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Motivation and self-regulated learning as predictors of academic performance in advanced medical students.

Motivación y aprendizaje autorregulado como predictores del rendimiento académico en estudiantes avanzados de Medicina.

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Summary.

This study analyzes the relationship between motivation, self-efficacy, and self-regulated learning (SR) strategies in advanced medical students, evaluating their influence on academic performance. The MSLQ questionnaire was used to examine motivational dimensions (intrinsic value, self-efficacy, test anxiety) and cognitive, metacognitive, and resource management strategies. The results show that high-achieving students exhibit higher levels of self-efficacy, intrinsic motivation, and use of metacognitive and resource management SR strategies, such as planning, effort regulation, and organization of the study environment. Correlations indicate that motivation enhances the application of effective strategies and that self-efficacy predicts commitment to self-regulated learning. Semi-structured interviews reveal that high-achieving students combine individual and collaborative study, prioritize and manage their time, and adjust their strategies according to academic demands. This indicates that they employ self-regulated learning strategies from Pintrich's model, such as time and environment management, effort regulation, metacognitive self-regulation, collaborative learning, and motivational regulation, all of which contribute to their successful academic performance. These findings underscore the importance of integrating programs that foster motivation and self-regulation to optimize academic performance and the development of clinical competencies in medicine.

Keywords: Self-regulated learning, Academic motivation, Self-efficacy, Academic performance, Medical education

Abstract.

This study examines the relationship between motivation, self-efficacy, and self-regulated learning strategies (SRL strategies) in advanced medical students, evaluating their influence on academic performance. The Motivated Strategies for Learning Questionnaire (MSLQ) was used to assess motivational dimensions (Intrinsic Value, Self-Efficacy, Test Anxiety) and cognitive, metacognitive, and resource management strategies. Results show that high-performing students exhibit higher levels of self-efficacy, intrinsic value, and use of metacognitive and resource management strategies,

such as time and study environment management, effort regulation, and organization. Correlational analyzes indicate that motivation enhances the application of effective strategies and that self-efficacy predicts engagement in self-regulated learning. Semi-structured interviews reveal that high-performing students combine individual and collaborative study, prioritize and manage their time, and adjust their strategies according to academic demands, indicating the use of Pintrich's self-regulated learning strategies including time and study environment management, effort regulation, metacognitive self-regulation, collaborative learning, and motivational regulation, which contribute to their academic success. These findings highlight the importance of integrating programs that foster motivation and self-regulation to optimize academic performance and the development of clinical competencies in Medicine.

Keywords: Self-regulated learning, Academic motivation, Self-efficacy, Academic performance, Medical education

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1. Introduction

Academic performance in higher education is a complex and multidimensional construct that reflects the degree to which a student achieves their educational goals, usually measured by grades or cumulative average (1) . It is influenced by personal factors (motivation, self-efficacy), contextual factors (family, social, and economic), and pedagogical factors (teaching methods, curriculum design) (2) , as well as by study habits and active participation (3) . Cognitive, motivational, and metacognitive variables determine the ability to plan, monitor, and regulate one's own learning (3) , while contextual and pedagogical factors influence motivation, access to resources, and the quality of learning (4-5).

Self-regulated learning (SRL, del inglés "self-regulated learning")is a process by which students actively direct and control their learning (6) . Influential models, such as those of Zimmerman (3) and Pintrich (7) , integrate cognition, motivation, emotions, behavior, and context. Zimmerman describes it SRLas active participation in planning, execution, and self-reflection, considering self-efficacy central (3, 8) . Pintrich defines it as "an active and constructive process in which students set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and limited by their goals and the characteristics of the context" (7) (p. 453), highlighting its cyclical nature and regulation in four areas: cognitive, motivational/affective, behavioral, and contextual.

Research shows that self-regulation explains differences in academic performance (9-12) . The MSLQ allows for the assessment of motivation and learning strategies considering the course context (13) . Associations between its dimensions and academic performance are usually weak to moderate, reflecting the influence of multiple external and sociodemographic factors, such as socioeconomic status, age, gender, and family context (14-17) . Numerous studies have confirmed the usefulness of the MSLQ for predicting performance and motivation in various university contexts and disciplines, including medicine, engineering, and health sciences (9, 13, 18-25) . In the Latin American region, recent research in Paraguay, Chile, and Uruguay shows positive associations between planning, self-regulation, and academic performance (26-30) .

In this study, we analyzed learning strategies and motivational components of advanced medical students, evaluating the relationship between self-efficacy, intrinsic value, test anxiety, and the dimensions of the MSLQ, as well as potential differences according to sex and academic performance. We also investigated the self-regulated learning process of high-achieving students.

2. Methods

2.1 Type of study

A descriptive, cross-sectional study with a mixed-methods approach was conducted to explore how third-year medical students Centro Universitario Regional (CENUR) Litoral Norte, una sede regional de la Universidad de la República (Uruguay).self-regulate their learning in the course unit (CU) "Hematology and Immunology." The quantitative component was addressed using the MSLQ, and the qualitative component through in-depth, semi-structured interviews.

The Hematology and Immunology Unit (UC) is offered in the third year, the final year of the Basic Clinical and Community Cycle, prior to hospital rotations. It lasts twelve weeks, divided into three four-week modules, and in 2024, 180 students enrolled at the Paysandú and Salto campuses. The UC covers physiological and pathophysiological aspects of the hematological and immunological systems, aiming to equip students with theoretical knowledge, apply it to pathological phenomena, and develop study habits, group work skills, and self-directed learning to foster meaningful learning. It employs La asignatura se desarrolló bajo a flipped classroom model, en el cual los contenidos teóricos se trabajaron previamente de forma autónoma mediante la plataforma Moodle, mientras que el tiempo de clase presencial se destinó a actividades prácticas, discusión y resolución de problemas. De esta forma, hubo with asynchronous activities prior to the instructor meeting, which can nbe online or in person depending on the chosen modality. Evaluation combines formative, summative, and diagnostic components: three individual written exams (up to 85 points) and collaborative oral workshops/seminars (up to 15 points). The results are added together to determine approval (40-69 points), exemption (more than >69 points) or disapproval (less than <40 points). La exoneración refiere a la aprobación de la asignatura sin necesidad de rendir examen final y se utiliza como indicador de rendimiento académico.

2.2 Instrument

The abbreviated version of the motivational block of the MSLQ, adapted and validated for Uruguay (21 items, α=0.76), and the full version of the learning strategies block (50 items, α=0.75) were used, following the adaptations by Curione et al. (31) and Curione & Huertas (32) of Pintrich's original version (13). The questionnaire assesses motivation (intrinsic value, self-efficacy, and test anxiety) and learning strategies (repetition, elaboration, organization, critical thinking, metacognitive self-regulation, environment and study management, effort regulation, peer learning, and help-seeking). It was administered in paper-and-pencil format and virtually via Moodle, with the same instructions and informed consent from the students. The study received ethical approval from the Psychology Faculty Committee.

2.3 Participants

Se trabajó con una muestra por conveniencia (33). 107 students participated, approximately 60% of those enrolled at UC in 2024. Sociodemographic variables such as age, gender, origin, place of residence, scholarship, work and type of secondary education were recorded. In-depth interviews were conducted with six high-achieving students (23% of the sample).

2.4 Data Analysis

Quantitative data were processed using Jamovi 2.5 ("The Jamovi project. Jamovi (Version 2.5) [Computer software]," 2025). Cronbach's alpha was calculated to assess the reliability of the blocks and their dimensions, and correlations were analyzed using Pearson's r. Mean differences were studied using one-way ANOVA and independent samples t-tests by sex. Students were grouped into three performance levels (high, medium, and low), and significant differences were analyzed using ANOVA. Spearman's rank correlation coefficient was used to assess the predictive capacity of the MSLQ dimensions on academic performance.

2.5 Interviews

A semi-structured, in-depth interview was conducted with high-achieving students to explore the self-regulated learning strategies they use in their course of study. The interviews included four sections: characteristics of the learning process, study time management, organization of the study environment, and effort management, concluding with recommendations for improving study strategies. The recordings were transcribed while maintaining anonymity, and the data were analyzed using MAXQDA 2020 (VERBIX., 2020).

3. Results

In 2024, 180 students enrolled at the Paysandú and Salto campuses, and 107 students participated in this study. Sixty-eight percent of the students identified as female. Seventy-one percent were 20 or 21 years old, and 64% entered the Faculty of Medicine in 2022. First, reliability analyses of the instrument used were performed by calculating Cronbach's alpha for each of the evaluated dimensions. As shown in Table 1, the dimensions presented adequate internal consistency, similar to the Uruguayan validation of the instrument, with Cronbach's alpha ranging from 0.547 to 0.879. The Motivation subscale showed the greatest internal consistency, followed by Elaboration, Organization, Critical Thinking, Time and Study Environment Management, and Peer Learning, from the Learning Environment block. All Cronbach's alpha coefficients were suitable for research.

On the other hand, Effort Regulation was the dimension that showed the lowest internal consistency (Table 1), similar to what Piriz found in her Master's thesis (Píriz, 2017). The score for the Effort Regulation dimension could be explained by the fact that it is generally one of the lowest-scoring dimensions of the instrument. Indeed, Credé and Phillips conducted a meta-analysis of the MSLQ (comprising 2158 correlations from 67 samples representing a total of 19,900 students) finding that this dimension has an internal consistency of 0.61 with a standard deviation of 0.10, which indicates that it is usually a dimension that does not report high scores in most studies. It is also important to add that this dimension contains reversed-score items, and these are usually eliminated in validations because they can be problematic items (10-11).

Secondly, we analyzed the means and medians obtained for each dimension, as well as the correlation between the dimensions. The dimension with the highest mean in the study was Intrinsic Value within the Motivation block (Table 2). Within the EA block, Elaboration, Organization, and Regulation of effort were the most frequently used strategies in the analyzed UC.

When analyzing the dimensions by gender, we found that women exhibited greater Intrinsic Value (motivation block) than men. Similarly, within the EA block, women appear to use more Elaboration and Organization strategies than men (Table 3).

Regarding the correlation analysis between dimensions, as shown in Table 4, in the Motivation block, Self-Efficacy and Intrinsic Value were positively and significantly correlated. On the other hand, within the Learning Outcomes block, Elaboration showed the highest positive correlation coefficient with Organization, Critical Thinking, and Metacognitive Self-Regulation. The latter also showed a high level of correlation with Organization, Critical Thinking, Time and Study Environment Management, and Effort Regulation. These observations are consistent with the self-regulated learning model; that is, students who use deep processing strategies tend to be those who self-regulate their learning. Finally, Time and Study Environment Management and Effort Regulation also showed a high positive correlation with each other. Furthermore, the Help-Seeking and Peer Learning dimensions showed a high positive correlation coefficient.

Table 1. Reliability analysis by subscale of the applied MSLQ.

	MSLQ	Number of Items	Cronbach's alpha	alpha MSLQ-Uy
Motivation	Entire block	22	0.849	0.76
	Intrinsic value	9	0.876	0.83
	Self-efficacy	9	0.879	0.63
	Test anxiety	4	0.801	0.67
Learning Strategies	Entire block	50	0.903	0.75
	Repetition	4	0.556	0.62
	Elaboration	6	0.756	0.76
	Organization	4	0.777	0.72
	Critical thinking	5	0.736	0.76
	Metacognitive self-regulation	12	0.653	0.74
	Time management and the study environment	8	0.788	0.75
	Regulation of effort	4	0.547	0.70
	Peer learning	3	0.76	0.71
	Seeking help	4	0.641	0.62

Table 2. Medians and means obtained for each dimension.

Dimension	Median	Average	Des. Est.
Intrinsic value	5,8890	5,7780	0.7353
Self-efficacy	5,3330	5.2980	0.7911
Test anxiety	4,7500	5.2980	0.7911
Repetition	4,7500	4,8060	1.2980
Elaboration	5,5000	5,4030	1,3000
Organization	5,2500	5.2750	1.1610
Critical thinking	4,8000	4,6420	0.9260
Metacognitive self-regulation	5,0000	4,9480	0.6982
Time management and the study environment	5,0000	4,9820	1.0480
Regulation of effort	5,2500	5,2010	0.8574
Peer learning	4,6670	4,4690	1.4220
Seeking help	4,0000	3,8630	1,6530

Table 3. Means obtained for each dimension according to gender.

	Women (n=73)		Men (n=32)		t-test
Dimension	Average	Des. Est.	Average	Des. Est.	p-value
Intrinsic value	5,911	5,485	5,556	0.7074	<0,01
Self-efficacy	5,390	5,076	5,111	0.8143	ns
Test anxiety	4,916	4,614	4,625	1,394	ns
Repetition	4,983	4,693	4.75	0.9811	ns
Elaboration	5,598	4,973	5,083	1,035	<0,05

Organization	5,506	4,727	5,000	1,044	<0,01
Critical thinking	4,703	4,481	4,500	1,077	ns
Metacognitive self-regulation	5,034	4,784	4,833	0.712	ns
Time management and the study environment	5,083	4,758	4,750	0.9985	ns
Regulation of effort	5,229	5,133	5,250	1,034	ns
Peer learning	4,507	4,380	4,500	1,512	ns
Seeking help	3,905	3,758	3,625	1,113	ns

Table 4. Correlation between dimensions in the total population.

Dimension	1	2	3	4	5	6	7	8	9	10	11	12
1. Intrinsic value	1.00											
2. Self-efficacy	0.61** [0.46-0.72]	1.00										
3. Test anxiety	0.01	-0.15	1.00									
4. Repetition	0.16	0.11	0.30**	1.00								
5. Preparation	0.52** [0-37 0,65]	0.55** [0,39-0,67]	0.08	0.24	1.00							
6. Organization.	0.31*	0.48**	0.16	0.39**	0.58** [0,44-0,69]	1.00						
7. Critical thinking	0.46**	0.43**	0.08	0.27**	0.55** [0,39-0,67]	0.31**	1.00					
8. Metacognitive self-regulation	0.46**	0.55** [0,39-0,67]	-0.05	0.41**	0.6** [0,45-0,71]	0.55** [0,39-0,67]	0.55** [0,39-0,67]	1.00				
9. Time/environment management for studying	0.22	0.55** [0,37-0,66]	-0.19	0.26**	0.38**	0.42**	0.34**	0.57** [0,42-0,69]	1.00			
10. Regulation of effort	0.44**	0.47**	-0.18	0.21*	0.41**	0.32**	0.43**	0.54** [0,38-0,66]	0.6** [0,46-0,71]	1,000		
11. Apprentice. Among peers	0.23*	0.40**	0.06	0.12	0.39**	0.3**	0.34**	0.39**	0.29**	0.21*	1,000	
12. Seeking help	0.04	0.14	-0.11	-0.04	0.21*	0.02	0.14	0.16	-0.04	-0.03	0.58** [0,44-0,69]	1,000

*p <0 ,05, **p <0 ,01, Para el r≥0,5 se indica el IC95% entre corchetes.

On the other hand, considering that self-efficacy correlated with cognitive learning skills (LSS) involving deeper information processing, such as elaboration, organization, and critical thinking, as well as metacognitive skills, we analyzed which LLS are used by students with high (means greater than 6), medium (means between 5 and 6), and low (means less than 5) self-efficacy. Table 5 shows that students with high levels of self-efficacy also exhibited high intrinsic value. These students utilize complex cognitive LLS such as elaboration, organization, and critical thinking. The most significant differences were detected in the use of metacognitive LLS, indicating that students with high levels of self-efficacy possess skills in metacognitive self-regulation, time and study environment management, and effort regulation (Table 5).

Table 5. Means obtained for each dimension according to the level of self-efficacy.

Dimension	Self-efficacy			p-value		
	High (n=24)	Average (n=53)	Low (n=30)	A vs M	A vs B	M vs B
Intrinsic value	6,333	5,778	5,278	<0.0001	<0.0001	<0.05
Self-efficacy	6,222	5,333	4,333	<0.001	<0.001	<0.001
Test anxiety	4,375	4.75	5.00	ns	ns	ns
Repetition	5,125	4.75	4,708	ns	ns	ns
Elaboration	5,917	5,333	5.00	ns	<0.0001	<0.05
Organization	6.25	5.25	5.00	ns	<0.001	<0.05
Critical thinking	5.00	4.80	4.40	<0.05	<0.001	ns
Metacognitive self-regulation	5,583	5,083	4.50	<0.001	<0.0001	<0.01
Time management and the study environment	6,188	5,125	4,375	<0.001	<0.0001	<0.01
Regulation of effort	5,875	5.25	4.75	<0.001	<0.0001	ns
Peer learning	5.5	4,667	3,667	ns	<0.01	<0.01
Seeking help	4.00	4.00	3.50	ns	ns	ns

Next, we evaluated the correlation between the analyzed dimensions and student performance, as measured by scores obtained in the analyzed course. Students could earn up to 100 points during the course, 85 of which were obtained through individual written tests consisting of multiple-choice questions with four distractors, and 15 points through collaborative oral presentations. Table 6 shows the results obtained for the total population. The dimensions that showed the highest positive and significant correlation coefficient with overall performance were Self-Efficacy, Metacognitive Self-Regulation, Time and Study Environment Management, and Effort Regulation. When analyzing the correlation of these dimensions with performance on individual exams, a high positive and significant correlation was found, similar to that observed in overall performance, and also including Critical Thinking. Finally, if we analyze the correlation with performance in collaborative oral tests only, the EAs that correlated significantly and positively with performance were Time Management, Effort Regulation and Peer Learning (table 6), which suggests that group activities promote collaboration and peer learning.

Table 6. Analysis of the correlation of the dimensions with performance in the total population.

Dimension	Total	Written	Oral
Intrinsic value	0.1960218*	0.2089000*	0.0041240
Self-efficacy	0.3250212**	0.3166000**	0.1731000
Test anxiety	-0.0878533	-0.0898300	-0.0258300
Repetition	0.1572887	0.1657000	0.1074000
Elaboration	0.1917857*	0.1589000	0.1617000
Organization	0.1825120	0.1291000	0.2286000*
Critical thinking	0.2268529*	0.2758000**	0.1188000
Metacognitive self-regulation	0.3323385**	0.3397000**	0.2202000*
Time management and the study environment	0.3782040**	0.3995000**	0.2672000**
Regulation of effort	0.4452019**	0.4738000**	0.3335000**

Peer learning	0.2388999*	0.2259000*	0.3229000**
Seeking help	0.1797621	0.1637000	0.1764000

Next, we evaluated the correlation between the analyzed dimensions and performance by gender (Table 7). First, we observed that the dimensions correlated with performance in women and men differed. For women, Self-Efficacy, Time and Study Environment Management, and Effort Regulation showed the highest positive and significant correlations. For men, the dimensions with these characteristics were Elaboration and Metacognitive Self-Regulation.

Table 7. Analysis of the correlation of dimensions with performance according to gender.

	Women			Men		
Dimension	**Total**	**Partial**	**Oral**	**Total**	**Partial**	**Oral**
Intrinsic value	0.1294	0.1359	0.01418	0.2204	0.3015	0.06553
Self-efficacy	0.3862**	0.3626**	0.2224	0.2151	0.2362	0.09369
Test anxiety	-0.07335	-0.09043	0.0848	-0.1732	-0.1116	-0.2484
Repetition	0.02706	0.04641	0.04657	0.3793*	0.3998*	0.2535
Elaboration	0.02396	-0.02119	0.1409	0.460**	0.4803**	0.2519
Organization	0.189	0.1445	0.2719*	0.1735	0.1608	0.2275
Critical thinking	0.1439	0.1882	0.1145	0.3244	0.4212	0.1376
Metacognitive self-regulation	0.2835*	0.2843*	0.2118	0.4176*	0.4727**	0.2942
Time management and the study environment	0.452**	0.4731**	0.3561**	0.2483	0.3129	0.1065
Regulation of effort	0.4706**	0.495**	0.4032**	0.3401	0.418*	0.1835
Peer learning	0.2346*	0.2245	0.297*	0.2284	0.2359	0.3577*
Seeking help	0.1063	0.08591	0.1308	0.3712	0.3245	0.2703

*p <0,05, **p< 0,01

Finally, to determine which dimensions are used by high-achieving students, we analyzed the scores for each dimension in three groups based on academic performance. One group, designated as "high-achieving," represented students who passed the course, meaning they scored more than 70 points. The "average-achieving" group consisted of students who passed the course but did not receive an exemption, scoring between 40 and 69 points. The "low-achieving" group, on the other hand, consisted of students who did not pass the course, scoring less than 39 points. Table 8 shows that the high-achieving student group exhibited greater intrinsic value, self-efficacy, use of complex cognitive strategies, and learning self-regulation. However, of all these dimensions, the ones that showed significant differences were metacognitive self-regulation, time and study environment management, and effort regulation. These results are consistent with those obtained in studies correlating with performance and show that the learning strategies used by high-achieving students are metacognitive.

Table 8. Averages obtained for each dimension according to performance.

	Performance			p-value		
Dimension	**High (n=26)**	**Half (n=63)**	**Low (n=18)**	**A vs M**	**A vs B**	**M vs B**
Intrinsic value	5,996	5,719	5,671	ns	ns	ns
Self-efficacy	5,684	5,219	5,018	<0.05	<0.05	ns
Test anxiety	4,356	4,986	4,826	ns	ns	ns
Repetition	5,058	4,896	4,569	ns	ns	ns
Elaboration	5,699	5,328	5,242	ns	ns	ns
Organization	5,654	5,111	5,303	ns	ns	ns
Critical thinking	5,054	4,507	4,519	<0.05	ns	ns

Metacognitive self-regulation	5,362	4,801	4,864	<0.0001	ns	ns
Time management and the study environment	5,702	4,778	4,657	<0.01	<0.01	ns
Regulation of effort	5,865	5,087	4,639	<0.0001	<0.0001	ns
Peer learning	5	4,328	4,194	ns	ns	ns
Seeking help	4,202	3.79	3.63	ns	ns	ns

In the analysis of sociodemographic characteristics according to academic performance level (low, medium, and high), no significant differences were found with respect to sex or type of secondary education (public or private). However, relevant associations were observed with other variables. First, 30.3% of students who do not work achieved high performance, a figure that dropped to 15% among those who combine study and work. Similarly, access to a financial aid scholarship was positively associated with performance: 38.7% of scholarship recipients showed high performance, compared to 22% of those who did not. These findings suggest that having more time and financial support is a key resource for sustaining learning, which coincides with Pintrich's emphasis on the regulation of context and resources, one of the four areas of his self-regulated learning model (7). According to the author, students who are able to effectively manage external factors such as available time or socioeconomic conditions are more likely to self-regulate their learning and achieve better results.

Regarding académico academic underachievement, definido como el retraso en la progresión curricular esperada,the entry cohorts and the number of times the course was taken were analyzed. Of the students who entered in 2022, 37.5% achieved high performance, while the proportion dropped to 7.1% and 15.8% among those who entered in 2021 or before 2020, respectively. A similar pattern was observed regarding course completion: 27.3% of those taking the course for the first time achieved high performance, compared to only 12.5% among those repeating the course. This evidence shows that academic underachievement is associated with lower performance. This phenomenon may be linked to the planning and activation phase of Pintrich's model, since underachieving students often face greater difficulties in setting realistic goals and effectively managing their time and effort (34). As delays accumulate, the cognitive and emotional load increases, which can limit motivation and self-efficacy, two critical components for sustaining the self-regulated learning cycle.

To delve deeper into the characteristics of self-regulated learning (SE) strategies used by high-achieving students, we conducted semi-structured interviews with six students (three women and three men) who took the course for the first time in a blended learning format.

3.1 Planning and organization

The narratives clearly demonstrated the ability to organize and plan: anticipating and distributing activities according to the schedule, supplementing materials with bibliography, and reserving days prior to the midterm for intensive review.

BO: "The first thing I did was grab a sheet of paper. And I started writing down all the topics that fell within the unit… For example, it's a checklist."

CC: "I always know that by a certain date I have to have X number of topics."

These testimonies reflect the planning and activation phase described by Pintrich, in which students set goals and organize cognitive and behavioral resources.

3.2 Monitoring and control

Students reported metacognitive monitoring strategies: explaining topics to themselves or others, self-assessing, using questions from previous exams, recording notes, and checking understanding in peer groups.

CC: "...explaining it to someone, among colleagues, let's say. That helps us a lot."

EL: “I felt that the self-assessments helped me a lot… and I really liked that I received feedback.”

HE: "...taking notes from classmates in seminars..."

AA: “When I can explain something, I know that I know it. If I can't explain it, it implies that I haven't yet internalized that information.”

When faced with obstacles, they resorted to adaptive strategies of seeking help from peers, teachers, books, the internet, or artificial intelligence.

BO: “I also used artificial intelligence… I would always ask, for example, ChatGPT… to explain this topic to me because I didn’t understand it well… I would do that. So I would observe and try to understand…”

FR: “You usually go to the Internet or books, which is the other classic option.”

NM: “(if) nobody understands (in the group of classmates) the teachers are consulted.”

In general, they resolved their doubts independently or with peers, resorting to teachers only as a last resort.

3.3 Reflection

Students reflected on their performance based on teacher feedback, analysis of partial exams, or comparison of expectations with results.

CC: "...first compare it with what I expected. And say: (...) it's what I expected; it's more; it's less. And (...) see what I lacked, what the weaknesses were."

BO: “I start analyzing what I could have done well. And (...) what I didn't do so well.”

AA: “I try to see afterwards, by doing a kind of retrospective analysis of what I learned, whether I really learned something different or not.”

3.4 Time Management

The interviewees prioritized studying over other activities and organized their day according to the most suitable times for studying.

HE: "...my life is dedicated to studying. So it's the only important role I have to fulfill."

CC: “I would start the week with an agenda where I knew what topics I had to cover on which days. So, in that organization, I included my personal life.”

Some followed structured schedules with regular breaks, while others preferred more flexible daily goals.

NM: “I start studying around 2 pm. And I never go over 2 hours… After that, I take a 1-hour break… And then I sit down again for 2 hours.”

In general, they used schedules, agendas, or checklists, reserving specific days for review.

NM: “First, I check the course schedule… and I try to reserve at least 3 days before a midterm.”

HE: "...I wrote it down on a little list... week 1... I have 7 videos... Then I crossed off the ones I made..."

3.5 Environment and effort management

The students agreed on the need for a quiet, tidy and well-lit space, regulating distractions such as cell phones.

BO: “I always try to choose (...) a place that is very quiet, very silent.”

FR: “I usually study with the computer.”

NM: “I need to have a comfortable space where I can keep all those materials within easy reach…”

To control distractions, they mentioned leaving their cell phones away or turning off the internet, as well as alternating study and rest intervals.

AA: “I usually have my computer, but I leave my phone far away. When I finish the activity, I pick up my phone again. And when I go back to studying, I leave it far away again.”

HE: "...you alternate study time with other activities..."

CC: "...I can't sit down to study for an hour, but I can do 20 minutes. So I set a 20-minute timer..."

CC: "(I use the cell phone with) a timer. Say, I don't know, I want to use the cell phone. Okay, 5 min. and that's it."

3.6 Individual and group study

The students combined individual study with group review.

CC: "When I first encounter a topic, I prefer to do it individually. I prefer to be alone, at home. (...). I think the group part is very enriching when it comes to reviewing."

AA: "...different points of view are often very important... Having someone tell you: look, I think it can go this way, is very good."

3.7 Motivational regulation and self-efficacy

Self-efficacy and perseverance emerged as drivers of motivation.

HE: "I know I'm capable. And I know that if I didn't make it, it was because of something I did wrong… I try to see where I went wrong so I can improve… If you believe it, anything is possible. So I think it's a matter of persevering."

AA: "...this path is not easy. And this is not a sprint. This is a marathon. And everyone's learning process is different."

They also used strategies such as short study intervals (e.g., Pomodoro Technique), challenges with rewards, prioritizing topics, and scheduled breaks.

FR: "What saved me was knowing how to prioritize the key issues or important points."

AA: "What I usually do is set myself mini-challenges, forcing myself to accomplish what I have to do and to have some reward at the end."

BO: "study, I don't know, 2 hours straight. Stop for half an hour. (...). Then go back to studying."

3.8 Advice to other students

In the end, they recommended resting, avoiding memorization, understanding, reviewing days before, setting clear goals, trusting the process, studying with peers, and minimizing distractions.

BO: "Have friends at university, have people with whom to share opinions…"

BO: "Try to avoid as many distractions as possible… lean on your close companions."

CC: "To achieve your goals, you have to have them clear and chart the path towards the objective."

FO: "...don't worry so much about memory issues... I think that, for me, a fundamental pillar is understanding the topics."

NM: "I therefore consider rest to be very important."

NM: "... to have practice days before an evaluation or a midterm."

In summary, high-achieving students demonstrated that they went through all phases of Pintrich's model: planning, monitoring, control, and reflection, articulated with the management of time, environment, effort, and motivation.

4. Discussion

This study explored learning strategies and certain motivational aspects in advanced medical students. The first objective was to examine the relationship between self-efficacy, intrinsic value, and test anxiety with the nine dimensions of self-regulated learning strategies on the MSLQ. For the motivational component, the Intrinsic Value and Self-Efficacy subscales showed the highest

averages, while Test Anxiety had the lowest. This aligns with correlation analyses, which indicated a significant and positive correlation between Intrinsic Value and Self-Efficacy. This suggests that students who consider a task important for their education, regardless of the grade, have greater self-confidence when faced with an academic challenge, or that students who feel more capable place greater importance on tasks. However, our study did not find a significant correlation with the Test Anxiety subscale. Other studies have described a significant negative correlation between the Self-Efficacy subscale and Test Anxiety (28, 31), which can be interpreted as meaning that students who are more confident in their knowledge experience less anxiety before an exam or test; this is of interest for further research. Another point to consider is the characteristics of the course, the assignments, and the assessment activities, which can vary between subjects and between different degree programs. The cited studies were conducted with first-year students, primarily in Psychology. Indeed, different degree programs have different objectives, and students' expectations, learning styles, and thought processes vary considerably (35).

Regarding learning strategies, the most used were the cognitive strategies Elaboration and Organization. Previous studies carried out during the last two decades also found that Elaboration and Organization are the most used in Psychology students from Michigan (36) , Argentina (37-39), Spain (40), South Africa (41) and Uruguay (27, 42) .

Motivation, for its part, plays a central role in the use of metacognitive self-regulation strategies, as it directly influences a student's willingness to plan, monitor, and adjust their learning processes. According to Pintrich's model, motivational components, such as self-efficacy, goal orientation, and perceived task value, determine the degree of commitment to self-regulation (7). Students with greater intrinsic motivation tend to employ metacognitive strategies, such as self-evaluation and replanning, more frequently because they perceive learning as valuable and achievable (3, 5). In turn, empirical research has shown that motivation not only predicts the use of these strategies but also moderates their effectiveness in improving academic performance (43).

On the other hand, we also found that the most frequently used EA was Effort Regulation. This comprises the resource management dimension. Some of the studies mentioned above coincide with these results (27, 44). The results of the comparisons between the dimensions of the motivational block and the EA block of the MSLQ indicate that they are positively and significantly correlated. The highest, most positive, and statistically significant values were found between: Peer Learning and Help Seeking, Metacognitive Self-Regulation and Elaboration, Effort Regulation and Management of the Study Environment and Space, and Elaboration and Organization. The remaining relationships were positive, weak, and statistically significant. These results coincide with the findings of a recent study conducted with engineering students in Chile, in which significant correlations were found in the learning self-regulation subscales of first- and second-year students (45). On the other hand, consistent with our findings, Curione et al. (31-32) found that intrinsic value is also associated with the use of cognitive and metacognitive strategies and resource management (particularly time and study environment management and effort regulation). They also observed that test anxiety is positively linked to the use of the cognitive strategy of surface information processing (repetition). For their part, Buffa et al. (46) found that, as students progress in their university studies, there is a decrease in the use of surface learning strategies, such as rote memorization and literal recall of information, and, in parallel, an increase in the use of deep processing strategies, linked to the elaboration and organization of content.

On the other hand, the Help-Seeking and Peer Learning subscales reported lower scores. These subscales also reported the highest standard deviations. Credé and Phillips (10-11) offer a possible explanation for this result. They suggest that item 68, “When I don’t understand the course material, I ask a classmate for help,” from the Help-Seeking subscale of the MSLQ, is biased, as it asks the student to respond to an event and indicate whether they participated in the response.

Consequently, it lacks clarity in discriminating between the following possibilities: the respondent would not seek help because they don't need it, or the respondent did not understand the course material but did not ask for help.

The second objective of this study was to identify potential differences in motivational and learning components according to students' gender, through an analysis of possible associations between scores on the Motivation and Learning Assessment (EA) subscales and gender. Women showed higher scores in Intrinsic Value, Organization, and Elaboration than men. The remaining dimensions did not show statistically significant differences according to gender. Other studies conducted in Uruguay found more marked differences between men and women, highlighting greater use of metacognitive and resource management skills by women, as well as test anxiety (28, 31-32). These differences found in our study could be due to the fact that we worked with advanced students rather than beginners.

The third objective of this study focused on analyzing the relationship between the dimensions of the MSLQ and academic performance in the evaluated subjects, as well as determining the predictive power of these dimensions on performance. In this regard, we found that students who demonstrated excellent performance (passing the course by obtaining more than 70 points across all assessments) used metacognitive and resource management learning strategies more frequently, such as metacognitive self-regulation, time and study environment management, and effort regulation, compared to students with average and low academic performance. These strategies allow students to plan, monitor, and adjust their learning, maintain effort when faced with difficult tasks, and effectively organize temporal and spatial resources, thus facilitating better performance (10, 11, 45). Previous studies have found that self-regulation of learning is positively related to academic performance (17, 45). This is also reflected in the correlation study of the different dimensions with academic performance. Curione (27) and Flores Araya et al. (45) found correlations between motivation, self-regulated learning, and academic performance in psychology students, indicating that cognitive self-regulatory strategies are related to metacognitive and resource management strategies. Finally, Bergin et al. (47) described how students with better results tend to use metacognitive and resource management strategies. However, like us, they did not find relationships between the use of cognitive strategies and academic performance. Similar results, placing metacognitive strategies as the best predictors of performance, have been found in other studies (48) . In fact, evidence suggests that, in students in advanced courses, these dimensions tend to show higher correlations with performance than other MSLQ scales, possibly because academic progress fosters the development of more sophisticated and adaptive self-regulatory skills (12, 37, 39, 49-50). This supports the idea that mastering self-regulation strategies is a key factor in sustaining academic success in the later stages of university education. These results align with information obtained from interviews, which showed that high-achieving students are able to manage and administer their effort, control distractions, make optimal use of their study environment and time, identify their level of understanding, and verify their knowledge acquisition. These students have a high level of self-efficacy and are able to learn from their peers, as they learn collaboratively after having gone through an individual learning process.

In this context, our results regarding the correlation between the motivational block and the self-regulated learning block indicate that once motivated, students are able to understand the objectives and facilitate learning. This conclusion is supported by the oresponses testimoniosof the students interviewed: once they perceive themselves as capable, students are more likely to persevere in the face of challenges and to use more effective self-regulated learning strategies (7). Similar results were found with psychology students in Uruguay (31-32), who observed similarities with the findings of the original studies of the instrument (6-7) when comparing the dimensions of the motivational block with those of the self-regulated learning block of the MSLQ.

On the other hand, this study also reveals self-efficacy as one of the motivational components that correlate with academic performance, especially in female students. In this sense, students with high levels of self-efficacy tend to engage more deeply with the task and employ complex cognitive and metacognitive learning strategies, managing resources more effectively and, consequently, improving their performance (51). The studies mentioned above also found that high levels of self-efficacy are related to higher levels of intrinsic value and negatively to test anxiety. Furthermore, Belletti and Vaillant (51) observed a strong correlation between intrinsic value and almost all self-regulation learning strategies in university students of computer systems in Uruguay. In this regard, students with high levels of self-efficacy tend to make greater use of cognitive strategies (particularly elaboration and critical thinking) and metacognitive self-regulation. Similarly, other studies have shown that self-efficacy is usually a better predictor of good academic performance (10-11). Self-efficacy has to do with the judgments that a person makes about the capabilities they have to organize and carry out actions that are oriented towards the type of performance they expect, therefore, it is related to beliefs about what we can achieve in certain situations (52) .

It is important to note that course characteristics, and particularly the assessment formats used, can affect the MSLQ's ability to predict academic performance. It has been previously indicated that the instrument is a good predictor of performance in subjects with more complex and challenging assessments, which in turn lead to greater use of self-regulated learning strategies (Curione, 2018), as is the case with the course in this study. In fact, the course includes diverse activities (online and in-person), tasks requiring the critical application of knowledge, and individual and collaborative assessments, both written and oral, essay-based and multiple-choice.

Few studies have been published on motivation and self-regulatory behavior (SRB) in medical students. A recent study analyzed motivation and SRB in medical students in different years in Spain, but did not examine the relationship with academic performance (53). This study found that first-year students were more motivated than residents, and that residents made greater use of metacognitive SRB and resource management strategies. Another study analyzed the link between academic performance and self-regulatory capacity over three consecutive years in medical students in the Clinical Cycle, demonstrating, as in our study, that motivational characteristics influence students' self-regulatory capacity and academic performance (54). Furthermore, researchers in Peru have evaluated whether self-efficacy and intrinsic value affect motivation and self-regulated SRB among medical students. Students who believe in their ability to learn tend to engage more deeply with the material, manage academic stress better, use self-regulated learning strategies, and manage resources efficiently (55). In short, medical students with high intrinsic motivation tend to be more autonomous and persistent, using advanced cognitive and metacognitive strategies to optimize their learning. These results highlight the importance of integrating educational programs that foster both intrinsic motivation and self-regulation skills in demanding educational environments, such as a medical degree program.

Finally, the fourth objective of this study was to delve deeper into the characteristics of self-regulated learning among high-achieving students through semi-structured interviews. These students demonstrated a high level of self-efficacy and the application of motivational regulation strategies, which aligns with Pintrich's model on the importance of sustaining motivation, managing anxiety, and regulating negative emotions in self-regulated learning (7, 56). Furthermore, the high-achieving students interviewed demonstrated a clear prioritization of their studies, organizing their schedules according to the most convenient time of day for learning and adjusting their personal activities accordingly. It is important to note that none of the students interviewed were employed, so they did not need to balance study and work. This aligns with the survey results, which indicate that, beyond individual characteristics, socioeconomic conditions (not working, having a scholarship) and academic conditions (attending classes on time) constitute

contextual resources that impact the ability to self-regulate learning and, consequently, academic performance.

In terms of time and environment management, they employ both structured and flexible plans, demonstrating planning and self-regulation skills. When faced with tight deadlines or complex situations, they restructure their schedules, prioritizing academic tasks, which demonstrates effort self-regulation strategies. They also create optimal study environments and use resources to minimize distractions. Regarding collaborative learning, they combine in-depth individual study with group work, where they review and verify knowledge, enhancing both comprehension and self-assessment. Therefore, these findings show that these students employ self-regulated learning strategies described in Pintrich's MSLQ, such as time and environment management, effort regulation, metacognitive self-regulation, collaborative learning, and motivational regulation, all of which contribute to their successful academic performance.Sin embargo, es fundamental destacar que este estudio presenta algunas limitaciones. En primer lugar, la muestra fue por conveniencia e incluyó al 60% de los estudiantes inscritos, lo que podría introducir un sesgo de selección. En segundo lugar, no se realizó un cálculo previo de poder estadístico, dado el carácter observacional y exploratorio del estudio. Asimismo, los análisis se basaron en correlaciones bivariadas (Spearman), sin ajuste multivariable por posibles variables de confusión como la condición de beca o la situación laboral, por lo que los resultados deben interpretarse como asociaciones y no como relaciones causales.

5. Conclusions

- This study analyzed the motivation and learning strategies (LS) used by advanced students of the Faculty of Medicine, showing that self-efficacy and metacognitive and resource management strategies are significantly associated with academic performance.
- As a continuation of this research, it is pertinent to delve deeper into the study of the digital learning strategies used by students, considering that the course is delivered in a blended or online format. These strategies are fundamental in current educational contexts, as they promote autonomy and critical thinking, essential skills for 21st-century students.
- Within the framework of medical school students' training, analyzing motivation and learning strategies not only contributes to academic success but is also key to developing committed, competent, and resilient physicians. In this sense, motivation stimulates curiosity, an interest in linking theoretical knowledge with its practical application, and a willingness to pursue continuing education—all central aspects of medical practice.
- Furthermore, medical training is characterized by its high demands and the significant stress levels students face. Properly guided motivation, coupled with the use of effective learning strategies, can facilitate a more effective approach to academic challenges, not only in theory but also in the development of fundamental clinical skills such as critical thinking, decision-making, and complex problem-solving—key elements in clinical practice.

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