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Research article

The level of nursing students' self-regulated learning and academic locus of control predicting self-confidence and anxiety in clinical decision-making

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ABSTRACT

Aim: This study examined the extent to which nursing students' self-regulated learning and academic locus of control predict self-confidence and anxiety in clinical decision-making.
Design: This study was a cross-sectional, descriptive, and correlational study.
Methods: The study sample was 627 undergraduate nursing students. Data were collected with the Student Introductory Information Form, Self-Regulated Learning Scale for Clinical Nursing Practice, Academic Locus of Control Scale, and Nursing Anxiety and Self-Confidence with Clinical Decision-Making Scale (NASC-CDM). Multiple linear regression analysis evaluated the predictive level of the variables on the self-confidence and anxiety scale subscale scores in clinical decision-making.
Results: The external locus of control and learning strategies significantly explain all sub-dimensions of the self-confidence scale in clinical decision-making. The internal locus of control and learning strategies meaningfully explain the sub-dimensions of the anxiety scale in clinical decision-making using resources to obtain information, fully listening, and knowing and taking action.
Conclusion: Self-regulated learning levels of nursing students affect clinical decision-making. It was determined that students with an internal locus of control had higher self-confidence in clinical decision-making and lower anxiety levels.

1. Introduction

Clinical decision-making (CDM) in nursing describes a complex and multidimensional process that includes the recognition of patients' clinical problems by nurses, the prioritization of problems with a systematic evaluation, the production of appropriate solutions, and implementation steps (Aktaş and Karabulut, 2016; Espinosa-Rivera et al., 2019; İlaslan et al., 2023; Keskin, 2020; White, 2014). Nurses make significant contributions to the healing process by focusing on the priority problems of patients during the decision-making process and the effective application of solutions (İlaslan et al., 2023; Keskin, 2020; White, 2014). Nurses acquire the skill of decision-making regarding critical situations, systematically addressing patients' clinical problems, providing appropriate care, and developing professional nursing attitudes through years of experience in nursing education and clinical practice (Aktaş and Karabulut, 2016; Espinosa-Rivera et al., 2019). CDM is a stressful process for nursing students who are still undergoing their education process and have limited knowledge and clinical experience (Aktaş and Karabulut, 2016; Espinosa-Rivera et al., 2019; İlaslan et al., 2023; Keskin, 2020; White, 2014).

CDM is a fundamental competency that nursing students need to acquire and includes identifying patients' clinical problems, producing solutions, and implementing effective interventions (Aktaş and Karabulut, 2016; Espinosa-Rivera et al., 2019). This competency is important for patient safety and ensuring quality care. However, the development of CDM skills is a complex process involving cognitive, emotional, and educational factors, including individual characteristics, attitudes toward the nursing profession, students' self-regulated learning (SRL), the academic locus of control (ALoC), and other factors (Aktaş and Karabulut, 2016; Bektas et al., 2021; Chen et al., 2019; Espinosa-Rivera et al., 2019; Iyama and Maeda, 2018; Panadero, 2017).

According to the existing literature, students' SRL affects self-

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confidence and anxiety in CDM. SRL defines students' motivational sources for learning and is associated with metacognitive maturity in learning processes (Chen et al., 2019; Song et al., 2022; Yan, 2020). SRL is a metacognitive process that allows students to actively plan, monitor, and evaluate their learning (Chen et al., 2019; Keçeci, 2017; Panadero, 2017). This situation emphasizes the student's assumption of responsibility for learning. SRL provides students the ability to adapt to challenges and maintain academic performance. Nursing students with strong SRL skills identify problems more easily in clinical settings by determining their learning needs and applying effective strategies to address knowledge gaps, more appropriately identify resources that can provide the correct information needed to solve problems, and solve problems better (Chen et al., 2019; Keçeci, 2017). This situation increases the student's self-confidence in the clinical setting. The literature shows that SRL reduces students' stress, increases their resilience, increases their self-confidence in clinical decision-making, and reduces their anxiety (Arkan et al., 2016; Hwang and Oh, 2021; Irvine et al., 2021; Jin and Ji, 2021; Keçeci, 2017; Panadero, 2017; Yan, 2020). In addition, SRL develops and supports students' lifelong learning skills, enabling them to access information more easily and use it in healthcare settings (Baysan and Orgun, 2023).

Another concept that affects self-confidence and anxiety in CDM is ALoC. ALoC refers to individuals' beliefs about the factors that affect their academic success. While internal locus of control (ILoC) attributes success to personal effort and abilities, external locus of control (ELoC) attributes results to external factors, such as luck or circumstances (Akın, 2007; Arkan et al., 2016; Mohamed et al., 2018). Nursing students with ILoC have high motivation in the learning process, which improves problem-solving. In addition, ILoC increases students' self-confidence by ensuring their active participation in the clinical practice process, identifying their own learning needs, and thus reducing their anxiety in CDM (Alkorashy and Alotaibi, 2023; Arkan et al., 2016; Bektas et al., 2021; Clemett and Raleigh, 2021). In contrast, ELoC causes students to feel powerless in solving problems in the clinical environment, creating more anxiety and difficulty in making clinical decisions.

Nursing students with high levels of SRL and ILoC are more successful in clinical settings due to their ability to manage stress, maintain self-confidence, and cope effectively with the challenges of patient care (Alkorashy and Alotaibi, 2023; Arkan et al., 2016; Bektas et al., 2021; Clemett and Raleigh, 2021; Dogu et al., 2022; Farčić et al., 2020; Hwang and Oh, 2021; Keçeci, 2017; Panadero, 2017). These characteristics also prepare students for professional nursing practice (Alkorashy and Alotaibi, 2023; Arkan et al., 2016; Bektas et al., 2021; Clemett and Raleigh, 2021). The literature suggests that SRL and ALoC should be integrated into nursing education to increase self-confidence and reduce anxiety levels in CDM. This integration also includes critical thinking, problem-solving, self-regulation, and metacognitive processes. These factors increase students' awareness of themselves and the educational process, supporting their professional development (Demir Acar et al., 2023; Günay and Kılınç, 2018). The aim of this study is to determine the extent to which these factors predict nursing students' self-confidence and anxiety levels in CDM, based on the importance of SRL and ALoC in the clinical decision-making process.

Research Questions

1. Is self-regulated learning a predictor of self-confidence and anxiety in CDM?
2. Is academic locus of control a predictor of self-confidence and anxiety in CDM?

2. Materials and methods

2.1. Design and sample

This study used a cross-sectional, descriptive, and correlational approach. It was planned that the study sample would consist of undergraduate nursing students. The number of students to be included in the study was calculated using the G*Power program. The estimated sample size was calculated as 602 people according to the 80 % power, $\alpha = 0.05$ significance level, small effect size (Cohen $f^2 = 0.02$), and four predictive variables for the regression analysis. The research was undertaken with 627 students in the 2nd, 3rd, and 4th grades in nursing undergraduate programs in three different cities. The study included students who were in clinical practice, who agreed to participate voluntarily, and who were only receiving undergraduate nursing education. Students who did not fill out the scales completely or who did not want their data to be used at any stage of the research were excluded from the study.

2.2. Instruments

2.2.1. Student introductory information form

This form includes the sociodemographic characteristics of the students (age, education level, and economic status).

2.2.2. Self-Regulated Learning Scale for Clinical Nursing Practice (SRLS-CNP)

The SRLS-CNP scale was developed in Japan by Iyama and Maeda in 2018 to assess the self-regulated learning of student nurses in clinical practice. The scale consists of 16 items and two subscales. The “Motivation” subscale consists of seven items and two dimensions: “Intrinsic Motivation” (4 items) and “Achievement Motivation” (3 items). The “Learning Strategies” subscale consists of nine items. The scale uses a Likert-type value range, and the items are scored as “Strongly Disagree” (1) to “Strongly Agree” (5). The minimum score that can be obtained from the entire scale is 16, and the maximum score is 80. A high score indicates that the student uses the self-regulated learning approach more. The scale does not have a cut-off point. The total and subscale Cronbach's alpha values of the Japanese version of the scale were 0.853, 0.785, and 0.814, respectively.

The validity and reliability of the scale in Turkish were determined by Baysan and Orgun (2023). In the exploratory factor analysis conducted on the Turkish version of the scale, the scale consisted of two subdimensions, similar to the Japanese version. The total and subscale Cronbach alpha values of the Turkish version of the scale were 0.898, 0.823, and 0.883, respectively (Baysan and Orgun, 2023). In our study, the total and subscale Cronbach's alpha values were 0.81, 0.76, and 0.88, respectively.

2.2.3. Academic Locus of Control Scale (ALoCS)

The ALoCS scale was developed in Turkey by Akın (2007). The scale consists of 17 items and two subscales: academic external locus of control and internal locus of control. ALoC reflects students' beliefs that their academic success is due to their own behavior and personality traits. This scale determines whether students attribute their academic success to external sources or to their own behavior or traits (Akın, 2007). The scale is a five-point Likert-type scale, with a minimum score of 17 and a maximum score of 85. As the scores from the subscales increase, the student has a higher level of characteristics related to the relevant dimension. There is no cut-off point in the scale. Akin found the subscale Cronbach's alpha values to be 0.94 and 0.95, respectively (Akın, 2007). In our study, the subscale Cronbach's alpha values were 0.82 and 0.77, respectively.

2.2.4. Nursing Anxiety and Self-Confidence with CDM Scale (NASC-CDM)

NASC-CDM was developed by White in the United States in 2014 to measure nursing students' confidence and anxiety levels in CDM. The scale consists of two independent scales: self-confidence and anxiety. Both scales consist of the same subscales: “Using sources to obtain information and listening fully,” “Using available information to determine the problem,” and “Knowing and taking action.” The lowest score that can be obtained on the self-confidence and anxiety scale is 27, and

the highest score is 162. High scores on the self-confidence scale and its subscales indicate that students have high self-confidence in CDM, while high scores on the anxiety scale and its subscales indicate that anxiety in CDM is high (White, 2014). White (2014) determined that the scale explains 63.39 % of self-confidence and 69.51 % of anxiety. Cronbach's alpha of the scale is 0.97 and 0.96 for the self-confidence and anxiety subscales, respectively (White, 2014).

The Turkish validity and reliability of the scale were conducted in 2017 by Bektaş, Yardımcı, Bektaş, and White using 334 nursing students. Bektaş et al. (2017) found that the Turkish version of the scale consisted of two separate scales, the scale consisted of three subdimensions, and the Turkish version had a similar structure to the original scale (White, 2014). Bektaş et al. (2017) determined that the scale explains 69.4 % of self-confidence and 66.9 % of anxiety. Cronbach's alpha of the Turkish version is 0.97 and 0.97 for self-confidence and anxiety, respectively (Bektaş et al., 2017). In our study, Cronbach's alpha values of the scales were 0.95 and 0.96 for self-confidence and anxiety, respectively.

2.3. Data collection

Data for the study were obtained from students at three different undergraduate nursing institutions located in the western, southern, and central parts of Turkey. An explanation was given to the students included in the study, and if they agreed to participate, they were asked to read and sign a detailed informed consent explaining the purpose of the research. The data were collected during appropriate class hours, and the data collection period took approximately 15 min. Students participating in the research were informed that the data would be processed within the scope of the research.

2.4. Data analysis

Values, percentages, and averages were used in the analysis of the descriptive data. The normal distribution of continuous data was evaluated with skewness and kurtosis, and it was determined that all data were normally distributed between ±2. One of the assumptions that must be met for multiple regression analysis is the absence of multicollinearity, which is evaluated using variance inflation factor (VIF) and tolerance measures. To demonstrate no multicollinearity, the VIF value must be <10, and the tolerance value must be >0.1. In this study, VIF was found to be <10, and tolerance was found to be >0.1 for all models (Dormann et al., 2013; Hair et al., 2019). The significance level was accepted as 0.05.

2.5. Ethical considerations

To conduct the research, permission was received from the Non-Interventional Ethics Committee of a university on September 27, 2023 (Decision No. 12l8). The necessary permissions were obtained from the institutions where the research was conducted. Finally, verbal and written permission was obtained from the students participating in the research with an informed consent form.

3. Results

In this section, the descriptive analysis and regression analysis results are given (Table 1).

The average age of the participants was 20.73 ± 1.21, 67.8 % were women ($n = 425$), 41.5 % ($n = 260$) were in the 2nd grade, 1.6 % ($n = 10$) were health vocational high school graduates, 24.2 % ($n = 152$) had lived in the district for the longest time, 82 % ($n = 514$) of the participants had a nuclear family, 45.8 % ($n = 287$) had only one sibling, 41.6 % ($n = 261$) of the mothers were primary school graduates, 22.8 % ($n = 143$) of the fathers were primary school graduates, and 46.1 % ($n = 289$) of the participants lived in a private dormitory (Table 1).

Table 1
Participants' descriptive characteristics.

Descriptive variables	M ± SD	
Age	20.73 ± 1.21	
	n	%
Gender		
Girl	425	67.8
Boy	202	32.2
Grade		
Second Year	170	27.1
Three Year	260	41.5
Four Year	197	31.4
Graduated High School		
General	417	67.1
Health Vocational High School	10	1.6
Not specifying	154	24.6
Longest lived place		
Village and Town	80	12.8
District	152	24.2
Province	115	18.3
Big city	126	20.1
Not specifying	154	24.6
Family Type		
Nuclear	514	82.0
Wide	97	15.5
Broken	16	2.5
Number of siblings		
One	287	45.8
Two	101	16.1
Three	93	14.8
Four	146	23.3
Mother Education		
Primary school	261	41.6
Middle school	91	14.5
High school	87	13.9
University and Above	34	5.4
Not specifying	154	24.6
Father Education		
Primary school	143	22.8
Middle school	105	16.7
High school	139	22.2
University and Above	86	13.7
Not specifying	154	24.6
Shelter		
Private Dormitory	289	46.1
Student House	44	7.0
Homestay	83	13.2
Other	211	33.7

M = mean, SD: standard deviation.

The mean, minimum, maximum, and standard deviations of the scales are given in Table 2.

A moderate, negative, and significant relationship was found between the sub-dimensions of NASC-CDM ($p < 0.05$). A positive, low-level significant relationship was found between the external locus of the control subscale and the self-confidence and anxiety in CDM subdimensions. In contrast, a negative, low-level significant relationship was found between the self-confidence scale sub-dimensions ($p < 0.05$). A negative, low-level significant relationship was found between the internal locus of control sub-scale and the self-confidence and anxiety in

Table 2
Mean, standard deviation, and standard errors of scales.

Variables	Sub-scale	*M*	*SD*	*n*	*SE*	Min	Max
Anxiety in Clinical Decision-Making Scale	Using Sources to Obtain Information and Listening Fully	32.92	13.09	627	0.53	13.00	78.00
	Using Available Information to Identify the Problem	19.42	6.57	627	0.27	7.00	42.00
	Knowing and Acting	19.94	7.46	627	0.30	7.00	42.00
Self-Confidence in Clinical Decision-Making Scale	Using Sources to Obtain Information and Listening Fully	52.32	12.52	627	0.51	13.00	78.00
	Using Available Information to Identify the Problem	26.78	6.38	627	0.26	7.00	42.00
	Knowing and Acting	25.75	6.87	627	0.28	7.00	42.00
Academic Locus of Control Scale	External Locus of Control	26.88	7.37	627	0.30	11.00	55.00
	Internal Locus of Control	23.58	4.21	627	0.17	6.00	30.00
Self-Regulated Learning Scale for Clinical Nursing Practice	Motivation	27.18	4.24	627	0.17	8.00	35.00
	Learning Strategy	35.87	5.09	627	0.21	9.00	45.00

M = mean, SD: standard deviation, SE: standard error.

CDM sub-dimensions. In contrast, a positive, low-level significant relationship was found between the self-confidence and anxiety in CDM sub-dimensions ($p < 0.05$) (Table 3).

While no significant relationship was found between the SRL Scale for Clinical Nursing Practice motivation sub-dimension and anxiety in CDM sub-dimensions ($p > 0.05$), a positive, low-level significant relationship was found between the self-confidence in CDM sub-dimensions ($p < 0.05$). A low-level relationship was found between the Learning Strategy sub-dimension and the self-confidence and anxiety in CDM sub-dimensions ($p < 0.05$) (Table 3).

The Learning Strategies and Motivation sub-dimensions of the SRLS-CNP and the internal and external control sub-dimension scores of the ALoCS significantly explained the CMD Self-Confidence Scale Using Sources to Obtain Information and Listening Fully sub-dimension score by 11.1 % (Model 1). When the variables were examined individually, it was determined that only the internal control, external control, and learning strategies sub-dimension scores significantly predicted the Using Sources to Obtain Information and Fully Listening sub-dimension scores of the scale, respectively ($p < 0.05$).

The learning strategies and motivation sub-dimensions of the SRLS-CNP and the internal control and external control sub-dimension scores of the ALoCS significantly explained 7.1 % of the score of the Using Available Information to Identify the Problem sub-dimension of the Self-Confidence in CDM scale (Model 2). When the variables were examined individually, only the external locus of control and learning strategies sub-dimension scores significantly predicted the Using Available Information to Identify the Problem sub-dimension score.

The learning strategies and motivation sub-dimensions of the SRLS-CNP and the internal control and external control sub-dimension scores of the ALoCS significantly explained 7.2 % of the scores of the Knowing and Acting sub-dimension of the Self-Confidence in CDM Scale (Model 3). Only the external locus of control and learning strategies sub-dimension scores significantly predicted the Knowing and Acting sub-dimension score when the variables were examined individually (Table 4).

The learning strategies and motivation sub-dimensions of the SRLS-CNP and the internal control and external control sub-dimension scores of the ALoCS significantly explained the Anxiety Scale in CDM Scale Using Sources to Obtain Information and Listening Fully sub-dimension score by 5.1 % (Model 4). When the variables were examined individually, only the internal control, external control, and learning strategies subscale scores significantly predicted the scores, respectively ($p < 0.05$).

The SRLS-CNP learning strategies and motivation sub-dimensions and the ALoCS internal control and external control sub-dimensions scores significantly explained 3.5 % of the Anxiety Scale in CDM Using Available Information to Identify the Problem sub-dimension score (Model 5). Only the external locus of control sub-dimension score significantly predicted the Using Available Information to Identify the Problem sub-dimension score when the variables were examined individually,

The learning strategies and motivation sub-dimensions of the SRLS-CNP and the ALoCS internal and external locus of control sub-dimension scores significantly explained 3.5 % of the scores of the Knowing and

Table 3
Relationship between variables.

Variable		1	2	3	4	5	6	7	8	9	10
Anxiety in Clinical Decision-Making Scale	1. Using Sources to Obtain Information and Listening Fully	1									
	2. Using Available Information to Identify the Problem	0.745**	1								
	3. Knowing and Acting	0.864**	0.705**	1							
Self-Confidence in Clinical Decision-Making Scale	4. Using Sources to Obtain Information and Listening Fully	−0.468**	−0.317**	−0.350**	1						
	5. Using Available Information to Identify the Problem	−0.245**	−0.363**	−0.229**	0.698**	1					
	6. Knowing and Acting	−0.392**	−0.301**	−0.468**	0.827**	0.713**	1				
Academic Locus of Control Scale	7. External Locus of Control	0.149**	0.167**	0.084*	−0.237**	−0.223**	−0.154**	1			
	8. Internal Locus of Control	−0.160**	−0.100*	−0.133**	0.212**	0.108**	0.109**	−0.205**	1		
Self-Regulated Learning Scale for Clinical Nursing Practice	9. Motivation	−0.066	−0.026	−0.034	0.231**	0.165**	0.198**	−0.263**	0.248**	1	
	10. Learning Strategy	−0.128**	−0.057	−0.118**	0.267**	0.216**	0.271**	−0.270**	0.277**	0.630**	1

** Significant at 0.01 Level.
* Significant at 0.05 Level.

Table 4
The predictive level of variables on the sub-dimensions of the self-confidence in clinical decision-making scale.

Variables		Model 1 Using Sources to Obtain Information and Listening Fully β[a]	Model 2 Using Available Information to Identify the Problem β[a]	Model 3 Knowing and Acting β[a]
Academic Locus of Control Scale	External Locus of Control	−0.160*	−0.177*	−0.085**
	Internal Locus of Control	0.114*	0.018	0.010
Self-Regulated Learning Scale for Clinical Nursing Practice	Motivation	0.076	0.027	0.039
	Learning Strategy	0.127*	0.128*	0.202*
Model Statistics	R[b]	0.333	0.267	0.269
	R^{2c}	0.111	0.071	0.072
	F[d]	19.410	11.918	12.116
	p	<0.001	<0.001	<0.001
	DW (1.5–2.5)[e]	1.921	1.940	2.012

* Significant at 0.01 level.
** Significant at 0.05 level.
[a] *β*, Standardized Beta.
[b] *R*, correlation coefficient.
[c] R^2, R Square.
[d] *F*, Anova Value.
[e] *DW*, Durbin Watson.

Table 5
The predictive level of variables on the sub-dimensions of the anxiety in clinical decision-making scale.

Variables		Model 4 Using Sources to Obtain Information and Listening Fully β[a]	Model 5 Using Available Information to Identify the Problem β[a]	Model 6 Knowing and Acting β[a]
Academic Locus of Control Scale	External Locus of Control	0.109*	0.157*	0.047
	Internal Locus of Control	−0.131*	−0.078	−0.111*
Self-Regulated Learning Scale for Clinical Nursing Practice	Motivation	0.056	0.046	0.092
	Learning Strategy	−0.112**	−0.031	−0.144*
Model Statistics	R[b]	0.226	0.188	0.186
	R^{2c}	0.051	0.035	0.035
	F[d]	8.360	5.670	5.602
	p	<0.001	<0.001	<0.001
	DW (1.5–2.5)[e]	1.517	2.084	1.960

* Significant at 0.01 level.
** Significant at 0.05 level.
[a] *β*, Standardized Beta.
[b] *R*, correlation coefficient.
[c] R^2, R Square.
[d] *F*, Anova Value.
[e] *DW*, Durbin Watson.

Taking Action sub-dimension of the Anxiety Scale in CDM (Model 6). When the variables were examined individually, only the internal locus of control subscale score significantly predicted the Knowing and Taking Action subscale score (Table 5).

The results of the regression analysis showed that the variables that significantly explain the level of self-confidence in CDM include the father's education, the family type being nuclear, class, and being female ($p < 0.05$). It was determined that anxiety level in CDM is significantly explained by the mother's education, the number of siblings, graduation from health vocational high school, and living in the city (Table 6).

Table 6
The predictive level of demographic variables on the self-confidence and anxiety in clinical decision-making scale.

Variables	Self-Confidence in Clinical Decision-Making Scale β[a]	Anxiety in Clinical Decision-Making Scale β[a]
Age	0.070	0.064
Gender (Girl = R)	0.200*	−0.090
Grade	−0.141*	0.105
Graduated High School (Health Vocational High School = R^{δ})	−0.016	−0.110*
Longest lived place (city = R)	−0.056	0.101**
Family Type (Nuclear = R)	−0.161*	0.047
Number of siblings	−0.078	−0.135*
Mother Education	0.055	0.214*
Father Education	−0.222*	−0.065
Shelter (Private Dormitory = R^{δ})	−0.011	0.077
R[b]	0.353	0.303
R^{2c}	0.125	0.092
F[d]	6.408	4.565
p	<0.001	<0.001
DW (1.5–2.5)[e]	1.801	1.880

* Significant at 0.01 level.
** Significant at 0.05 level.
[a] *β*, Standardized Beta.
[b] *R*, correlation coefficient.
[c] R^2, R Square.
[d] *F*, Anova Value.
[e] *DW*, Durbin Watson, R^{δ} = Reference Value.

4. Discussion

In our study, it was determined that nursing students' self-regulated learning and academic locus of control regarding clinical nursing practices significantly explained the self-confidence and anxiety in CDM scores. The scores obtained for all scales are at the middle level and above.

A low-level significant relationship was found between self-confidence and anxiety in CDM, academic locus of control, and self-regulated learning. The literature also emphasizes that there is a relationship between these variables (Bektas et al., 2021; Durmaz et al., 2018; Günüşen and Üstün, 2011; Irvine et al., 2021; Kurt and Eskimez, 2022; Mollart et al., 2021; Song et al., 2022). Since the relationship between the variables does not provide information about causality, the cause-effect relationship was evaluated using regression analysis.

4.1. Self-confidence in CDM

According to the results of this study, the learning strategies sub-dimensions of SRLS-CNP and the internal and external control subscales of the ALoCS scores significantly predicted the "Using Sources to Obtain Information and Listening Fully" subscale score of self-confidence in CDM (Model 1).

In the literature, it is stated that individuals with an ILoC believe that their success in learning is due to their skills and personal characteristics. In contrast, individuals with an ELoC believe that they need support

for learning and success and that both failure and success are due to external factors. It is suggested that students with a developed ILoC can take more responsibility for their learning, are more motivated to learn, and can more easily identify problems and find solutions (Günüşen and Üstün, 2011; Irvine et al., 2021; Song et al., 2022).

Students with high SRL and ALoC can more easily access the information necessary to identify and solve clinical problems. Therefore, motivating students to learning, encouraging them to take responsibility for their learning, and supporting them in determining their learning strategies will support and facilitate students' use of resources to access information and communicate appropriately (Irvine et al., 2021). In nursing practice, students need to obtain accurate data from the patient and listen to their problems fully to be more effective in the care of patients in the clinic, follow the patient's process, and plan nursing interventions appropriately (Aktaş and Karabulut, 2016).

Students' SRL levels and awareness of their responsibilities in the learning process significantly affect their self-confidence in accessing information sources in CDM (Dogu et al., 2022). Students who are motivated to learn and have an ILoC have more well-developed problem-solving, critical thinking, and metacognitive awareness skills, and these skills make it easier for them to access data to address clinical problems (Batran et al., 2022; İlaslan et al., 2023). Similar to the existing literature, the results of this study revealed that students' SRL and ILoC for learning affect their CDM self-confidence levels. Therefore, practice environments and nursing curricula need to be planned in a way that will develop learning strategies and ILoC (Bektas et al., 2021; Kurt and Eskimez, 2022; Mollart et al., 2021).

Our study results showed that the "using available information to determine the problem" sub-dimension of the CDM self-confidence scale was significantly affected by ELoC and learning strategies (Model 2). In the study, it was observed that as ELoC decreases and learning strategies increase, students' level of using information in determining the problem increases. In particular, it was observed that as ELoC decreases, students assume more responsibility for determining clinical problems and are more motivated to access the information they need and use this information to solve the problem (Song et al., 2022). In parallel with this, it has previously been observed that students with low ELoC and different learning strategies have more skills in synthesizing, organizing, and controlling information, and they use synthesized information more in determining and solving clinical problems (Günüşen and Üstün, 2011).

Previous studies have found that students who effectively define problems and find appropriate solutions develop self-confidence in CDM. Therefore, learning how to define existing problems, how to determine solution processes, and how to make appropriate interventions develops students' self-confidence. Formatting clinical practices and educational curricula to include clinical problems and solutions will increase students' self-confidence (Aktaş and Karabulut, 2016; Arkan et al., 2016; Barutçu, 2019; Günüşen and Üstün, 2011). The decrease in the ELoC may provide insight into the development of the ILoC by highlighting students' responsibilities in the learning process. Nursing students' ability to plan and prioritize the care of patients with complex care needs and self-confidence in CDM makes it easier to transfer theoretical knowledge into practice (Aktaş and Karabulut, 2016; Arkan et al., 2016; Barutçu, 2019; Günüşen and Üstün, 2011).

In this study, the ELoCS and SRLS-CNP sub-dimension scores significantly predicted the knowing and acting sub-dimension score of self-confidence in CDM (Model 3). Nursing students who have ELoC experience high stress in organizing and transferring knowledge into practice when solving patients' clinical problems. This situation reduces their self-confidence by negatively affecting their ability to deliver care, even though they are knowledgeable in clinical decision-making (Barutçu, 2019; Yıldırım et al., 2016). For this reason, nursing students need to realize the importance of knowledge and acting on knowledge in solving clinical problems. They need to understand that the ELoC and SRL also impact the transfer of information to the clinic (Bektas et al., 2021). In our study, it was seen that students with an ELoC have more problems accessing information and taking action, and these students need to be supported more by educators on how to access and use information in care (Alkorashy and Alotaibi, 2023; Arkan et al., 2016). Consequently, developing students' SRL, determining their locus of control, and developing student-specific learning strategies will increase their self-confidence.

ALoC and SRL were determined to be predictors of self-confidence in CDM, thus answering our first research question.

4.2. Anxiety in CDM

The "Using Sources to Obtain Information and Listening Thoroughly" subscale of the CDM anxiety scale was significantly affected by the ILoC, ELoCS and SRLS-CNP subscales (Model 4). Nursing students experience high anxiety due to limited knowledge, clinical experience, and communication skills in determining priority care needs (Bektaş et al., 2020). Students need more information to identify clinical problems and an effective teaching strategy on how to use this information (Chen et al., 2019). Students must be aware that they must be active in the learning process and make individual efforts to decide what knowledge is necessary to solve clinical problems.

Students with an ILoC take more responsibility for learning and use different sources to access information, and students who have access to information experience less anxiety and can communicate more with their patients and obtain information. For this reason, the anxiety experienced by students regarding the ability to use information, access the right learning resources, and obtain data related to clinical procedures is affected by their academic ILoC and ELoC (Günüşen et al., 2014; Özen et al., 2017). Students with advanced learning strategies and ILoC try to obtain more data about clinical problems by turning to different sources in this process; they relate information to clinical problems, suggest solutions to problems, and feel more successful. This situation reduces anxiety, enabling students to take more responsibility for their learning, be more motivated, and develop new strategies for learning (Durmaz et al., 2018; Irvine et al., 2021).

In our study, it was found that the ELoCS sub-dimension score significantly predicted the "Using available information to determine the problem" sub-dimension of the anxiety scale in CDM (Model 5). Nursing students obtain large amounts of data from the clinical environment. However, very little of the data obtained is used to identify real clinical problems. Relating data obtained from the clinical environment to real clinical problems is a complex and stressful process for students (Kanbay and Okanlı, 2017). For this reason, it is normal for students to associate the anxiety they experience in this complex process with external factors that do not originate from them (Arkan et al., 2018; Günüşen et al., 2014). The anxiety experienced by nursing students in identifying clinical problems and determining priorities in care may also be due to a general lack of knowledge (Günay and Kılınç, 2018).

Due to the hierarchical, horizontally, and vertically integrated structure of undergraduate nursing education, students must frequently repeat the information they have learned. Students with an ELoC may think that the difficult process of transferring knowledge into practice is due to the clinical environment, educator, or patient (Arkan et al., 2018; Günüşen et al., 2014). These students need approval, encouragement, and support to transfer knowledge into practice. Students can more easily use their knowledge to identify and solve problems in clinical environments when educators support them.

In our study, it was found that the "Knowing and taking action" subdimension of the anxiety in the CDM scale was significantly predicted by the ILoC and learning strategies sub-dimension scores (Model 6). Students who have an ILoC can better identify their knowledge gaps, develop different learning strategies to complete their missing knowledge, and use the clinical environment better for learning purposes (Arkan et al., 2018; Demir Acar et al., 2023; Mohamed et al., 2018). Meanwhile, students who feel that their knowledge is incomplete, take

responsibility for their own learning, and develop different learning strategies for this are more successful and experience less anxiety (Arkan et al., 2018; Demir Acar et al., 2023; Mohamed et al., 2018). In our study, the fact that ILoC and learning strategies were found to be associated with low anxiety is consistent with these results in the extant literature.

ALoC and SRL were determined to be predictors of anxiety in CDM, thus answering our second research question.

4.3. The level of explanation of self-confidence and anxiety in CDM by socio-demographic characteristics

In our study, it was determined that the father's education, mother's education, family type, class, graduation from health vocational high school, and gender significantly predicted the level of self-confidence and anxiety in CDM. Studies in the literature both support and do not support the fact that these variables significantly affect self-confidence and anxiety in CDM (Gebreegziabher et al., 2023; Keskin, 2020; Medel et al., 2024; Özden et al., 2018). In our study, it is thought that especially the higher levels of father's and mother's education and the nuclear type of the family provide students with more opportunities for their development, so their general self-confidence may be high, and this may affect the students' self-confidence and anxiety levels in CDM.

Being female was found to be a factor that increases self-confidence in our study. Again, graduating from health vocational high school may have been determined as an affecting factor due to having more knowledge and experience in the health field compared to other students. Students who graduate from health vocational high schools can communicate with patients, make diagnoses, and understand medical information more easily. These situations can cause students to experience less anxiety and increase their self-confidence (Gebreegziabher et al., 2023; Keskin, 2020; Medel et al., 2024; Özden et al., 2018).

4.4. Study limitations

Despite the many strengths of this study, it has some limitations. First, convenience sampling was used to collect data from students who attended school and volunteered. However, the fact that the study was conducted in different nursing undergraduate programs from three different regions reduces this limitation and increases the generalizability of the results. Second, the educational models and clinical areas in schools differ from each other, which may affect the generalizability of the results. Third, all of the scales are based on self-reporting. This situation may have led to social desirability and response bias. To reduce this risk, the study data were collected by people who were not involved in the study, and they explained the purpose of the study to the students. Therefore, it is recommended that further studies be conducted to understand the relationships between the variables better. The last limitation is that the effects of different education models cannot be examined. However, recruiting students from many different schools in this study may have reduced this limitation.

5. Conclusion

In the present study, nursing students' SRL levels increased self-confidence in CDM and reduced anxiety in CDM. It was determined that students with an ILoC had higher self-confidence in CDM and lower anxiety levels. It is recommended that students' locus of control be determined, strategies for obtaining information for students with an ELoC be supported, and support be provided in transferring the information to the clinic setting. Therefore, it is recommended that curriculum content be created in nursing education programs that will improve CDM skills, increase students' self-confidence in CDM, and reduce their anxiety.

It is also recommended that students' self-confidence in CDM skills in different situations be increased with scenarios regarding CDM in education programs, and that the anxiety they experience while making decisions be reduced. It is further recommended that students' CDM skills and experiences in different situations be increased by increasing their reflective learning in clinical practice.

Since this is a cross-sectional study, it is limited in establishing causal relationships or determining changes over time. Therefore, it is recommended that experimental-prospective studies be conducted to determine changes over time and to monitor the relationships between the variables in the future. It is also recommended that descriptive and interventional studies be conducted to examine the effects of confounding variables such as differences in educational environments and programs that could not be addressed in this study.

CRediT authorship contribution statement

İlknur Bektas: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Aslı Akdeniz Kudubeş:** Data curation, Conceptualization. **Dijle Ayar:** Data curation, Conceptualization. **Murat Bektas:** Writing – original draft, Supervision, Methodology.

Declaration of competing interest

The authors declare that they have no competing interests.

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