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Artificial intelligence anxiety among nursing and midwifery students: the role of resistance to change - a cross-sectional study

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Abstract

Objective This study aimed to determine the levels of resistance to change and artificial intelligence (AI) anxiety among nursing and midwifery students and to examine the association between these variables.

Methods This cross-sectional, descriptive-correlational study was conducted with 413 nursing and midwifery students enrolled at a state university during the 2024–2025 academic year. Data were collected using a Personal Information Form, the Resistance to Change Scale, and the Artificial Intelligence Anxiety Scale. Descriptive statistics, independent samples t-tests, one-way ANOVA, Pearson correlation analysis, and multiple linear regression analysis were performed.

Results Students demonstrated moderate levels of resistance to change (Mean = 39.15 ± 7.99) and moderate levels of AI anxiety (Mean = 44.62 ± 11.04). Based on the recommended cut-off score of 48, 45.8% of participants ($n = 189$) were classified as experiencing high AI anxiety, while 54.2% ($n = 224$) had low-to-moderate levels of AI anxiety. Among AI anxiety subdimensions, the highest mean score was observed in sociotechnical blindness. Resistance to change was positively associated with AI anxiety ($r = 0.296$, $p < 0.01$). In the regression model, resistance to change showed the strongest association with AI anxiety (B = 0.47, $p < 0.001$), while gender and academic department were also significantly associated. The final model explained 14.1% of the variance in AI anxiety ($R^2 = 0.141$).

Conclusion Higher levels of resistance to change are associated with increased AI anxiety among nursing and midwifery students. These findings suggest that resistance to change represents a modifiable psychological factor that may be addressed through educational interventions, alongside technical AI skill development, within digital transformation initiatives in health professions education.

Keywords Artificial intelligence anxiety, Resistance to change, Nursing and midwifery students, Health education, Digital transformation

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Introduction

Rapid technological advancements have led to significant transformations in healthcare, with artificial intelligence (AI) increasingly integrated into both administrative and clinical processes. AI applications are now widely used to support healthcare management, clinical decision-making, and diagnostic practices, contributing to efficiency, accuracy, and error reduction [1–3]. Driven by population ageing, the growing burden of chronic diseases, and increasing demands on health systems, investments in AI technologies in healthcare continue to expand globally; however, the integration of AI also raises important concerns [4]. In particular, questions have been raised regarding the potential impact of AI on human interaction and caring relationships, leading to concerns about a diminished human element in healthcare delivery [5]. At the same time, AI is recognized for its potential to enhance clinical workflows and improve diagnostic performance, highlighting a complex balance between perceived benefits and emerging psychological concerns related to technology adoption [6].

Alongside these developments, anxiety related to AI is increasingly observed among healthcare professionals and students, and emerging evidence suggests that such concerns extend beyond educational settings into clinical practice, influencing professional confidence and technology-related decision-making [7]. Johnson and Verdicchio (2017) conceptualize *artificial intelligence anxiety* as an emotional response characterized by fear and uncertainty regarding the loss of control over AI systems or their potential misuse [8]. Misunderstandings about AI capabilities and uncertainty about its implications are among the primary sources of this anxiety. In addition, concerns about the impact of AI on the workforce-such as changes in professional roles, job displacement, and the restructuring of existing job descriptions-have been shown to further intensify AI-related anxiety [9].

From a theoretical perspective, students' responses to artificial intelligence can be understood within frameworks that emphasize both technological acceptance and psychological readiness for change. The Technology Acceptance Model (TAM) posits that individuals' adoption of new technologies is shaped not only by perceived usefulness and ease of use, but also by affective and cognitive responses that influence attitudes toward technology [10, 11]. Within this context, resistance to change represents a key psychological barrier that may hinder technology acceptance by amplifying uncertainty, perceived threat, and emotional discomfort [12]. (Oreg, 2006). When technological change is perceived as rapid, complex, or disruptive, resistance to change may manifest as anxiety toward artificial intelligence, particularly in educational environments where students are expected to integrate emerging technologies into their future professional roles [12, 13].

The integration of AI into health professions education requires not only the acquisition of technical competencies but also students' ability to adapt psychologically to ongoing technological change [14]. In human-centred disciplines such as nursing and midwifery, students may be particularly cautious toward technological innovations due to the traditionally relational nature of care. *Resistance to change* refers to the cognitive, emotional, and behavioural reactions individuals experience when transitioning from familiar practices to new methods, and it may be more pronounced in healthcare contexts where adherence to traditional practices is strong [15]. Consequently, adaptation to digital health technologies among nursing and midwifery students requires not only technical knowledge but also psychological acceptance and openness to change. Nursing and midwifery students are often considered together in educational research, as both groups are trained within human-centred care paradigms and are increasingly expected to engage with digital health technologies during their education and future professional practice.

Existing literature suggests a strong association between resistance to change and AI anxiety. International studies indicate that individuals with higher levels of resistance to change tend to experience greater AI-related anxiety, which negatively affects their attitudes toward technology and their adaptation processes [16, 17]. Moreover, students' prior experiences with technology and their perceived competence play a critical role in shaping AI anxiety. Higher levels of AI-related self-efficacy have been associated with lower anxiety, whereas students who perceive themselves as less competent report higher levels of uncertainty, threat perception, and academic stress [18]. In addition, knowledge about AI, technology usage habits, and trust in AI systems have been identified as significant predictors of AI anxiety among students [19].

Beyond anxiety, the integration of AI into educational settings prompts students to re-evaluate their future professional roles. Concerns that AI may replace or diminish the human element in clinical decision-making significantly influence students' attitudes toward technology adoption [20, 21]. Therefore, the success of digital transformation in health education is closely linked to students' psychological readiness and openness to change.

Despite growing interest in AI-related issues in health professions education, no previous study has simultaneously examined resistance to change and AI anxiety among nursing and midwifery students. Addressing this gap, the present study aims to investigate the relationship between resistance to change and artificial intelligence anxiety among nursing and midwifery students. By identifying psychological barriers in the digital transformation of health education, this study seeks to contribute to the development of targeted educational strategies that support students' needs and facilitate the effective adoption of health technologies.

Aim of the study

The aim of this study was to examine the levels of resistance to change and artificial intelligence anxiety among nursing and midwifery students and to investigate the relationship between these two variables.

Objectives of the study

The specific objectives of the study were to:

1. Determine the levels of resistance to change among nursing and midwifery students,
2. Assess the levels of artificial intelligence anxiety among nursing and midwifery students,
3. Examine the relationship between resistance to change and artificial intelligence anxiety.

Methods

Study design

This study was conducted using a descriptive–correlational, cross-sectional design to examine the association between resistance to change and artificial intelligence (AI) anxiety among nursing and midwifery students.

Population and Sample

Study Population

The study population consisted of 614 undergraduate students enrolled in the Faculty of Health Sciences at Sinop University during the 2024-2025 spring semester, including 118 midwifery and 496 nursing students

Sample Size and Sampling Procedure

The minimum required sample size was calculated using the Sample Size for Frequency in a Population module of OpenEpi Version 3.01. Assuming an unknown prevalence of 50%, a margin of error of 5%, a confidence level of 99%, and a design effect of 1 (DEFF = 1), the minimum sample size was determined to be 320 students. A total of 413 students were reached through face-to-face data collection, exceeding the minimum sample size requirement and thereby increasing the statistical power of the study.

A non-probability convenience sampling method was used. Students who met the inclusion criteria and voluntarily agreed to participate were included in the study.

Inclusion criteria

Participants were included if they:

- were 18 years of age or older,
- were enrolled in the nursing or midwifery undergraduate program,
- were able to read, write, and speak Turkish, and.
- provided voluntary informed consent to participate in the study.

Study variables

- Dependent variable: Level of artificial intelligence anxiety.
- Independent variables:
    - Sociodemographic characteristics of students
    - Total and subscale scores of the Resistance to Change Scale

Data collection instruments

Data were collected using a Personal Information Form, the Resistance to Change Scale, and the Artificial Intelligence Anxiety Scale.

Personal information form

The Personal Information Form was developed by the researchers based on the literature and consisted of 12 items assessing students' sociodemographic characteristics, parental information, and professional-related variables.

Resistance to change scale

The Resistance to Change Scale, originally developed by Oreg (2006) and adapted into Turkish by Çalışkan (2019), was used to assess students' levels of resistance to change [12, 22]. The scale consists of 15 items across three subdimensions: Cognitive Reaction (items 1–5), Emotional Reaction (items 6–10), and Behavioral Reaction (items 11–15). Items are rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Items 4, 5, 8, and 15 are reverse-coded. Total scores range from 15 to 75, with higher scores indicating greater resistance to change [18]. In the current sample, the internal consistency of the Resistance to Change Scale was good (Cronbach's $\alpha = 0.821$). Cronbach's α coefficients for the subdimensions were 0.713 for Cognitive Reaction, 0.729 for Emotional Reaction, and 0.708 for Behavioral Reaction.

Artificial intelligence anxiety scale

AI anxiety was measured using the Artificial Intelligence Anxiety Scale developed by Wang and Wang (2022) and adapted into Turkish by Akkaya et al. [9, 23]. The scale consists of 16 items rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The Turkish adaptation reported a Cronbach's alpha coefficient of 0.937.

The scale includes four subdimensions: Learning Anxiety (items 1–5), Job Replacement Anxiety (items 6–9), Sociotechnical Blindness (items 10–13), and AI Configuration Anxiety (items 14–16). Total scores range from 16 to 80, with higher scores indicating higher levels of AI anxiety. A cut-off score of 48 was used, with scores ≥ 48 indicating high AI anxiety and scores < 48 indicating low-to-moderate anxiety [22]. In the current sample, the Artificial Intelligence Anxiety Scale demonstrated excellent internal consistency (Cronbach's α = 0.923). Cronbach's α coefficients for the subdimensions were 0.933 for Learning Anxiety, 0.891 for Job Replacement Anxiety, 0.871 for Sociotechnical Blindness, and 0.940 for AI Configuration Anxiety.

Data analysis

Data analysis was performed using SPSS version 22.0. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to summarize the data. Normality of continuous variables was assessed using skewness and kurtosis values, the Shapiro–Wilk test, and visual inspection of histograms and Q-Q plots. Scale total scores were found to meet the assumptions of normal distribution.

Independent samples *t*-tests and one-way ANOVA were used to compare scale scores across groups, with Levene's test applied to assess homogeneity of variances. Pearson correlation analysis was conducted to examine relationships between scale scores.

Multiple linear regression analysis was performed to identify predictors of AI anxiety. Candidate variables (resistance to change, gender, department, and family income) were initially included in the model, and non-significant variables were removed to obtain a parsimonious final model. Regression assumptions, including normality of residuals, linearity, multicollinearity, and homoscedasticity, were assessed and met. Statistical significance was set at $p < 0.05$.

Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki and the national ethical standards of Turkey. Ethical approval for the study was obtained from the Sinop University Human Research Ethics Committee (Decision date: 15.05.2025; Decision no: 2025/223). Institutional permission was also obtained from the Faculty of Health Sciences prior to data collection.

Data were collected face to face during the 2024–2025 spring semester in classroom settings. Participants were informed about the study purpose, voluntary participation, their right to withdraw at any time, and confidentiality of their data. Written informed consent was obtained from all participants. To ensure anonymity, no identifying information was collected, and questionnaires were coded numerically. Completion of the questionnaires took approximately 10–12 min.

Results

Preliminary assumption testing

Before conducting parametric analyses, assumptions of normality and homogeneity of variance were evaluated. Based on the Shapiro-Wilk test results, skewness and kurtosis values, and visual inspection of Q-Q plots, the data were found to be sufficiently normally distributed for parametric analyses.

Participant characteristics

A total of 413 students participated in the study. The mean age of the participants was 20.96 ± 2.13 years, with an age range of 18 to 39 years. The majority of the sample consisted of female students (78.5%) and students enrolled in the nursing program (74.8%). With regard to academic year, approximately one-third of the students were in their third year of study (33.9%).

More than half of the participants reported living primarily in a city center (55.2%), and most had a nuclear family structure (77.5%). Mothers' education levels were predominantly primary school (45.5%) and middle school (24.0%), while fathers' education levels were mainly primary school (25.7%), middle school (25.4%), and high school (31.5%).

Regarding perceived family income, 73.1% of participants reported that their income was equal to their expenses, 14.5% reported income lower than expenses, and 12.3% reported income higher than expenses. Participants reported their perceived monthly family income, with a mean of 45,661 ± 19,679 Turkish Lira (range: 10,000–150,000 TL).This distribution suggests that a substantial proportion of the sample fell within lower-to-middle income categories (Table 1).

Levels of resistance to change

Analysis of the Resistance to Change Scale total scores revealed that students' overall resistance to change was at a moderate level (Mean = 39.15). Within the theoretical range of the scale (15–75), this score corresponds to a moderate position, positioning the mean score at a moderate level within the scale range.

At the subscale level, the highest mean score was observed in the Behavioral Reaction dimension (Mean = 13.71), with the highest mean score observed in the Behavioral Reaction subscale. This indicates a greater tendency toward observable behaviors such as reluctance, postponement, or avoidance during change processes.

In contrast, the lowest mean score was found in the Cognitive Reaction dimension (Mean = 12.57), suggesting relatively greater cognitive flexibility and openness to

Table 1 Sociodemographic characteristics of participants ($n = 413$)

Variable	Category	*n*	%
Gender	Female	324	78.5
	Male	89	21.5
Department	Nursing	309	74.8
	Midwifery	104	25.2
Academic year	1st year	117	28.3
	2nd year	111	26.9
	3rd year	140	33.9
	4th year	45	10.9
Longest place of residence	City	228	55.2
	Town	147	35.6
	Small town	5	1.2
	Village	33	8.0
Family type	Nuclear	320	77.5
	Extended/Separated	93	22.5
Mother's education	Primary school	188	45.5
	Middle school	99	24.0
	High school	90	21.8
	University	36	8.7
Father's education	Primary school	106	25.7
	Middle school	105	25.4
	High school	130	31.5
	University	72	17.4
Perceived family income	Income < expenses	60	14.5
	Income = expenses	302	73.1
	Income > expenses	51	12.3

Table 2 Subscale and total scores of the resistance to change scale

Scale	Min	Max	Mean	SD
Cognitive Reaction (5–25)	5	25	12.57	3.29
Emotional Reaction (5–25)	5	23	12.86	3.53
Behavioral Reaction (5–25)	5	25	13.71	2.92
Total Resistance to Change (15–75)	17	68	39.15	7.99

understanding and mentally accepting change. Overall, these findings indicate that resistance to change among students was more strongly reflected in behavioral responses than in cognitive reactions (Table 2).

Levels of artificial intelligence anxiety

Analysis of the Artificial Intelligence Anxiety Scale total scores indicated that students' overall AI anxiety levels were moderate (Mean = 44.62 ± 11.04; Min = 16, Max = 80). Based on the recommended cut-off score of 48, 45.8% of participants ($n = 189$) were classified as experiencing high AI anxiety, while 54.2% ($n = 224$) had low-to-moderate levels of AI anxiety.

Among the subdimensions, the highest mean score was observed in the Sociotechnical Blindness dimension (Mean = 13.01 ± 3.56), reflecting higher mean scores related to concerns about the potential misuse of AI technologies, loss of societal control, and unintended systemic consequences.

Table 3 Artificial intelligence anxiety scale scores ($n = 413$)

Scale / Subdimension	Min	Max	Mean	SD
Total AI Anxiety (16–80)	16	80	44.62	11.04
Learning Anxiety (Y1-Y5; 5–25)	5	25	10.87	4.04
Job Replacement Anxiety (Y6-Y9; 4–20)	4	20	12.20	3.61
Sociotechnical Blindness (Y10-Y13; 4–20)	4	20	13.01	3.56
AI Configuration Anxiety (Y14-Y16; 3–15)	3	15	8.54	3.08

The Learning Anxiety subdimension also demonstrated a notable mean score (Mean = 10.87 ± 4.04), indicating elevated mean scores in domains related to cognitive and emotional anxiety related to learning AI applications, developing competence in working with AI technologies, and adapting to evolving digital skill requirements.

Moderate levels of anxiety were also observed in the Job Replacement Anxiety (Mean = 12.20 ± 3.61) and AI Configuration Anxiety (Mean = 8.54 ± 3.08) subdimensions. These findings suggest that students experienced a degree of uncertainty and perceived threat regarding potential changes in professional roles, employment security, and the increasing autonomy or human-like features of AI systems. Overall, both total and subscale scores indicate that students' perceptions of AI technologies were shaped within a multidimensional anxiety framework (Table 3).

Associations between AI anxiety and sociodemographic variables

A statistically significant positive correlation was found between age and AI anxiety ($r = 0.108$, $p = 0.029$), indicating a slight increase in AI anxiety with increasing age. A positive and significant correlation was also observed between monthly family income and AI anxiety ($r = 0.143$, $p = 0.004$), indicating a weak positive association between family income and AI anxiety.

Comparisons by gender revealed that female students had significantly higher AI anxiety scores than male students (t = -3.04, $p = 0.003$). A statistically significant difference in AI anxiety levels was observed between nursing and midwifery students (t = 3.94, $p < 0.001$), with higher scores observed among midwifery students.

No statistically significant differences in AI anxiety were observed according to academic year, longest place of residence, family type, or maternal and paternal education levels ($p > 0.05$) (Table 1).

When AI anxiety levels were categorized using the recommended cut-off score (≥ 48), 48.3% of female students and 37.1% of male students were classified as having high AI anxiety. In terms of academic department, high AI anxiety was observed in 56.3% of midwifery students compared to 42.4% of nursing students. These findings indicate that female students and midwifery students constitute groups with a higher prevalence of elevated AI anxiety.

Correlation between resistance to change and AI anxiety

Pearson correlation analysis revealed a significant positive association between total resistance to change scores and total AI anxiety scores ($r = 0.296$, $p < 0.001$). At the subdimension level, the strongest correlation was observed between resistance to change and Learning Anxiety ($r = 0.465$, $p < 0.001$).

Additionally, low but statistically significant positive correlations were found between resistance to change and Job Replacement Anxiety ($r = 0.125$, $p = 0.011$) as well as AI Configuration Anxiety ($r = 0.220$, $p < 0.001$). In contrast, no significant correlation was observed between resistance to change and the Sociotechnical Blindness subdimension ($r = 0.071$, $p = 0.150$). No statistically significant association was observed between resistance to change and sociotechnical blindness (Table 4).

Table 4 Correlations between resistance to change and artificial intelligence anxiety

AI Anxiety Variable	*r*	*p*
Total AI Anxiety	0.296	< 0.001
Learning Anxiety	0.465	< 0.001
Job Replacement Anxiety	0.125	0.011
Sociotechnical Blindness	0.071	0.150
AI Configuration Anxiety	0.220	< 0.001

Predictors of artificial intelligence anxiety

Multiple linear regression analysis was conducted to examine the combined effects of resistance to change and selected sociodemographic variables on AI anxiety. Candidate variables included total resistance to change score, gender, academic department, and monthly family income. As the coefficient for monthly family income was not statistically significant in the initial model ($p > 0.05$), this variable was excluded using a stepwise approach. The final model included resistance to change, gender, and academic department (Table 5).

The final regression model was statistically significant ($F(3, 409) = 22.30$, $p < 0.001$) and explained 14.1% of the variance in AI anxiety ($R^2 = 0.141$; adjusted $R^2 = 0.134$). Resistance to change emerged as a significant positive predictor of AI anxiety ($B = 0.47$, $SE = 0.07$, $p < 0.001$), indicating that higher resistance to change was associated with higher AI anxiety and showing the largest standardized coefficient among the variables included in the model.

Among the sociodemographic variables, gender was a significant predictor ($B = -3.15$, $p = 0.015$), indicating that male students had AI anxiety scores approximately 3.15 points lower than female students when other variables were held constant. Similarly, academic department was a significant predictor ($B = -4.33$, $p = 0.001$), with nursing students reporting AI anxiety scores approximately 4.33 points lower than midwifery students. The proportion of unexplained variance suggests that additional psychosocial and environmental factors may also contribute to AI anxiety among students. The 95% confidence intervals for the regression coefficients did not cross zero, further supporting the robustness of the observed associations.

Discussion

This study examined the relationship between resistance to change and artificial intelligence (AI) anxiety among nursing and midwifery students. Overall, the findings underscore the importance of psychological readiness for change in shaping students' responses to emerging AI technologies in health professions education.

In the present sample, resistance to change was at a moderate level, indicating that students were neither strongly resistant to change nor fully open to innovations. Notably, behavioral reactions were higher than the cognitive and emotional dimensions. This pattern suggests that even when students can cognitively appraise and make sense of change, they may experience greater difficulty translating this appraisal into their daily practices and behavioral routines. Oreg's conceptualization of resistance to change as a multidimensional construct highlights that behavioral resistance can be particularly influential in shaping adaptation during change processes, especially in practice-based fields such as healthcare where students are expected to apply new approaches under conditions of responsibility and uncertainty [12]. In such contexts, behavioral resistance may hinder the uptake of new technologies (e.g., AI-enabled applications) and may be accompanied by heightened uncertainty and anxiety. However, not all studies report strong associations between psychological

Table 5 Multiple linear regression analysis predicting artificial intelligence anxiety

Variable	B	SE(B)	β	t	*p*	95% CI for B
Constant	41.728	1.602	—	26.04	< 0.001	31.64 to 43.94
Resistance to Change (total)	0.470	0.071	0.339	6.65	< 0.001	0.34 to 0.59
Gender (0 = Female, 1 = Male)	-3.152	1.292	-0.123	-2.44	0.015	-5.69 to -0.60
Department (0 = Midwifery, 1 = Nursing)	-4.329	1.293	-0.168	-3.35	0.001	-6.86 to -1.8

Gender was coded as 0 = female and 1 = male; department was coded as 0 = midwifery and 1 = nursing

$R = 0.376$ $R^2 = 0.141$ Adjusted $R^2 = 0.134$ $F(3, 409) = 22.30$ $p < 0.001$

or demographic factors and AI-related attitudes. For example, Wolfe et al. (2024), using an extended UTAUT framework, reported that demographic variables accounted for limited variance in AI adoption and usage, while emotional responses such as anxiety exhibited small but context-dependent differences across groups [24]. This suggests that the strength of resistance-anxiety relationships may vary across settings and populations, underscoring the importance of contextual and organizational factors when interpreting such associations.

While behavioral resistance appears to influence how students adapt to AI in practice, this influence does not extend uniformly across all dimensions of AI anxiety. Notably, resistance to change was not significantly associated with the sociotechnical blindness subdimension, suggesting that ethical and societal concerns about artificial intelligence may operate independently from individuals' psychological readiness for change. This finding aligns with emerging evidence indicating that sociotechnical apprehensions constitute a distinct dimension of students' responses to AI technologies, reflecting broader normative and ethical evaluations rather than reactions to practical or skill-based change [25, 26]. From an educational perspective, this distinction implies that resistance to change may be more effectively addressed through experiential learning strategies such as hands-on training and simulations, whereas sociotechnical concerns require pedagogical approaches emphasizing ethics, governance, accountability, and critical reflection [25, 26, 27]. Accordingly, the absence of an association between resistance to change and sociotechnical blindness underscores the need for educational strategies that separately address practical adaptation and ethical–societal dimensions of AI in nursing and midwifery education.

Students' overall AI anxiety was moderate, and nearly half of the participants exceeded the suggested cut-off, indicating that AI anxiety is a salient concern among nursing and midwifery students. Consistent with prior studies, this anxiety may reflect uncertainties about changing professional roles, the boundaries of AI in care, and ethical implications, concerns that are also reported by practicing nurses as AI becomes more integrated into clinical practice [7, 20, 28]. Similar anxieties have been described in other health disciplines, including medical students, suggesting that AI anxiety is not unique to a single profession; however, its drivers may vary by professional identity and curricular exposure to digital technologies [29, 30]. In nursing and midwifery, the emphasis on relational, human-centred care may heighten sensitivity to sociotechnical and ethical issues surrounding AI.At the subdimension level, sociotechnical blindness showed the highest mean score, indicating that students' AI anxiety is strongly shaped by concerns about human oversight, ethical boundaries, data security, and potential misuse of AI systems, consistent with the multidimensional framework of AI anxiety [9]. Learning anxiety was also notable, suggesting that students may experience burden when acquiring AI-related skills and adapting to evolving digital competency expectations. Evidence indicates that greater AI literacy and perceived competence are associated with lower anxiety, whereas limited knowledge and experience may amplify learning-related concerns [18, 19]. Together, these patterns highlight that sociotechnical-ethical apprehensions may require educational strategies (e.g., ethics, governance, accountability) that differ from approaches aimed primarily at improving skills and confidence.

At the subdimension level, the highest AI anxiety score was observed for sociotechnical blindness. This suggests that AI anxiety among students extends beyond individual learning competence to include broader concerns about controllability, ethical boundaries, data security, and the potential misuse of AI technologies. This pattern is consistent with the multidimensional framework proposed by Wang and Wang (2022), who argue that anxiety intensifies when AI is perceived as a system that could exceed human oversight [9]. Learning anxiety also showed a notable mean score, indicating that students may experience cognitive and emotional burden when attempting to learn AI-related skills and adapt to evolving digital competency expectations. Prior work suggests that greater AI literacy and technical competence are associated with lower anxiety, whereas limited knowledge and experience can amplify learning-related concerns [18, 19]. Accordingly, the sociotechnical and learning-related concerns observed in this study may be linked to perceived uncertainty and gaps in competence. These findings suggest that ethical and societal concerns about AI may require educational strategies distinct from those aimed at reducing individual resistance to change.

One of the most notable findings of this study is that resistance to change emerged as a significant and stronger predictor of AI anxiety than sociodemographic variables. In the regression model, each one-unit increase in resistance to change was associated with an approximate 0.47-point increase in AI anxiety, suggesting that resistance to change functions as a meaningful psychological correlate of AI-related anxiety among students. Consistent with prior evidence, individuals with higher resistance to change may be more likely to interpret technological innovations as uncertain or threatening, thereby experiencing elevated stress and reduced readiness to adopt new technologies [16, 17]. However, previous studies have demonstrated that the relationships between psychological factors and technology-related anxiety are often weaker or context-dependent, varying across educational environments, levels of technological exposure, and cultural settings [31, 32, 33]. One possible explanation for resistance to change emerging as a stronger predictor in the present study lies in the nature of artificial intelligence as a disruptive rather than incremental innovation. Disruptive technologies have the potential to fundamentally alter professional roles, workflows, and decision-making structures rather than gradually extending established practices [34, 35]. In healthcare contexts, such transformations may challenge perceptions of professional autonomy and control, eliciting affective responses such as uncertainty, threat perception, and anxiety. From a change psychology perspective, these responses are more closely aligned with resistance to change than with relatively stable demographic characteristics [12, 36]. Accordingly, resistance to change may reflect students' subjective appraisal of AI-driven disruption, which can override the influence of gender or academic department when predicting AI anxiety. This interpretation is also consistent with technology acceptance frameworks emphasizing that cognitive and emotional evaluations of innovation exert stronger effects on attitudes and anxiety than demographic factors alone [11, 13]. In the present sample, this pattern suggests that AI anxiety among nursing and midwifery students is shaped less by demographic characteristics and more by how students psychologically interpret AI as a disruptive change to established care practices and professional identities.

Gender and academic department were also significant predictors of AI anxiety. Male students reported lower AI anxiety than female students, which should be interpreted alongside mixed findings in the literature. While some studies report higher AI anxiety among women [37–39], others report no significant gender differences [28], suggesting that the role of gender may vary by cultural context, academic field, and perceived technological competence. In terms of department, differences between nursing and midwifery students may be related to differential exposure to digital systems and technology-based practices within curricula. Evidence indicating that digital experience and perceived competence are associated with lower AI anxiety supports this interpretation [9, 40]. This interpretation is further supported by the higher prevalence of elevated AI anxiety observed among female students and midwifery students in the subgroup analysis.

Although the regression model was statistically significant, it explained a limited proportion of the variance in AI anxiety (14.1%), indicating that AI anxiety is likely influenced by factors beyond resistance to change and the sociodemographic variables included in the model. Potential contributors may include exposure to AI-related learning opportunities, curricular content, clinical experience, peer and media narratives, and broader sociocultural meanings attached to technology. This interpretation aligns with perspectives suggesting that AI anxiety should not be viewed solely as an individual psychological reaction, but rather as a phenomenon shaped by multiple contextual and environmental influences [41]. Consistent with this view, evidence indicates that nursing students' psychological responses to educational demands are shaped by concurrent stressors such as academic pressures and broader contextual challenges, which may indirectly influence their reactions to emerging technologies [42]. Importantly, the observed association between resistance to change and AI anxiety should not be interpreted as strictly unidirectional. While resistance to change may increase AI anxiety by framing AI as a disruptive or threatening innovation, heightened AI anxiety may, in turn, reinforce resistance by intensifying uncertainty, avoidance behaviors, and preference for established routines. Such reciprocal dynamics have been described in the change psychology and technology adoption literature, suggesting that resistance and anxiety may mutually reinforce one another during periods of technological transformation [12, 16, 17, 36]. Within this framework, the present findings are best understood as reflecting an interactive process in which psychological responses to AI both shape and are shaped by resistance to change among nursing and midwifery students.

Implications for nursing and midwifery education

The findings indicate that preparing nursing and midwifery students for AI-related changes in healthcare requires structured and actionable educational strategies that address both psychological readiness and practical engagement. First, AI literacy modules can be integrated into existing courses to introduce basic AI concepts alongside ethical dilemmas commonly encountered in clinical practice, such as data confidentiality, accountability, and decision-making responsibility. These modules may be delivered through short lectures combined with case-based discussions rather than stand-alone technical courses.

Second, simulation-based training may be used to reduce behavioral resistance by allowing students to interact with AI-supported clinical tools in a controlled learning environment. For example, simulation scenarios may include AI-assisted fetal monitoring, risk alerts, or triage recommendations, where students practice interpreting outputs while retaining clinical judgment and professional responsibility.

Finally, mentorship or role-modeling approaches can be incorporated by involving faculty members or clinicians who are familiar with digital health tools. Observing how experienced professionals critically and ethically engage with AI-supported systems may help normalize AI use, reduce uncertainty, and promote more positive attitudes toward technological change.

Conclusion

This study examined the relationship between resistance to change and AI anxiety among nursing and midwifery students. Overall, both resistance to change and AI anxiety were observed at moderate levels, and nearly half of the participants were classified as having high AI anxiety based on the suggested cut-off score. Resistance to change was more evident at the behavioral level, while cognitive reactions appeared relatively more flexible.

Sociodemographic factors such as gender and academic department were associated with AI anxiety, and higher levels of resistance to change were related to higher AI anxiety. Taken together, these findings suggest that AI anxiety among nursing and midwifery students reflects a multidimensional construct influenced by both individual and contextual factors. Within the scope of this study, the results highlight the importance of educational approaches that consider students' readiness for change and adaptation to emerging technologies.

Limitations

This study has several limitations. First, the use of convenience sampling may have introduced selection bias, as participation was limited to students who were accessible and willing to take part in the study. Consequently, the sample may not fully represent the broader population of nursing and midwifery students. In addition, the study employed a cross-sectional design, which prevents causal inferences regarding the relationships between AI anxiety and resistance to change.Second, data were collected using self-report measures, which may be subject to social desirability bias, subjective reporting errors, and common method variance, potentially inflating the observed associations. Furthermore, students' prior AI familiarity or hands-on experience was not directly assessed, which may have influenced their reported levels of AI anxiety and resistance to change. Third, the study was conducted at a single institution, which further limits the generalizability of the findings to other educational settings with different curricular structures or levels of technological exposure.Fourth, the gender distribution was unbalanced, with a predominance of female participants, which may have reduced the robustness and generalizability of gender-based comparisons. Moreover, the Resistance to Change Scale used in this study is a generic instrument and was not specifically designed to assess resistance toward technological or AI-related change, which may have limited its sensitivity to technology-specific attitudes.Finally, although associations between AI anxiety and resistance to change were examined, mediation or moderation model fit was not tested. Future research should include multi-center and longitudinal designs with more balanced samples and consider examining whether factors such as resilience, digital self-efficacy, or coping styles moderate or mediate the relationship between AI anxiety and resistance to change.

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Authors' contributions
ÖG conceptualized the study, designed the methodology, performed the statistical analyses, and drafted the manuscript.MSA contributed to data collection, data analysis, and manuscript drafting.All authors read and approved the final manuscript.

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Data availability
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests
The authors declare no competing interests.

Conflict of interest
The authors declare that they have no conflict of interest.

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