Original Article

Online self-regulated learning and related factors among medical sciences students during the COVID-19 pandemic, 2021

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Abstract

Background & Objective: Learners prefer to use a system for learning that improves their interaction; therefore, self-regulated learning is important. The present study aimed to determine online self-regulated learning (OSRL) and its related factors among medical science students during the COVID-19 pandemic, 2021.

Materials & Methods: This cross-sectional study was conducted on 249 students affiliated with Mazandaran University of Medical Sciences, Mazandaran, Iran, using a non-randomized quota sampling method. The required data were collected using a demographic form, an Online Self-Regulated Learning Questionnaire, and a researcher-made questionnaire of related factors of OSRL based on a literature review. The data were analyzed using descriptive and inferential statistical methods, such as ANOVA, t-test, Pearson, and multivariate linear regression using the Enter method.

Results: The mean of the total score of self-regulated learning was 80.2±15.5 and in a good range. Among the related factors, students' gender (β=-0.239), marital status (β=-0.210), age (β=0.195), and time management (β=-0.125) explored 16.5% of the variance OSRL. The other variables had no significant relationship with OSRL.

Conclusion: In the present study, marital status, gender, age, and time management significantly correlated with the variance of OSRL. Different studies are necessary to investigate the variables that explore OSRL so that educational managers can provide a better virtual learning environment for students by considering these variables.

Keywords: Online self-regulated learning, Online education, Student, COVID-19

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Introduction

In learning, self-regulation, which means the learner's mastery over his learning process, is one of the new learning constructs that has been specially examined in the learning process over the past thirty years. Self-regulation is a process in which learners determine their goals, monitor their learning process, organize it, and evaluate it (1, 2). Today, learners prefer to use a system for learning that improves their interaction in the learning process; this fact highlights the importance of self-regulated learning, which gives students more authority in the learning process on the one hand and less role for instructors in regulating this process on the other (3).

Online environments require self-regulation. Therefore, learning self-regulation is essential for better performance in the online educational environment (4). In other words, online self-regulated learning (OSRL) is considered one of vital factors for the success of a training course (5). According to the results of a study, the amount of OSRL among nursing students was at a good level (80.63±20.42) (6). The results of studies during the epidemic of coronavirus disease 2019 (COVID-19) showed that the rate of OSRL was

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3.44±0.47 among nursing students and high among newly graduated doctors (7, 8).

So far, several studies have been conducted to identify OSRL and its related factors; however, the existing challenge is its application in the e-learning environment, and the result of its interaction with this system, especially in Iran, has been less discussed. Based on a study conducted in 2015, the factors related to self-regulated learning can generally be expressed in five groups, family, peers, teachers, educational environment, and the learner himself (9). According to the available resources, students have significant familiarity with the online environment; however, they have not had a useful experience with the online education environment (10).

According to the research conducted on the factors related to self-regulated learning, most focus has been on the educational environment and the individual's personality and skill components (1). In addition, the success of people in online education systems can be attributed to the features of the desired system, including the quality of the system, the quality of information, the quality of service, the quality of access and communication, customer satisfaction, and the student's perspective (2, 11). The results of a study showed that the most challenging stage of learning self-regulation for students is time management, which can be overcome by teaching proper planning methods, which is the most important factor in the learning process (10).

According to the findings of a study conducted in 2016 on the students of two universities in Beijing and Hong Kong, China, the demographic information of the learners, including gender, age, level of education, and the amount of work experience, also plays an effective role in the self-regulated learning process. In this study, it was revealed that male students were more satisfied with the e-learning system and showed better feedback from self-regulated learning. Although age and educational level showed no particular effect on the amount of OSRL in students, the amount of their work experience showed a direct relationship with the way they related to the education system and satisfaction with this system (2).

Students around the world, especially in medical sciences, use self-regulated learning strategies to evaluate their ability to learn and have shown the relationship between this skill and self-efficacy beliefs. Monitoring students' performance in these skills and positive support can play important roles in their success, as well as helping those who have difficulty in learning or have inappropriate learning strategies (12).

Numerous studies have been conducted to investigate the effect of self-regulated learning on the success of people and factors related to it; nevertheless, according to the available databases, no research has been published regarding the aggregation of these factors in the e-education environment in the world, especially in Iran, during the COVID-19 epidemic. Examining related factors can help professors to improve students' online self-regulation. Therefore, the present study was conducted to determine the amount of OSRL and its related factors in medical sciences students during the COVID-19 pandemic from October 2021 to January 2022.

Materials & Methods

Design and setting(s)

This cross-sectional study was conducted to determine the amount of OSRL and its related factors in the students of Mazandaran University of Medical Sciences, Mazandaran, Iran, during the COVID-19 pandemic from October 2021 to January 2022. The research population consisted of all students of Mazandaran University of Medical Sciences.

Participants and sampling

The statistical sample size of the research was determined at a minimum of 245 cases according to the standard deviation (11.19) of the OSRL obtained for undergraduate students of the Department of Social Sciences in a study entitled " The examination of online self-regulated learning skills in web-based learning environments in terms of different variables (10) and considering a test power of 80%, confidence interval of 95%, and precision value of 2 (Equation 1).

$$n = \frac{\left[Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right]^2 .s2}{[d]^2}$$

Equation 1. Formula of calculating sample size

The total number of eligible students (research samples) in each faculty was as follows: 110 students (27 samples) in the Faculty of Dentistry, 320 students (78 samples) in the Faculty of Nursing and Midwifery, 120 students (30 samples) in the Faculty of Pharmacy, 180 students (44 samples) in the Faculty of Paramedicine, 70 students (17 samples) in the Faculty of Health, and 200 students (49 samples) in the Faculty of Medicine. The participants were selected using a non-random quota sampling method. Students who had participated in at least one semester in virtual education during the COVID-19 pandemic were included in the study. On the other hand, student interns were excluded from the study.

Tools/Instruments & Data collection methods

To participate in the study, written consent and questionnaires were provided to the students electronically by the representative of each group

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through email, WhatsApp, and Telegram; finally, 249 cases completed the questionnaires. The questionnaire consisted of three parts. The first part was the students' demographic information, including age, gender, the field of study, marital status, faculty, academic semester, number of semesters participating in virtual education, and hours of internet use per day.

The second part was the Online Self-Regulated Learning Questionnaire, which was first designed by Barnard et al. (2009). The replies to this questionnaire are scored on a five-point Likert scale (from 1=completely disagree to 5=completely agree). The total score of the questionnaire is obtained in the range of 24-120. A score of 24-48 represents poor, 48-72 average, 73-96 good, and 97-120 excellent OSRL. The different dimensions of this questionnaire include environmental structuring (items 1-4), goal setting (items 5-9), task strategies (items 10-13), time management (items 14-16), help-seeking (items 17-20), and self-evaluation (items 21-24) (13). This 24-item questionnaire was psychometrically evaluated in Iran (2020) on 418 postgraduate students in Tehran universities.

In this study, these six dimensions accounted for 56.78% of the total variance of OSRL. The Cronbach's alpha coefficient of this tool was obtained in the range of 0.84-0.94 in the current study. The intraclass correlation coefficient and Pearson correlation coefficient in the test-retest method were 0.77 and 0.78, respectively (14). Moreover, based on a study conducted by Bagheri et al. on nursing students during the COVID-19 epidemic, Cronbach's alpha of 0.96 was reported in the psychometrics of this instrument (6).

The third part of the questionnaire examined the factors related to OSRL. These factors, which included 17 items, were gathered by the researchers of this study based on the review of the available literature. For this purpose, all the studies related to OSRL were searched and related factors were extracted. Finally, a list of these items was prepared that included the presence of family members who monitored and were aware of the affairs, interaction with classmates and peers, the feeling of competition between students and classmates, the quality level of presentation of materials by professors, student-professor interaction and professors' amount of support, speed and quality of content presentation in the e-learning environment, the effectiveness of the student's awareness and understanding of the e-learning environment, the level of attractiveness of the information resources uploaded in the e-learning environment, the variety of content uploaded in the e-learning environment, determining a specific goal in each educational course, specific and regular planning, note-taking and summarizing, time management, the management and organization of available information resources, the amount of effort and perseverance dedicated to each of the e-learning courses, motivation, and the effectiveness of the anxiety level.

Students completed the questionnaires by choosing one of the two options of yes or no to determine whether each of the mentioned factors was effective on their self-regulated learning or not. The qualitative content validity of the tool was confirmed by 10 members of the research faculty in education. Finally, each of the factors was entered into the linear regression model as an independent variable and was then analyzed.

Data analysis

The collected data were analyzed in SPSS24 software. Variables were described as percentage, mean, and standard deviation. Pearson's correlation coefficient, ANOVA, and t-test were used to determine the relationship of each variable with OSRL. Variables with a significance level of less than 0.2 were included in the regression model. Afterward, the variables with a variance inflation factor (VIF) of greater than 4 or a tolerance of less than 0.25 were excluded from the analysis due to the possibility of collinearity. The remaining variables were entered into the multivariate linear regression model. The significance level was considered less than 0.05.

Results

Most of the participants were female (n=153, 61.4%), single (n=224, 90.0%), nursing and midwifery students (n=78, 31.3%); working in the second semester (n=107, 43.0%); and had participated in one virtual semester during the COVID-19 pandemic (n=162, 65.1%). Furthermore, the mean age of the students was obtained at 21.1±1.7 years (Table 1).

The mean score of OSRL and its dimensions are presented in Table 2. The mean total score of OSRL in medical sciences students of Mazandaran was 80.2±15.5 and in a good range. The mean OSRL scores of the students in the faculties were obtained as follows: 90.56±2.20 in the Faculty of Dentistry, 80.04±13.48 in the Faculty of Nursing and Midwifery, 75.71±17.43 in the Faculty of Pharmacy, 82.02±13.94 in the Faculty of Paramedicine, 85.74±14.20 in the Faculty of Health, and 74.20±19.55 in the Faculty of Medicine.

The following factors were determined as effective on OSRL by the students: the presence of family members who monitored and were aware of the affairs (n=143, 57.4%), interaction with classmates and peers (n=236, 94.8%), the feeling of competition between students and classmates (n=145, 58.2%), the quality level of presentation of materials by professors (n=197, 79.1%), student-professor interaction and professors' amount of support (n=170, 68.3%), speed and quality of content presentation in the e-learning environment (n=210, 84.3%), the effectiveness of the student's awareness and

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understanding of the e-learning environment (n=210, 84.3%), the level of attractiveness of the information resources uploaded in the e-learning environment (n=171, 68.7%), the variety of content uploaded in the e-learning environment (n=183, 73.5%), determining a specific goal in each educational course (n=222, 89.2%), specific and regular planning (n=222, 89.2%), note-taking and summarizing (n=197, 79.1%), time management (n=236, 94.8%), management and organization of available information resources (n=222, 89.2%), the amount of effort and perseverance dedicated to each of the e-learning courses (n=210, 84.3%), motivation (n=223, 89.6%), and the effectiveness of the anxiety level (n=156, 62.7%).

Table 1. The demographic characteristics of Mazandaran university of medical sciences students (N=249)

Variable (Qualitative)		**Frequency (%)**
Gender	Female	153 (61.4%)
	Male	96 (38.6%)
Marital Status	Married	25 (10.0%)
	Single	224 (90.0%)
Faculty	Dentistry	27 (10.8%)
	Nursing and Midwifery	78 (31.3%)
	Pharmacy	31 (12.4%)
	Paramedicine	44 (17.7%)
	Health	19 (7.6%)
	Medicine	50 (20.1%)
Study Semester	Semester 2	107 (43.0%)
	Semester 3	30 (12.0%)
	Semester 4	50 (20.1%)
	Semester 5	50 (20.1%)
	Semester 6 And More	12 (4.8%)
Participation In Virtual Semester	One Semester	162 (65.1%)
	Two Semester	87 (34.9%)
Internet Availability Status	Good	110 (44.1%)
	Medium	98 (39.3%)
	Poor	41 (16.4%)
Variable (Quantitative)		Mean (Sd)
Age (Year)		21.1 (1.7)
Daily Internet Using (Hours)		2.4 (0.5)

First, the relationship between OSRL and each of the variables was investigated using t-test, ANOVA, and Pearson tests (Table 3), and the variables with a significance level of less than 0.2 were entered into the regression model, including gender, marital status, faculty, semester, internet access status, age, the experience of virtual education, use of the internet around the clock, the presence of family members who monitored and were aware of the affairs, the effectiveness of the student's level of knowledge and understanding of the e-learning environment, and time management. Then, the variables with a VIF of greater than 4 or a tolerance of less than 0.25 were excluded from the analysis due to the possibility of collinearity. Eventually, variables, such as age, gender, marital status, semester, the presence of family members who monitored and were aware of the affairs, the student's level of knowledge and understanding of the e-learning environment, and time management were included in the final regression model. Multivariate linear regression analysis was performed with the Enter method, the results of which showed that it was a suitable model for investigating the relationship of OSRL with its related factors ($F=7.990$, $P<0.001$). Among the 7 related factors, gender ($\beta=0.239$), marital status ($\beta=0.210$), age ($\beta=0.195$), and time management ($\beta=0.125$) could explain 16.5% of the variance of OSRL, while the other variables had no significant relationship with OSRL (Table 4).

Table 2. The mean score of OSRL in Mazandaran university of medical sciences students

OSRL and its dimension	**Mean (SD)**	**The score range of scale**
Environment structuring	14.7 (3.3)	4-20
Goal setting	17.3 (4.0)	5-25
Task strategies	12.6 (3.2)	4-20
Time management	9.2 (3.1)	3-15
Help seeking	13.2 (3.3)	4-20
Self-evaluation	13.0 (3.1)	4-20
Total score	80.2 (15.5)	24-120

Discussion

Based on the results of the present study, the mean score of OSRL was in a good range among medical sciences students during the COVID-19 epidemic, which was consistent with the findings of studies conducted during this epidemic. For instance, in an Iranian study, the OSRL score of nursing students was reported to be good (6). In another study conducted on female nursing students with no previous experience with online education, the OSRL score was in the medium level (7). The findings of another study conducted during the COVID-19 pandemic on the students of an English language course showed that the OSRL score was at the average level (15). The results of a study carried out on

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medical students showed that the OSRL score was higher than average during the COVID-19 epidemic (16).

The results of studies before the epidemic of COVID-19 showed that the OSRL score was not significantly different before and after the epidemic. In a study conducted on agricultural students, it was shown that the OSRL score was at a good level (17). The results of a study in Russia revealed that the OSRL level of engineering students was average (18). These differences in the level of OSRL can be due to the conduction of studies in different learning environments.

The results of the present study showed that marital status, gender, age, and time management explained 16.5% of the variance of OSRL of medical sciences students. In this study, a significant relationship was observed between gender and OSRL score. Similarly, the findings of a study in Indonesia showed that female students had a higher OSRL score (19). However, in another study in Vietnam, which was conducted on undergraduate and graduate students, it was revealed that gender had no significant relationship with OSRL scores (20). Nevertheless, the results of previous studies showed that female students had better self-regulated learning than their male counterparts due to having higher practical and time management strategies (21, 22).

Table 3. Factors related to OSRL in Mazandaran university of medical sciences students

Variable	Statistical test	Parameter	*p*-value
Gender	t-test	t=4.195	$p<0.001$
Marital status	t-test	t=4.195	$p<0.001$
Faculty	ANOVA	F=5.448	$p<0.001$
Study semester	ANOVA	F=3.791	$p<0.001$
Internet availability status	ANOVA	F=3.532	$p<0.001$
Age	Pearson	r=0.237	$p<0.001$
Participation in virtual semester	Pearson	r= -0.112	$p=0.077$
Daily internet using	Pearson	r=0.131	$p=0.039$
Presence of family members who monitored and were aware of the affairs	t-test	t=1.518	$p=0.130$
Interaction with classmates and peers	t-test	t= -0.726	$p=0.468$
The feeling of competition between students and classmates	t-test	t= -0.533	$p=0.594$
The quality level of presentation of materials by professors	t-test	t= 0.742	$p=0.459$
Student-professor interaction and professors' amount of support	t-test	t=0.962	$p=0.337$
Speed and quality of content presentation in the e-learning environment	t-test	t= -0.606	$p=0.545$
The effectiveness of the student's awareness and understanding of the e-learning environment	t-test	t= -1.700	$p=0.090$
The level of attractiveness of the information resources uploaded in the e-learning environment	t-test	t= -1.171	$p=0.243$
The variety of content uploaded in the e-learning environment	t-test	t= 0.966	$p=0.335$
Determining a specific goal in each educational course	t-test	t= 0.102	$p=0.919$
Specific and regular planning	t-test	t= 0.194	$p=0.846$
Note-taking and summarizing	t-test	t= -0.208	$p=0.835$
Time management	t-test	t= 2.466	$p=0.014$
The management and organization of available information resources	t-test	t= 0.194	$p=0.846$
The amount of effort and perseverance dedicated to each of the e-learning courses	t-test	t= 0.816	$p=0.415$
Motivation	t-test	t= -0.804	$p=0.422$
The effectiveness of the anxiety level	t-test	t= 0.719	$p=0.473$

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Table 4. The association between OSRL and related factors based on regression model

Variable	β	SE	Standardized coefficients β	t	Collinearity statistics		*p*-value
					Tolerance	VIF	
Gender	7.616	1.867	0.239	4.080	0.984	1.017	<0.001
Marital status	10.848	3.094	0.210	3.506	0.939	1.065	0.001
Age	1.747	0.545	0.195	3.209	0.912	1.096	0.002
Time management	8.730	4.214	0.125	2.072	0.924	1.082	0.039
The effectiveness of the student's awareness & understanding of the e-learning environment	-3.508	2.705	-0.082	-1.297	0.840	1.191	0.196
Presence of family members who monitored and were aware of the affairs	-0.876	2.053	-0.028	-0.426	0.788	1.269	0.670
Study semester (Semester 6 and more)	3.195	10.405	0.018	0.307	0.941	1.063	0.759

According to the results of the present study, the age of the students had a significant relationship with the OSRL score. In this regard, the results of another study on nursing students showed that age had a significant relationship with OSRL scores (6). In contrast, the findings of a study in Russia indicated that age had no significant relationship with any of the OSRL dimensions (18). It is noteworthy that the age range of the participants in the Russian study was wide, which can justify different results from the present study.

In the current study, no significant relationship was observed between motivation and the OSRL score. The absence of a significant relationship between motivation and self-regulated learning was also shown in other studies (23, 24). In other pieces of research, the motivation to participate in training courses was proposed as a predictive variable of higher self-regulated learning (25, 26). This discrepancy in the results of the studies can be due to the fact that in our study online courses were not optional due to the conditions of COVID-19 and students had to take online courses. As a result, motivation was not a factor in choosing training courses.

Based on the results of the present study, a previous experience of virtual education had no significant relationship with the OSRL score. However, in a study on agricultural students, it was shown that a previous experience of online education had a significant relationship with self-regulated learning so that students with such an experience had a better self-regulated learning score (17). The difference between the results of the mentioned study and those of the current study can be related to the type of virtual education experience; accordingly, satisfaction from previous experience can be a more effective variable for self-regulated learning.

In the current research, it was found that time management had a significant relationship with OSRL scores. In line with the results of this study, those of another study showed that time management strategy had a positive effect not only on self-regulated learning behavior but also on self-regulated learning performance (27).

It was also revealed that the academic semester had no significant relationship with OSRL score. However, the findings of another study conducted on nursing students showed that those studying in the 3rd, 4th, and 6th semesters had higher self-regulated learning (6). This difference in the results can be attributed to the fact that the mentioned study was conducted on nursing students, while the current study included all medical sciences students.

According to the findings of the current study, interaction with classmates and peers had no significant relationship with the OSRL score. However, in another study conducted in Iran on medical students, it was found that interaction with classmates and peers could be effective on OSRL (9). This discrepancy in the results of the two studies can be due to the fact that our study was conducted in a condition that many students did not experience face-to-face training and interaction with classmates from the beginning of entering the university due to the pandemic and university closures.

Among the limitations of the present study was the use of a non-probability sampling method. Moreover, it was possible that the students were not careful enough in completing the questionnaire. Therefore, the precision value of 2 was considered in calculating the sample size.

Conclusion

The results of the present study showed that marital status, gender, age, and faculty could explain 17.2% of the variance of OSRL of medical sciences students. It seems necessary to conduct different studies in other learning environments to investigate the variables that explain the OSRL score; as a result, educational managers can provide a better virtual learning environment for students by considering these variables.

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Ethical considerations

The present study was approved by the Ethics Committee of Mazandaran University of Medical Sciences (IR.MAZUMS.REC.1400.532). Before answering the questions of the questionnaire, the students were asked about their consent to participate in the study, and if they were willing, the questions of the questionnaires were displayed. Students were also assured about the confidentiality of personal information.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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Authors' contributions

Masoumeh Bagheri Nasami: Study design, data analysis, supervision of all stages of the study, review of the article, and its final approval. Mahsa Kamali: Data collection and article writing. Fahimeh Ghasemi: Data collection. The text of the article was approved by all authors.

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