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Relationship between nursing students' global climate change awareness, climate change anxiety and sustainability attitudes in nursing: a descriptive and cross-sectional study

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Abstract

Background As a major global health threat, climate change is an important issue for nurses who play a pivotal role in health protection and improvement, and in the development of climate-smart healthcare systems. Sustainability attitudes in nursing should be developed together with awareness and concern for climate change.

Aim The aim of this study was to determine the relationship between nursing students' global climate change awareness, climate change anxiety, and sustainability attitudes in nursing.

Methods This descriptive, correlational study was conducted with 289 nursing students at a state university. Data were collected using the Descriptive Characteristics Form, the Global Climate Change Awareness Scale, the Climate Change Anxiety Scale, and the Sustainability Attitudes in Nursing Survey. Mean and percentage distributions, the Independent Samples t-test, ANOVA test, Pearson correlation and multiple regression analysis were used to analyze the data. The STROBE checklist was used to report this study.

Results Global climate change awareness of the nursing students was at a moderate level, and the levels of climate change anxiety and sustainability attitudes in nursing were above average. There was determined to be a moderate positive correlation between climate change awareness and sustainability attitude in nursing, between anxiety and sustainability attitude in nursing, and between climate change awareness and anxiety. Climate change awareness and anxiety explained 25.1% of the sustainability attitude in nursing.

Conclusions The study provides evidence of the relationship between nursing students' global climate change awareness and anxiety, and sustainability attitudes in nursing. It can be recommended that climate change and sustainability awareness-raising content are integrated into the nursing curriculum. The development of a sustainability attitude in nursing will contribute to the development of sustainable and low-carbon healthcare practices.

Keywords Anxiety, Awareness, Climate change, Nursing students, Sustainability

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Introduction

Global climate change is defined as the disruption of the composition of the climate due to the increase in greenhouse gases in the atmosphere resulting from human activities [1]. Climate deteriorations have resulted in situations such as floods, forest fires, decreased biodiversity, and increased infectious diseases, which threaten the life of all living creatures [2]. The World Health Organization [3] has declared that global climate change is the biggest health threat to the world population. In the Puplics' Climate Vote survey conducted by the United Nations with participants from 50 different countries, more than 65% of the participants perceive global climate change as a global threat [4].

As a major health threat, global climate change has led to an increase in the incidence and severity of acute and chronic diseases, causing an increase in demand on the healthcare system in terms of workforce and financial resources [3, 5]. Increased demand also increases resource use, thus increasing healthcare-related greenhouse gas emissions [6]. In a study by Dzau et al. [7], it was stated that the healthcare system, one of the largest sectors of the economy, produces 10% of the national carbon emissions in the USA. Healthcare professionals, who provide healthcare with a professional philosophy that aims to protect and improve human health, have demanded the construction of climate-smart and low-carbon health systems [8]. A workforce trained in climate change and sustainability is among the key components of the framework published by the World Health Organization [9] for climate-smart and low-carbon health systems.

Professional nurses, who provide uninterrupted care using many resources within the healthcare system and constitute the largest section of the workforce, are in a pivotal role [10]. In order to understand and manage the effects of global climate change on health and to develop eco-friendly sustainable health systems, nurses need to become change agents by gaining knowledge, attitude and skills during the education process [11]. However, it has been emphasized that the integration of global climate change and its effects on health in nursing education is insufficient [12, 13]. Therefore, the integration of the climate change and sustainable healthcare into both the undergraduate and graduate nursing curriculum has been recommended [14–16].

When the literature is examined, variables such as age, gender, having knowledge about concepts, taking precautions against climate change in daily life, and attending meetings about environmental problems been shown to have an impact on nursing students' awareness of climate change and their attitudes towards sustainable development [14, 15, 17, 18]. In addition, nursing students have increasingly positive attitudes towards the integration of content about climate change and sustainability into the nursing curriculum [19], and they see themselves as important actors in climate change and sustainability efforts [20]. Based on these results, it is predicted that nursing students' awareness and anxiety levels towards climate change may be related to their attitudes towards sustainability in nursing. However, there are no studies in the literature that have determined the impact of nursing students' global climate change awareness and anxiety on sustainability attitudes in nursing.

The aim of this study was to determine the relationship between nursing students' global climate change awareness, climate change anxiety, and sustainability attitudes in nursing. The results of the study will guide revisions that can be made in the nursing curriculum in order to train professional nurses who will take part in the development of climate-smart, eco-friendly, and sustainable healthcare. Therefore, this study attempted to answer the following questions.

Study questions:

- What are the levels of nursing students' global climate change awareness, climate change anxiety, and sustainability attitudes in nursing?
- Is there a relationship between nursing students' global climate change awareness, climate change anxiety and sustainability attitudes in nursing?
- How do climate change awareness and climate change anxiety predict nursing students' sustainability attitudes in nursing?

Methods

Study design

This study used a descriptive and cross-sectional design.

Setting and sample

The population of the study consisted of a total of 822 students (206 in the first year, 219 in the second year, 212 in the third year and 185 in the fourth year) studying in the nursing department of the faculty of health sciences of a state university in the fall semester of the 2022–2023 academic year. There were no specific courses related to climate change, sustainability, etc. in the nursing education curriculum of the university where the study was conducted. The determinants of health are taught in fundamental nursing courses such as internal diseases nursing, public health nursing etc. As a result of sample calculation with the known population, it was determined that at least 300 nursing students should be reached to provide an error level of 5% and confidence interval of 95%. The students were selected using a simple random number table to include an equal percentage of

students from each class in the sample. The sample consisted of 289 students: 73 from the first year (25.3% of the sample), 75 from the second year (26.0% of the sample), 76 from the third year (26.2% of the sample), and 65 from the fourth year (22.5% of the sample). Eleven students did not want to participate in the study. The inclusion criteria for the study were determined as not having previously graduated from any other healthcare-related department and full completion of the data collection forms. The STROBE checklist was used to report this study.

Data collection tools

Introductory information form

The form was designed by the researchers for this study, including the students' age, gender, whether they were aware of global climate change and sustainability before, and whether they had received training on these concepts [21, 22].

Global climate change awareness scale (GCCAS)

This scale was developed by Deniz et al. [23] to evaluate the awareness levels of university students regarding global climate change. It has four dimensions of impacts on natural and human environment (1), awareness of global organizations and agreements (2), reasons for global climate change (3) and awareness of the relationship between global climate change and energy consumption (4). The scale has 21 items evaluated on a 5-point Likert structure ranging from "strongly not aware" (1) to "very aware" (5). There are no reverse-coded items. The total scale score ranges between 21–105 points. The item score average is evaluated as 1–2.33 (low level awareness), 2.34–3.66 (medium level awareness), and 3.67–5.00 (high level awareness). The Cronbach alpha value of the total scale was reported as 0.826, with values of 0.876 for the first, 0.814 for the second, 0.814 for the third, and 0.725 for the fourth dimension [23]. In this study, the Cronbach alpha value was found to be 0.89 for the total scale, 0.88 for the first, 0.92 for the second, 0.85 for the third, and 0.79 for the fourth dimension.

Climate change anxiety scale (CCAS)

The scale was developed by Stewart [24] and was translated into Turkish by Gezer and İlhan [25]. The scale has 2 dimensions of anxiety and feeling of helplessness, with 10 items evaluated on a five-point Likert structure ranging from never (1) to always (5). There are no reverse-coded items in the scale. The total score ranges between 10–50 points, with a high score indicating a high level of climate change anxiety is high. The Cronbach alpha coefficient of the total scale was determined as 0.91, with values of 0.87 for the anxiety dimension, and 0.83 for the feelings of helplessness dimension [25]. In the current study, the Cronbach alpha value was found to be 0.90 for the total scale, 0.86 for the first, and 0.70 for the second dimension.

Sustainability attitudes in nursing survey-2 (SANS-2)

The scale was developed by Richardson et al. [26] to measure nursing students' attitudes towards sustainability in nursing There are 9 items in a single dimension scored on a 7-point Likert-type scale from "Strongly disagree" to " Strongly agree". The total score in the range of 9 to 63 points is then divided by the number of items, and a higher score indicates a higher level of sustainability attitude in nursing. The Cronbach alpha value of the original scale was 0.82. The scale was adapted into Turkish by İlaslan and Şahin Orak [27], and the single-factor structure of the scale was confirmed and the Cronbach alpha coefficient was determined as 0.76. In this study, the Cronbach alpha value of the scale was 0.90.

Ethical considerations

Written permission was obtained from the Düzce University Scientific Research and Publication Ethics Committee (Decision number: 2022–418, Decision date: 20.10.2022) and the head of the nursing department (Decision number: 225971, Decision date: 01.11.2022) of the Düzce University. Permission was obtained via e-mail for the data collection tools used in the study. The students who participated in the study were informed about the purpose and process of the research, and written informed consent was obtained from the participants.

Data collection

After obtaining the approval from the the scientific research and publication ethics committee and the head of the nursing department, the students who provided written informed consent to participate in this study were informed about the aim and scope of the study. Data were collected face-to-face using data collection forms during the fall semester of the 2022–2023 academic year. The data collection forms were administered by the first researcher who not the instructor of students for any course. It took approximately 20–25 min for the students to complete the data collection forms. The data were collected at a time when students were available at the educational institution outside of class hours.

Statistical analysis

Descriptive statistical tests (frequency, percentage, mean, standard deviation) were used in the analysis of the descriptive characteristics. ANOVA and the Independent Samples t test were used in comparisons between groups based on descriptive characteristics. The relationships between the scores obtained from the scales were

examined using the Pearson correlation test and multiple linear regression analysis. SPSS 25 package program was used to evaluate the data and the level of statistical significance was accepted as $p < 0.05$.

Results

The mean age of the students participating in the study was 20.56 ± 1.51 years and 76.8% were female. Of the total sample, 64.7% of the students stated that they had heard about global climate change before through social media (34.6%), and 55% had heard about the concept of sustainability before through social media (21.8%). It was stated that no education on climate change had been received by 89.3% of the students and on sustainability by 90.3%. The educational resources of the students who stated that they had received education about climate change and sustainability consisted of elective courses, social media, conferences and project work.

The climate change awareness of the students was determined to be at a moderate level (Mean ± SD = 3.43 ± 0.69) and their climate change anxiety (Mean ± SD = 33.10 ± 8.08) and sustainability attitudes (Mean ± SD = 4.00 ± 1.23) in nursing were above average (Table 1).

When the scale scores were compared with the descriptive characteristics, female students had significantly higher GCCAS first dimension scores (t = 3.087, $p = 0.002$), climate change anxiety (t = 2.481, $p = 0.014$), and sustainability attitudes in nursing (t = 2.190, $p = 0.029$). Third grade students had significantly higher GCCAS second dimension scores (F = 4.005, $p = 0.008$), climate change anxiety (F = 5.000, $p = 0.002$), and sustainability attitudes in nursing (F = 15.875, $p = 0.000$). Those who had previously heard of the concept of climate change had significantly higher GCCAS first (t = 3.029, $p = 0.003$), third (t = 1.999, $p = 0.047$), and fourth (t = 2,577, $p = 0,010$) dimension scores, and those who had previously heard of the concept of sustainability had significantly higher GCCAS first (t = 2.522, $p = 0.012$) and fourth (t = 2.654, $p = 0.008$) dimension scores and SANS-2 scores (t = 2.092, $p = 0.037$). The students who had previously received education on global climate change and sustainability were determined to have significantly higher climate change awareness, climate change anxiety, and sustainability attitudes in nursing ($p < 0.05$) (Table 2).

When the relationship between the scale scores was examined, there was a moderate positive relationship between global climate change awareness and climate change anxiety ($r = 0.455$, $p = 0.001$), and between global climate change awareness and sustainability attitudes in nursing (r = 0.375, $p = 0.001$). A moderate positive relationship was determined between climate change anxiety and sustainability attitudes in nursing ($r = 0.468$, $p = 0.001$) (Table 3).

From the results of the regression analysis model, it was determined that 25.1% of the variance in sustainability attitudes in nursing was explained by climate change awareness and climate change anxiety. Awareness of the causes of global climate change (GCCAS 3rd dimension β = -0.15, $p = 0.836$) and feeling of helplessness scores (CCAS 2nd dimension β = -0.014, $p = 0.720$) were found to negatively affect sustainability attitudes in nursing (Table 4).

Table 1 Global climate change awareness, climate change anxiety and sustainability attitudes in nursing mean scores of nursing students ($n = 289$)

Scale	Mean ± SD	Min.-Max.*
Global Climate Change Awareness Scale (GCCAS)		
Total score	3.43 ± 0.69	1.00–5.00
Awareness of the effects of global climate change on the natural and social environment (1.dimension)	4.07 ± 0.72	1.00–5.00
Awareness of global organizations and agreements (2.dimension)	2.64 ± 1.19	1.00–5.00
Awareness of the causes of global climate change (3.dimension)	2.62 ± 1.18	1.00–5.00
Awareness of the energy consumption relation of global climate change (4.dimension)	3.89 ± 0.96	1.00–5.00
Climate Change Anxiety Scale (CCAS)		
Total score	33.10 ± 8.08	15.00–51.00
Anxıety (1.dimension)	23.28 ± 5.65	8.00–36.00
Feeling of helplessness (2.dimension)	9.81 ± 2.82	3.00–15.00
Sustainability Attitudes in Nursing Survey-2 (SANS-2)		
Total score	4.00 ± 1.23	1.33–7.00

* Minimum–maximum

Table 2 Comparison of scale scores according to descriptive characteristics ($n = 289$)

Descriptive characteristics	GCCAS Total score	GCCAS 1.dimension	GCCAS 2.dimension	GCCAS 3.dimension	GCCAS 4.dimension	CCAS Total score	CCAS 1.dimension	CCAS 2.dimension	SANS-2
Gender									
Female	3.47 ± 0.67	4.14 ± 0.68	2.65 ± 1.20	2.61 ± 1.19	3.95 ± 0.91	33.74 ± 7.95	3.38 ± 0.79	3.33 ± 0.93	4.09 ± 1.24
Male	3.29 ± 0.73	3.83 ± 0.80	2.61 ± 1.14	2.66 ± 1.18	3.69 ± 1.10	30.97 ± 8.22	3.11 ± 0.83	3.04 ± 0.92	3.71 ± 1.13
	t = 1.844 $p = 0.066$	t = 3.087 $p =$ **0.002**	t = 0.271 $p = 0.787$	t = -.259 $p = 0.795$	t = 1.796 $p =$ **0.048**	t = 2.481 $p =$ **0.014**	t = 2.438 $p =$ **0.015**	t = 2.225 $p =$ **0.027**	t = 2.190 $p =$ **0.029**
Grade									
1.grade	3.33 ± 0.63	3.97 ± 0.73	2.41 ± 1.03	2.68 ± 1.14	3.94 ± 0.94	30.91 ± 7.14	3.13 ± 0.73	2.99 ± 0.86	3.43 ± 0.91
2.grade	3.49 ± 0.73	3.99 ± 0.81	2.89 ± 1.16	2.84 ± 1.16	3.82 ± 0.95	34.10 ± 8.42	3.41 ± 0.84	3.40 ± 0.96	3.72 ± 1.20
3.grade	3.53 ± 0.77	4.19 ± 0.66	2.85 ± 1.35	2.56 ± 1.31	3.89 ± 1.04	35.38 ± 7.86	3.56 ± 0.76	3.48 ± 0.91	4.63 ± 1.22
4.grade	3.35 ± 0.58	4.15 ± 0.65	2.37 ± 1.08	2.40 ± 1.08	3.91 ± 0.93	31.72 ± 8.24	3.16 ± 0.81	3.18 ± 0.95	4.22 ± 1.20
	F = 1.435 $p = 0.233$	F = 1.695 $p = 0.168$	F = 4.005 $p =$ **0.008** Posthoc 2 > 4	F = 1.765 $p = 0.154$	F = 0.201 $p = 0.896$	F = 5.000 $p =$ **0.002** Posthoc 3 > 1	F = 4.807 $p =$ **0.003** Posthoc 3 > 1,4	F = 4.327 $p =$ **0.005** Posthoc 1 > 2,3	F = 15.875 $p =$ **0.000** Posthoc 3 > 1,2 ve 4
Have you ever heard of global climate change?									
Yes	3.46 ± 0.64	4.17 ± 0.62	2.58 ± 1.16	2.52 ± 1.16	4.00 ± 0.92	33.52 ± 8.19	3.38 ± 0.81	3.28 ± 0.95	4.04 ± 1.26
No	3.38 ± 0.77	3.88 ± 0.85	2.75 ± 1.22	2.81 ± 1.21	3.69 ± 1.01	32.31 ± 7.87	3.22 ± 0.78	3.25 ± 0.91	3.92 ± 1.18
	t = 0.914 $p = 0.361$	t = 3.029 $p =$ **0.003**	t = -1.161 $p = 0.246$	t = -1.999 $p =$ **0.047**	t = 2.577 $p =$ **0.010**	t = 1.222 $p = 0.223$	t = 1.615 $p = 0.107$	t = 0.274 $p = 0.784$	t = 0.812 $p = 0.418$
Have you ever heard of sustainability?									
Yes	3.46 ± 0.64	4.17 ± 0.63	2.57 ± 1.16	2.55 ± 1.18	4.03 ± 0.93	33.54 ± 8.25	23.66 ± 5.77	9.87 ± 2.86	4.13 ± 1.26
No	3.39 ± 0.74	3.95 ± 0.81	2.73 ± 1.21	2.72 ± 1.19	3.73 ± 0.98	32.56 ± 7.88	22.81 ± 5.48	9.74 ± 2.77	3.83 ± 1.17
	t = 0.803 $p = 0.423$	t = 2.522 $p =$ **0.012**	t = -1.172 $p = 0.242$	t = -1.222 $p = 0.223$	t = 2.654 $p =$ **0.008**	t = 1.024 $p = 0.307$	t = 1.275 $p = 0.203$	t = 0.383 $p = 0.702$	t = 2.092 $p =$ **0.037**
Have you ever received education about global climate change?									
Yes	3.77 ± 0.72	4.41 ± 0.49	3.04 ± 1.37	2.89 ± 1.43	4.17 ± 0.91	36.61 ± 8.98	25.80 ± 6.24	10.80 ± 2.94	4.94 ± 1.42
No	3.39 ± 0.67	4.03 ± 0.73	2.59 ± 1.15	2.59 ± 1.15	3.86 ± 0.97	32.67 ± 7.88	22.98 ± 5.51	9.69 ± 2.78	3.88 ± 1.15
	t = 2.905 $p =$ **0.004**	t = 3.793 $p =$ **0.000**	t = 1.973 $p =$ **0.050**	t = 1.309 $p = 0.192$	t = 1.684 $p = 0.093$	t = 2.584 $p =$ **0.010**	t = 2.658 $p =$ **0.008**	t = 2.080 $p =$ **0.038**	t = 4.687 $p =$ **0.000**
Have you ever received education about sustainability?									
Yes	3.84 ± 0.68	4.50 ± 0.41	3.11 ± 1.40	2.88 ± 1.43	4.26 ± 0.89	37.46 ± 8.90	26.39 ± 6.05	11.07 ± 3.00	5.24 ± 1.20
No	3.39 ± 0.67	4.03 ± 0.73	2.59 ± 1.15	2.60 ± 1.15	3.85 ± 0.96	32.63 ± 7.87	22.95 ± 5.51	9.68 ± 2.77	3.87 ± 1.16
	t = 3.323 $p =$ **0.001**	t = 5.154 $p =$ **0.000**	t = 2.225 $p =$ **0.027**	t = 1.182 $p = 0.238$	t = 2.116 $p =$ **0.035**	t = 3.047 $p =$ **0.003**	t = 3.109 $p =$ **0.002**	t = 2.500 $p =$ **0.013**	t = 5.918 $p =$ **0.000**

t = Independent samples t test, F = ANOVA test

Table 3 Correlation between global climate change awareness, climate change anxiety and sustainability attitudes in nursing ($n = 289$)

CCAS	GCCAS										SANS-2	
	Total score		GCCAS 1.dimension		GCCAS 2.dimension		GCCAS 3.dimension		GCCAS 4.dimension			
	r	p	r	p	r	p	r	p	r	p	r	p
Anxiety (1.dimension)	0.433	0.001*	0.319	0.001*	0.318	0.001*	0.290	0.001*	0.303	0.001*	0.476	0.001*
Feeling of helplessness (2.dimension)	0.437	0.001*	0.319	0.001*	0.339	0.001*	0.294	0.001*	0.270	0.001*	0.388	0.001*
CCAS total score	**0.455**	**0.001***	0.334	0.001*	0.340	0.001*	0.305	0.001*	0.306	0.001*	**0.468**	**0.001***
SANS-2	**0.375**	**0.001***	0.301	0.001*	0.267	0.001*	0.211	0.001*	0.277	0.001*	1	

* $p < 0.01$

Table 4 Multivariate linear regression model explaining sutainability attitudes in nursing ($n=289$)

The dependent variable	Independent variables	Beta	Standard error	t	p	Tolerance	VIF
SANS-2	Constant	0.613	0.395	1.555	0.121		
	GCCAS	0.364	0.102	3.553	**0.000**	0.793	1.260
	GCCAS 1.dimension	0.188	0.108	1.732	0.084	0.638	1.567
	GCCAS 2.dimension	0.125	0.074	1.696	0.091	0.514	1.945
	GCCAS 3.dimension	-.015	0.073	-.207	0.836	0.527	1.897
	GCCAS 4.dimension	0.104	0.081	1.288	0.199	0.649	1.541
	CCAS	0.057	0.009	6.533	**0.000**	0.793	1.260
	Anxiety (1.dimension)	0.089	0.019	4.698	**0.000**	0.347	2.878
	Feeling of helplessness (2.dimension)	-.014	0.038	-.359	0.720	0.347	2.881
R2 = 0.251	F = 17.061	$p=0.000$	Durbin Watson = 1.710				

Discussion

The ensuring climate-smart, eco-friendly, and sustainable healthcare is one of the priorities for healthcare sector. This descriptive and cross-sectional study aimed to determine the relationship between nursing students' global climate change awareness, climate change anxiety, and sustainability attitudes in nursing. So, the results of the study will guide revisions that can be made in the nursing curriculum in order to train professional nurses who will take part in the development of climate-smart, eco-friendly, and sustainable healthcare.

The results of this study demonstrated that the nursing students' global climate change awareness was at a moderate level, and their climate change anxiety and sustainability attitudes in nursing were above average. When it is considered that the majority of the students have not heard or received education on the concepts of climate change and sustainability before, this result can be related to the nursing education provided in line with the professional philosophy based on the concepts of environment, people, health and nursing. In nursing education, students are made aware of the relationship between environment and health from the first year onwards [28]. This may have made it easier for students to make connections between climate change and nursing with their basic knowledge, even if they were not trained on the concept. In a study of nursing students by Cugini et al. [29], 80.4% of the students had not received any education on climate change, more than 70% of the students were able to predict that climate change would increase health problems, and a very high rate of 91.4% stated that healthcare professionals should support the Paris Agreement. Similarly, in the study by Cengiz and Bahar [30], in which 47.9% of the students were first-year nursing students, the students' environmental literacy levels were high and their attitudes towards the environment were moderate. In another study using the awareness scale used in this study and in which the majority of participants had not received education on climate change, it was found that nursing students' climate change awareness was above average and that there was a positive relationship between climate change awareness and environmental literacy [17]. So, it is thought that the conceptual structure of nursing based on human–environment-health supports the development of climate change awareness in nursing students. Also, the cases that students encounter in their clinical practice (respiratory diseases related to air pollution, diarrhea caused by contamination that may be transmitted through drinking water due to floods, deaths caused by high temperatures, etc.) can support the development of climate change awareness by facilitating the understanding of the relationship between environment and health.

According to the study results, it was determined that variables such as gender, having heard of global climate change and sustainability concepts before and having received education on these concepts affect climate change awareness, climate change anxiety, and sustainability attitudes in nursing. Considering that the majority of students had not received education on the concepts, it is noteworthy that a positive moderate relationship was determined between the measured variables. In addition, when the regression model was examined, a one-unit increase in the climate change awareness score increased the sustainability attitude in nursing six-fold more than the climate change anxiety. Moreover, awareness of the causes of global climate change and the feeling of helplessness scores negatively affected sustainability attitudes

in nursing. Therefore, taking into consideration that social media is the source of the few students who hear about the concepts of climate change and sustainability, increasing the awareness of nursing students about climate change with evidence-based scientific resources during their nursing education is important for the acquisition of sustainability attitudes in nursing [31]. Social media can cause dysfunctional climate change anxiety through sources of questionable reliability and possible bias [32]. Portela Dos Santos et al. [33] stated that nursing education should pioneer the development of students' awareness of climate change. However, it has also been emphasized that the curriculum regarding climate change is inadequate in current nursing education [20, 34]. In a study by Anaker et al. [20], it was seen that nursing students have a basic level of knowledge about climate change, and the students stated that they were in a mismatched discourse because people are struggling with the effects of climate change caused by human activities. This mismatched discourse can increase climate change anxiety in individuals when it makes life difficult with frequently encountered environmental problems such as floods, fires, temperature increases, etc. [35, 36]. In another study of nursing students by Atta et al. [37], the low level of attitude towards the environment was associated with high climate anxiety and therefore, the need for educational activities to reduce climate anxiety of students was emphasized. Similarly, Zacher and Rudolph [38] revealed that having climate-specific knowledge was negatively associated with climate anxiety. At the same time, educational activities can also strengthen adaptive coping mechanisms [37]. In a study by Greaves et al. [39], it was determined that exposure to information about climate change increased the intention to demonstrate environmentally-aware behavior.

In this study, both awareness levels and climate change concerns were found to be higher in students who had previously heard about the concepts of climate change and sustainability and had received education on these. This result was thought to be due to the fact that the source of information about these concepts was mostly social media, which may contain manipulative content. Similarly, Torre et al. [40] conducted a study of healthcare professionals and students, and determined that the most common sources of information about climate change were the internet, television and newspapers. Ramírez-López et al. [41] reported that individuals who read and obtain information about climate-related news on news channels more frequently were found to have higher climate change anxiety. These sources may negatively affect awareness by overloading with unrealistic or excessive information and by affecting individuals' interpretations of the threat, thereby increasing anxiety about climate change to undesirable levels [42]. The information to be conveyed about climate change should be solution-oriented and compatible with the cognitive capacity of the individual, and it should be remembered that excessive or incomprehensible information can increase the anxiety of individuals [41]. Innocenti et al. [43] stated that the feeling of anxiety affects the ability of individuals to transform anxiety into action. They also emphasized that strengthening anxiety at the cognitive level by raising awareness through education can reduce the inability to transform anxiety into action. Therefore, it is important for nurse educators to increase students' climate change awareness during the education process with solution-oriented and evidence-based scientific information [37]. The awareness gained will enable students to keep their anxiety levels at a moderate level that keeps the individual most ready to learn and solve problems, as stated in Yerkes and Dodson's inverted U hypothesis [44]. The awareness and moderate anxiety gained will be a driving factor in students' action-taking behaviors by having a positive effect on their sustainability attitudes in nursing, as revealed in the regression model of this study.

Limitations

As this study was conducted in a single centre, the data cannot be generalized to all nursing students. Climate change and sustainability policies vary from country to country, and the variables in the study may be affected by this factor in future studies. Since the study was designed to be correlational, it was not possible to reveal a causal inference between the variables. At least 25.1% of sustainability attitudes in nursing was explained by the variables of awareness and anxiety. Therefore, further investigation is needed to determine whether other variables could act as mediators.

Conclusıon

The results of this study demonstrated that nursing students' climate change awareness was at a moderate level, and climate change anxiety and sustainability attitudes in nursing were above average. There was a positive moderate relationship between climate change awareness, climate change anxiety, and sustainability attitudes in nursing. It was also seen that 25.1% of the variance in sustainability attitudes in nursing was explained by climate change awareness and climate change anxiety.

It can be recommended that content related to climate change and sustainability be integrated into nursing education. Active teaching methods should be used so that students can understand sustainability in nursing. The knowledge and attitudes acquired by students should be measured in the short and long term, and the action-taking behaviors of students should be monitored during the

nursing care. To increase the likelihood of implementing eco-friendly and sustainable practices in the clinic, clinical nurses who are role models for students should also be educated and the decision-makers and politicians should provide a facilitating environment for sustainable healthcare systems.

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Author contributions
Nagihan İlaslan: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft & review & editing. Nuray Şahin Orak: Conceptualization, Methodology, Supervision, Writing – review & editing.

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Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Written permission was obtained from the Düzce University Scientific Research and Publication Ethics Committee (Decision number: 2022–418, Decision date: 20.10.2022) and the head of the nursing department (Decision number: 225971, Decision date: 01.11.2022) of the Düzce University. Permission was obtained via e-mail for the data collection tools used in the study. The students who participated in the study were informed about the purpose and process of the research, and written informed consent was obtained from the participants.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. NASA Global Climate Change. Understanding our planet to benefit humankind. https://climate.nasa.gov/ (2023). Accessed 10 Jun 2024.
2. Intergovernmental Panel on Climate Change (IPCC). Climate Change 2023, Synthesis Report: Summary for Policymakers [Core writing team, Hoesung Lee, José Romero (eds.)]. Geneva. https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf. (2023). Accessed 06 Mar 2024.
3. World Health Organization. Climate change. https://www.who.int/health-topics/climate-change#tab=tab_1 (2022). Accessed 10 Jun 2024.
4. United Nations Development Programme. World's largest survey of public opinion on climate change: A majority of people call for wide-ranging action. https://www.undp.org/press-releases/worlds-largest-survey-public-opinion-climate-changemajority-people-call-wide-ranging-action. (2021) . Accessed 10 Jun 2024.
5. Salas RN. The Climate Crisis and Clinical Practice. N Engl J Med. 2020;382(7).https://doi.org/10.1056/NEJMp2000331.
6. Sarkodie SA, Owusu PA. Impact of COVID-19 pandemic on waste management. Environ Dev Sustain. 2021;23(5):7951–60.https://doi.org/10.1007/s10668-020-00956-y.
7. Dzau VJ, Levine R, Barrett G, Witty A. (2021). Decarbonizing the US health sector-a call to action. N Engl J Med. 2021;385(23):2117-19. https://doi.org/10.1056/NEJMp2115675.
8. WHO. Over 40 million health professionals demand bold health and climate action at COP28News [Fact sheet]. https://www.who.int/news/item/02-12-2023-over-40-million-health-professionals-demand-bold-health-and-climate-action-at-cop28. (2023) . Accessed 10 Jun 2024.
9. WHO. Operational framework for building climate resilient and low carbon health systems. https://www.who.int/publications/i/item/9789240081888. Accessed 10 Jun 2024. (2023). Accessed 10 Jun 2024.
10. U.S. Bureau of Labor Statistics. Registered nurses. https://www.bls.gov/ooh/healthcare/registered-nurses.htm#tab-6. (2023). Accessed 10 Jun 2024.
11. Luque-Alcaraz OM, Aparicio-Martinez P, Gomera A, Vaquero-Abellan M. (2022). Nurses as agents for achieving environmentally sustainable health systems: A bibliometric analysis. J Nurs Manag. 2022;30(8):3900–8. https://doi.org/10.1111/jonm.13798.
12. National League for Nursing. Climate change and health. https://www.nln.org/news/newsroomnln-position-documents/nln-vision-series. (2022). Accessed 10 Jun 2024.
13. Poindexter K. Global Code Red: Nursing Education's Call to Climate Change. Nurs Educ Perspect. 2023;44(2):73-4. https://doi.org/10.1097/01.NEP.0000000000001103.
14. Örs M. A Measurement of the Environmental Literacy of Nursing Students for a Sustainable Environment. Sustainability. 2022;14(17):11003. https://doi.org/10.3390/su141711003.
15. Ergin E, Altinel B, Aktas E. A mixed method study on global warming, climate change and the role of public health nurses from the perspective of nursing students. Nurse Educ Today. 2021;107:105144. https://doi.org/10.1016/j.nedt.2021.105144.
16. Shaw E, Walpole S, McLean M, Alvarez-Nieto C, Barna S, Bazin K, et al. AMEE Consensus Statement: Planetary health and education for sustainable healthcare. Med Teach. 2021;43(3):272-86. https://doi.org/10.1080/0142159X.2020.1860207.
17. İncesu O, Yas MA. The relationship between nursing students' environmental literacy and awareness of Global Climate Change. Public Health Nurs. 2024;41:67–76. https://doi.org/10.1111/phn.13255.
18. Tahkol D, Öztürk Haney M. Determinants of Turkish nursing students' attitudes towards sustainable development and knowledge of climate change: A descriptive and correlational study. Public Health Nurs. 2023;1-12. https://doi.org/10.1111/phn.13270.
19. Álvarez-Nieto C, Richardson J, Navarro-Perán MÁ, Tutticci N, Huss N, Elf M, Anaker A, Aronsson J, Baid H, López-Medina IM. Nursing students' attitudes towards climate change and sustainability: A cross-sectional multisite study. Nurse Educ Today. 2022;108:105185. https://doi.org/10.1016/j.nedt.2021.105185.
20. Anåker A, Spante M, Elf M. Nursing students' perception of climate change and sustainability actions–A mismatched discourse: A qualitative, descriptive exploratory study. Nurse Educ Today. 2021;105:105028. https://doi.org/10.1016/j.nedt.2021.105028.
21. Cruz JP, Felicilda-Reynaldo RFD, Alshammari F, Alquwez N, Alicante JG, Obaid KB, et al. Factors ınfluencing arab nursing students' attitudes toward climate change and environmental sustainability and their ınclusion in nursing curricula. Public Health Nurs. 2018;35(6):598-605. https://doi.org/10.1111/phn.12516.
22. Richardson J, Clarke D, Grose J, Warwick P. A cohort study of sustainability education in nursing. Int J Sustain High Educ. 2019;20(4):747-60. https://doi.org/10.1108/IJSHE-02-2019-0064.
23. Deniz M, İnel Y, Sezer A. Awareness Scale of University Students About Global Climate Change. International Journal of Geography and Geography Education. 2021;43:252-64. https://doi.org/10.32003/igge.818561.
24. Stewart AE. (2021). Psychometric properties of the climate change worry scale. Int J Environ Res Public Health. 2021;18(2):494. https://doi.org/10.3390/ijerph18020494.

25. Gezer M, İlhan M. Climate Change Worry Scale: Turkish adaptation study. Aegean Geographical Journal. 2021;30(1):195-204. https://doi.org/10.51800/ecd.932817.
26. Richardson J, Grose J, Bradbury M, Kelsey J. Developing awareness of sustainability in nursing and midwifery using a scenario-based approach: Evidence from a pre and post educational intervention study. Nurse Educ Today. 2017;54:51-5. https://doi.org/10.1016/j.nedt.2017.04.022.
27. İlaslan N, Şahin Orak N. Sustainability attitudes in nursing survey: A cross-cultural adaptation and validation study. Journal of Human Sciences. 2023;20(3):212-22. https://doi.org/10.14687/jhs.v20i3.6352.
28. Kalogirou MR, Olson J, Davidson S. Nursing's metaparadigm, climate change and planetary health. Nurs Inq. 2020;27(3):e12356. https://doi.org/10.1111/nin.12356.
29. Cugini F, Velez EV, Gómez PR. The climate crisis and human health: Survey on the knowledge of nursing students in the Comunidad de Madrid. Nurse Educ Today. 2024;132:106041. https://doi.org/10.1016/j.nedt.2023.106041.
30. Cengiz B, Bahar Z. The characteristics of university students on environmental attitude and environmental literacy level: Example of Faculty of Nursing. Fenerbahce University Journal of Health Sciences. 2023;3(2):161-74. https://doi.org/10.56061/fbujohs.1210065.
31. Gaudreau C, Guillaumie L, Jobin É, Diallo TA. Nurses and Climate Change: A Narrative Review of Nursing Associations' Recommendations for Integrating Climate Change Mitigation Strategies. Can J Nurs Res. 2024. https://doi.org/10.1177/08445621241229932.
32. Hou Q, Han M, Qu F, He JS. Understanding social media beyond text: A reliable practice on Twitter. Comput Soc Netw. 2021;8:1-20. https://doi.org/10.1186/s40649-021-00088-x.
33. Portela Dos Santos O, Melly P, Joost S, Verloo H. Climate change, environmental health, and challenges for nursing discipline. Int J Environ Res Public Health. 2023;20(9):5682.https://doi.org/10.3390/ijerph20095682.
34. Amerson RM, Boice O, Mitchell H, Bible J. Nursing faculty's perceptions of climate change and sustainability. Nurs Educ Perspect. 2022;43(5):277-82. https://doi.org/10.1097/01.NEP.0000000000000991.
35. Hickman C, Marks E, Pihkala P, Clayton S, Lewandowski RE, Mayall EE, Wray B, Mellor C, Van Susteren L. Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. Lancet Planet Health. 2021;5(12):e863-73. https://doi.org/10.1016/S2542-5196(21)00278-3.
36. Parmentier ML, Weiss K, Aroua A, Betry C, Rivière M, Navarro O. The influence of environmental crisis perception and trait anxiety on the level of eco-worry and climate anxiety. J Anxiety Disord. 2024;101:102799. https://doi.org/10.1016/j.janxdis.2023.102799.
37. Atta MHR, Zoromba MA, El-Gazar HE, Loutfy A, Elsheikh MA, El-Ayari OSM, Sehsah I, Elzohairy NW. Climate anxiety, environmental attitude, and job engagement among nursing university colleagues: A multicenter descriptive study. BMC Nurs. 2024;23(1):1-14. https://doi.org/10.1186/s12912-024-01788-1.
38. Zacher H, Rudolph CW. Environmental knowledge is inversely associated with climate change anxiety. Clim Change. 2023;176(4):32. https://doi.org/10.1007/s10584-023-03518-z.
39. Greaves S, Harvey C, Kotera Y. Exposure to Climate Change Information on Affect and Pro-Environmental Behavioural Intentions: A Randomised Controlled Trial. Earth. 2023;4(4):845-58. https://doi.org/10.3390/earth4040045.
40. Torre GL, Sestili C, Cocchiara RA, Barbato D, Mannocci A, Del Cimmuto A. Knowledge and perception about climate change among healthcare professionals and students: A cross-sectional study. South East Eur J Public Health. 2023;8. https://doi.org/10.56801/seejph.vi.155.
41. Ramírez-López AS, Rosetti MF, Poma A. Gender, exposure to news, knowledge about climate change, and prosociality predict climate anxiety scores in Mexican students. Ecopsychology. 2023;15(2):184-92. https://doi.org/10.1089/eco.2022.0049.
42. Pihkala P. Anxiety and the ecological crisis: An analysis of eco-anxiety and climate anxiety. Sustainability. 2020;12(19):7836. https://doi.org/10.3390/su12197836.
43. Innocenti M, Perilli A, Santarelli G, Carluccio N, Zjalic D, Acquadro Maran D, Ciabini L, Cadeddu C. How does climate change worry influence the relationship between climate change anxiety and eco-paralysis? A moderation study. Climate. 2023;11(9): 190. https://doi.org/10.3390/cli11090190.
44. Yerkes RM, Dodson JD. The relation of strength of stimulus to rapidity of habit-formation. Punishment: Issues and Experiments. 1908;18(5):27–41. https://doi.org/10.1002/cne.920180503.

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