



# Evaluation of Critical Thinking Skills in Medical Students of Kermanshah University of Medical Sciences

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## Abstract

**Background:** According to the 21st Century Partnership Learning Framework, several competencies or skills should be possessed regarding critical thinking and problem-solving, communication and collaboration skills, creative and updating skills, information and communication technology literacy skills, contextual learning skills, and information and media literacy skills. Increasing critical thinking skills is necessary in modern and advanced educational systems.

**Objectives:** This study aimed to evaluate the critical thinking skills of medical students.

**Methods:** This descriptive and analytical cross-sectional study was conducted on 271 medical students in the primary science section of Kermanshah University of Medical Sciences, Iran, in 2023 who were selected by a convenient sampling method. The data were collected by demographic characteristics and the California Critical Thinking Skills Test (CCTST). Descriptive and inferential statistical methods were used to analyze the data using SPSS software version 21.

**Results:** The total critical thinking skills score in the studied students was  $8.89 \pm 3.60$ , equivalent to 25% of the total score. The highest and lowest areas were related to comparative reasoning and inference, with an average of  $4.35 \pm 1.94$  and  $2.59 \pm 1.56$ , respectively. There was no significant difference between the average critical thinking skills score regarding age, gender, academic semesters, and living or not in a dormitory.

**Conclusions:** Based on the results, medical students' critical thinking skills are weak and lower than the exam average. The educational system of Kermanshah University of Medical Sciences should be reviewed in designing a curriculum to foster critical thinking.

**Keywords:** Critical Thinking Skills, Medical Students, Basic Sciences

## 1. Background

### 1.1. Statement of the Problem

Higher education is one of the effective institutions in the all-round development of the country, which provides reasons for the continuation of learning and the active presence of students in various social, economic, and cultural fields by creating the basis for producing and deepening knowledge (1). Training graduates to engage in scientific activity using different methods of critical thinking is one of the goals of higher education. Today, the ability to process information is valuable, and knowledge is practical when used accordingly in innovation and production. Educating learners as critical thinkers, readers, and writers for the new millennium

requires the foundation of educational programs on the model of critical thinking (2). Being able to think and be aware of one's behavior is an essential characteristic of human beings. In other words, a person can be self-aware of his behavior and use his thinking power in dealing with various issues and affairs (3).

Critical thinking is the art of thinking to improve thinking to express it more clearly, correctly, and justifiably. In other words, critical thinking is a unique type of purposive thinking for which the thinker regularly establishes prudent standards, accepts responsibility for the structure of thinking, guides it based on standards, and evaluates the effectiveness of thinking based on standards. A person can examine problems and determine

the course of action he should take using critical thinking. The interventional role of cognitive necessary thinking skills is imposed to achieve such belief and performance (4-6). Critical thinking is a purposive and self-regulated judgmental process that includes interpretation, analysis, evaluation, inference, and explanation of issues related to evidence, concepts, methods, criteria, or contexts in which judgment is made. Thus, critical thinking is a thinking skill, purposive judgment, and self-regulation formed from interpretation, analysis, evaluation, and inference (7). Higher education experts believe that teaching facts that quickly become old and outdated is no longer necessary in today's rapidly changing and challenging world, and strengthening critical thinking is needed at all educational levels (8). Critical thinking is vital for business decisions, management, clinical judgment, professional success, and effective participation of the individual in community activities (9). The necessity of critical thinking in medical science education has been emphasized in response to the rapid change in the healthcare environment. Physicians should think critically to provide adequate care while adapting to the expanding role of the complexities of today's healthcare system. Some of these changes that medical science faces today include the development of technology, the demand for optimal care in the hospital, the increase in the elderly population, complex disease processes, and the rise in patient accuracy. Managing these complex changes effectively requires doctors to have higher-level thinking and reasoning skills. The university succeeds in today's pluralistic and global society when students need more than anything to think at a high level. Separation of reality from interpretation, evaluation of the correctness of intellectual tendencies, and correct judgment of evidence are needed (10).

Critical thinking is an essential cognitive process that increases students' ability to solve problems and is one of the main outputs of higher education and accreditation standards of institutions. In addition, critical thinking is especially essential for medical sciences as its graduates prepare for the patient's bedside. Transferring knowledge and psycho-motor skills from the classroom environment to the clinic and their application requires critical thinking (11). In general, students' ability to use critical thinking skills is low despite the importance of critical thinking as an essential tool for learning (12). Considering the importance of the subject, medical students need critical thinking skills so that they can make informed decisions and perform appropriately in a variety of conditions. Therefore, it is necessary to examine the state of critical thinking of medical students so that strategies can be used to improve this thinking.

## 2. Objectives

This research aimed to determine the critical thinking skills of medical students in the basic sciences of Kermanshah University of Medical Sciences in 2023.

## 3. Methods

This descriptive-analytical cross-sectional study was conducted on 271 medical students in the primary sciences section of Kermanshah University of Medical Sciences in 2022-23 who were selected using the convenient sampling method.

The required data were collected using the demographic characteristics and California Critical Thinking Skills Test (CCTST) questionnaire. This questionnaire was translated into Farsi by Mehrinejad in 2007 and localized with 34 questions to measure a person's critical thinking skills (evaluation, analysis, inference, inductive reasoning, and deductive reasoning). The reliability of the adapted Form A of the California Critical Thinking Test for Tehran University students was 0.78 through binomial and 0.88 using the Spearman-Brown method, which shows the high reliability of the test. The correlation coefficient of total evaluation skills scores with total test scores (0.79), total analysis skill scores were obtained with the total test scores (0.75), the total inference skill scores with the total test scores (0.91), and Cronbach's alpha for the entire critical thinking test was (0.83) (13). The researcher registered the questionnaire in the Digit system of the Deputy of Electronic Research after approving the research by the university's ethics committee and obtaining permission from the relevant officials. The questionnaire link was provided to the students after explaining the objectives and working method and assuring them of the confidentiality of the obtained information so that they could complete it voluntarily and if they wished. The data were analyzed using SPSS software version 21.

The data was analyzed with the help of descriptive statistics (prevalence, mean, and standard deviation) and inferential statistics after completing the questionnaires by the students in the Digit system of Kermanshah University of Medical Sciences. The Kolmogorov-Smirnov test was used to check the data distribution and their description. Man-Whitney non-parametric methods, Spearman's correlation coefficient, and Kruskal-Wallis were utilized to compare the mean scores of critical thinking skills in demographic variables due to the non-normality of data distribution.

#### 4. Results

The total number of studied people was 271, of whom 57.2% (155) were male and 42.8% (116) were female. The average age of the participants was  $24.42 \pm 2.14$ , and their minimum and maximum ages were 18 and 35. The highest percentage of participants completing the questionnaire was first-semester students, with 38.4% (104), and the lowest for second-semester students, with 4.1% (11). In addition, 50.2% (136) of the samples were dormitory residents, and 49.8% (135) were non-dormitory residents.

The average total score of critical thinking skills in students was  $8.89 \pm 3.60$ , with a minimum score of 2 and a maximum score of 19 (Table 1). As shown in Table 1, the highest domain was related to inductive reasoning, and the lowest domain was related to analysis.

There is no significant relationship between the average scores of critical thinking skills and the variables of gender, place of residence, and academic semester (Table 2).

Spearman's correlation coefficient indicated no significant relationship between age and critical thinking scores in students.

#### 5. Discussion

The average critical thinking of the studied subjects is  $8.89 \pm 3.6$  (out of a total score of 34). Despite the importance of critical thinking as an essential learning tool, students are generally unable to use critical thinking skills. This result is consistent with that of Shakournia and Sharifinia, Hosseini et al., Shakurnia and Aslami, Maleki and Rezaee (14-17) and inconsistent with Mirchooli and Naemi (18). Athari et al. indicated that the average score of critical thinking skills in domestic studies ranges between 10.12 and 11.68 using the California critical thinking skills test, while the average score of this test in the standardization process in America is 15.89 (19).

Students of the medical department enter the university in a tough competition. Hence, there is no doubt about the intelligence and excellence of these students, but their poor performance in applying critical thinking is questionable. Being smart is innate, and being accepted in the university entrance exam also requires perseverance and reserving the mind. In Bahmani et al., the poor performance of students in applying critical thinking was attributed to the lack of attention or little attention to the subject. Due to the reservations, only answers that look more correct attract students' attention, and the rest of the problem is not in their field of attention but in teaching methods and assessing students' learning. Following the students' previous educational experience,

their new university experience, and the exchange of opinions with the senior students, they concluded how to succeed in the exams. The prestigious position of the professor has caused the students to think they have made gross mistakes. Since criticizing the professor in Iran's educational system sometimes does not have a good outcome, students have also learned to act cautiously (20). Taking a critical and thoughtful approach to science and other life issues requires specialized training, which has been neglected in the current educational system. University educational programs seem to have failed to address critical thinking and need to be revised. Cognitive functions required in critical thinking, such as reasoning skills, analysis, and answering questions, require educational measures so that learners can experience evaluative judgments, analysis of arguments, justification of opinions, adjustment of their thought systems, and criticism of others' views. The desired mental changes are realized not automatically but in the shadow of active educational measures. Therefore, the weakness of the higher education system in developing appropriate educational and curriculum programs can be considered in explaining the weakness of students' critical thinking (21). Lee showed that allowing students the freedom to think in the classroom significantly impacts the development of their critical thinking skills. The professor's role is fundamental in creating an environment where students can express their opinions and views easily (22). Universities transmit large volumes of information to students and emphasize reservations while leaving them to reason and problem-solving skills. Engaging students in discursive thinking requires discussion of critical thinking education (23). Researchers believe the main obstacle to the growth and cultivation of critical thinking in universities and higher education centers is the traditional education system, where the lecture is the most dominant teaching method. A problem and a task prompt a person's thinking, and the person is active in thinking when a problem and task become the topic of their thinking. In Iran's higher education system, the foundation of education and learning focuses more on increasing and strengthening the mind and the scope of reserves rather than training and developing critical thinking skills. Probably, critical thinking is not considered an essential goal in the curriculum of universities, and the ways of cultivating it are not predicted and implemented (14, 16, 24-26). Although the level of critical thinking skills in female students is higher than in male students, there is no significant difference between male and female students regarding the level of critical thinking. These results are consistent with those of Sabzi et al. (27), Amini and Fazlinejad (28), and Shafiei et al.

**Table 1.** Average Distribution of Critical Thinking Skill and its Areas (N = 271)

Variables	Mean $\pm$ SD
Assessment	3.70 $\pm$ 1.6
Inferential	2.6 $\pm$ 1.56
Analysis	2.32 $\pm$ 1.57
Deductive reasoning	3.14 $\pm$ 1.61
Inductive reasoning	4.35 $\pm$ 1.94
Total score of critical thinking skills	8.89 $\pm$ 3.6

**Table 2.** Average Critical Thinking Skill Scores and Their Relationship with the Variables of Gender, Place of Residence, and Academic Semester

Critical Thinking Skills	No.	Assessment	Inferential	Analysis	Deductive Reasoning	Inductive Reasoning	Total
<b>Gender</b>							
Female	155	1.73 $\pm$ 3.80	1.57 $\pm$ 2.75	1.58 $\pm$ 2.30	1.66 $\pm$ 3.09	1.89 $\pm$ 4.56	3.44 $\pm$ 9.80
Male	116	1.66 $\pm$ 3.63	1.54 $\pm$ 2.46	1.56 $\pm$ 2.33	1.57 $\pm$ 3.17	1.98 $\pm$ 4.20	3.71 $\pm$ 8.74
P-value	271	0.26	0.08	0.91	0.59	0.10	0.37
<b>Place of living</b>							
Dormitory	136	3.75 $\pm$ 1.75	2.38 $\pm$ 1.36	2.15 $\pm$ 1.57	2.98 $\pm$ 1.56	4.28 $\pm$ 1.94	8.53 $\pm$ 3.44
Non-dormitory	135	3.66 $\pm$ 1.63	2.80 $\pm$ 1.71	2.50 $\pm$ 1.54	3.29 $\pm$ 1.65	4.30 $\pm$ 1.95	9.24 $\pm$ 3.73
P-value	271	0.71	0.08	0.05	0.13	0.67	0.16
<b>Semester</b>							
First	104	3.71 $\pm$ 1.80	2.70 $\pm$ 1.58	2.25 $\pm$ 1.62	2.25 $\pm$ 1.62	4.56 $\pm$ 2.07	8.96 $\pm$ 3.71
Second	11	4.27 $\pm$ 1.0	2.27 $\pm$ 1.0	2.81 $\pm$ 1.25	2.17 $\pm$ 1.34	5.18 $\pm$ 1.53	9.63 $\pm$ 2.01
Third	68	3.89 $\pm$ 1.74	2.58 $\pm$ 1.31	2.52 $\pm$ 1.35	3.29 $\pm$ 1.55	4.32 $\pm$ 1.74	9.22 $\pm$ 3.26
Fourth	88	3.47 $\pm$ 1.56	2.50 $\pm$ 1.75	2.19 $\pm$ 1.66	3.13 $\pm$ 1.51	4.02 $\pm$ 1.94	8.44 $\pm$ 3.85
P-value	271	0.14	0.69	0.21	0.21	0.10	0.21

(29). The results of Rezaeian et al. (30), Taghavi Larijani et al. (31), which indicated a significant relationship between gender and the level of critical thinking of students, were not in line with those of the present study.

There was no significant difference in the academic semester of medical students regarding the level of critical thinking. The results of Shakurnia (32) and Cisneros (33) showed that the increase in years of study did not significantly affect students' level of critical thinking, which was consistent with the results of the present study. Many studies have reported the lack of impact of academic years on the critical thinking skills of students of different levels (34-36). The results of Profetto-McGrath (37) by Baba Mohammadi and Khalili (38) revealed that the amount of students' critical thinking increases with rising years of study, which is not consistent with the results of the present study. There was no significant relationship between the critical thinking score and the place of living (dormitory and non-dormitory) and the age of the students, which is consistent with the findings of similar

studies that did not report a significant relationship (35, 39).

One of the limitations of this research is the time-consuming and long time required to complete the questionnaires, which made some students tired and unmotivated. Another problem and limitation in this study is the possibility of bias in providing information due to the self-report aspect of the questionnaire.

### 5.1. Conclusions

Based on the results, the level of critical thinking skills in medical students could be more robust and lower than the exam average. The educational system of Kermanshah University of Medical Sciences should be reviewed for designing a curriculum to cultivate critical thinking. This revision can include examining critical thinking in students, learning-teaching methods, and choosing course content and teaching methods. In addition, the growth and improvement of critical thinking in the medical education system is possible by conducting

more comprehensive research and identifying the causes and obstacles of the development.

## Footnotes

**Authors' Contribution:** Study concept and design: M. R. Kh, and A. Sh; analysis and interpretation of data: V. S.; drafting of the manuscript: A. Sh.; critical revision of the manuscript for important intellectual content: E. N.

**Conflict of Interests:** The first and second authors were a couple.

**Ethical Approval:** This study is approved under the ethical approval code of [IR.KUMS.MED.REC.1400.132](#).

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