



Correlation of Motivational Beliefs and Cognitive and Metacognitive Strategies with Academic Achievement of Students of Shiraz University of Medical Sciences

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Abstract

Background: Success and academic achievement are among the most important goals of both students and educational systems. Researchers have examined the impact of different factors such as intelligence, personality, attitude, study habits, thinking skills and academic motivation on students' academic performance.

Objectives: The purpose of this study was to investigate the relationship of motivational beliefs and cognitive and metacognitive strategies with students' academic achievement.

Methods: In this descriptive - analytic cross-sectional study, the statistical population included all medical and health students of Shiraz University of Medical Sciences (1405 students), 250 of whom were selected according to the Levy and Lemeshow's formula. After estimating the sample size, the stratified random sampling method was used. To collect data, Pintrich and de Groot's motivated strategies for learning questionnaire (MSLQ) was employed. Data were analyzed using descriptive statistics, Pearson's correlation and independent *t*-test.

Results: Among the components of cognitive learning strategies, comprehension ($r = 0.1266$, $P < 0.10$), and among the components of metacognitive learning strategies, the regulation component ($r = 0.049$, $P < 0.05$) had a significant positive correlation with academic performance. Among the components of motivational beliefs, the self-efficacy component ($r = 0.173$, $P < 0.10$) showed a significant positive correlation with academic performance. Based on the results of multiple regression analysis, only metacognitive learning strategies had the ability to predict the academic performance of the students. There was no significant difference between male and female students in any of the studied variables.

Conclusions: Based on the results, students who use more diverse cognitive strategies show better performance than others. Performance is more desirable among those who evaluate their understanding of the content of the course and make more efforts and have more perseverance (regulation) in the learning process. Students who believe in their abilities (self-efficacy) and reinforce these beliefs will have a better academic performance.

Keywords: Learning Strategies, Cognitive, Metacognitive, Academic Achievement, Students

1. Background

Today, success and academic achievement are among the most important goals of both students and educational systems, because the success of students plays an important role in acquiring job opportunities and creating a desirable life, it also reflects the effectiveness and efficiency of educational systems. Therefore, better understanding of individual factors influencing students' academic achievement has always been one of the main concerns in the field of learning psychology (1) and one of the

challenges faced by teachers in the higher health education system (2).

Accordingly, many studies have examined the factors affecting the academic achievement of students and have examined the impact of different variables such as intelligence, personality, attitude, study habits, thinking skills, competence and academic motivation on learner's academic performance (3-10). In this regard, researchers have pointed to self-regulated learning strategies in their efforts to explain the factors affecting performance and academic achievement (11).

Self-regulated learning is defined as the ability of students to take responsibility and manage their learning processes. Therefore, self-regulated learning involves equipping or mobilizing cognitive, metacognitive, emotional and motivational resources of students (12). Accordingly, researchers regard self-regulated learning as a multidimensional construct that emphasizes on learners' active role (13). Therefore, focusing on self-regulated learning strategies (cognitive, metacognitive and motivational) of learners has led to the introduction and presentation of different models and patterns of these strategies. Although all these models offer different perspectives on self-regulated learning, they all consider self-regulating learners as actively involved in building knowledge and using diverse cognitive and metacognitive strategies to manage and regulate their learning (14).

One of the most widely used theories in this field is Pintrich's self-regulated learning theory. Pintrich and de Groot defined self-regulated learning, in which the learner regulates and controls his/her learning goals, cognition, motivation and behaviors (11). In fact, Pintrich et al. (1995) argued that by considering motivational components along with cognitive components, learner's learning and performance can be explained more realistically. Similarly, they referred to the three components of cognitive strategies, metacognitive strategies and motivational beliefs (15).

Cognitive strategies are those strategies that are directly related to information processing and can be used to acquire, store and use information better. In contrast, metacognitive strategies are methods used by individuals to plan, monitor and regulate learning (13). Pintrich and de Groot proposed that motivational beliefs include self-efficacy, intrinsic value and test anxiety (11).

Learning strategies play an important role in the acquisition, storage and use of knowledge (16). Also, they play a facilitating role in learners' learning process (17). Accordingly, students who use more diverse strategies can achieve better learning and higher academic performance than their peers who do not have the skills to use these strategies (7, 8, 12, 13). Studies in this field have confirmed the effectiveness of these strategies and have shown their positive relationship with learners' performance and academic achievement (12, 18-21).

The results of some studies suggest that self-regulated learning strategies can predict academic performance (21, 22), because students who use self-regulation in their learning process are more focused on their own performance and have a sense of competence and ability to fulfill tasks. Not only are these students more motivated, but they also have more self-control behaviors and educational ambitions. In contrast, students who do not have suffi-

cient experience in the self-regulation process have a lower sense of competence and self-efficacy and higher levels of anxiety. Also, they avoid learning opportunities ahead of them (23).

Regarding the importance of self-regulated learning strategies in the learning process, several studies have examined these strategies. Generally, previous studies were mainly focused on motivational-cognitive constructs such as epistemological beliefs (24), self-efficacy beliefs (25), academic emotions (17, 26), progress goals (2) and assignment value (27), but in the context of the consequences of self-regulated learning strategies, research is limited, especially in higher education in health and medical sciences. On the other hand, most studies have been conducted in Western countries (2, 11, 12, 28), and the extrapolation of these results to other countries, especially developing countries, has been criticized (29). Therefore, this study was conducted to investigate the effect of self-regulated learning strategies (cognitive and meta-cognitive strategies) and motivational beliefs on academic performance of medical and health students of Shiraz University of Medical Sciences in 2017 - 2018.

2. Objectives

Therefore, this study was conducted to investigate the effect of self-regulated learning strategies (cognitive and meta-cognitive strategies) and motivational beliefs on academic performance of medical and health students of Shiraz University of Medical Sciences in 2017 - 2018.

3. Methods

This was an applied cross-sectional (descriptive - analytical) study. The statistical population of the study included all the health and medical students of Shiraz University of Medical Sciences. According to the obtained data and Levy and Lemeshow's formula, 250 students were selected (30). This formula is one of the sampling formulas that is widely used in human and behavioral sciences research (30) and is presented in Equation 1, where n is sample size, N denotes population size, S_x shows standard deviation, ε signifies error coefficient, V_x is coefficient of variation and Z is the level of confidence.

$$n \geq \frac{Z^2 N V_x^2}{(N - 1) \varepsilon^2 + Z^2 V_x^2}, V_x = \frac{S_x}{\bar{X}} \quad (1)$$

It should be noted that the motivated strategies for learning questionnaire was first piloted among a sample of 40 students and the standard deviation and mean were calculated and then placed in the formula. After estimating the sample size, the stratified random sampling

method was used. According to the size of the statistical population, which included 625 medical students and 780 health students, the proportional sample was estimated for each stratum, and accordingly, 113 medical students and 137 health students were randomly selected. To collect data, the Pintrich and de Groot's motivated strategies for learning questionnaire (MSLQ) was used.

This questionnaire includes 47 items and two subscales of motivational beliefs (25 items) and self-regulated learning strategies (22 items) that are rated using a 5-point Likert scale (1 = completely disagree to 5 = strongly agree). The motivational beliefs subscale is comprised of the three components of self-efficacy, intrinsic value and test anxiety, and the self-regulated learning subscale is composed of the two components of cognitive and metacognitive strategies (11). Pintrich and de Groot confirmed the validity and reliability of the MSLQ using factor analysis and Cronbach's alpha coefficient, respectively (11). Studies in Iran have also reported acceptable psychometric indices for MSLQ (31).

In the present study, Cronbach's alpha coefficient was used for reliability analysis and the obtained value (0.84) indicated desirable reliability of this tool. The face and content validity of the questionnaire was confirmed by experts and faculty members. It should be noted that in the present study, the students' grade point average (GPA) was considered as the index of academic performance. This research was approved by the Deputy of Research of Shiraz University of Medical Sciences and registered at the University's Ethics Committee (No. 15677). Also, the confidentiality criteria were met and the participants were assured that the data will be analyzed without indicating the name of the participants.

4. Results

Based on the descriptive findings, 68.6% (162 cases) of the samples were female students and 31.4% (74 men) were male students. In terms of field and educational level, 55% (130 people) were students of health and 45% (106) were medical students. Of the medical students, 13.1% (31 persons) were studying basic sciences, 7.2% (17 subjects) were studying physiopathology, 5.9% (14 persons) were externs and 18.64% (44 persons) were interns. The mean age of the medical and health sciences students was 26.46 and 24.96 years, respectively.

As shown in Table 1, the correlation coefficient between cognitive learning strategies and academic performance was 0.110, but this relationship was not significant ($P = 0.94$). Also, among the components of cognitive learning strategies, only the component of comprehension with a correlation coefficient of 0.266 showed a significant and weak correlation with academic performance ($P \leq 0.01$).

Table 1. Correlation of Self-Regulated Learning Strategies (Cognitive and Metacognitive Strategies) and Motivational Beliefs with Academic Performance of the Students

Independent Variables	Academic Performance	
	Correlation Coefficient	P Value
Cognitive learning strategies	0.110	0.094
Rehearsal strategies	0.086	0.192
Elaboration	0.103	0.117
Summarizing	0.081	0.217
Organizational strategies	0.025	0.705
Comprehension	0.216	0.001
Metacognitive strategies	0.181	0.005
Planning	0.096	0.143
Monitoring and control	0.112	0.087
Regulating (effort and perseverance)	0.149	0.023
Arrangement activity	0.120	0.069
Motivational beliefs	0.047	0.472
Self-efficacy	0.173	0.008
Goal orientation	0.060	0.360
Intrinsic value	0.017	0.796
Test anxiety	0.090	0.172

Other findings indicated that there was a significant and weak correlation between meta-cognitive learning strategies and academic performance ($P \leq 0.01$, $r = 0.186$), which means that as metacognitive learning strategies are reinforced in students, their academic performance will improve more and vice versa. Also, in examining the dimensions of metacognitive learning strategies, the findings showed that only the regulation component (effort and perseverance) had a significant and weak correlation with academic performance ($P \leq 0.023$, $r = 0.149$), but there was no significant relationship between other dimensions and academic performance.

Finally, the findings showed that there was no significant positive correlation between motivational beliefs and academic performance ($P = 0.472$). However, among the components of motivational beliefs, only the self-efficacy component had a significant and weak correlation with academic performance of students ($P \leq 0.01$, $r = 0.173$), and other dimensions did not show any significant relationship with academic performance.

In order to predict academic performance of the students based on the variables of learning strategies and motivational beliefs, multiple regression analysis was used, the results of which are presented in Table 2.

The results of multiple regression analysis showed that among the predictive variables, only the metacognitive

Table 2. The Prediction of Academic Performance Based on Learning Strategies and Motivational Beliefs Using Multiple Linear Regression

Model	β	Beta	Error	R	R ²	t	P Value
Constant value	14.780	-	0.876	0.183	0.033	16.880	< 0.001
Cognitive learning	0.070	0.028	0.201			0.347	0.729
Metacognitive learning	0.436	0.171	0.193			2.250	0.025
Motivational beliefs	-0.045	-0.014	0.226			-0.200	0.842

learning strategies variable had a significant predictive power for the students' academic performance criterion ($P=0.025$) and the other predictive variables did not have a significant contribution to the prediction of academic performance.

Independent *t*-test was used to examine gender differences in the use of cognitive and metacognitive strategies and to evaluate the difference in motivational beliefs, the results of which are demonstrated in Table 3.

Independent *t*-test results reflected no significant difference between male and female students regarding cognitive and metacognitive strategies or motivational beliefs.

Pearson correlation test was used to examine the relationship between age and the use of learning strategies and motivational beliefs in students, the results of which are displayed in Table 4.

According to Table 4, there was a significant and weak correlation between students' age and cognitive strategies ($r = 0.289$), metacognitive strategies ($r = 0.195$), motivational beliefs ($r = 0.139$) and goal orientation ($r = 0.158$).

5. Discussion

The results of this study showed a positive, but non-significant, relationship between cognitive learning strategies and academic performance, which was consistent with the results of Colorado (32) and Valkyrie (33) studies. In their studies, no significant relationship between cognitive learning strategies and academic performance was reported (32, 33). In this regard, some researchers believe that cognitive learning strategies are more commonly used by ordinary students, while intelligent and high-performing students often use metacognitive learning strategies (34).

Also, since cognitive learning strategies are superficial strategies for learning (for example, the strategy of recitation and review that is superficial and shallow), it can be expected that the use of these strategies does not make any significant difference in students' learning and performance. On the other hand, Zimmerman et al. in their research argued that students who use more diverse cognitive strategies show better learning and higher academic

performance. Also, learning outcomes are more positive in these students than their peers who do not have the skills to use these strategies (12). Therefore, it can be stated that the lack of sufficiently diversified cognitive strategies causes these strategies not to be significantly effective on performance.

Other results of the present study showed that among the components of cognitive learning strategies, only the component of comprehension had a significant positive correlation with academic performance of students. Strategies such as reading comprehension, help students remember contents in a more consistent and organized manner and have a satisfactory performance in their exams. Students who evaluate their understanding of the content in the learning process and use this strategy to self-assess can improve their performance since if they have a problem in comprehension, they still have the opportunity for reviewing and learning both in the classroom and outside the educational environment, and these students through rumination of contents enhance their learning and performance.

Based on the results of the present study, there was a significant positive correlation between meta-cognitive learning strategies and academic performance; it means that as the metacognitive learning strategies are strengthened in students, their academic performance improves as well. This finding is consistent with the results of numerous studies that have shown metacognitive learning strategies are among the most important predictors of students' academic achievement (1, 12, 28, 35-38). Accordingly, it can be admitted that students who use metacognitive strategies more effectively, have better planning for their studies, more effective evaluation and monitoring of their learning and greater understanding of the subject. Accepting the responsibility of their work, these students discover and solve their learning problems. Therefore, it is reasonable that these people gain more academic achievements compared to peers who do not have the skills to use these strategies (12, 39, 40).

In other words, metacognition is a tool that not only involves students in the process of learning, but also grants their learning responsibility to themselves (41). In fact, more engagement of students in the learning process

Table 3. Comparison of Learning Strategies and Students' Motivational Beliefs Based on Gender

Variable	Sample Size	Mean \pm SD	t	P Value
Motivational beliefs			-1.782	0.076
Male	73	0.417 \pm 3.580		
Female	162	0.441 \pm 3.690		
Cognitive learning strategies			0.006	0.995
Male	73	0.593 \pm 3.880		
Female	162	3.880 \pm 0.515		
Metacognitive learning strategies			-1.600	0.110
Male	73	0.453 \pm 3.500		
Female	162	0.572 \pm 3.620		

Table 4. The Relationship Between Age and Learning Strategies and Motivational Beliefs in Students

Variables	Mean \pm SD	Correlation Coefficient with the Age Variable	P Value
Cognitive strategies	3.880 \pm 0.537	0.298	< 0.001
Metacognitive strategies	3.580 \pm 0.535	0.195	0.003
Motivational beliefs	3.650 \pm 0.434	0.139	0.032
Self-efficacy	3.960 \pm 0.561	0.127	0.051
Goal orientation	4.000 \pm 0.569	0.158	0.015
Intrinsic value	3.870 \pm 0.601	0.100	0.123
Text anxiety	2.870 \pm 0.917	0.029	0.660

leads to their active encounter with the materials and course contents, which in turn can affect their learning and performance. In addition, metacognition is a factor that allows students to manage their learning and performance through managing thoughts, evaluating learning and appraising the time needed for study.

In examining the dimensions of metacognitive learning strategies, the results indicated a significant positive correlation between the regulation component (effort and perseverance) and the academic performance of the students, which was similar to the findings of Farhadinia et al. (31). Pintrich and de Groot believe that not only students should know what cognitive learning strategies they should use, but they also need to know how and when to use them (metacognition) (11). Therefore, it can be argued that students who are able to manage and regulate their efforts to better understand and learn naturally show superior learning and performance (11).

Other results indicated that among motivational beliefs components, self-efficacy had a significant positive correlation with academic performance of students. This finding was supported by the results of Alyami et al. (42), Zajacova et al. (43), Domenech-Betoret et al. (44), Villavicencio and Bernardo (45), Sadi and Uyar (46), Diseth (47), Komarraju and Nadler (48) and Lee et al. (49). Therefore, it

seems that self-efficacy can be one of the most important factors in student's academic achievement. In a study by Chemers et al., it was found that students' self-efficacy level in their freshman year was a powerful predictor of their future academic performance. In other words, students who enter the university with high academic self-efficacy show a significantly better performance (50).

Academic self-efficacy refers to learners' beliefs in relation to their academic performance and is defined as the belief that they can successfully fulfill academic tasks and learn contents (51-53). Self-efficacy beliefs increase performance through increased commitment, effort and perseverance (54, 55). Researchers believe that learners with high self-efficacy generally attribute their failures to less effort than ability. In contrast, learners with low self-efficacy attribute failures to their lower ability (56). For this reason, self-efficacy can influence the choice of assignments and perseverance in doing them (57).

Students with low self-efficacy beliefs are more likely to be afraid of accepting and performing tasks, postpone tasks and give up very soon (53, 54, 58). In contrast, students with high self-efficacy are more likely to find themselves suited to deal with complex problems. In the process of problem-solving, they are patient and show more effort and perseverance to overcome challenges (46, 52, 54).

Also, people with high self-efficacy consider tasks as challenges that they need to master, believe themselves more, show more effort and perseverance, use cognitive and meta-cognitive learning strategies better, are superior in memorizing and remembering and have better performance in doing assignments (59, 60), which is why they show higher performance as compared to others.

The results of this study showed no significant difference between male and female students in any of the variables of self-regulated learning strategies (cognitive and meta-cognitive) and motivational beliefs. This finding was congruent with the results of Anderman and Young (61) and Linn and Hyde (62). However, this finding was not in line with results of Zimmerman and Martinez-Pons, who concluded that girls were significantly more concerned with recording, self-monitoring and organizing the study environment than boys (63). Peklaj and Pecjak also found that girls in all the four components of self-regulated learning strategies (recitation, elaboration, organization and metacognitive strategies) were significantly different than boys and used these strategies more (64).

The results of this study showed a significant positive correlation between age and self-regulated learning strategies (cognitive and metacognitive). Accordingly, it can be stated that with increasing age and consequently, increasing academic years and gaining experience in dealing with academic and learning situations, students are more likely to become proficient in using learning strategies, that is, with increasing academic years, they can use more effective strategies to understand and learn lessons. Acquiring experience during study years helps students to use cognitive and metacognitive learning strategies.

5.1. Conclusion

Based on the results of this study, the learning strategies of comprehension and regulation (effort) have a positive correlation with academic performance. In fact, teaching and learning the above strategies can improve students' performance. Also, the results of this study showed that students who believe in their abilities (self-efficacy) show better performance. Therefore, medical professors can minimize students' stress by creating a supportive and peaceful environment, because stressful and competitive situations can affect individuals' self-efficacy. Also, professors can boost their students' self-efficacy through providing positive and supportive feedback.

Supplementary Material

Supplementary material(s) is available [here](#) [To read supplementary materials, please refer to the journal website and open PDF/HTML].

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Footnotes

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