehv12-12-303
- IBM (2022). IBM SPSS Statistics (Version 29.0) [Computer software].
- Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review of studies of depression prevalence in university students. *Journal of Psychiatric Research, 47*(3), 391–400. DOI: 10.1016/j.jpsychires.2012.11.015
- Ilić, I., & Ilić, M. (2024). Academic burnout syndrome among medical students in Serbia: Prevalence of high risk and determinants. *BMC Medical Education, 24*, 948. DOI: 10.1186/s12909-024-05937-7

- Jalok, Q., & Idris, F. (2020). Using metacognition in lowering writing anxiety and improving writing performance among low-intermediate ESL students. *International Journal of Academic Research in Business and Social Sciences*, 10(6), 733–748. DOI: 10.6007/IJARBSS/v10-i6/7088
- Johnston, L., Kotze, A., & Smith, T. (2024). Risk and protective factors of self-harm and suicidality in adolescents: An umbrella review with meta-analysis. *Journal of Youth and Adolescence, 53*, 1301–1322. DOI: 10.1007/s10964-024-01969-w
- Keyes, C. L. M. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior, 43*(2), 207–222. DOI: 10.2307/3090197
- Khosravi, R., Dastgoshadeh, A., & Jalilzadeh, K. (2023). Writing metacognitive strategy-based instruction through flipped classroom: An investigation of writing performance, anxiety, and self-efficacy. *Smart Learning Environments, 10*, Article 48. DOI: 10.1186/s40561-023-00264-8
- Knežević, M., Jović, J., Rancic, N., & Ignjatović-Ristić, D. (2012). Depression among medical students. *Medicinski časopis, 46*(1), 1–6.
- Lečić-Toševski, D., Draganić Gajić, S., Pejović Milovančević, M., Kostić, M., & Vuković, O. (2021). Mental health issues among medical students in Serbia: Challenges and perspectives. *Vojnosanitetski pregled, 78*(12), 1304–1311. DOI: 10.2298/VSP200918089L
- Li, M., Su, H., Liao, Z., Qiu, Y., Chen, Y., Zhu, J., Pei, Y., Jin, P., Xu, J. & Qi, C. (2021). Gender differences in mental health disorder and substance abuse of Chinese international college students during the COVID-19 pandemic. *Frontiers in Psychiatry, 12*, Article 710878. DOI: 10.3389/fpsyt.2021.710878
- Masoodi, M. (2018). Metacognitive awareness and its relationship with self-regulation among university students. *Journal of Education and Learning, 12*(4), 45–56.
- Miletić, V., Mitić, M., & Stanković, M. (2015). Demographic risk factors for suicide and depression among Serbian medical school students. *Vojnosanitetski pregled, 72*(12), 1065–1070. DOI: 10.2298/VSP1501065M
- Mega, C., Ronconi, L., & De Beni, R. (2014). What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of Educational Psychology*, 106(1), 121–131. DOI: 10.1037/a0033546
- Musullulu, H., Gómez Vázquez, D., García Sanz, S., & García-Orza, J. (2025). Cognitive control and metacognitive awareness: Do they shape academic achievement in university students? *Frontiers in Psychology, 16*, Article 1633996.
- O'Neil, H. F., Jr., & Abedi, J. (1996). Reliability and validity of a state metacognitive inventory: Potential for alternative assessment. *Journal of Educational Research, 89*(4), 234–245. DOI: 10.1080/00220671.1996.9941208
- Olop, J., Granström, M., & Kikas, E. (2024). Students' metacognitive knowledge of learning-strategy effectiveness and their recall of teachers' strategy instructions. *Frontiers in Education, 9*, Article 1307485. DOI: 10.3389/feduc.2024.1307485
- Olsson, D. P., & Kennedy, M. G. (2010). Mental health literacy among young people in a small US town: Recognition of disorders and hypothetical helping responses. *Early Intervention in Psychiatry, 4*(4), 291–298. DOI: 10.1111/j.1751-7893.2010.00196.x
- Oswalt, S. B., Lederer, A. M., Chestnut-Steich, K., Day, C., Halbritter, A., & Ortiz, D. (2020). Mental health disparities among college students: Current trends and challenges. *Journal of American College Health, 68*(4), 408–415. DOI: 10.1080/07448481.2018.1515748
- Oxford, R. L. (2003). *Language learning strategies: What every teacher should know* (Rev. ed.). Heinle & Heinle.
- Pan, S. C., & Rivers, M. L. (2023). Metacognitive awareness of the pretesting effect improves with self-regulation support. *Memory & Cognition, 51*(8), 1461–1480. DOI: 10.3758/s13421-022-01392-1
- Patel, V., Flisher, A. J., Hetrick, S., & McGorry, P. (2007). Mental health of young people: A global public-health challenge. *The Lancet, 369*(9569), 1302–1313. DOI: 10.1016/S0140-6736(07)60368-7

- Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2011). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational Psychologist, 46*(2), 89–105. DOI: 10.1080/00461520.2011.538645
- Pereles, A., Ortega-Ruipérez, B., & Lázaro, M. (2024). The power of metacognitive strategies to enhance critical thinking in online learning. *Journal of Technology and Science Education, 14*(3), 831–843. DOI: 10.3926/jotse.2721
- Pérez-González, J. C. (2022). Integrating self-regulated learning and individual differences: Testing interest and self-efficacy as predictors of academic self-regulation and achievement. *Contemporary Educational Psychology, 71*, Article 102086. DOI: 10.1016/j.cedpsych.2022.102086
- Pérez-Jorge, D., Boutaba-Alehyan, M., González-Contreras, A. I., & Pérez-Pérez, I. (2025). Examining the effects of academic stress on student well-being in higher education. *Humanities and Social Sciences Communications, 12*, Article 449. DOI: 10.1057/s41599-025-04698
- Pinjatela, R. (2012). Self-regulation in early childhood. *Paediatria Croatica, 56*(3), 237–242. DOI: 10.13112/pc.733
- Pintrich, P. R. (2002). The role of metacognitive knowledge in learning, teaching, and assessing. *Theory into Practice, 41*(4), 219–225. DOI: 10.1207/s15430421tip4104_3
- Pintrich, P. R., Smith, D. A. F., García, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational and Psychological Measurement, 53*(3), 801–813.
- Prihandoko, L. A., Morganna, R., & Amalia, S. N. (2024). Self-efficacy and metacognition as the mediated effects of growth mindset on academic writing performance. *Journal of Language and Education*. DOI: 10.17323/jle.2024.13979
- Ristić-Ignjatović, D., Hinić, D., Jakovljević, M., Smirnova, D., Siepera, M., & Rančić, N. (2013). A ten-year study of depressive symptoms in Serbian medical students. *Acta Clinica Croatica, 52*(2), 157–163. https://pubmed.ncbi.nlm.nih.gov/24053075/
- Rivas, S. F., Saiz, C., & Ossa, C. (2022). Metacognitive strategies and development of critical thinking in higher education. *Frontiers in Psychology, 13*, Article 913219. DOI: 10.3389/fpsyg.2022.913219
- Rotenstein, L. S., Ramos, M. A., Torre, M., Segal, J. B., Peluso, M. J., Guille, C., Sen, S., & Mata, D. A. (2016). Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: A systematic review and meta-analysis. *JAMA, 316*(21), 2214–2236. DOI: 10.1001/jama.2016.17324
- Ruiz-Martín, H., Blanco, F., & Ferrero, M. (2024). Which learning techniques supported by cognitive research do students use at secondary school? Prevalence and associations with students' beliefs and achievement. *Cognitive Research: Principles and Implications, 9*(1), Article 44. DOI: 10.1186/s41235-024-00567-5
- Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science, 26*(1–2), 113–125. DOI: 10.1023/A:1003044231033
- Siqueira, M. A. M., Gonçalves, J. P., Mendonça, V. S., Kobayasi, R., Arantes-Costa, F. M., Tempski, P. Z., & Martins, M. D. A. (2020). Relationship between metacognitive awareness and motivation to learn in medical students. *BMC Medical Education, 20*, Article 349. DOI: 10.1186/s12909-020-02318-8
- Spitzer, R. L., Kroenke, K., Williams, J. B. W., & the PHQ Primary Care Study Group (1999). Validation and utility of a self-report version of PRIME-MD: The PHQ primary care study. *JAMA, 282*(18), 1737–1744. DOI: 10.1001/jama.282.18.1737
- Stanton, J. D., Sebesta, A., & Dunlosky, J. (2021). Fostering metacognition to support student learning and performance. *CBE—Life Sciences Education, 20*(2), Article fe3. DOI: 10.1187/cbe.20-12-0289
- Stephanou, G., & Mpiontini, M. (2017). Metacognitive knowledge and metacognitive regulation in self-regulatory learning style, and in its effects on performance expectation and subsequent performance across diverse school subjects. *Psychology, 8*(12), 1941–1975. DOI: 10.4236/psych.2017.812125

- Temircan, Z. (2023). Exploring the relationship between metacognition, emotional regulation and perceived stress among college students. *Current Approaches in Psychiatry, 15*(Supplement 1), 110–118. DOI: 10.18863/pgy.1246718
- Umemoto, T. (2013). The effects of metacognitive and motivational regulation strategies on the use of cognitive strategies and persistence in learning. *Japan Journal of Educational Technology, 37*, 79–87. DOI: 10.15077/jjet.KJ00008721440
- Veenman, M. V. J., & Beishuizen, J. J. (2004). Intellectual and metacognitive skills of novices while studying texts under conditions of text difficulty and time constraint. *Learning and Instruction*, *14*(6), 621–640. DOI: 10.1016/j.learninstruc.2004.09.004
- Veit, C. T., & Ware, J. E., Jr. (1983). The structure of psychological distress and well-being in general populations. *Journal of Consulting and Clinical Psychology, 51*(5), 730–742. DOI: 10.1037/0022-006X.51.5.730
- Vučeljić, M., & Čabrilo, N. (2008). Naša škola: Marzanova taksonomija ili naučiti kako učiti [Our school: Marzano's taxonomy or learning how to learn]. Zavod za školstvo.
- Wang, X. (2023). Enhancing metacognition to improve learning outcomes: Evidence from higher education students. *Journal of Educational Psychology, 115*(5), 1023–1038. DOI: 10.1037/edu0000708
- Wilkinson, E. (2023). Medical students face high levels of mental health problems but stigma stops them getting help. *BMJ, 381*, p. 933. DOI: 10.1136/bmj.p933
- WHO (2016). *Mental health: Strengthening our response* [Fact sheet]. https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response
- Yelgeç, N., & Dağyar, M. (2022). A structural equation modelling of middle school students' metacognitive awareness, self-efficacy beliefs and foreign language learning anxiety. *International Journal of Contemporary Educational Research,* 7(1), 127–148. DOI: 10.33200/ijcer.657172
- Youssef, N. H., & Alibraheim, E. A. (2025). Self-regulated learning strategies among graduate students and their relationship with statistics anxiety. *Education Sciences, 15*(1), Article 17. DOI: 10.3390/educsci15010017
- Zhang, Y., & Li, X. (2022). Direct and indirect learning strategies in higher education: A study of metacognitive, cognitive, and affective approaches. *Frontiers in Psychology, 13*, Article 918345. DOI: 10.3389/fpsyg.2022.918345
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice, 41*(2), 64–70. DOI: 10.1207/s15430421tip4102_2