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The effect of critical thinking education on nursing students' critical thinking dispositions, social intelligence levels, and nursing education stress: a quasi-experimental study

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Abstract

Background Developing critical thinking is important in nursing as it supports basic cognitive processes; however, students may have difficulty developing these skills due to high academic and clinical stress. Social intelligence and stress management are seen as critical for clinical success and quality of care.

Aim This study aimed to investigate the effects of a structured critical thinking education course on nursing students' critical thinking dispositions, social intelligence levels, and nursing education-related stress.

Methods A quasi-experimental design with pretest–posttest control groups was employed. The study included 66 first-year undergraduate nursing students. The intervention group received a 14-week structured critical thinking education course.

Results Posttest Critical Thinking Disposition Scores were statistically significant from pretest scores ($p = .004$). No significant changes were seen in the mean scores of Social Intelligence and Nursing Education Stress. There was a moderate positive correlation between Critical Thinking Disposition and the Social Intelligence Scale subscales.

Conclusion The findings suggest that integrating critical thinking education into nursing curricula may enhance students' cognitive and social competencies. While stress levels were not significantly reduced, improved systematic thinking was linked to lower perceived stress, indicating the potential of critical thinking strategies to strengthen essential nursing skills and stress resilience.

Keywords Critical thinking education, Nursing students, Metacognitive skills, Social intelligence, Stress management

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Background

Critical thinking (CT) is a key twenty-first century competency emphasized in educational systems, regarded as an essential skill for clinical students and a fundamental component of clinical decision-making, professional competence, and the training of qualified health professionals [18, 36, 43]. Those with critical thinking skills possess the ability to seek information, analyze data, make decisions, and reflect, as well as being academically successful. On the other hand, those with weak critical thinking skills may experience clinical conditions such as depression, inability to solve patient problems, and inadequate clinical reasoning. It is emphasized that the primary goal of nursing education is to develop this skill in students [8]. In nursing, critical thinking is a vital psychological asset that supports sound clinical decisions, reduces errors, improves patient outcomes, and strengthens students' well-being [9, 45].

Stress is defined as any physical or emotional factor that causes mental and/or physical tension and distress [7]. Nursing students experience more stress than students in other health disciplines due to heavy course loads, new clinical experiences, and care of chronic and terminally ill patients [33]. A systematic review conducted by McCarthy and colleagues reported that nursing students consistently experience higher levels of stress and exhibit poorer indicators of psychological well-being compared to students in other health disciplines. The study noted the prevalence of depression ranging from 27 to 51% [23]. These mental health problems persist throughout professional practice, with approximately 40% of early-career nurses experiencing symptoms of burnout and psychological distress [31]. Research conducted in Türkiye, in particular, indicates that 47% of nursing students experience moderate to severe symptoms of anxiety and depression during their training [16].

Social intelligence has been defined as "the ability of an individual to understand other people's moods, feelings, desires, motivations, intentions, how they work, how to work together with them, and to solve problems and confusion" [42]. Healthcare workers may experience emotional breakdowns and poor job performance due to difficult working conditions, low wages, and a lack of social life. As self-esteem, social intelligence, and psychological resilience increase, it becomes easier for them to cope with stress and burnout [27].

Rapid advances in science and technology increase the need for qualified workforce, especially competent nurses, in a globalizing world. To adapt to these developments, nurses must be able to use information selectively, generate creative ideas, act flexibly, and develop critical thinking skills. To date, no studies have examined the relationship between nursing students' critical thinking dispositions, social intelligence levels, and nursing education-related stress. Therefore, the aim of this study was to investigate the effects of structured critical thinking education on nursing students' critical thinking dispositions, social intelligence, and stress related to nursing education.

Research hypotheses

H1. The Critical thinking levels of students in the intervention group are higher than those in the control group.
H2. The social intelligence levels of students in the intervention group are higher than those in the control group.
H3. The nursing education-related stress levels of students in the intervention group are lower than those in the control group.

Methods

Study design

This study employed a quasi-experimental pretest–posttest design with intervention and control groups. A quasi-experimental design of this nature aims to assess the impact of an intervention within a specific population without the use of random assignment. This design was chosen due to its practicality and ethical considerations in nursing research, making it suitable for evaluating interventions in educational settings [37].

Samples and settings

The study was conducted at a nursing school located in the Western Antalya region of Türkiye. The population consisted of 92 first-year undergraduate nursing students who met the specified inclusion and exclusion criteria. First-year undergraduate nursing students were selected because they were at the beginning of their education and had limited experience with professional practice, making them an appropriate population to evaluate the impact of structured critical thinking training. A purposive sampling approach was used to reach the entire target population. No power analysis was performed to estimate the sample size; instead, all students who volunteered to participate in the study were included.

A total of 92 first-year nursing students participated. During course registration at the beginning of the semester, students randomly selected one of the elective courses: Critical Thinking (maximum 50 seats) or Caring Behaviors (maximum 50 seats). They were required to choose only one of these two electives. There were no other elective courses listed in the school curriculum. Students' course selections were made completely randomly during registration before the start of the semester. Students were unaware of the course content, and the randomization process contributed to preventing

publication bias. Those who selected the Critical Thinking course were assigned to the "experimental" group, and those who selected the Caring Behaviors course were assigned to the "control" group. The experimental group (EG) consisted of 35 students who selected the Critical Thinking elective course and agreed to participate voluntarily in the study. The control group (CG) consisted of 31 students who selected the Caring Behaviors elective course and agreed to participate voluntarily in the study (see Fig. 1). Accordingly, a total of 66 first-year undergraduate nursing students agreed to participate in the study, resulting in a participation rate of 71.73%.

Inclusion criteria for students in the study

Students were included in the study if they were first-year undergraduate nursing students and agreed to participate voluntarily, while those who declined participation or did not complete the post-test were excluded.

Intervention

In the fall semester of the 2023–2024 academic year, first-year undergraduate nursing students were offered two elective courses: *Critical Thinking* and *Caring Behaviors in Nursing*. Students are required to choose one of these electives during the course registration phase before the semester begins, in accordance with school regulations, and these selections are made randomly. Students are blinded to information such as course content and instructor information before selecting an elective.

The Structured Critical Thinking course, offered as part of this study, aims to develop student competencies. It is offered as an elective course to first-year undergraduate nursing students each year. The course content for the Critical Thinking course is prepared by the relevant faculty member, based on current literature, presented to the school administration, and feedback is obtained to ensure compliance. The training is not part of any project. The Structured Critical Thinking course was administered two hours per week throughout the fall semester (14 weeks). Educational activities were conducted simultaneously in the classrooms of both groups. The training was expanded to include not only the topics but also the teaching methods (e.g., case-based learning, group discussions, problem-solving exercises) and resources used (e.g., scientific articles, clinical scenarios, reflective assignments).

Teaching methods included case-based learning, group discussions, the Six Thinking Hats technique, problem-solving exercises, brainstorming sessions, discussion sessions, critical film viewing, and post-film discussions. During the fall semester, the first hour of the two-hour course consisted of theoretical lectures and the second hour consisted of discussion sessions. Each week, a current topic (e.g., whether we should receive the coronavirus vaccine or not) was chosen to encourage students to reflect on the learning techniques mentioned above.

To avoid biases related to different teaching practices, all activities were conducted by the instructor who developed the content of the critical thinking course. Each group completed the 14-week structured course under the supervision of the instructor in their assigned classrooms between October 2, 2023, and January 22, 2024. The study was completed by the same instructor. The control group did not take the Critical Thinking course and followed the curriculum content of the Nursing Caring Behaviors course throughout the study. Because the Nursing Caring Behaviors course was assumed not to contain content that would directly influence critical thinking, it was used as the control group. The topics of the Structured Critical Thinking course applied to the intervention group are given in Table 1 (see Table 1).

Data collection

The data of the study were collected with the same measurement tools in the first week of the Critical thinking course (pre-test) and in the last week of the 14-week structured training course (post-test). The research flow chart is given in Fig. 1.

Data collection tools

The research data were collected through the Socio-demographic Characteristics Form, Critical Thinking Disposition Scale, Tromso Social Intelligence Scale, and Nursing Education Stress Scale.

Socio-demographic characteristics form

This form is a form consisting of 7 questions including socio-demographic characteristics such as age, gender, high school graduation and grade point average, place of birth, perceived economic status and self-expression, prepared by researchers using literature [5, 46].

Critical Thinking Disposition Scale (CTDS)

It was developed by Semerci [34]. The scale consists of 5 dimensions and a total of 49 items. The scale sub-dimensions are listed as metacognition, flexibility, systematicity, perseverance and patience, and open-mindedness. Cronbach's Alpha value for the total scale was found to be 0.963 [34]. In the current sample, Cronbach's $\alpha = 0.94$ for the Critical Thinking Disposition Scale.

Tromsø Social Intelligence Scale (TSIS)

This scale was developed by Silvera et al. [38]. Its Turkish validity and reliability were done by Doğan and Çetin [10] and it is a 21-item Likert-type scale. Tromsø Social Intelligence Scale measures social intelligence in three separate dimensions: social knowledge process, social

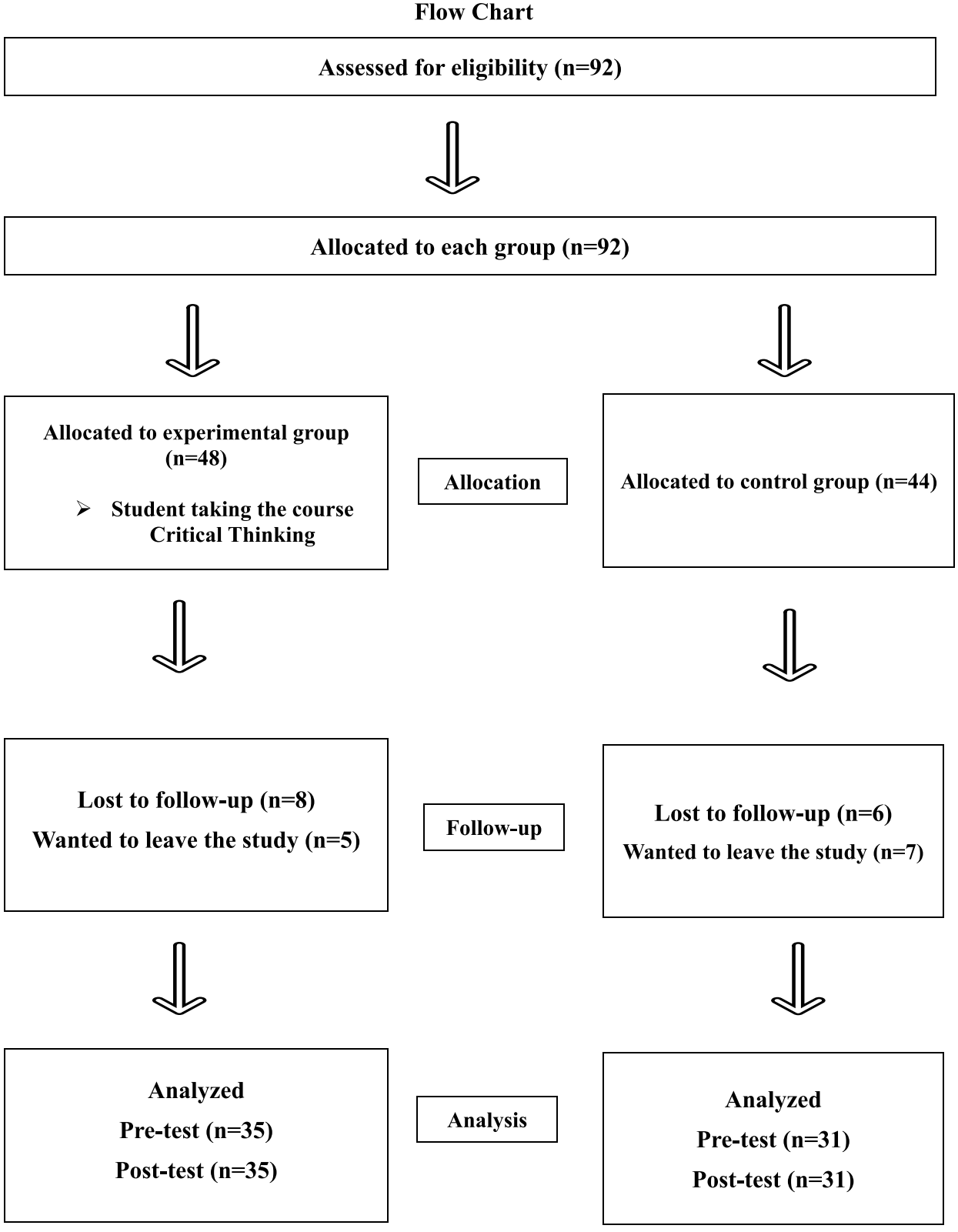


Fig. 1 Flow chart of the research

Table 1 Critical thinking course content list

Week	Topic titles
1	Basic Concepts Related to Critical Thinking
2	Definition, Importance, and Key Characteristics of Critical Thinking
3	Scope and Skills of Critical Thinking
4	Relationship Between Critical Thinking and Other Types of Thinking
5	Critical Thinking Skills, Strategies, and Prerequisite Skills
6	Standards of Critical Thinking
7	Fundamental Approaches to Acquiring Critical Thinking Skills
8	Evaluation of Critical Thinking
9	Importance of Critical Thinking in Nursing Practice
10	Relationship Between Critical Thinking and the Nursing Process
11	Critical Thinking Activities: Debate, Critical Article Reading
12	Critical Thinking Activities: Brainstorming, Problem Solving
13	Critical Thinking Activities: Concept Mapping
14	Critical Thinking Activities: Clinical Decision Making, Case Analysis

awareness and social skills [10, 38]. In the current sample, Cronbach's α = 0.67 for the Tromsø Social Intelligence Scale.

Nursing Education Stress Scale (NESS)

The Turkish validity and reliability of the scale developed by Rhead [29] was made by Karaca et al. [15]. The scale is a Likert-type scale with a score of 0–3 and consists of 32 items. The scale has 2 sub-dimensions: academic and application stress [15, 29]. In the current sample, Cronbach's α = 0.94 for the Nursing Education Stress Scale.

Analysis of data

The data collected were analyzed using the IBM SPSS 23.0 statistical program. The general characteristics of the participants were converted to mean, standard deviation, real numbers and percentages. In order to show whether the dependent variables were normally distributed, the Kolmogorov–Smirnov (KS) test and Tabachnick and Fidell [40] were evaluated according to the assumption that the distribution was normal when the skewness and kurtosis values were between ± 1.50. Since the skewness and kurtosis values of the CTDS, TSIS and NESS mean scores in the study were within this range, it can be said that the data distribution showed a normal distribution. Homogeneity tests regarding the general characteristics of the participants were performed using the chi-square test (χ2) and independent t-test. The comparison of the pre- and post-tests of the IG and CG was performed using the paired t-test. The pre-test and post-test mean score differences between the IG and CG were compared using independent t-tests. The Pearson correlation coefficient was calculated to examine the relationship between numerical variables.

Results

Participants' general characteristics and homogeneity

A total of 66 students participated in the study. The sample consisted of 48 females (72.7%) and 18 males (27.3%). The mean age of the participants was 18.67 ± 0.98 years. The demographic characteristics of nursing students are presented in Table 2. A chi-square test was performed to assess homogeneity between the groups based on demographic characteristics at the pretest stage, with results shown in Table 2 ($p > 0.05$). This confirmed that the groups were homogeneous (Table 2).

Differences between CTDS, TSIS and NESS mean scores between groups

Before the intervention differences between the IG and CG

Before the intervention, the mean CTDS Scale Score was 3.76 ± 0.33 in the IG and 3.75 ± 0.47 in the CG, with no statistically significant difference between the groups ($p = 0.870$). Similarly, no statistically significant differences in TSIS and NESS mean scores were found between groups before the intervention (see Table 3).

Post-intervention differences between IG and CG

After the intervention, the mean CTDS score was 4.05 ± 0.34 in the IG and 3.77 ± 0.42 in the CG. The difference between the two groups was statistically significant ($p = 0.004$). Significant differences were also observed between the IG and CG in the Metacognition (IG = 4.12 ± 0.34, CG = 3.85 ± 0.43, $p = 0.006$), Flexibility (IG = 4.09 ± 0.38, CG = 3.82 ± 0.43, $p = 0.009$), Systematicity (IG = 3.95 ± 0.39, CG = 3.67 ± 0.61, $p = 0.037$), and Perseverance and Patience (IG = 4.05 ± 0.43, CG = 3.76 ± 0.52, $p = 0.018$) subscales of the CTDS. However, the difference in the Open-mindedness subscale was not statistically significant (IG = 4.04 ± 0.58, CG = 3.82 ± 0.43, $p = 0.083$) (see Table 3).

After the intervention, the mean TSIS score was 3.22 ± 0.35 in the IG and 3.06 ± 0.40 in the CG. The difference in TSIS scores between the two groups was not statistically significant ($p = 0.088$). For the Social Information Processing subscale, the mean score was 3.75 ± 0.46 in the IG and 3.60 ± 0.62 in the CG, with no statistically significant difference ($p = 0.277$). The Social Skills subscale score was significantly higher in the IG (3.31 ± 0.48) compared to the CG (2.98 ± 0.47) ($p = 0.006$). However, there was no significant difference between the groups in the Social Awareness subscale (IG = 2.53 ± 0.73, CG = 2.51 ± 0.94, $p = 0.896$) (see Table 3).

Following the intervention, the mean NESS score was 1.99 ± 0.48 in the IG and 1.96 ± 0.43 in the CG, with no

Table 2 Homogeneity test of socio-demographic characteristics and dependent variables in pre-test ($n=66$)

Variables	*Characteristics (n = 66)*	*Exp. (n = 35)*	*Cont. (n = 31)*	χ^2 *or t*	*p*
Age	Overall Mean. = 18.67 ± .98	18.66 ± 1.02	18.68 ± .94	-.083	.934
Gender	Female (*n* = 48, %72.7)	27	21	1.106	.776
	Male (*n* = 18, %27.3)	8	10		
Graduated from high school	Science High School (*n* = 10, %15.2)	4	6	8.546	.480
	Anatolian High School (*n* = 55, %83.3)	31	24		
	Social sciences high school (*n* = 1, %1.5)	0	1		
	Vocational High School (*n* = 0)	0	0		
Birthplace region in Türkiye	South East Region (*n* = 19, %28.8)	9	10	11.134	.889
	Eastern Anatolia Region (*n* = 12, %18.0)	6	6		
	Black Sea region (*n* = 2, %3)	1	1		
	Central Anatolia Region (*n* = 11, %16.7)	7	4		
	Mediterranean region (*n* = 10, %15.2)	4	6		
	Aegean region (*n* = 7, %10.6)	5	2		
	Marmara region (*n* = 5, %7.6)	3	2		
Economic situation	Low (*n* = 8, %12.1)	4	4	2.956	.814
	Middle (*n* = 58, %87.9)	31	27		
	High (*n* = 0)	0	0		
Self-expression	I express it in every environment (*n* = 18, %27.3)	8	10	5.390	.495
	Sometimes good, sometimes bad (*n* = 47, %71.2)	27	20		
	I have difficulty expressing it. (*n* = 1, %1.5)	0	1		

M Mean, *SD* Standard Deviation, X^2 Chi square, *t* t independent sample test, $p<0.5$

statistically significant difference between the two groups ($p=0.798$), (see Table 3).

Within-group differences in pretest and posttest scores for CTDS, TSIS, and NESS

Within-group differences in pretest and posttest scores in the IG

The mean CTDS score in the IG was 3.76 ± 0.33 at pretest and 4.05 ± 0.34 at posttest, with the difference between the two scores being statistically significant ($p=0.011$). Significant improvements were also found in the Metacognition (pretest = 3.79 ± 0.33, posttest = 4.12 ± 0.34, $p=0.003$), Flexibility (pretest = 3.82 ± 0.37, posttest = 4.09 ± 0.38, $p=0.018$), and Systematicity (pretest = 3.63 ± 0.49, posttest = 3.95 ± 0.39, $p=0.025$) subscales of the CTDS. However, changes in the Perseverance and Patience (pretest = 3.90 ± 0.43, posttest = 4.05 ± 0.43, $p=0.235$) and Open-mindedness (pretest = 3.71 ± 0.61, posttest = 4.04 ± 0.58, $p=0.050$) subscales were not statistically significant (see Table 3).

The IG's mean TSIS score increased from 2.92 ± 0.32 at pretest to 3.22 ± 0.35 at posttest, with this increase being statistically significant ($p=0.001$). Significant improvements were also observed in the Social Information Processing subscale (pretest = 3.44 ± 0.65, posttest = 3.75 ± 0.46, $p=0.038$) and the Social Skills subscale (pretest = 2.31 ± 0.72, posttest = 3.31 ± 0.48, $p<0.001$). No significant change was found in the Social Awareness subscale (pretest = 2.31 ± 0.72, posttest = 2.53 ± 0.73, $p=0.213$), (see Table 3).

The mean NESS score in the IG was 1.89 ± 0.46 at pretest and 1.99 ± 0.48 at posttest, with no statistically significant difference observed ($p=0.451$). Similarly, no significant changes were found in the Practice Stress and Academic Stress subscales of the NESS between pretest and posttest (see Table 3).

within-group differences between pretest and posttest mean scores in the CG

The mean CTDS score in the CG was 3.75 ± 0.47 at pretest and 3.77 ± 0.42 at posttest, with no statistically significant difference between the two time points ($p=0.901$). The CG's mean TSIS score was 3.10 ± 0.46 at pretest and 3.06 ± 0.40 at posttest, showing no statistically significant difference ($p=0.755$). The mean NESS score in the CG was 1.90 ± 0.55 at pretest and 1.96 ± 0.43 at posttest, with no statistically significant difference detected ($p=0.707$), (see Table 3).

Post-intervention correlations between CTDS, TSIS, and NESS

There was a moderate positive correlation between the CTDS mean scores and the Systematicity, Open-mindedness, Well-being and Metacognition subscale of TSIS

Table 3 Comparison of differences in mean scores of intervention and control groups in terms of critical thinking disposition, social intelligence level and nursing education stress

Variables	Intra-Group Pre-Test/Post-Test Mean Scores						Post-Test Mean Scores Between Groups		
	Intervention Group			Control Group			IG	CG	
	Pretest *M* ± *SD*	Posttest *M* ± *SD*	p^a	Pretest *M* ± *SD*	Posttest *M* ± *SD*	p^a	*Posttest M* ± *SD*	*Posttest M* ± *SD*	p^b
Critical Thinking Disposition	**3.76 ± .33**	**4.05 ± .34**	**.011**	3.75 ± .47	3.77 ± .42	.901	**4.05 ± .34**	**3.77 ± .42**	**.004**
Metacognition	**3.79 ± .33**	**4.12 ± .34**	**.003**	3.73 ± .59	3.85 ± .43	.411	**4.12 ± .34**	**3.85 ± .43**	**.006**
Flexibility	**3.82 ± .37**	**4.09 ± .38**	**.018**	3.81 ± .49	3.82 ± .43	.984	**4.09 ± .38**	**3.82 ± .43**	**.009**
Systematicity	**3.63 ± .49**	**3.95 ± .39**	**.025**	3.71 ± .57	3.67 ± .61	.860	**3.95 ± .39**	**3.67 ± .61**	**.037**
Perseverance and Patience	3.90 ± .43	4.05 ± .43	.235	3.78 ± .68	3.76 ± .52	.914	**4.05 ± .43**	**3.76 ± .52**	**.018**
Open-Mindedness	3.71 ± .61	4.04 ± .58	.050	3.67 ± .88	3.82 ± .43	.463	4.04 ± .58	3.82 ± .43	.083
Social Intelligence	**2.92 ± .32**	**3.22 ± .35**	**.001**	3.10 ± .46	3.06 ± .40	.755	3.22 ± .35	3.06 ± .40	.088
Social knowledge process	**3.44 ± .65**	**3.75 ± .46**	**.038**	3.81 ± .57	3.60 ± .62	.214	3.75 ± .46	3.60 ± .62	.277
Social Skills	**2.31 ± .72**	**3.31 ± .48**	**.000**	3.09 ± .49	2.98 ± .47	.340	**3.31 ± .48**	**2.98 ± .47**	**.006**
Social awareness	2.31 ± .72	2.53 ± .73	**.**213	2.29 ± .83	2.51 ± .94	.360	2.53 ± .73	2.51 ± .94	.896
Nursing Education Stress	1.89 ± .46	1.99 ± .48	.451	1.90 ± .55	1.96 ± .43	.707	1.99 ± .48	1.96 ± .43	.798
Internship stress	1.90 ± .52	2.01 ± .50	.427	1.89 ± .61	2.00 ± .50	.520	2.01 ± .50	2.00 ± .50	.936
Academic stress	1.87 ± .45	1.96 ± .50	.508	1.91 ± .52	1.91 ± .41	.977	1.96 ± .50	1.91 ± .41	.674

M Mean, *SD* Standard Deviation

[a]t paired sample test

[b]t independent sample test, $p < 0.05$

(respectively, $r = 0.571$, $p < 0.001$; $r = 0.510$, $p = 0.002$; $r = 0.450$, $p = 0.007$; $r = 0.542$, $p = 0.001$; $r = 0.565$, $p < 0.001$). A weak but statistically significant negative correlation was found between the Systematicity subscale of CTDS and the academic and practical subscales of NESS (respectively, $r = -0.385$, $p = 0.022$; $r = -0.356$, $p = 0.036$; $r = -0.383$, $p = 0.023$), (see Table 4).

Discussion

The purpose of this study was to examine the effects of the Structured Critical Thinking (CT) course provided to first-year undergraduate nursing students on their CT disposition, social intelligence levels, and nursing education-related stress. The findings of the study are discussed below.

Participation in the CT course was associated with a statistically significant increase in the students' mean CTDS scores. Similarly, the subscales of CTDS; Metacognition, Well-being, Systematicity, Perseverance & Patience showed significant increases in mean scores after the intervention. Although the mean score for the Open-mindedness subscale increased post-intervention, this change was not statistically significant. This may be attributed to the fact that the nursing students were in their first year and still in the process of adapting to university life. Kanbay and Okanlı [14] conducted a study with 93 nursing students who received 12 weeks of CT training and similarly found an increase in CT levels after the education, consistent with our findings. In our literature review, studies conducted on nursing students showed that various educational techniques used to develop CT increased CT skills in students [4, 5, 19, 22]. In some studies in the literature, it has been determined that nursing students have low CT levels [3, 17, 24, 26, 32]. However, we should note that comparing CT scores across studies may not yield accurate results, given the different instruments with different scales and scoring systems used in these studies [11]. A review of the literature reveals mixed findings regarding nursing students' CT skills; some studies report insufficient levels, while others indicate improvement through education. These inconsistencies may stem from factors such as the broad scope of CT, large student cohorts, limited weekly course hours, and the lack of reinforcement of early-year instruction.

Social intelligence

Community-based education, emphasizing active learning in real-life contexts, is increasingly recommended in nursing education to enhance students' social-emotional awareness of poverty and illness [30]. Within the scope of our study, the mean scores of the TSIS for first-year undergraduate nursing students in the IG increased significantly after the intervention. Similarly, the mean scores of the social information processing and social skills sub-dimensions of the TSIS also showed a statistically significant increase in post-intervention. It can be concluded that the CT course enhanced students' social intelligence levels. However, when interpreting this result, it is helpful to consider that the Cronbach's alpha value of the scale in our study was 0.67. Previous research has reported that some community-based educational

Table 4 Posttest correlations between CTDS and TSIS and NESS and all subscales for the intervention group (IG, $n=35$)

Total CTDS and its sub-dimensions		Social Intelligence	Social Intelligence (social knowledge)	Social Intelligence (social skill)	Social Intelligence (social awareness)	Nursing Education Stress	Nursing Education Stress (academic)	Nursing Education Stress (internship)
CTDS Systematicity	Pearson r	.159	**.510****	-.113	-.077	**-.385***	**-.356***	**-.383***
	p	.362	**.002**	.519	.662	**.022**	**.036**	**.023**
	n	35	35	35	35	35	35	35
CTDS Perseverance and Patience	Pearson r	.108	.328	-.060	-.048	-.073	-.053	-.087
	p	.538	.054	.731	.783	.676	.761	.617
	n	35	35	35	35	35	35	35
CTDS Open-Mindedness	Pearson r	.114	**.450****	.032	-.179	-.203	-.233	-.157
	p	.514	**.007**	.857	.304	.241	.178	.368
	n	35	35	35	35	35	35	35
CTDS Flexibility	Pearson r	-.004	**.542****	-.057	-.305	-.151	-.184	-.105
	p	.981	**.001**	.744	.227	.387	.289	.549
	n	35	35	35	35	35	35	35
CTDS Metacognition	Pearson r	.203	**.565****	.041	-.139	-.161	-.170	-.138
	p	.242	**.000**	.817	.426	.356	.328	.430
	n	35	35	35	35	35	35	35
Overall CTDS	Pearson r	.144	**.571****	-.044	-.181	-.242	-.243	-.221
	p	.409	**.000**	.802	.299	.162	.160	.202
	n	35	35	35	35	35	35	35

*Correlation is significant at the 0.05 level (2-tailed) *r* Pearson correlation

**Correlation is significant at the 0.01 level (2-tailed)

programs enhance nursing students' emotional intelligence levels and caregiving behaviors [13]. A systematic review found that a positive relationship exists between high emotional intelligence levels and improved academic performance and clinical competence [39]. In light of this evidence, our findings are consistent with the literature. Nursing educators should design curricula aimed at developing all sub-dimensions of social intelligence.

Nursing education stress

Nursing students may experience stress due to complex hospital environments, lack of motivation, insufficient theoretical education, lack of clinical skills, increased responsibility toward patients, and time pressure [1, 6]. Previous studies have demonstrated that nursing education can be an extremely stressful experience [21, 35, 41]. Within the scope of our study, the post-intervention mean NESS scores of both the IG and CG increased, but the difference was not statistically significant. This increase in students' stress levels may be related to their awareness following the 14-week structured training period, which may have led to a heightened perception of potential concerns.

Similar to the findings of our study, research conducted in Türkiye on the stress experienced by nursing students has reported that students perceive their stress levels as mild to moderate [1, 28, 35]. In the United States, Wolf et al. [44] found that accelerated and undergraduate nursing students experienced moderate levels of perceived stress. In a study conducted by Labrague et al. [21] with nursing students from the Philippines, Greece, and Nigeria, the students were found to experience high levels of stress. Onieva-Zafra et al. [25] reported that approximately half of the students experienced moderate levels of perceived stress. The variation in findings across the literature may be attributed to differences in nursing curricula between countries, cultural perceptions of stress, or variations in the assessment tools used.

Correlations

In our study, a moderately positive and statistically significant correlation was found between the overall CTDS of first-year undergraduate nursing students and the total score of the social information processing subscale of the TSIS. Specifically, the subdimensions of Systematicity, Open-mindedness, Well-being, and Metacognition were found to be associated with the social information subscale. Accordingly, it can be stated that an increase in students' CTD may lead to an increase in their social information processing abilities. These results emphasize the importance of CT education in predicting students' social information skills.

The systematicity subdimension of CTDS was found to have a statistically significant negative correlation, though below a moderate level, with students' educational stress. Similarly, the systematicity subdimension was negatively and significantly correlated with both academic stress and clinical practice stress subdimensions of educational

stress, also at a level below moderate. These findings suggest that the systematicity component of CT may influence students' experience of educational stress. In line with our findings, Köksal [20] also reported a negative relationship between the systematicity subdimension of CT and perceived stress levels among students. Likewise, another study conducted with university students found a negative association between CT and perceived stress, supporting the results of our study [2].

Conclusion

To effectively develop and strengthen CT skills, it is important to implement targeted training programs, workshops, and seminars appropriate to each academic level. Evaluating the effectiveness of these interventions on nursing students' CT development is also necessary. Replicating such studies in diverse educational settings and with larger sample sizes would enhance generalizability. Nurse educators play a vital role in cultivating CT by employing dynamic strategies, including reflective learning, simulation, supportive supervision, mentoring, role modeling, and video-assisted feedback.

Limitations

There were some limitations in our study. A limitation should be considered as to whether other uncontrollable factors experienced by students in or outside of nursing school affected the scores during the research period. The study design was quasi-experimental, and the sample size was small. Given that the study included a limited sample, the participants may not be representative of the entire population of nursing students. Therefore, the findings cannot be generalized. Further studies using randomized controlled experimental designs with more detailed methodologies are needed.

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Authors' contributions

Selçuk GÖRÜCÜ: Conceptualization, Methodology, Software. Selçuk GÖRÜCÜ-Aysun ÜNAL: Data curation, Writing- Original draft preparation. Selçuk GÖRÜCÜ—Aysun ÜNAL: Visualization, Investigation. Selçuk GÖRÜCÜ-Emine ARIKAN: Supervision.: Selçuk GÖRÜCÜ: Software, Validation.: Selçuk GÖRÜCÜ: Writing- Reviewing and Editing.

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Data availability

Not applicable.

Declarations

Ethics approval and consent to participate

For the implementation of the study, ethical approval was obtained from the Akdeniz University Faculty of Medicine Clinical Research Ethics Committee (Approval No: KAEK-762, Date: 27.09.2023), and institutional permission was granted by the Dean's Office of Akdeniz University Kumluca Faculty of Health Sciences (Official Letter No: 68295535–100-791505, Date: 29.11.2023). The students of Kumluca Faculty of Health Sciences were informed that their data would remain confidential, their participation was voluntary, and they could withdraw from the study at any time without consequence. Written informed consent was obtained from all participating students. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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