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Abstract

Background: Epistemological beliefs and critical thinking affect the approach to knowledge and decision-making processes in nursing practice. These characteristics positively contribute to the personal development and quality of patient care of nurses. This study investigated the relationship between nursing students' epistemological beliefs and critical thinking skills.

Methods: This descriptive and correlational study included 752 students studying nursing. The study was conducted with students enrolled in nursing programs at two state universities located in the northeast and west of Turkey. Data were collected using a Student Information Form, the Epistemological Beliefs Questionnaire (EBQ), and the Critical Thinking Disposition Scale (CTDS).

Results: The mean age of the students was 20.49 ± 1.73 years, and 78.2% were females. The students' mean scores were 82.73 ± 12.05 on the total EBQ and 43.00 ± 5.35 on the CTDS. A negative and moderate ($r = -0.315$, $p = 0.000$) relationship was noted between the nursing students' mean scores on the EBQ and CTDS.

Conclusions: The study results indicate that the nursing students' epistemological beliefs and critical thinking levels were above mean and that students with higher epistemological beliefs had higher critical thinking skills. According to these findings, utilizing instructional strategies incorporating practice and questioning in nursing education may enhance students' epistemological beliefs and critical thinking abilities.

Keywords: critical thinking, epistemology, nursing students, Türkiye

INTRODUCTION

Epistemological beliefs are judgments about what knowledge and knowing are, what the beliefs about learning are, and what the nature of acquiring knowledge is.^{1,2} They are cognitive variables that enable students to actively participate in learning, understand and apply knowledge, and contribute to learning by facilitating decision-making.^{3,4} Individuals who have undeveloped epistemological beliefs believe that knowledge is simple and unchanging, that it is conveyed by an authority, that learning is innate, and that learning cannot occur with effort or ability.³ Individuals with advanced epistemological beliefs attempt to access information, question the information they obtain, have high motivation and academic success, and have a developed critical perspective.⁵ Several studies have reported that personal beliefs about knowledge and learning are effective in the learning process and change an individual's perspective on learning and teaching.⁶⁻⁸ Underdeveloped epistemological beliefs can affect nursing students' ability to acquire nursing knowledge

and relate nursing concepts to practices and their capacity to understand. Nursing students with developed epistemological beliefs are more effective in clinical settings, develop good practice, and are more willing to access up-to-date information. A study showed that students with higher epistemological beliefs can cope more effectively with uncertainty in the clinical setting.⁹ Thus, even throughout their school years, future nurses should possess the skills necessary to successfully obtain information and use it to provide evidence-based, safe nursing care for patients.³

Criticizing means evaluating something regarding its positive or negative sides. Critical thinking is defined as the constructive expression of an evidence-based perspective in explaining facts or events. Moreover, it means that students can evaluate their thinking skills and change their behavior by putting their knowledge into practice, evaluating the accuracy and precision of information, generating ideas and applying them, analyzing facts, upholding their opinions, making inferences and comparisons, solving problems, and evaluating discussions.^{10,11} Some studies revealed a relationship between students' critical thinking skills and epistemological beliefs,^{2,6} and others indicated that this relationship has positive effects.^{5,12,13} Currently, the aim of

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nursing education is to provide students with information and enable them to access information and raise them as nurses who think, produce, analyze, criticize, and learn to learn.² Some of the crucial qualifications sought among working nurses include knowing how to learn, access information, think critically, and reflect all of these in nursing care and practices.⁶ From this perspective, nurses working in multiple fields should have high critical thinking skills and developed epistemological beliefs to continue their studies and development. For nurses to maintain quality continuous care treatment practices to effectively manage quality improvement studies, they should be versatile, use critical thinking skills, and have positive beliefs about knowledge and knowing.¹⁴ Similar to this information, some studies showed that critical thinking skills have a positive effect on students' self-directed learning and problem-solving skills.^{15,16}

Epistemological beliefs and critical thinking skills are critical in nursing students' education and the successful execution of the nursing profession. Studies reported that students with high epistemological beliefs are better at academic achievement and understanding science.^{17,18} These findings indicate that utilizing instructional strategies that incorporate practice and questioning in nursing education may enhance students' epistemological beliefs and critical thinking abilities. When the relationship between students' critical thinking skills and epistemological beliefs is known, instructional designs that will improve epistemological beliefs and increase critical thinking skills can be developed, and thus, educational changes can be made. This study aimed to determine the relationship between the epistemological beliefs and critical thinking skills of nursing students.

METHODS

This descriptive and correlational research study was conducted to ascertain the connection between nursing students' epistemological beliefs and critical thinking abilities. The study was conducted from February 1, 2023, to March 1, 2023, with nursing students enrolled in two different state universities located in the northeast and west of Turkey. In these universities, nursing education is provided according to the National Core Education Program for Nursing.

This study included 1,212 students enrolled in the nursing programs in the academic year 2022–2023 at the state universities where the study was conducted. The sample size was determined using G*Power software (version 3.1.9.2, Heinrich-Heine University of Dusseldorf, Germany). A power analysis was done, and the sample size was calculated as 746 subjects, based on a confidence interval of 0.95%, statistical power of 0.80 (1- β), and a margin of error of 0.05.³ The sample of the study consisted of 752 nursing students who voluntarily agreed

to participate in the study and completed the data collection forms.

Data were collected using the questionnaire technique. The Epistemological Beliefs Questionnaire (EBQ), the Critical Thinking Disposition Scale (CTDS), and a Student Information Form were used. Student Information Form was created by the researchers. It consisted of eight questions about students' age, school year, high school that the student graduated from, economic status of the family, education level of the mother and father, and the voluntary choice of profession.

The EBQ scale was created by Schommer, and Deryakulu and Buyukozturk performed studies on its reliability and validity and its adaptation into Turkish. It is a 5-point Likert scale and consists of 34 items, including 17 positives and 17 negatives, and has three sub-factors, namely, "Belief in Learning Depends on Effort (Factor 1)," "Belief in Learning Depends on Capability (Factor 2)," and "Belief that Only One Truth Exists (Factor 3)." The scale scores vary between 34 and 170. A high score on one of the scale's factors indicates that the person has immature or underdeveloped beliefs about that factor, whereas a low score means the person has mature or developed beliefs. The Cronbach's alpha value of the scale was 0.83 for the first factor, 0.62 for the second factor, 0.59 for the third factor, and 0.71 for the total scale.¹⁹ In this study, the first factor's alpha value was 0.86, the second factor's alpha value was 0.87, the third factor's alpha value was 0.75, and the total scale's alpha value was 0.83.

The Turkish validity and reliability of the CTDS scale developed by Sosu was performed by Akın *et al.*^{20,21} It is a 5-point Likert scale with two dimensions, namely, critical openness and reflective skepticism, and a total of 11 items. The scale scores range between 11 and 55. An increase in the scale score indicates an increase in critical thinking tendency. Confirmatory factor analysis shows that the two-dimensional model fits well ($\chi^2 = 53.24$; $df = 40$; RMSEA = 0.040; NFI = 0.90; NNFI = 0.96; GFI = 0.96; AGFI = 0.93; CFI = 0.97; IFI = 0.97; and SRMR = 0.046). The Cronbach's alpha internal consistency reliability coefficients were 0.78 for the whole scale, 0.75 for the reflective skepticism subscale, and 0.68 for the Openness to Criticism subscale. The item-total score correlation coefficients of the scale vary between 0.25 and 0.57. These results show that the Turkish form of the CTDS can be used as a valid and reliable measurement tool. The scale's Cronbach's alpha value was 0.78.²⁰ In this study, the scale's alpha value was 0.85.

Research data were collected using an online questionnaire that was created on "Google Forms" after ethics committee and institutional approvals were obtained. The questionnaire includes the Student Information Form (8 questions), EBQ (34 items), and CTDS (11 items) which were used to collect the research data.

The link to the questionnaire was sent to the students' WhatsApp groups, and they were requested to fill it out. On the first page, participants approved an informed consent form which included information about the purpose of the study, that the participation was voluntary, and that their data would be kept confidential. After approving the consent form, they were allowed to access the questionnaire. No identifying personal information was collected, which ensured the confidentiality of the participants' information in the study. After the questionnaire was completed by the participants, the data were downloaded from the "Google Form" to the researcher's password-protected computer and saved.

Data were analyzed using the SPSS 25.00 software (IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test showed no evidence of a normal distribution of the data ($p < 0.05$). Descriptive and comparative methods were used to analyze the data. The relationship between the scales was evaluated using the Spearman Correlation analysis. A 95% confidence interval and a significance level of $p = 0.05$ were used to assess the outcomes.

Ethics committee approval was obtained from the Trakya University Faculty of Medicine Scientific Research Ethics Committee (date: 28.11.2022, decision number: TUTF-BAEK/ 23/08), and institutional permission was obtained from the institutions where the research would be conducted. Scale usage permission was obtained from the authors of the scales used in the study. Data were collected using a questionnaire created on Google Forms. Furthermore, students' consent was obtained online via an "Informed Volunteer Consent Form" at the start of the questionnaire. All items on the form were made available to students who agreed to participate in the study.

RESULTS

The students included in the study had a mean age of 20.49 ± 1.73 years; 78.2% were females, 32.0% were first-year students, and 79.1 were Anatolian/Science High School graduates. Additionally, 80.0% of the nursing students were found to have a medium income, 56.4% of their mothers and 49.2% of their fathers were primary school graduates, and 84.5% of them had voluntarily chosen the nursing profession (Table 1). A significant difference was noted between students' sex and their mean scores on the total EBQ ($p < 0.05$). However, no significant difference was observed between sex and mean scores on the total CTDS ($p > 0.05$). The male students scored higher on the EBQ on mean than the female students (Table 1).

A significant difference was found between the students' school year and their mean scores on both total EBQ and CTDS ($p < 0.05$). Although the second-year students had higher mean EBQ scores than other students, they had lower mean scores than first- and fourth-year students on

the total CTDS (Table 1). A significant difference was determined between students' family income status and their mean scores on the total EBQ ($p < 0.05$). However, no difference was noted between income level and mean scores on the total CTDS ($p > 0.05$). Furthermore, students who had a low family income had higher mean scores than those who had a medium family income (Table 1).

While no difference was observed between students' desire to become a nurse and their mean scores on the total EBQ ($p > 0.05$), a significant difference was determined between this variable and their mean scores on the total CTDS ($p < 0.05$). Students who wanted to study nursing had a higher overall CTDS score than other students (Table 1). No significant difference was found between the types of high schools that students graduated from, the education level of their parents, and their mean scores on the total EBQ and CTDS ($p > 0.05$) (Table 1).

The students' mean scores on the EBQ were as follows: total scale, 82.73 ± 12.05 ; Factor 1 subdimension, 35.38 ± 7.78 ; Factor 2 subdimension, 20.17 ± 5.15 ; and Factor 3 subdimension, 27.17 ± 5.15 . Regarding CTDS, the mean scores were 43.00 ± 5.35 for the total scale, 27.11 ± 3.45 for the Openness to Criticism subdimension, and 15.88 ± 2.31 for the Reflective Skepticism subdimension (Table 2).

Regarding the relationship between students' mean scores on EBQ and CTDS, a negative significant relationship was noted between the mean scores on the total EBQ, the Factor 1 subdimension, and the Factor 3 subdimension and their mean scores on the total CTDS and its subdimensions. Moreover, a positive relationship was determined between mean scores on the Factor 2 subdimension of the EBQ and the scores on the total CTDS and reflective skepticism subdimension (Table 3).

DISCUSSION

In this study, which examines the epistemological beliefs and critical thinking skills of student nurses, it was found that the demographic variable of sex affects epistemological belief levels. Specifically, female students received lower scores than male students, indicating that they possess more advanced epistemological beliefs. In a study by Kutluca *et al.* examining epistemological beliefs, it was determined that female students possess more advanced epistemological beliefs than male students.²² In a meta-analysis, which included 36 studies, it was concluded that women's epistemological beliefs were more developed than those of men.²³ Similar results were found in another study.³ Additionally, in a mixed-methods study, it was identified that sex is a significant factor influencing university students' epistemological beliefs.²⁴ In the current study, female students are found to possess higher epistemological beliefs, consistent with the findings in the literature.

TABLE 1. Nursing students' demographic characteristics and their distribution by EBQ score and CTDS score (N = 752)

	N (%)	EBQ Mean ± SD	<i>p</i>	CTDS Mean ± SD	<i>p</i>
Characteristics					
Sex					
Female	588 (78.2)	82.11 ± 11.38	0.016*	43.21 ± 4.69	0.644
Male	164 (21.8)	84.94 ± 14.00		42.24 ± 7.20	
Grade					
1	241 (32.0)	81.67 ± 11.33	0.005*	43.36 ± 5.70	0.026*
2	181 (24.1)	85.41 ± 10.65		42.36 ± 4.90	
3	182 (24.2)	82.02 ± 12.57		42.89 ± 5.53	
4	148 (19.7)	81.97 ± 13.68		43.33 ± 5.02	
Graduate of high schools					
General high schools	49 (6.5)	86.87 ± 11.32	0.052	42.18 ± 6.86	0.979
Health occupational high school	108 (14.4)	83.34 ± 13.92		42.88 ± 5.80	
Science and Anatolian high schools	595 (79.1)	82.28 ± 11.69		43.09 ± 5.12	
Perceived economic level					
High	44 (5.9)	84.70 ± 11.59	0.038*	42.37 ± 6.51	0.662
Moderate	602 (80.0)	82.16 ± 11.91		43.11 ± 5.12	
Low	106 (14.1)	85.15 ± 12.76		43.00 ± 5.29	
Mother education status					
Illiterate	66 (8.8)	81.18 ± 12.98	0.245	42.95 ± 5.19	0.830
Literacy	34 (4.5)	80.97 ± 14.37		43.00 ± 7.45	
Primary school graduates	424 (56.4)	82.41 ± 12.33		43.01 ± 5.40	
High school and above	228 (30.3)	84.03 ± 10.76		43.00 ± 4.94	
Father education status					
Illiterate	11 (1.5)	84.54 ± 13.47	0.276	36.63 ± 8.45	0.246
Literacy	29 (3.9)	78.55 ± 14.93		41.24 ± 7.52	
Primary school graduates	371 (49.2)	82.56 ± 12.43		43.19 ± 5.30	
High school and above	341 (45.4)	83.21 ± 11.27		43.04 ± 5.01	
Willingness to come to nursing education					
Yes	136 (84.5)	82.46±12.05	0.165	43.24±5.45	0.028*
No	25 (15.5)	83.48±12.06		42.33±5.01	

EBQ: Epistemological Beliefs Questionnaire; CTDS: Critical Thinking Disposition Scale; SD: standard deviation; Mann-Whitney U test, and Kruskal-Wallis Test were used appropriately; * $p < 0.05$.

TABLE 2. Mean scores for EBQ and CTDS subscales (N = 752)

EBQ and CTDS subscales	Mean \pm SD	Min-Max
Total EBQ	82.73 \pm 12.05	41-136
Belief in Learning Depends on Effort (Factor 1)	35.38 \pm 7.78	17-85
Belief in Learning Depends on Capability (Factor 2)	20.17 \pm 5.15	8-40
Belief in Only One Truth is Exist Factor 3)	27.17 \pm 5.15	9-45
Total CTDS	43.00 \pm 5.35	11-55
Openness to Criticism	27.11 \pm 3.45	7-35
Reflective Skepticism	15.88 \pm 2.31	4-20

EBQ: Epistemological Beliefs Questionnaire; CTDS: Critical Thinking Disposition Scale; SD: standard deviation.

TABLE 3. Correlation (r) between the EBQ and CTDS scores of nursing students (N = 752)

EBQ	CTDS		Total CTDS
	Openness to Criticism	Reflective Skepticism	
Belief in Learning Depends on Effort (Factor 1)	-0.500*	-0.457*	-0.530*
Belief in Learning Depends on Capability (Factor 2)	-0.061*	-0.097*	-0.090*
Belief in Only One Truth is Exist (Factor 3)	0.109*	0.093*	0.105*
Total EBQ	-0.279*	-0.288*	-0.315*

EBQ: Epistemological Beliefs Questionnaire; CTDS: Critical Thinking Disposition Scale; Spearman Correlation statistical Analysis was used.

Moreover, the present study shows that the school year variable affected students' epistemological belief levels and critical thinking skills. The epistemological beliefs of second-year students were less developed than those of other students, and they had a lower level of critical thinking skills than first- and fourth-year students. Orhan revealed that students studying in the upper classes had more mature epistemological beliefs and that their epistemological beliefs matured in parallel with the education they received.²⁵ Additionally, Kaya *et al.* found that the level of critical thinking increases as nursing students advance through their academic years.²⁶ Furthermore, Jimenez *et al.* noted significant differences in the mean critical thinking scores of students across their academic years.²⁷ In a study by Hunter *et al.*, it was indicated that academic year is a significant predictor of critical thinking skills, with first-year students achieving the lowest scores.²⁸ As the level of education increases, students' self-confidence and professional development also increases as they will have different problems, solutions, and experiences. Similarly, students' multidimensional thinking, analysis, and synthesis skills, that is, their epistemological beliefs and critical thinking levels, will increase to find solutions to the problems they encounter. However, in the present study, second-year students had the highest epistemological beliefs and lowest level of critical thinking, demonstrating that variables other than the school year may have affected this situation.

In the study, it was determined that another factor affecting nursing students' epistemological belief levels was their family's income level. Notably, the epistemological beliefs of individuals with medium family income were more developed than those of individuals with low family income. This shows that the income level of the family can affect the way and perception of individuals in accessing education and information. Thus, having a moderate-income level can be a balance point for students to access sources and information and enable them to develop a positive perspective on their knowledge and thoughts. In a study by Abedalaziz *et al.*, students with a higher socioeconomic status had more advanced epistemological beliefs.²⁹ Ata and Alpaslan found that university students with a middle/high economic level possess more advanced epistemological beliefs compared to other students.³⁰ A study conducted by Ozturk *et al.* with science teachers showed that income level did not affect epistemological beliefs.³¹ Studies have shown contrasting results. While this may have been due to differences between samples, the association between income level and epistemological beliefs can be revealed by conducting comprehensive studies that show the effect of economic level on epistemological beliefs more clearly.

Students who voluntarily chose the nursing program scored higher on critical thinking tests. Critical thinking is a basic skill in the nursing profession. High critical thinking

increases the quality and adequacy of nursing services and contributes to the professionalism and autonomy of the profession.³² In addition, being successful in the profession is closely related to wanting the profession.³³ It is reported that nurses who choose their profession voluntarily have a greater love for their job, higher professional relationships and job satisfaction, reduced intention to quit, and a higher quality of patient care and professional development.³⁴ No study has examined the relationship between liking the profession and critical thinking. However, in this study, the critical thinking level of students who had willingly chosen their profession was higher than that of other students, which is a crucial finding regarding the future of the profession, the quality of patient care, and increasing commitment to the profession.

In the present study, it was determined that students' mean scores on the total Epistemological Beliefs Scale were below the mean. Considering that individuals had more highly developed beliefs as the score obtained from the Epistemological Beliefs scale decreased, this result is critical in that it showed that the students had an advanced level of beliefs. In the literature, it is noted that epistemological beliefs are significant cognitive variables affecting learning and teaching processes. Additionally, students with more developed epistemological beliefs have been reported to have higher academic success and more effective learning habits and acquire new information more easily.³⁵ Research in the literature into student nurses' epistemological beliefs is limited. Karadağ *et al.* showed that students possessed high levels of epistemological beliefs.² They demonstrated that advanced epistemological beliefs facilitate a more critical, creative, and objective approach to events, thus enhancing students' scientific thinking skills.² Similarly, Yılmaz and Kaya reported that among nursing students, the subdimension of the scale indicating the belief that learning depends on effort was the most developed. They underscored the importance of providing diverse learning experiences and involving students in the teaching-learning process.⁶ Furthermore, Özen *et al.* identified that the belief in learning as a function of ability was the most developed, recommending an increased emphasis on the philosophy of knowledge within the nursing curriculum. They argued that this could improve students' perspectives on knowledge and their ability to critically question it.³ Having well-developed epistemological beliefs is crucial because of the significance of fostering creative and critical thinking in modern nursing education.²

Another concept examined that is as important as epistemological belief is critical thinking, which is an art of thinking that involves analyzing and evaluating information and drawing conclusions. Nurses and nursing students should be able to think creatively, self-directedly, and critically to make appropriate decisions and solve the

clinical problems they encounter.³⁶ Critical thinking enables nurses to perform self-assessment and reflect these insights into healthcare services, identify and address individuals' needs, make rapid and accurate decisions, communicate by striving to understand individuals' emotions and thoughts, and develop awareness in this regard.³⁷ Critical thinking is a critical process for safe, efficient, and skilled nursing practice. Therefore, nursing education programs should adopt attitudes that encourage critical thinking and stimulate critical reasoning skills.³⁸ In this study, students' mean scores on the Critical Thinking Skills Scale were above the mean, which is a desired result for nursing students. In other studies, on the examination of the critical thinking levels of nursing students, it was seen that students' critical thinking levels were mostly at low^{39,40} or medium levels.⁴¹ The high level of critical thinking obtained in this study is a positive finding in that it is a relevant indicator for improving the quality of nursing care for future nurse candidates.

This study started with the premise that highly developed epistemological beliefs and strong critical thinking abilities were significantly correlated. Critical thinking is a higher-order cognitive skill that is crucial for nursing students.⁴² Epistemological beliefs are closely related to critical thinking.¹³ Similarly, a weak and negative correlation between the total scores on the critical thinking scale and the Epistemological beliefs scale was found in the analysis between the study's scales. That is, it was found that people with developed epistemological beliefs displayed higher critical thinking abilities. Studies have reported a close relationship between having high-level thinking skills and developed epistemological beliefs. Additionally, it has been stated that since critical thinking is one of the high-level thinking skills that an individual should possess, the development of critical thinking skills will positively affect the development of epistemological beliefs.¹ A study by Orhan demonstrated that epistemological beliefs significantly influence critical thinking.²⁵ In a study by Kandemir and Eǧmir, a relationship between critical thinking and beliefs was identified.⁵ Additionally, in studies by arkit and Kurnaz, positive relationships were found between subdimensions of teacher candidates' epistemological belief perceptions and subdimensions of their critical thinking tendencies.⁴³ The findings of the present study were consistent with those in the literature. These findings support the notion that students' epistemological beliefs have a positive impact on their critical thinking abilities. In a profession such as nursing, where critical thinking and epistemological beliefs are crucial, determining and developing the characteristics of students while they are still in the education period is important for individual and professional development.

The study was limited to nursing students enrolled in two public universities, and the data used to draw conclusions came from the students themselves. Additionally, this

study examined a limited number of factors that influenced epistemological beliefs.

CONCLUSIONS

The results of this study reveal that female nursing students had higher epistemological beliefs than their male counterparts. It was found that epistemological beliefs were influenced by students' sex and academic level and their family's income status. In contrast, the level of critical thinking among students was affected by their academic level and their voluntary choice to pursue nursing. Additionally, the study demonstrates that the nursing students' levels of critical thinking and epistemological beliefs were above mean, and those with stronger epistemological beliefs possessed stronger critical thinking abilities. Future studies should include larger samples to better determine the epistemological beliefs of nursing students. This study examined a limited number of factors affecting epistemological beliefs. It is recommended that future research address a broader range of factors and that intervention-based initiatives be implemented to enhance students' epistemological beliefs. Further, it is recommended that students be mentored and guided, continuous feedback is provided, and interactive learning methods with different clinical experiences are offered.

CONFLICT OF INTEREST

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