

The effect of the clinical oriented reasoning examination on anxiety and perceived stress levels in nursing students: A quasi-experimental study

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Abstract

Background

The clinical oriented reasoning examination is a structured assessment developed to evaluate students' clinical decision-making rather than their recall of factual knowledge. Because such examinations require students to reason under time pressure and to justify their decisions, they may be experienced as more demanding than conventional written assessment, and their affective consequences for students are not well understood. Anxiety and stress can influence both examination performance and student wellbeing, yet the relationship between this form of assessment and students' anxiety and stress has not previously been examined. This study aimed to examine the effect of the clinical oriented reasoning examination on state anxiety, trait anxiety and perceived stress in nursing students.

Methods

A quasi-experimental, single-group pretest–posttest study was conducted in a nursing faculty in the Mediterranean region of Türkiye. A total of 131 first-year nursing students who sat the clinical oriented reasoning examination and met the inclusion criteria participated. Data were collected using a student information form, the State–Trait Anxiety Inventory and the Perceived Stress Scale, administered immediately before and after the examination. Differences between measurements were analysed using paired comparisons, and the relationship between examination performance and the psychological measures was examined using correlation analysis.

Results

State anxiety decreased significantly after the examination, whereas trait anxiety and perceived stress did not change. Examination score was weakly and negatively correlated with post-examination state anxiety and with perceived stress.

Conclusions

State anxiety declined following the clinical oriented reasoning examination, while trait anxiety and perceived stress remained unchanged, consistent with the distinction between transient and dispositional components of anxiety. Examination performance was largely independent of anxiety and stress, suggesting that this form of assessment does not disadvantage students with higher baseline anxiety. As the study used a single-group design without a comparison examination, the decline in state anxiety cannot be attributed to the examination format itself and may reflect the natural resolution of anticipatory anxiety once an examination has ended. Controlled designs comparing assessment formats are needed.

1. Introduction

A central focus of nursing education is to ensure that students acquire the ability to transfer theoretical knowledge into clinical practice in a safe, effective and patient-specific manner. In this process, clinical reasoning and clinical judgment skills are of central importance for enabling nursing students to assess complex patient situations, determine priorities and make evidence-based decisions [1]. Indeed, the literature emphasises that clinical reasoning competence is one of the strongest determinants of nursing students' post-graduation clinical performance and that this skill should be systematically developed and evaluated within educational programmes [2].

Various measurement and evaluation methods have been developed to assess clinical competence in nursing education. These include written examinations, case-based assessments, simulation-based applications, computer-assisted tests and the Objective Structured Clinical Examination (OSCE). Simulation-based assessment approaches have been reported to be effective in developing students' clinical decision-making and social problem-solving skills [3]. Similarly, educational interventions have been shown to contribute positively to clinical reasoning skills [4]. In recent years, the effects of artificial intelligence–assisted, simulation-based preparation programmes on OSCE performance, anxiety and reflective thinking have also begun to be investigated [5]. Among these methods, the Clinical Oriented Reasoning Examination (CORE), which aims to directly measure clinical reasoning skill, is a relatively new and structured examination model that evaluates students' decision-making processes at case stations resembling real clinical scenarios.

Measurement and evaluation processes reflect academic achievement for nursing students but may also create a significant psychological burden. Many studies have reported that test anxiety is a common problem among nursing students and that this anxiety may adversely affect cognitive performance [6, 7]. In particular, performance-based, time-limited and observable examination formats such as the OSCE have been shown to create marked anxiety and stress in students [8, 9]. Although anxiety may adversely affect examination performance, some studies have found no significant relationship between anxiety and examination outcome [10]. This suggests that the anxiety–performance relationship is complex and multidimensional and may yield different results across different examination formats.

The concept of anxiety is addressed in two dimensions: state anxiety and trait anxiety. State anxiety refers to a temporary, situation-specific state of tension and worry experienced at a particular moment in response to a specific stimulus (e.g. an examination), whereas trait anxiety reflects an individual's general, relatively stable predisposition to anxiety. Perceived stress, in turn, is a subjective concept concerning the extent to which an individual appraises situations in their life as stressful, uncontrollable or unpredictable. Although state anxiety may fluctuate before and after an examination, trait anxiety and perceived stress may follow a more stable course; this differentiation necessitates examining separately which dimension of anxiety is affected, and to what extent, by examination-based interventions.

A review of the literature shows that examination-related anxiety and stress in nursing students have largely been investigated in the context of the OSCE, computer-assisted tests or traditional written examination formats, whereas few studies have examined the effect of relatively new, clinical scenario-based assessment methods such as the CORE on nursing students' state anxiety, trait anxiety and perceived stress. Yet understanding the effect that such examinations exert on students at both the cognitive and emotional levels is of great importance for designing the examination process in a way that safeguards student wellbeing, for developing pre-examination preparation and support strategies, and for structuring nursing curricula so that they protect student mental health while measuring clinical reasoning skill. Moreover, given that anxiety and stress may adversely affect clinical reasoning performance, elucidating the psychological effects of high-stakes assessment tools such as the CORE will provide guidance for both the validity of the measurement tool and the planning of student support systems.

In this context, the present study was planned in a quasi-experimental design to examine the effect of the CORE on state anxiety, trait anxiety and perceived stress levels in nursing students. The study is expected to contribute to the literature on the effects of new-generation clinical reasoning-based examination models used in nursing education on student psychology, and to offer educators an evidence-based perspective on the design of examination processes.

Hypotheses:

H0: The CORE administered to nursing students has no effect on students' anxiety and perceived stress levels.

H1: The CORE administered to nursing students has an effect on students' anxiety and perceived stress levels.

2. Methods

2.1. Study type and aim

This quasi-experimental study was conducted to determine the effect of the CORE on anxiety and perceived stress levels in nursing students.

2.2. Study setting

The study was conducted at a nursing faculty located in the Mediterranean Region of Türkiye.

2.3. Population and sample

First-year students at Akdeniz University Faculty of Nursing (N = 264) constituted the study population. The G*Power program was used to calculate the sample size for this quasi-experimental study. For the effect size, the effectiveness of the intervention for anxiety in the study by Yusefzadeh et al. [11] was calculated, and a large effect size was found ($d = 1.38$). According to Cohen [12], an effect size of ≥ 0.2

indicates a small effect, ≥ 0.5 a medium effect and ≥ 0.8 a large effect. In the G*Power program, using a paired-samples t-test, 90% power, a 95% confidence interval and a large effect size ($d = 0.80$), the sample size was calculated as 19 participants. Allowing for a 20% attrition rate, the aim was to reach at least 23 participants, and the study was completed with data from 131 nursing students. Inclusion criteria were: being a first-year nursing student; having no prior CORE experience; and being enrolled in the Fundamentals of Nursing course. Exclusion criteria were: repeating the Fundamentals of Nursing course; and not attending the CORE.

2.4. Data collection tools

The study data were collected using a Student Information Form, the State–Trait Anxiety Inventory (STAI) and the Perceived Stress Scale.

Student Information Form. This form consists of a total of 10 questions that ask about students' sociodemographic characteristics, such as age and sex, as well as their thoughts about the CORE.

State–Trait Anxiety Inventory (STAI). The inventory was developed by Spielberger et al. in 1970, and its validity and reliability in Türkiye were established by Öner in 1977. The scale consists of state anxiety and trait anxiety subscales of 20 items each. The total score obtained from each subscale ranges from 20 to 80, with higher scores indicating a higher level of anxiety and lower scores a lower level. It is a four-point Likert-type scale ranging from “not at all” to “completely.” Direct items express negative emotions, whereas reversed items express positive emotions. In the State Anxiety Inventory, the reversed items are items 1, 2, 5, 8, 10, 11, 15, 16, 19 and 20; in the Trait Anxiety Inventory, the reversed items are items 21, 26, 27, 30, 33, 36 and 39. After the total weights of the direct and reversed items are calculated separately, the total weight of the reversed items is subtracted from the total weight of the direct items, and a predetermined, fixed value is added to this figure (50 for the State Anxiety Inventory and 35 for the Trait Anxiety Inventory). The final value is the individual's anxiety score. The State Anxiety Inventory is a highly sensitive tool for assessing rapidly changing emotional reactions, whereas the Trait Anxiety Inventory aims to measure the continuity of the anxiety that a person generally tends to experience; scores range from 20 (low anxiety) to 80 (high anxiety) [13, 14]. In this study, the Cronbach's alpha value was 0.390 for the State Anxiety Inventory, 0.575 for the Trait Anxiety Inventory and 0.564 for the State–Trait Anxiety Inventory total.

Perceived Stress Scale (PSS). The scale was developed by Cohen et al. [15], and its Turkish validity and reliability were established by Eskin et al. [16]. Comprising a total of 14 items, the PSS was designed to measure the extent to which certain situations in a person's life are perceived as stressful. Participants rate each item on a five-point Likert-type scale ranging from “never (0)” to “very often (4).” Seven items containing positive statements are reverse-scored. In addition to the 14-item long form, the PSS has 10-item and 4-item forms; the 14-item long form was used in this study. Scores on the PSS-14 range from 0 to 56, with higher scores indicating a higher perception of stress. In this study, the Cronbach's alpha value of the scale was 0.853.

2.5. Procedure

The study was carried out in two stages.

Stage 1. One day before the CORE, the Student Information Form, the STAI and the Perceived Stress Scale were converted into an online Google Forms survey, and the link was shared with students via the Microsoft Teams platform. In addition, to enable all students to access the link and answer the questions, reminder messages were sent through the first-year WhatsApp group in cooperation with the student representative.

Stage 2. On the date specified in the table of specifications and course curriculum of the Fundamentals of Nursing course, the CORE was conducted via Microsoft Forms on the Microsoft Teams platform. The total response time for the CORE was 40 minutes, and it comprised six different stations covering the main topics of the Fundamentals of Nursing course (vital signs, hot–cold applications, intramuscular injection, respiration, nutrition and physical examination). Within one day at the latest after the CORE, students completed the STAI and the Perceived Stress Scale via an online Google Forms survey. Each student's CORE score was then calculated on a 100-point scale, and students who scored at least 60 were considered successful.

2.6. Data analysis

The licensed IBM SPSS 23.0 program was used in the data analysis. Descriptive data were presented as frequency, percentage, mean and standard deviation. The normal distribution of continuous variables was assessed using the Kolmogorov–Smirnov test, and the homogeneity of variance using the Levene test. As the continuous variables were normally distributed, the independent-samples t-test was used for comparisons of two groups and analysis of variance for comparisons of more than two groups; where a difference was found among the means of more than two groups, the Bonferroni post hoc test was used to determine the source of the significance. The paired-samples t-test was used to examine the change in state anxiety, trait anxiety and perceived stress levels before and after the CORE. Pearson correlation analysis was used to examine relationships between continuous variables. Pearson correlation coefficients were interpreted as weak ($r = 0.10–0.39$), moderate ($r = 0.40–0.69$), strong ($r = 0.70–0.89$) and very strong ($r = 0.90–1.00$) [17, 18]. The level of significance for the tests was accepted as $p < 0.05$.

2.7. Ethical considerations

This study was performed in accordance with the Declaration of Helsinki. Approval was granted before starting the research by the local ethics board of the university (date: 15.09.2021; number: KAEK-675). Students included in the study were informed about the research, and their written informed consent was obtained.

3. Results

The mean age of the nursing students who participated in the study was 19.65 ± 1.11 years, and 70.6% of the participants were female. The students' mean grade point average (GPA) and mean CORE score were 2.88 ± 0.52 and 19.50 ± 6.79 , respectively.

Regarding the CORE, 41.5% of the students had received information from students in higher years. The information they received from these students was as follows: not having the opportunity to go back and correct incorrectly answered questions (76.9%), the questions being very difficult (41.0%), insufficient time to answer the questions (29.5%), not understanding the logic of the questions (19.2%), the possibility of seeing the answers to the questions (15.4%), learning topics not understood during the examination (12.8%), the examination content and procedure (6.4%) and the questions being very easy (2.6%). Before the CORE, 62.8% of the students agreed or strongly agreed that the questions would be very difficult, 13.8% agreed or strongly agreed that they would be very successful in the examination, 67.0% agreed or strongly agreed that they were very afraid of the CORE, and 76.1% agreed or strongly agreed that the experience gained in the CORE would contribute to their education and training process. In addition, 23.4% of the nursing students had previously experienced a mood disorder (Table 1).

Table 1
Students' pre-CORE thoughts about the examination

Before the CORE examination	Category	n	%
Received information about the CORE from higher years (n = 188)	Yes	78	41.5
	No	110	58.5
Information received from higher years (n = 78)*	Questions being very difficult	32	41.0
	Questions being very easy	2	2.6
	Not understanding the logic of the questions	15	19.2
	Insufficient time to answer the questions	23	29.5
	Learning topics not understood during the examination	10	12.8
	No opportunity to go back and correct wrong answers	60	76.9
	Possibility of seeing the answers to the questions	12	15.4
	Examination content and procedure	5	6.4
Thought that the questions would be very difficult (n = 188)	Disagree	10	5.3
	Undecided	60	31.9
	Agree	75	39.9
	Strongly agree	43	22.9
Believed they would be very successful (n = 188)	Strongly disagree	16	8.5
	Disagree	35	18.6
	Undecided	111	59.0
	Agree	23	12.2
	Strongly agree	3	1.6
Very afraid of the CORE (n = 188)	Strongly disagree	4	2.1
	Disagree	22	11.7
<i>*More than one option could be selected.</i>			

Before the CORE examination	Category	n	%
	Undecided	36	19.1
	Agree	73	38.8
	Strongly agree	53	28.2
Believed the experience would contribute to education (n = 188)	Strongly disagree	3	1.6
	Disagree	7	3.7
	Undecided	35	18.6
	Agree	106	56.4
	Strongly agree	37	19.7
Previous mood disorder (panic attack, anxiety disorder, test anxiety, etc.) (n = 188)	Yes	44	23.4
	No	144	76.6
<i>*More than one option could be selected.</i>			

During the CORE, 84.7% of the students experienced a problem. The most frequent problems the students experienced were, respectively, time (62.2%), platform problems (51.4%), anxiety and stress during the examination (13.5%), not fully understanding the cases (12.6%), internet connection (8.1%) and taking the examination on a mobile phone (4.5%) (Table 2). After the CORE, 72.5% of the nursing students stated that the cases at each station were understandable, 65.7% that each of the questions was understandable, and 17.6% that the time allotted for the examination was sufficient. In addition, 68.7% of the students stated that they were able to grasp the logic of this examination, 9.9% that the CORE went very well, 39.7% that the examination platform used was adequate, and 68.0% that this examination was instructive for them (Table 2).

Table 2
Students' post-CORE thoughts about the examination

After the CORE examination	Category	n	%
Experienced a problem during the CORE (n = 131)	Yes	111	84.7
	No	20	15.3
Problems experienced during the CORE (n = 111)*	Time problem	69	62.2
	Platform problem	57	51.4
	Anxiety and stress during the examination	15	13.5
	Cases not fully understood	14	12.6
	Internet connection problem	9	8.1
	Taking the examination on a mobile phone	5	4.5
Cases at each station were understandable (n = 131)	Strongly disagree	6	4.6
	Disagree	4	3.1
	Undecided	26	19.8
	Agree	79	60.3
	Strongly agree	16	12.2
Each of the questions was understandable (n = 131)	Strongly disagree	6	4.6
	Disagree	6	4.6
	Undecided	33	25.2
	Agree	72	55.0
	Strongly agree	14	10.7
The allotted time was sufficient (n = 131)	Strongly disagree	32	24.4
	Disagree	45	34.4
	Undecided	31	23.7
	Agree	19	14.5
	Strongly agree	4	3.1
<i>*More than one option could be selected.</i>			

After the CORE examination	Category	n	%
I was able to grasp the logic of the examination (n = 131)	Strongly disagree	7	5.3
	Disagree	7	5.3
	Undecided	27	20.6
	Agree	72	55.0
	Strongly agree	18	13.7
The examination went very well (n = 131)	Strongly disagree	29	22.1
	Disagree	38	29.0
	Undecided	51	38.9
	Agree	13	9.9
The examination platform was adequate (n = 131)	Strongly disagree	18	13.7
	Disagree	22	16.8
	Undecided	39	29.8
	Agree	49	37.4
	Strongly agree	3	2.3
I did not experience a problem during the examination (n = 131)	Strongly disagree	29	22.1
	Disagree	23	17.6
	Undecided	18	13.7
	Agree	44	33.6
	Strongly agree	17	13.0
The examination was instructive for me (n = 131)	Strongly disagree	7	5.3
	Disagree	10	7.6
	Undecided	25	19.1
	Agree	74	56.5
	Strongly agree	15	11.5
<i>*More than one option could be selected.</i>			

The effect of students' pre-examination thoughts about the CORE on the CORE result, pre-examination state and trait anxiety and perceived stress levels was analysed. Students' receipt of information about the CORE from higher years did not affect the CORE result, state or trait anxiety, or perceived stress ($p > 0.05$, Table 3).

Table 3

Effect of students' pre-CORE thoughts on the CORE result and pre-examination state anxiety, trait anxiety and perceived stress levels (n = 131)

Variable / Group	CORE result Mean (SD)	Pre-exam state anxiety Mean (SD)	Pre-exam trait anxiety Mean (SD)	Pre-exam perceived stress Mean (SD)
Information from higher years**				
Yes	19.70 (6.76)	50.19 (10.84)	45.80 (8.50)	27.66 (6.22)
No	19.70 (6.64)	50.75 (11.10)	46.38 (8.13)	28.20 (7.68)
p	0.996	0.730	0.640	0.613
Thought questions would be very difficult***				
Disagree	18.50 (7.45)	38.00 (10.04)	39.50 (5.06)	23.90 (4.99)
Undecided	20.83 (6.11)	46.70 (9.45)	44.53 (8.34)	26.00 (6.18)
Agree	19.22 (6.86)	53.52 (10.46)	47.52 (8.07)	29.33 (7.36)
p	0.269	< 0.01	0.002	0.002
Believed they would be very successful***				
Disagree	20.33 (6.16)	56.92 (9.56)	48.58 (8.58)	30.80 (8.63)
Undecided	19.73 (6.91)	49.15 (10.04)	46.05 (7.58)	27.16 (5.69)
Agree	18.30 (6.64)	43.80 (11.59)	41.73 (8.84)	25.92 (7.90)
p	0.453	< 0.01	0.002	0.003
Very afraid of the CORE***				
<i>Disagree = "disagree" and "strongly disagree" combined; Agree = "agree" and "strongly agree" combined.</i>				
<i>**Independent-samples t-test; ***one-way analysis of variance.</i>				
<i>Significant p values ($p < 0.05$) indicate that state anxiety, trait anxiety and perceived stress differed by group,</i>				
<i>whereas the CORE result did not.</i>				

Variable / Group	CORE result Mean (SD)	Pre-exam state anxiety Mean (SD)	Pre-exam trait anxiety Mean (SD)	Pre-exam perceived stress Mean (SD)
Information from higher years**				
Disagree	18.73 (6.62)	39.38 (10.15)	40.11 (8.83)	22.57 (7.43)
Undecided	19.52 (7.63)	44.27 (7.17)	43.69 (7.81)	26.36 (6.17)
Agree	19.95 (6.42)	54.60 (9.54)	48.08 (7.51)	29.55 (6.66)
p	0.689	< 0.01	< 0.01	< 0.01
Believed experience would contribute to education***				
Disagree	17.80 (9.12)	47.90 (15.31)	43.60 (12.47)	23.30 (9.47)
Undecided	19.60 (6.23)	57.45 (9.10)	49.17 (7.46)	31.40 (7.26)
Agree	19.86 (6.62)	49.00 (10.44)	45.58 (7.99)	27.46 (6.59)
p	0.640	< 0.01	0.042	0.001
Previous mood disorder**				
Yes	20.54 (6.63)	55.40 (8.70)	51.59 (7.64)	30.25 (5.61)
No	19.44 (6.69)	49.02 (11.17)	44.47 (7.74)	27.28 (7.38)
p	0.340	0.001	< 0.01	0.015
<i>Disagree = "disagree" and "strongly disagree" combined; Agree = "agree" and "strongly agree" combined.</i>				
<i>**Independent-samples t-test; ***one-way analysis of variance.</i>				
<i>Significant p values ($p < 0.05$) indicate that state anxiety, trait anxiety and perceived stress differed by group,</i>				
<i>whereas the CORE result did not.</i>				

State anxiety, trait anxiety and perceived stress levels were significantly higher in students who agreed with the thought that the questions in the CORE would be very difficult ($p < 0.05$). However, the thought that the questions in the CORE would be very difficult did not affect the CORE result ($p > 0.05$, Table 3).

State and trait anxiety levels were statistically significantly lower in students who believed they would be very successful in the CORE ($p < 0.05$), whereas perceived stress levels were statistically significantly higher in students who did not believe they would be very successful ($p < 0.05$). However, believing that one would be very successful in the CORE did not affect the CORE result ($p > 0.05$, Table 3).

State anxiety, trait anxiety and perceived stress scores were statistically significantly higher in students who were very afraid of the CORE ($p < 0.05$, Table 3). Being afraid of the CORE had no effect on the examination result ($p > 0.05$, Table 3).

State anxiety, trait anxiety and perceived stress scores were statistically significantly higher in students who were undecided about whether the experience gained in the CORE would contribute to their education and training process ($p < 0.05$, Table 3). However, believing that the experience gained in the CORE would contribute to the education and training process did not affect the result of this examination ($p > 0.05$).

State anxiety, trait anxiety and perceived stress scores were statistically higher in students who had previously experienced a mood disorder ($p < 0.05$). However, there was no statistically significant difference in the CORE scores of students with this problem ($p > 0.05$, Table 3).

The change in nursing students' state and trait anxiety levels and perceived stress before and after the CORE was examined. A statistically significant decrease was found in students' state anxiety level after the CORE, from 51.67 ± 10.29 to 47.47 ± 12.77 ($t = 3.84$, $p < 0.01$). However, there was no significant change in students' trait anxiety (46.48 ± 7.84 to 45.87 ± 7.97 ; $t = 1.87$, $p = 0.063$) or perceived stress (27.87 ± 6.31 to 27.52 ± 6.74 ; $t = 0.82$, $p = 0.410$) levels before and after the CORE ($p > 0.05$) (Table 4).

Table 4

Change in nursing students' state anxiety, trait anxiety and perceived stress before and after the CORE

Variable	Before the CORE Mean (SD)	After the CORE Mean (SD)	t	p*
State anxiety (20–80)	51.67 (10.29)	47.47 (12.77)	3.84	< 0.01
Trait anxiety (20–80)	46.48 (7.84)	45.87 (7.97)	1.87	0.063
Perceived stress (0–56)	27.87 (6.31)	27.52 (6.74)	0.82	0.410
<i>*Paired-samples t-test.</i>				

There was a weak negative relationship between the CORE score and post-examination state anxiety level ($r = -0.386$, $p < 0.01$), whereas there was no relationship with trait anxiety level ($p > 0.05$). A weak negative relationship was also found between the post-examination perceived stress level and the CORE score ($p < 0.05$). No statistically significant relationship was found between the CORE score and pre-examination state anxiety, trait anxiety or perceived stress levels ($p > 0.05$).

4. Discussion

In our study, the nursing students' mean GPA was 2.88 ± 0.52 and their mean CORE score was 19.50 ± 6.79 . Vasli et al. [19], in a study conducted with nursing students, reported that academic achievement (GPA) was a significant predictor of OSCE-type clinical competence examinations, whereas examination anxiety did not affect the examination outcome. This finding is consistent with our observation that GPA may be related to CORE performance but that anxiety-based variables do not directly determine the examination outcome. That academic achievement is a strong determinant of performance in clinical reasoning examinations suggests that such examinations largely reflect theoretical knowledge and that academically strong students therefore tend to succeed in clinical scenario-based examinations as well.

The fact that 41.5% of students received information about the CORE from higher years, and that this information mostly conveyed negative content about the difficulty of the examination and the irreversibility of errors, is consistent with qualitative findings in the literature. Hosseini et al. [20], in a qualitative study on the OSCE, reported that students often received stressful and sometimes inaccurate information from peers who had previously taken the examination, which led them to develop a negative attitude towards it and increased their anxiety levels. These findings show that information conveyed by senior students is usually experience-based but unstructured and anxiety-provoking, and that institutions should therefore strengthen formal and transparent pre-examination information processes.

That the majority of students thought the questions would be difficult before the CORE, feared the examination intensely, yet believed the experience would contribute to their education reflects the multidimensional nature of examination anxiety. In a recent study entitled "The Storm Within," first-year nursing students described the OSCE as both an empowering and a stressful experience, reporting that it increased students' self-confidence while also creating anxiety and concerns about fairness [21]. Consistent with our findings, that students held strong negative expectations before the examination yet found the experience instructive afterwards shows that clinical reasoning-based examinations, despite being anxiety-provoking, can also be perceived as a learning opportunity that contributes to professional development. That some students with a history of mood disorder were present in this process is also an expected result, since a mental health history is a known risk factor for increased anxiety symptoms during examination periods.

That the great majority of students experienced problems during the CORE, chiefly insufficient time and platform-related technical disruptions, is consistent with the current literature on computer- and online-based examination applications. Makhene et al. [22] reported that nursing students frequently encountered technological infrastructure problems such as power cuts, internet connection problems and a lack of digital skills during online learning and assessment, and that this adversely affected the learning and assessment experience. Similarly, the study by Hosseini et al. (2025) showed that inadequacies in the educational-technology infrastructure were an important determinant of OSCE-related stress. These findings indicate that, when clinical reasoning-based examinations are

administered on digital platforms, strengthening the technical infrastructure and treating time management as an integral part of examination design are essential.

That a large proportion of students found the cases and questions understandable after the CORE, stated that they were able to grasp the logic of the examination, and evaluated the experience as instructive is a notable positive finding. This result is consistent with the literature indicating that clinical scenario-based examinations have educational value by enabling students to learn through realistic case experiences; indeed, similar examination models have been reported to develop students' clinical judgment and reasoning skills [1]. However, that only 17.6% of students found the examination time sufficient and only 9.9% thought the examination went very well shows that the examination still has aspects open to improvement in terms of time pressure and self-assessment.

That receiving information from higher years did not affect the CORE result, state or trait anxiety, or perceived stress suggests that peer-based information, although it shapes subjective expectations, may not have a determining effect on objective psychological and performance indicators. This finding is consistent with studies indicating that the source of examination anxiety may be more strongly related to the individual's subjective attitude towards the examination and personality structure than to external information transfer alone.

That state anxiety, trait anxiety and perceived stress levels were significantly higher in students who agreed that the questions would be very difficult, yet this did not affect the CORE result, is notable. This pattern is consistent with the OSCE literature showing that the perception of difficulty strongly affects the emotional response but does not directly determine performance; many studies have found no significant relationship between anxiety level and examination performance [19]. This indicates that the cognitive/emotional dimension of anxiety may follow a course independent of the behavioural/performance dimension.

That state and trait anxiety levels were lower in students who believed they would be very successful, whereas perceived stress was higher in those who did not, is consistent with current findings supporting the protective role of self-efficacy beliefs against anxiety. Zilber et al. [23] reported that, during the postponement of a licensing examination, nursing graduates with low self-efficacy beliefs had higher levels of uncertainty and anxiety. Based on Bandura's self-efficacy theory, these findings show that an individual's subjective belief in success shapes the anxiety experience independently of the objective examination outcome; indeed, in our study too, the belief in success did not affect the examination result.

That state anxiety, trait anxiety and perceived stress scores were significantly higher in students who feared the CORE intensely, yet this fear was not reflected in the examination result, is consistent with findings showing that the relationship between examination anxiety and performance is generally weak or non-significant in OSCE-type examinations. This suggests that nursing students can demonstrate the clinical knowledge and skills they have acquired at the moment of examination despite high anxiety levels, and that anxiety therefore does not necessarily lead to a loss of performance.

That anxiety and stress levels were higher in students who were undecided about the contribution of the examination experience to their education shows that uncertainty itself may be a source of anxiety. This finding is supported by results from virtual reality–based OSCE preparation studies indicating that individuals with low tolerance of uncertainty perceive ambiguous assessment situations as more threatening, and that intolerance of uncertainty can make the perception of the examination environment less secure.

That state anxiety, trait anxiety and perceived stress scores were higher in students who had previously experienced a mood disorder, yet this did not create a significant difference in CORE scores, shows that a psychiatric history strongly affects the emotional experience but does not directly determine academic/clinical performance. Agyapong-Opoku et al. [24] reported that a history of previous mental health problems was among the important determinants of anxiety and depression in health sciences students. This finding indicates that students with a mental health history may require additional psychological support during examination processes, although this does not necessarily adversely affect indicators of clinical competence.

The significant decrease in state anxiety after the CORE, with no change in trait anxiety or perceived stress, is an important finding that confirms the conceptual distinction between state and trait anxiety. This finding supports the notion that the acute, situation-specific tension created by the examination decreases once the examination is completed, whereas the individual's general predisposition to anxiety is not affected by a short-term examination experience.

Finally, the weak negative relationship between the CORE score and post-examination state anxiety and perceived stress, with no relationship with trait anxiety, is consistent with studies reporting that the anxiety–performance relationship is generally weak, inconsistent or non-significant in OSCE-type examinations [19]. This finding shows that clinical reasoning–based examinations have the potential to elicit knowledge and skills even in students with high anxiety levels, but that students with lower performance may experience relatively higher state anxiety and stress in the post-examination period. That this relationship remained weak indicates that the CORE score is determined by academic knowledge and clinical reasoning skill rather than by anxiety level.

4.1. Limitations

This study has several limitations. First, the internal consistency coefficients of the State–Trait Anxiety Inventory were low in this sample, particularly for the state anxiety subscale (Cronbach's alpha = 0.390) and the trait anxiety subscale (0.575), which fall below the commonly accepted threshold of 0.70. This may reflect the characteristics of the first-year sample, the online administration of the inventory, or the timing of data collection around an anxiety-provoking examination, and it limits the reliability with which the anxiety findings can be interpreted; the results relating to state and trait anxiety should therefore be treated with caution. Second, the study used a single-group, pre–post quasi-experimental design without a control or comparison group, which limits the extent to which the observed changes—particularly the

post-examination decrease in state anxiety—can be attributed solely to the CORE rather than to the passage of time or the relief of examination completion. Third, the study was conducted with first-year students at a single nursing faculty in one region of Türkiye, so the findings may not be generalisable to nursing students in other years, institutions or countries. Fourth, all data were based on self-report, which may introduce social desirability and recall bias. Finally, the cross-sectional timing of the anxiety and stress measurements (one day before and up to one day after the examination) captures only the acute period surrounding the CORE and cannot reveal how these effects evolve over time. Future multicentre studies with larger and more diverse samples, control groups, validated instruments with adequate reliability, and longitudinal follow-up are recommended to confirm and extend these findings.

5. Conclusion

This study was conducted in a quasi-experimental design to examine the effect of the CORE on state anxiety, trait anxiety and perceived stress levels in nursing students. The findings revealed that the CORE created multifaceted effects on nursing students across cognitive-emotional and performance-based dimensions.

One of the most notable findings of the study was that students with high CORE scores had lower post-examination state anxiety. This result points to a reciprocal and probably bidirectional relationship between examination performance and situation-specific anxiety. On the one hand, it is expected that students who successfully resolve clinical scenarios and obtain high scores experience a strengthened sense of competence after completing the examination, which in turn reduces momentary tension and lowers state anxiety. On the other hand, it is also possible that students with lower state anxiety before and during the examination performed better because they were able to sustain attention, concentration and clinical reasoning processes with less disruption. This reciprocal relationship suggests that clinical reasoning-based examinations in nursing education indirectly measure not only knowledge level but also the student's ability to manage their emotional state. Accordingly, it is recommended that structured preparation sessions aimed at reducing examination anxiety (simulation-based practice examinations, relaxation and breathing technique training, and activities to build familiarity with the examination format) be integrated into nursing curricula before CORE-like clinical reasoning examinations. In addition, increasing regular case-based educational practices that strengthen students' clinical reasoning skills may reduce state anxiety by strengthening both examination performance and self-efficacy beliefs regarding the examination.

Another important finding of the study was that, in students with high post-examination perceived stress, the CORE score was not affected by this stress. This result shows that perceived stress does not directly impair students' objective clinical competence performance in a structured, scenario-based assessment tool such as the CORE, and that nursing students can therefore demonstrate the knowledge and skills they have acquired even under a high perception of stress. This indicates that the cognitive-appraisal (perception) dimension of stress may follow a course independent of the behavioural-performance dimension; even if a student subjectively appraises the examination process as highly stressful, this

subjective appraisal is not necessarily reflected in objective examination success. Nevertheless, that perceived stress was not reflected in examination performance should not be interpreted as a finding that can be disregarded in terms of the student's psychological wellbeing, since high perceived stress, even if it does not affect the examination result in the short term, may create cumulative, long-term adverse effects on the student's general mental health, burnout level and attitude towards the profession. Accordingly, it is recommended that educational institutions not evaluate examination performance as a sufficient indicator on its own, and that they develop support mechanisms (psychological counselling units, peer support groups, and post-examination feedback and emotion-sharing sessions) that regularly monitor the level of stress students perceive after the examination. Moreover, that post-examination stress was not reflected in performance shows that faculty members should attend not only to the score but also to the emotional experience the student underwent throughout the process when interpreting examination results.

Overall, the findings of our study reveal that the CORE significantly reduced state anxiety after the examination but did not affect trait anxiety or perceived stress, and that examination performance was largely independent of anxiety and stress variables and was determined by academic achievement and clinical reasoning competence. In light of these findings, it is recommended that the design of clinical reasoning-based examinations in nursing curricula consider not only measurement validity but also student wellbeing; that pre-examination information processes be standardised; that technical infrastructure and time management be improved; and that self-efficacy-enhancing educational interventions be integrated into the curriculum. Finally, because this study was conducted in a single centre and in a quasi-experimental design, future studies conducted in different nursing faculties with larger samples and longitudinal designs may more comprehensively reveal the course over time of the effects of the CORE on anxiety and stress.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was granted by the Clinical Research Ethics Committee of Akdeniz University (date: 15.09.2021; approval number: KAEK-675), and institutional permission was obtained from the nursing faculty in which the study was conducted. All participating students were informed of the aim and procedures of the study, of the voluntary nature of participation and of their right to withdraw at any point without consequence for their academic standing, and all provided written informed consent. Participation had no bearing on examination results or course grades.

Consent for publication

Not applicable. The manuscript contains no individual person's data in any form.

Availability of data and materials

The datasets generated and analysed during the current study are not publicly available in order to protect participant confidentiality, but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

BT and FDE conceived and designed the study. BT and FDE collected the data. BT performed the statistical analysis and FDE interpreted the results. BT drafted the manuscript, and FDE and EK critically revised it for important intellectual content. All authors read and approved the final manuscript.

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Use of artificial intelligence

During the preparation of this manuscript, the authors used Claude Opus 5 (Anthropic) to assist with translation and language editing. The authors reviewed and edited all output and take full responsibility for the content of the publication. No artificial intelligence tool was used to collect, generate, analyse or interpret the data, or to produce the scientific content of the manuscript.

References

1. Hallemeyer D, Tyo M, Travers EA. Implementation of clinical reasoning concepts to improve clinical judgment and self-confidence of nursing students in the clinical setting. *Teach Learn Nurs*. 2024;19(2):e350–7. <https://doi.org/10.1016/j.teln.2023.12.013>.
2. Hong S, Lee J, Jang Y, Lee Y. A cross-sectional study: what contributes to nursing students' clinical reasoning competence? *Int J Environ Res Public Health*. 2021;18(13):6833. <https://doi.org/10.3390/ijerph18136833>.
3. Chen L, Kong D, Zhang S, Yang L. A quasi-experimental study of specialized training on the clinical decision-making skills and social problem-solving abilities of nursing students. *Contemp Nurse*. 2021;57(1–2):4–12. <https://doi.org/10.1080/10376178.2021.1912616>.
4. de Sá Tinôco JD, Cossi MS, Fernandes MIDCD, Paiva AC, de Oliveira Lopes MV, de Carvalho Lira ALB. Effect of educational intervention on clinical reasoning skills in nursing: a quasi-experimental study.

- Nurse Educ Today. 2021;105:105027. <https://doi.org/10.1016/j.nedt.2021.105027>.
5. Sengul T, Sarıköse S, Cikirikci EHK, Köksal A, Karadağ A. AI-mediated, simulation-based OSCE preparation program in nursing education: clinical skill performance, anxiety, reflective thinking and learner perceptions: a mixed-methods study. *Clin Simul Nurs*. 2026;116:101992. <https://doi.org/10.1016/j.ecns.2026.101992>.
 6. Kaur Khaira M, Raja Gopal RL, Mohamed Saini S, Md Isa Z. Interventional strategies to reduce test anxiety among nursing students: a systematic review. *Int J Environ Res Public Health*. 2023;20(2):1233. <https://doi.org/10.3390/ijerph20021233>.
 7. McCormick S, Lamberson J. Interventions for test anxiety in nursing students: a literature review. *Teach Learn Nurs*. 2024;19(2):e404–11. <https://doi.org/10.1016/j.teln.2024.01.005>.
 8. Mojarrab S, Bazrafkan L, Jaber A. The effect of a stress and anxiety coping program on objective structured clinical examination performance among nursing students in Shiraz, Iran. *BMC Med Educ*. 2020;20(1):301. <https://doi.org/10.1186/s12909-020-02228-9>.
 9. Abbasi A, Bazghaleh M, Fadaee Aghdam N, Basirinezhad MH, Tanhan A, Montazeri R, et al. Efficacy of simulated video on test anxiety in objective structured clinical examination among nursing and midwifery students: a quasi-experimental study. *Nurs Open*. 2023;10(1):165–71. <https://doi.org/10.1002/nop2.1291>.
 10. Kassabry MF. The effect of simulation-based advanced cardiac life support training on nursing students' self-efficacy, attitudes, and anxiety in Palestine: a quasi-experimental study. *BMC Nurs*. 2023;22(1):420. <https://doi.org/10.1186/s12912-023-01588-z>.
 11. Yusefzadeh H, Iranagh JA, Nabilou B. The effect of study preparation on test anxiety and performance: a quasi-experimental study. *Adv Med Educ Pract*. 2019;10:245–51. <https://doi.org/10.2147/AMEP.S192053>.
 12. Cohen J. *Statistical power analysis for the behavioral sciences*. 2nd ed. Hillsdale: Lawrence Erlbaum Associates; 1988.
 13. Lecompte G, Öner N. Development of the Turkish edition of the State–Trait Anxiety Inventory. *Bogazici Univ J*. 1975;3:49–68.
 14. Öner N, Lecompte A. *Durumluk-Sürekli Kaygı Envanteri el kitabı [Handbook of the State–Trait Anxiety Inventory]*. 2nd ed. Istanbul: Boğaziçi University; 1983.
 15. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983;24(4):385–96.
 16. Eskin M, Harlak H, Demirkıran F, Dereboy Ç. The adaptation of the Perceived Stress Scale into Turkish: a reliability and validity analysis. *New Symp J*. 2013;51(3):132–40.
 17. Mukaka MM. Statistics corner: a guide to appropriate use of correlation coefficient in medical research. *Malawi Med J*. 2012;24(3):69–71.
 18. Schober P, Boer C, Schwarte LA. Correlation coefficients: appropriate use and interpretation. *Anesth Analg*. 2018;126(5):1763–8. <https://doi.org/10.1213/ANE.0000000000002864>.

19. Vasli P, Shahsavari A, Estebsari F, AsadiParvar-Masouleh H. The predictors of nursing students' clinical competency in pre-internship objective structured clinical examination: the roles of exam anxiety and academic success. *Nurse Educ Today*. 2021;107:105148. <https://doi.org/10.1016/j.nedt.2021.105148>.
20. Hosseini FA, Hemati M, Shaygan M, Gheysari S, Jaber A, Ghobadi M, et al. Exploring the challenges and needs of nursing students in relation to OSCE exam stress: a qualitative study. *PLoS ONE*. 2025;20(7):e0327898. <https://doi.org/10.1371/journal.pone.0327898>.
21. Stojiljkovic M, Nortvedt L, Röhr K, Hessevaagbakke E, Lindeflaten K, Indregard AMR, et al. The storm within: exploring first-year nursing students' experiences of the objective structured clinical examination. *Glob Qual Nurs Res*. 2025;12. <https://doi.org/10.1177/23333936251400692>.
22. Makhene A, Nene SE, Mhlongo M. Technology challenges in a higher education institution: student nurse experience. *Health SA Gesondheid*. 2025;30:a2749. <https://doi.org/10.4102/hsag.v30i0.2749>.
23. Zilber R, Hazan Hazoref R, Kagan I. Self-efficacy, uncertainty and anxiety among nursing graduates in response to licensing test postponement due to the COVID-19 pandemic: a mixed-methods study. *Int J Nurs Pract*. 2023;29(1):e13091. <https://doi.org/10.1111/ijn.13091>.
24. Agyapong-Opoku G, Agyapong B, Obuobi-Donkor G, Eboreime E. Depression and anxiety among undergraduate health science students: a scoping review of the literature. *Behav Sci*. 2023;13(12):1002. <https://doi.org/10.3390/bs13121002>.