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Evaluation of health professionals' perceptions on the use of artificial intelligence in radiology: a questionnaire-based study

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Abstract

Background Artificial intelligence has become an integral part of modern radiology, improving diagnostic accuracy, workflow efficiency, and decision-making processes. However, the acceptance and effective use of artificial intelligence in healthcare largely depends on healthcare professionals' perceptions and literacy regarding these technologies. The aim of this study was to develop and validate the "Perception Scale for Artificial Intelligence in Radiologic Imaging" and to examine the factors that influence healthcare professionals' perceptions of artificial intelligence in radiology. It also aimed to determine healthcare professionals' perceptions regarding the use of artificial intelligence in radiology and to examine the factors that influence these perceptions, particularly the role of artificial intelligence literacy.

Methods This cross-sectional, questionnaire-based study was conducted between March and May 2025 among healthcare professionals working in public and private hospitals in Turkey. Data were collected from 425 participants using convenience sampling. The "Perception Scale for Artificial Intelligence in Radiologic Imaging" was developed for this study, and the "Artificial Intelligence Literacy Scale" was employed to test contextual validity. Validity and reliability were evaluated using Cronbach's Alpha, and analyses were performed with parametric tests in SPSS 26.0 and AMOS 24.

Results The Perception of Artificial Intelligence in Radiologic Imaging Scale demonstrated a valid three-dimensional structure with 14 items and high reliability. The mean perception score of healthcare professionals regarding artificial intelligence in radiologic imaging was 3.14 ± 0.66 (mean ± standard deviation), indicating a moderate level of perception. A significant positive correlation was observed between artificial intelligence literacy and perception ($r = 0.270$, $p < 0.001$), while no significant differences were found across demographic variables ($p > 0.05$).

Conclusion The study highlights that healthcare professionals in Turkey hold a moderately positive perception of artificial intelligence use in radiology. Furthermore, higher artificial intelligence literacy levels are associated with more favorable perceptions. These findings emphasize the need for educational initiatives to improve artificial intelligence literacy and foster informed, confident adoption of artificial intelligence technologies in clinical radiology practice.

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Keywords Radiological imaging, Health professionals, Artificial intelligence perception, Artificial intelligence literacy, Scale development, Digitalization in health

Introduction

Artificial intelligence technologies are rapidly spreading in radiology as in almost every field of medicine [1]. The success of deep learning and machine learning algorithms in radiological image analysis has accelerated the integration of these technologies into clinical practice [2, 3]. Artificial intelligence-based systems provide important support to radiologists in areas such as lesion detection, classification, prognostic evaluation, and workflow optimization [4, 5].

Artificial intelligence is increasingly used in the automated processing and interpretation of radiological images through machine learning and deep learning algorithms [6]. For instance, in modalities such as computed tomography (CT), magnetic resonance imaging (MRI), and mammography, artificial intelligence-based systems assist radiologists in processes such as lesion detection, classification, and prognostic evaluation [7–9]. Of note, artificial intelligence models developed by Google DeepMind have achieved results close to human accuracy in breast cancer screening [4, 10]. Similarly, artificial intelligence systems have produced promising results in detecting pathologies such as pneumonia, pulmonary embolism, and Covid-19 in chest radiography and CT images [11, 12]. However, the effective adoption of artificial intelligence in healthcare systems depends not only on technological advancements but also on healthcare professionals' perceptions and acceptance of these technologies [2].

Studies examining healthcare professionals' attitudes towards artificial intelligence are increasing. Some radiologists view artificial intelligence as a supportive tool that reduces diagnostic errors and lightens their workload [4, 13]; however, others express concerns about its potential impact on professional roles and job security [14, 15]. Speculation that artificial intelligence could replace human judgment has raised anxiety among some professionals [6]. Nevertheless, the acceptance of artificial intelligence as an assistive rather than a threatening tool is closely linked to healthcare professionals' educational background and experience. Those with higher artificial intelligence literacy tend to approach these technologies with a more positive and informed perspective [8, 14, 16].

Healthcare professionals' attitudes towards artificial intelligence are shaped by several factors, including trust, ease of use, professional autonomy, ethical awareness, and technology literacy [8, 9]. Therefore, for the successful and ethical integration of artificial intelligence in radiology, it is essential to systematically evaluate healthcare professionals' perceptions and attitudes towards these technologies [14, 17].

The growing prevalence of artificial intelligence applications in radiological imaging underscores the need to comprehensively examine perception, acceptance, and utilization levels among healthcare professionals [17]. The knowledge and awareness levels of users play a decisive role in integrating technological innovations into clinical practice. The ability of healthcare professionals to understand, evaluate, and ethically assess technology directly affects this process [4, 16]. In this context, artificial intelligence literacy stands out as a key factor that contributes to improving the quality of clinical decisions and increasing trust in technology-based systems [16, 18].

A review of the literature indicates that there are only a limited number of studies measuring healthcare professionals' attitudes and perceptions regarding artificial intelligence in radiology, and there remains a need for valid and reliable measurement tools [9, 15, 19]. Developing a comprehensive scale that assesses these perceptions is crucial both scientifically and practically, as it can guide the education of practitioners and decision-makers in healthcare institutions [1].

Based on this need, the present study was designed to develop a valid and reliable "Perception Scale for Artificial Intelligence in Radiological Imaging" and to evaluate its psychometric properties. Additionally, the study utilized the "Artificial Intelligence Literacy Scale" to test the contextual validity of the newly developed scale. The study further aimed to explore how healthcare professionals' artificial intelligence literacy levels influence their perceptions of the use of artificial intelligence in radiologic applications.

Accordingly, this research seeks to:

1. What perception do healthcare professionals have about the use of artificial intelligence in radiology?
2. Is the developed "Perception Scale for Artificial Intelligence in Radiologic Imaging" a valid and reliable measurement tool?
3. Do the demographic characteristics of health professionals (type of institution, gender, age, education level, occupation, years in the profession, etc.) lead to differences in their perceptions towards artificial intelligence in radiologic imaging?
4. Do the radiologic imaging perceptions of health professionals who have previous experience with artificial intelligence technologies differ from those who do not?

5. How does the level of artificial intelligence literacy affect health professionals' perceptions of radiologic artificial intelligence applications?
6. What kind of effects do awareness, usage, evaluation and ethical levels of artificial intelligence have on health professionals' general perceptions of technologies in radiologic imaging?

The findings of this study will make an important contribution to the evaluation of health professionals' attitudes towards the use of artificial intelligence in radiology. The developed scale will contribute to the literature as a valid and reliable tool that can be applied in future studies. In addition, evaluating the relationship between artificial intelligence literacy and perceptions will provide important information in terms of shaping educational programs. Finally, the analysis of ethical and security concerns may provide guidance for managers and technology developers in the field of healthcare.

Methods

Research design

This study employed a quantitative, cross-sectional research design to determine healthcare professionals' perceptions of artificial intelligence in radiology. A structured questionnaire was used as the data collection tool. A convenience sampling method was applied, as participation was voluntary and based on accessibility of healthcare professionals.

Research population and sample

The population of the study consists of a group of 1500 healthcare professionals in total, including approximately 1000 healthcare professionals working at Hatay Mustafa Kemal University Hospital and approximately 500 healthcare professionals working at Private Başarı Hospital operating in Turkey. Participation in the study was completely voluntary and convenience sampling was preferred as the sampling method. According to the sample size calculation made with a 95% confidence level and 5% margin of error considering the population size, it is accepted that at least 306 participants are sufficient to represent the research population [20, 21]. In this framework, data were obtained from a total of 425 health professionals within the specified data collection period. This sample size was considered to be sufficient for the analysis conducted within the scope of the research.

Data collection tools of the study

The data of the study were collected through both face-to-face and online survey applications (Google Forms) between March and May 2025. The questionnaires were administered to healthcare professionals on a voluntary basis and using convenience sampling method. Ethical consent was obtained from the participants through the informed consent text in the introduction section of the questionnaire form.

During the data collection process, three different measurement tools were used to determine the demographic characteristics of the participants and to measure the variables in the study: "Personal Information Form", "Perception Scale for Artificial Intelligence in Radiologic Imaging" and "Artificial Intelligence Literacy Scale". Through these forms, data on both descriptive information and the variables that the study focused on were obtained.

Before the main data collection, all instruments were pilot-tested with 50 healthcare professionals to assess clarity, comprehensibility, and timing. Minor linguistic revisions were made based on pilot feedback to ensure the usability and reliability of the survey form.

Personal information form

The demographic data of the health professionals participating in the study were obtained through statements regarding the type of institution where the participants work, their age, gender, education level, occupation, years of experience in the profession, whether they have used artificial intelligence applications before, and their level of knowledge about artificial intelligence.

Perception scale for artificial intelligence in radiologic imaging

Perception of artificial intelligence in radiologic imaging refers to health professionals' thoughts, attitudes and beliefs about the role, capabilities, limitations and effects of artificial intelligence in medical imaging. This concept encompasses various elements such as awareness, knowledge, trust, acceptance and concern about artificial intelligence technologies utilized in medical imaging. A pool of questions was created by examining the literature and considering the "Perception of Artificial Intelligence in Radiologic Imaging" in the society [1, 2, 5, 6, 9–13, 15–17]. The question pool was evaluated by taking expert opinions, and the draft form was determined as 16 items. The initial 16 items were generated through an extensive literature review and qualitative feedback from radiologists, technologists, and healthcare management experts to ensure content relevance. Each item was evaluated for conceptual clarity, redundancy, and linguistic simplicity. Based on expert consensus and item-total correlation analyses, two items that demonstrated overlapping meanings and low factor loadings were removed, resulting in a final set of 14 items. This systematic refinement ensured that each dimension—benefit, concern, and future perception—was theoretically and empirically well represented. The scale prepared in 5-point Likert type was graded as '1 - Strongly disagree, 2 - Disagree, 3 - Somewhat agree, 4 - Agree, 5 - Strongly agree'. As a result of the analyses presented under the heading of reliability and validity in the methodology section of the study, a final scale form consisting of 14 items and three dimensions was formed. The perception of artificial intelligence in radiologic imaging is shown to be declining as the individuals' mean score gets nearer 1, and increasing as it approaches 5. It was observed that the data of the scale was highly reliable.

Artificial intelligence literacy scale

In addition to the Perception Scale for Artificial Intelligence, the "Artificial Intelligence Literacy Scale", developed by Wang et al. [22] and adapted into Turkish by Polatgil ve Güler [23], was used to evaluate the context validity of the scale. The scale consists of four sub-dimensions: awareness, use, evaluation, and ethics, and includes a total of 12 items. All items were organized on a 5-point Likert-type rating system, and participants were asked to mark the appropriate option from '1 = Strongly disagree' to '5 = Strongly agree' for each statement. The total score obtained from the scale is calculated by averaging the item scores. Accordingly, a score approaching 5 indicates that the participant's artificial intelligence literacy level is high, while a score approaching 1 indicates that it is low. There are three statements among the scale items that require reverse coding. As a result of the reliability analysis conducted during the adaptation of the scale into Turkish, the internal consistency coefficient (Cronbach's Alpha) was reported as 0.939 [23].

Analysis of research data

The validity and reliability analyses of the scale data obtained in the study were conducted using SPSS 26.0 and AMOS 24 software. Item-total score correlations, Cronbach's Alpha internal consistency coefficient, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) methods were used to evaluate the validity and reliability of the scale. In the item-total correlation analysis, the significance level was taken as $p < 0.05$, and items below 0.30 were excluded from the analysis [24–26].

The internal consistency of the scale was evaluated with Cronbach's Alpha coefficient. The values obtained were above the reliability limits. The factor structure of the scale was revealed with EFA, and then the model obtained was confirmed with CFA. As a result of CFA, the validity of the model was tested by examining the fit indices such as X^2/Sd, GFI, AGFI, CFI, RMR and RMSEA [27–32].

Frequency and percentage distributions were used to analyze the demographic characteristics of the participants. Skewness and Kurtosis coefficients were evaluated to determine the suitability of the data for normal distribution. Since the values were within the appropriate range, the assumption of normality was accepted as met [25, 33].

Although the data were collected using Likert-type scales, the total and subscale scores were treated as continuous variables in accordance with previous methodological studies. Prior to analysis, the assumptions of normality were assessed using skewness and kurtosis values (between −1 and +1) and visual inspection of Q–Q plots, confirming that parametric analyses were appropriate for this dataset. Accordingly, parametric tests such as t-tests, ANOVA, and regression analyses were used to examine group differences and predictive relationships. In addition to descriptive statistics, the data were evaluated with Pearson correlation analysis, simple linear regression and multiple linear regression analyses. The interpretation of the findings was based on 95% confidence interval and $p < 0.05$ significance level.

Reliability and validity

EFA was applied to assess the construct validity of the Perception Scale for Artificial Intelligence in Radiologic Imaging. Before the analysis, Kaiser-Meyer-Olkin (KMO) and Bartlett's test were performed to determine the suitability of the data for factor analysis. While the KMO value indicates sampling adequacy, Bartlett's test examines the significance of the correlation between variables. In factor analysis, factor loadings of 0.50 and above were considered significant [25]. In addition, items with high loadings on more than one factor were excluded [24–26]. Accordingly, Q8th and Q10th items were excluded from the analysis by examining item-total score correlations.

According to Table 1, the KMO coefficient for the Perception Scale for Artificial Intelligence in Radiologic Imaging is 0.904 and Bartlett's test is significant ($p < 0.001$). These results show that the data are suitable for factor analysis. As a result of EFA, it was determined that the scale had a single-factor structure and explained 56.93% of the total variance. Confirmatory Factor Analysis (CFA) was conducted to support construct validity and fit indices (X^2/sd, GFI, AGFI, CFI, TLI, RMR, RMSEA) were evaluated [34, 35]. In addition, the item Cronbach Alpha coefficient regarding the reliability of the scale was found to be high and the internal consistency of the scale was found to be sufficient with the item-total correlation analysis [36].

According to the CFA path analysis results in Fig. 1, it is seen that the standardized item loadings vary between 0.50 and 0.86. Loadings above 0.32 indicate an acceptable level of factor loading [26, 35, 37]. Therefore, no item was removed from the scale. Covariance was defined between some items to increase the fit level of the model [27, 28, 32, 35].

Table 1 Explanatory factor analysis findings of the scale questions

QUESTIONS (Q)	Factor Loadings			Adjusted Total Question Correlation	Cronbach's Alpha when Question Deleted
	F1	F2	F3		
Q1.Artificial intelligence detects pathological findings in radiological images faster and more accurately.	0.737			0.649	0.837
Q2.Artificial intelligence reduces the workload of radiologists, enabling them to see more patients.	0.784			0.718	0.832
Q3.Artificial intelligence increases the expertise of radiologists by enabling them to focus on more complex cases.	0.762			0.573	0.841
Q4.Artificial intelligence helps to make more accurate diagnoses by improving radiologic image quality.	0.817			0.647	0.836
Q5.Artificial intelligence enables more precise results in treatment planning (radiotherapy, surgery, etc.).	0.731			0.643	0.837
Q6.The fact that artificial intelligence gives erroneous results may lead to misdiagnosis.		0.611		0.654	0.854
Q7.I am concerned that I do not fully understand the decision-making processes of artificial intelligence.		0.633		0.601	0.861
Q9.I have concerns about the reliability and transparency of artificial intelligence systems.		0.730		0.646	0.859
Q11.Artificial intelligence carries risks in terms of patient privacy and data security.		0.655		0.683	0.858
Q12.Artificial intelligence will enable complete automation in radiological imaging in the future.			0.661	0.657	0.854
Q13.Artificial intelligence will change the role of radiologists and require them to learn new skills.			0.705	0.574	0.841
Q14.Artificial intelligence will help in creating customized treatment plans for patients.			0.589	0.590	0.840
Q15. Artificial intelligence will lead to new discoveries in medical research.			0.609	0.644	0.837
Q16. Artificial intelligence will spark new discussions on medical ethics.			0.630	0.544	0.843

KMO = 0.904; Bartlett's $X^2 = 2118.41$; $p < 0.001$; Total Variance Explained = 56.929

F1 Benefit Perception Dimension, *F2* Worry Perception Dimension, *F3* Future Perception Dimension

According to the goodness of fit index values of the scales in Table 2 and the values stated in the literature, it was determined that the scales generally showed good fit and acceptable fit [27–32, 35]. In the literature, it is stated that AGFI values up to 0.85 can be accepted [27, 34].

According to Tabachnick and Fidell [33], Skewness and Kurtosis values between − 1.5 and + 1.5 indicate that the data are normally distributed. In addition, in Likert-type scales, a Cronbach Alpha coefficient between 0.60 and 0.79 is sufficient and 0.80 and above indicates a high level of reliability [25, 30, 36]. In this context, the normality and reliability analyses of the scale used in the study are presented in detail in Table 3.

When Table 3 is examined, it is seen that the Skewness and Kurtosis values for both scales and dimensions are in the range of −1.5 to + 1.5, thus the data are normally distributed. In addition, Cronbach's Alpha coefficients were as high as 0.855, especially for the Perception of Artificial Intelligence in Radiologic Imaging Scale, indicating that the internal consistency of the scales was strong. Other scale data were also found to be sufficiently reliable.

Results

In this section, the findings including the demographic characteristics of the individuals who participated in the study and the descriptive statistics of the scales used in the study are presented. In line with the normality assumption, parametric analysis results (t test and anova test in independent groups) were presented. In addition, the results of Pearson correlation analysis performed to examine the relationships between variables and the findings of simple and multiple linear analysis evaluating the effects of variables on the dependent variable were discussed in detail.

Table 4 presents the demographic characteristics of the research group descriptively. A total of 425 people participated in the study. It is seen that the majority of the participants work in public hospitals (82.6%). 54.1% of the participants were females and 45.9% were males. In terms of age distribution, it was determined that the most intense participation was between the ages of 20–29 (49.2%), followed by the age groups between 30 and 39 (33.6%) and 40 years and over (17.2%), respectively. In terms of educational attainment, 39% of the participants had bachelor's degrees, 38.6% had associate's degrees, and 15.3% had postgraduate degrees. When the occupational distribution was analyzed, 43.3% of the participants were defined as "other health personnel" and nurses were in second place with 32.7%. Radiology technicians and physicians were 12.5% and 11.5%, respectively. In terms of years of working in the profession, it is seen that the highest number of participants were those

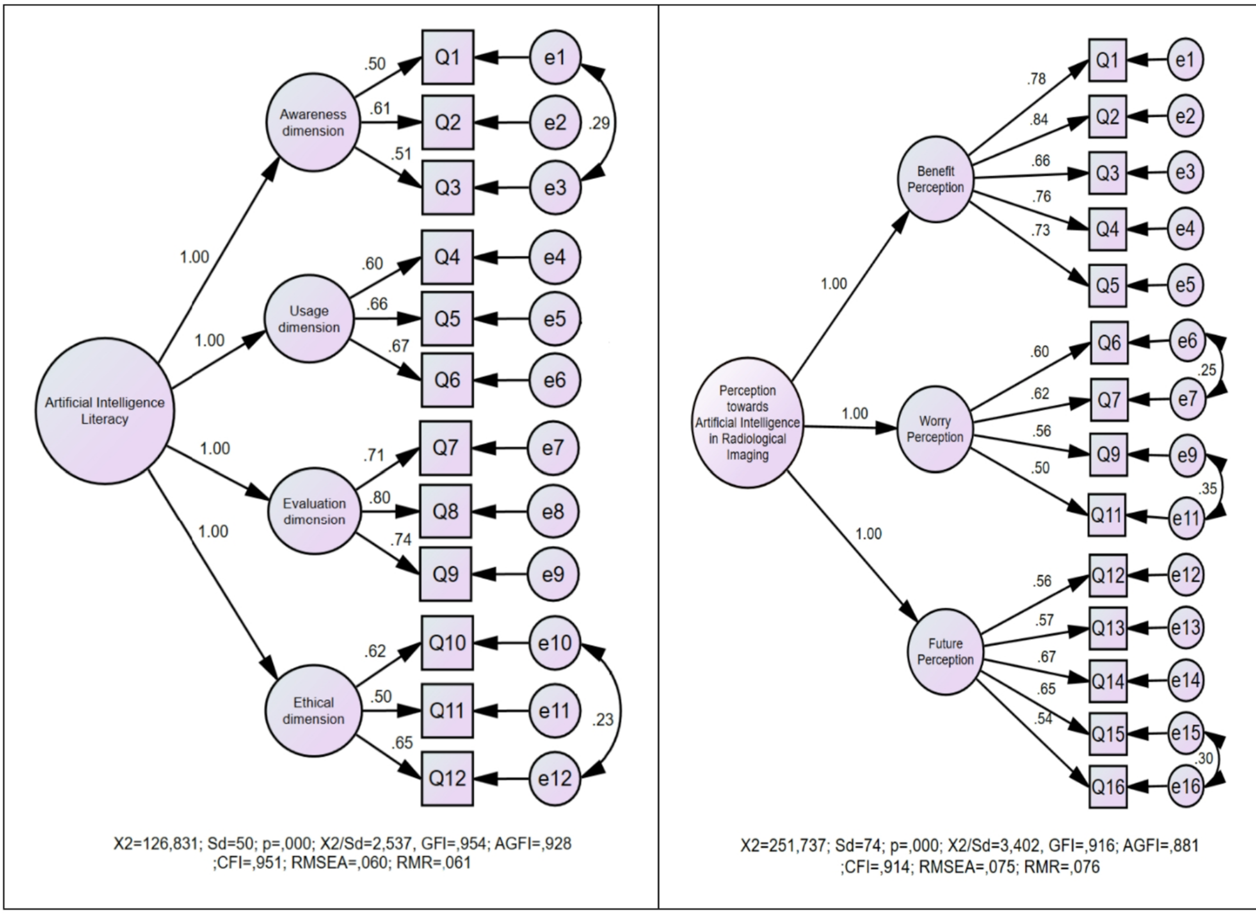

Fig. 1 Path diagram of the scales

Table 2 CFA results of the scales fit index values

Fit indices	Good Fit	Acceptable Fit	Artificial Intelligence Literacy	Perception of Artificial Intelligence in Radiologic Imaging
X^2/Sd	< 2	< 5	2.537	3.402
GFI	> 0.95	> 0.90	0.954	0.916
AGFI	> 0.95	> 0.90	0.928	0.881
CFI	> 0.95	> 0.90	0.951	0.914
TLI	> 0.95	> 0.90	0,911	0,940
RMSEA	< 0.05	< 0.08	0.060	0.074
SRMR	< 0.05	< 0.08	0.061	0.076

working for 10 years or more (36.5%), followed by those working between 0 and 3 years (32.7%). While 63.3% of the participants stated that they used artificial intelligence software, 36.7% stated that they did not. In terms of the level of knowledge about artificial intelligence, the highest rate was "I know a little bit" with 45.4%, followed by "I know" (31.1%) and "I don't know at all" (8.5%). The percentages of those who said "I know well" and "I know very well" are lower at 10.1% and 4.9% respectively.

It shows that the participants are mostly young, educated at associate's and bachelor's level, health

Table 3 Normality and reliability analysis results of scales and dimensions

Scales and Dimensions	Number of Items	Skewness	Kurtosis	Cronbach Alpha
Perception of Artificial Intelligence in Radiological Imaging	14	−0.608	0.190	0.855
Benefit Perception Dimension	5	−0.546	−0.018	0.867
Worry Perception Dimension	4	−0.311	0.194	0.693
Future Perception Dimension	5	−0.520	0.070	0.777
Artificial Intelligence Literacy	12	−0.213	0.116	0.787
Awareness Dimension	3	0.047	0.348	0.684
Use Dimension	3	0.167	0.169	0.655
Evaluation Dimension	3	−0.669	0.565	0.801
Ethics Dimension	3	−0.274	0.409	0.763

Table 4 Descriptive data on demographic characteristics of the research group

Demographic Characteristics	Groups	Number (*n*)	Percentage (%)
Type of Institution	Public Hospital	351	82.6
	Private Hospital	74	17.4
Gender	Female	230	54.1
	Male	195	45.9
Age	20–29 years old	209	49.2
	30–39 years old	143	33.6
	40 years and over	73	17.2
Educational Status	High School	30	7.1
	Associate's degree	164	38.6
	Undergraduate	166	39.0
	Graduate	65	15.3
Occupation	Doctor	49	11.5
	Nurse	139	32.7
	Radiology Technician	53	12.5
	Other Health Personnel	184	43.3
Years in the Profession	0–3 years	139	32.7
	4–6 years	85	20.0
	7–9 years	46	10.8
	10 years and over	155	36.5
Do you use artificial intelligence software?	Yes	269	63.3
	No	156	36.7
What is your level of knowledge about artificial intelligence?	I don't know at all	36	8.5
	I know a little bit	193	45.4
	I know	132	31.1
	I know well	43	10.1
	I know very well	21	4.9
TOTAL		425	100.00

Table 5 Minimum (min), maximum (max), mean and standard deviation (sd) findings of the data

Scales and Dimensions	Min-Max	Mean	SD
Perception of Artificial Intelligence in Radiological Imaging	1,21 – 5,00	3,14	0,66
Benefit Perception Dimension	1,00–5,00	3,14	0,93
Worry Perception Dimension	1,00–5,00	3,08	0,73
Future Perception Dimension	1,00–5,00	3,18	0,83
Artificial Intelligence Literacy	1,92 – 5,00	3,54	0,56
Awareness Dimension	1,67 – 5,00	3,47	0,63
Use Dimension	1,33 – 5,00	3,41	0,67
Evaluation Dimension	1,00–5,00	3,54	0,81
Ethics Dimension	1,33 – 5,00	3,73	0,76

professionals working in public hospitals, and their level of knowledge about artificial intelligence is generally limited.

Table 5 presents the minimum, maximum, mean and standard deviation values for the scales and sub-dimensions in the study. In general, the mean score of the Perception of Artificial Intelligence in Radiologic Imaging scale is 3.14 (±0.66), indicating that the participants' perceptions of artificial intelligence are at a moderate level. When the sub-dimensions of this scale are analyzed, it is seen that the perception of benefit (3.14±0.93), perception of concern (3.08±0.73) and perception of future (3.18±0.83) are similarly at a moderate level. It is understood that there is not a great variability in the participants' responses. In addition, the mean of the Artificial Intelligence Literacy Scale was found to be 3.54 (±0.56) and this value shows that the participants' artificial intelligence literacy levels are at the middle-high level. In terms of sub-dimensions, the highest mean score was obtained in the ethics dimension (3.73±0.76), and this finding shows that the ethical awareness of health professionals regarding artificial intelligence applications is relatively high. Awareness (3.47±0.63), utilization (3.41±0.67) and evaluation (3.54±0.81) dimensions were also scored at a medium-high level. The overall averages show a positive trend. These findings reveal that healthcare professionals have a positive but not completely high level of awareness and acceptance of artificial intelligence in both perception and literacy levels.

The t-test and ANOVA test results in independent groups for the differences in the perception of artificial intelligence in radiologic imaging according to the demographic variables of health professionals are provided in Table 6. There was no statistically significant difference ($p > 0.05$) in the perception of artificial intelligence in radiologic imaging according to the demographic variables (type of institution, gender, age, education level, profession, years of profession, etc.) of health professionals.

In Table 7, the relationships between the scales and sub-dimensions used to assess the contextual validity of the study were analyzed with Pearson correlation coefficient. The significant and positive correlations obtained between the Artificial Intelligence Literacy Scale and the Perception of Artificial Intelligence in Radiologic Imaging Scale support the contextual validity of the scales used in the study. In particular, the fact that the level of artificial ıntelligence literacy is significantly correlated with the general perception of artificial ıntelligence in radiologic imaging ($r = 0.270$), utility ($r = 0.283$) and future perceptions ($r = 0.254$) shows that this scale has a high capacity to reflect the perception of healthcare professionals in this specific context. The significant correlations between the sub-dimensions of the scale, namely awareness, use, evaluation and ethics, and the perception of radiologic imaging indicate that the concepts contained in the scale overlap with the clinical context in which the research was conducted. These findings reveal the contextual relevance of the scale and its suitability for use in the study sample. On the other hand, the weak and insignificant relationship between artificial ıntelligence literacy and anxiety perception suggests that some dimensions may

Table 6 Findings related to differences in perception of artificial intelligence in radiologic imaging according to health professionals' demographic variables

Variables	Benefit Perception Dimension		Worry Perception Dimension		Future Perception Dimension		Perception of Artificial Intelligence in Radiological Imaging	
Type of Institution	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Public Hospital	3.15	0.93	3.06	0.74	3.18	0.84	3.13	0.66
Private Hospital	3.09	0.91	3.14	0.70	3.21	0.77	3.15	0.67
	t = 0.487 p = 0.626		t = –0.831 p = 0.406		t = –0.221 p = 0.825		t = –0.118 p = 0.906	
Gender	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Female	3.13	0.86	3.06	0.72	3.20	0.77	3.13	0.62
Male	3.16	1.01	3.10	0.76	3.17	0.90	3.15	0.71
	t = –0.271 p = 0.789		t = –0.599 p = 0.549		t = 0.347 p = 0.729		t = –0.167 p = 0.866	
Age	Mean	SD	Mean	SD	Mean	SD	Mean	SD
20–29 years old	3.17	0.92	3.07	0.72	3.24	0.83	3.16	0.66
30–39 years old	3.09	0.94	3.07	0.82	3.13	0.82	3.10	0.67
40 years and over	3.16	0.96	3.13	0.61	3.16	0.85	3.15	0.66
	F = 0.350 p = 0.705		F = 0.177 p = 0.838		F = 0.720 p = 0.448		F = 0.455 p = 0.635	
Educational Status	Mean	SD	Mean	SD	Mean	SD	Mean	SD
High School	2.93	0.86	3.07	0.73	3.13	0.81	3.04	0.66
Associate's degree	3.11	0.92	3.07	0.71	3.15	0.80	3.11	0.65
Undergraduate	3.14	0.98	3.07	0.78	3.20	0.88	3.14	0.69
Graduate	3.33	0.86	3.15	0.70	3.28	0.81	3.26	0.64
	F = 1.493 p = 0.216		F = 0.228 p = 0.877		F = 0.408 p = 0.747		F = 1.040 p = 0.375	
Occupation	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Doctor	3.11	0.96	3.14	0.74	3.16	0.87	3.14	0.71
Nurse	3.20	0.92	3.08	0.73	3.22	0.84	3.17	0.66
Radiology Technician	3.20	0.83	3.14	0.58	3.18	0.66	3.17	0.49
Other Health Personnel	3.09	0.97	3.05	0.79	3.18	0.86	3.11	0.70
	F = 0.431 p = 0.731		F = 0.332 p = 0.803		F = 0.112 p = 0.953		F = 0.290 p = 0.833	
Years in the Profession	Mean	SD	Mean	SD	Mean	SD	Mean	SD
0–3 years	3.17	0.95	3.05	0.75	3.18	0.83	3.15	0.66
4–6 years	3.10	0.97	2.99	0.78	3.19	0.81	3.10	0.69
7–9 years	3.22	0.99	3.11	0.62	3.20	1.00	3.18	0.73
10 years and over	3.12	0.88	3.15	0.73	3.17	0.78	3.15	0.63
	F = 0.224 p = 0.880		F = 0.943 p = 0.420		F = 0.056 p = 0.982		F = 0.162 p = 0.922	
Do you use artificial intelligence software?	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Yes	3.10	0.96	3.07	0.75	3.20	0.87	3.13	0.69
No	3.21	0.88	3.09	0.72	3.17	0.77	3.16	0.62
	t = –1.206 p = 0.228		t = –0.263 p = 0.792		t = 0.440 p = 0.660		t = –0.490 p = 0.625	
What is your level of knowledge about artificial intelligence?	Mean	SD	Mean	SD	Mean	SD	Mean	SD
I don't know at all	3.16	1.08	3.22	0.84	3.24	0.76	3.20	0.70
I know a little bit	3.14	0.80	3.04	0.69	3.13	0.75	3.11	0.59
I know	3.17	0.96	3.15	0.74	3.25	0.87	3.19	0.71
I know well	3.06	1.18	3.09	0.77	3.09	1.03	3.08	0.78
I know very well	3.15	1.08	2.73	0.84	3.40	0.93	3.12	0.75
	F = 0.114 p = 0.978		F = 1.964 p = 0.099		F = 0.880 p = 0.476		F = 0.447 p = 0.774	

Table 7 Pearson correlation results of scales and dimensions

Scales and Dimensions	Pearson Correlation (*r*)								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1.Perception of Artificial Intelligence in Radiological Imaging	1	0.873**	0.566**	0.859**	0.270**	0.207**	0.193**	0.287**	0.147**
2.Benefit Perception Dimension		1	0.255**	0.652**	0.283**	0.233**	0.220**	0.269**	0.161**
3.Worry Perception Dimension			1	0.272**	0.045	−0.025	0.017	0.060	0.076
4.Future Perception Dimension				1	0.254**	0.219**	0.174**	0.299**	0.096*
5.Artificial Intelligence Literacy					1	0.733**	0.805**	0.814**	0.763**
6.Awareness Dimension						1	0.509**	0.445**	0.404**
7.Use Dimension							1	0.559**	0.471**
8.Evaluation Dimension								1	0.469**
9.Ethics Dimension									1

$n = 425$

**$p < 0.001$; *$p < 0.05$

Table 8 Simple linear regression results for the effect of artificial intelligence literacy on the perception of artificial intelligence in radiologic imaging

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t	*p*	F	Model (*p*)
	B	**Std. Error**	**β**				
Constant	2.016	0.198		10.19	0.000**	33.20	0.000**
Artificial Intelligence Literacy	0.318	0.055	0.270	5.76	0.000**		

Dependent Variable: Perception of Artificial Intelligence in Radiologic Imaging

R^2: 0.073, **$p < 0.001$, Regression Equation of the Model: Y = 2.016 + (0.270X)

Table 9 Multiple linear regression results for the effect of artificial intelligence literacy dimensions on the perception of artificial intelligence in radiological imaging

Independent Variables	Unstandardized Coefficients		Standardized Coefficients	t	*p*	F	VIF	Model (*p*)
	B	**Std. Error**	**β**					
Constant	2.087	0.202		10.31	0.000**	10.42		0.000**
a) Awareness Dimension	0.101	0.059	0.097	1.72	0.087		1.46	
b) Use Dimension	0.014	0.060	0.014	0.23	0.814		1.74	
c) Evaluation Dimension	0.197	0.048	0.241	4.07	0.000**		1.63	
d) Ethics Dimension	−0.010	0.049	−0.012	−0.21	0.832		1.44	

Durbin-Watson: 1.783, R^2: 0.090, R: 0.600, **$p < 0.001$

Regression Equation of the Model: Y = 2.087 + (0.241c)

Dependent Variable: Perception of Artificial Intelligence in Radiologic Imaging

have more limited validity in this context. However, this can be considered not as a negative finding, but as a finding reflecting that there is no direct relationship between health professionals' knowledge levels and anxiety levels. In conclusion, the findings obtained from the correlation analysis reveal that the Perception of Artificial Intelligence in Radiological Imaging Scale is a valid and appropriate tool for understanding the perceptions of health professionals working in the radiology context. This supports the context validity of the scale.

Table 8 presents the results of the simple linear regression analysis conducted to examine the effect of artificial intelligence literacy on the perception of artificial intelligence in radiological imaging. According to the results of the regression analysis, a significant regression model (F = 256.67; $p < 0.001$) was found in which artificial intelligence literacy, the independent variable in the model, explained 7.3% of the perception of artificial intelligence in radiological imaging. It was observed that the variable of artificial intelligence literacy had a positive and significant effect on the perception of artificial intelligence (β = 0.270; t = 5.76; $p < 0.001$). This finding indicates that as artificial intelligence literacy increases, health professionals' attitudes towards the perception of artificial intelligence in radiological imaging become more positive. The regression equation was expressed as Y = 2,016 + (0,270X). Here, X represents artificial intelligence literacy and Y represents the perception of artificial intelligence in radiologic imaging.

Table 9 presents the results of the multiple linear regression analysis evaluating the effect of artificial intelligence literacy dimensions on the perception of artificial intelligence in radiological imaging. According to the results of the regression analysis, the Durbin-Watson coefficient (1,783) value between 1.5 and 2.5 and the Variance Inflation Factor (VIF) values less than 10 indicate that there are no autocorrelation and multicollinearity problems [25, 38]. A significant regression model (F = 10.42; $p < 0.001$) was found that the dimensions of artificial intelligence literacy, which are independent variables in the model, explained 9% of the perception of artificial intelligence in radiologic imaging. When the effects of artificial intelligence literacy dimensions on the perception of artificial intelligence in radiologic imaging were examined, only the evaluation (β = 0.241; t = 4.07; $p < 0.001$) dimension had a significant effect. Awareness, usage and ethics dimensions did not have a significant effect. These findings showed that the evaluation dimension had a positive and significant effect on the perception of artificial intelligence in radiologic imaging. The regression equation was expressed as Y = 2,087 + (0,241c).

Discussion

The study developed the "Perception of Artificial Intelligence in Radiologic Imaging Scale" and confirmed that it is a valid and reliable measurement tool. This scale consists of 14 items categorized into three dimensions: perceived benefits, perceived concerns and future perceptions and shows high internal consistency. Alshehri et al. [39] in their research emphasized the importance of reliability in perception scales, especially in medical contexts where professionals need robust instruments to measure their attitudes towards emerging technologies such as artificial intelligence in healthcare. The literature supports the positive perception of the benefits of artificial intelligence in radiology. Lim et al. [40] and Sur et al. [41] reported that healthcare professionals view artificial intelligence as a tool that improves diagnostic accuracy and workflow. However, Kansal et al. [42] and Neri et al. [43] emphasized that professional identity and accountability concerns remain. Pakdemirli [44] and Richardson et al. [45] revealed the need for education on ethics and integration into practice for the future of artificial intelligence.

This study extends the existing literature by empirically confirming a multidimensional structure of perception (benefit, concern, and future orientation) through scale development and validation. Unlike prior works that primarily described attitudes, this study provides a standardized measurement tool that can quantitatively assess how healthcare professionals perceive artificial intelligence in radiology. Moreover, by linking perception with artificial intelligence literacy, the findings contribute novel evidence demonstrating that literacy plays a predictive role in shaping perceptions. Therefore, the results offer both theoretical and practical contributions to understanding how readiness, knowledge, and ethical awareness collectively influence technology acceptance in radiological practice.

Examining the perceptions of healthcare professionals revealed a moderately positive opinion (3.14 ± 0.66) toward artificial intelligence in radiologic imaging. This indicates that healthcare professionals generally acknowledge artificial intelligence as a valuable supportive tool for diagnostic processes, although certain barriers—such as limited experience, insufficient training, and ethical uncertainties—hinder its full integration. Studies in the literature confirm optimism about its implementation among healthcare providers, showing that artificial intelligence can significantly reduce the workload of radiologists and improve diagnostic accuracy [46–49]. In particular, Liu et al. [46] suggest that artificial intelligence-assisted imaging can potentially alleviate radiologists' workloads by automating repetitive tasks. This has been associated with a significant reduction in workload during cancer screenings. However, our study found considerable concern among healthcare professionals about the possibility of artificial intelligence leading to full automation in radiologic practice, with an average score of 3.18 on the future perceptions dimension. In Rony et al. [50], similar sentiments were highlighted among medical professionals, underscoring fears of devaluation of their years of training and expertise in the context of increasing automation. Furthermore, in Shin et al. [51] and Kwee and Kwee [52], perceptions that radiologists may lose their ability to accurately interpret images and become obsolete as artificial intelligence becomes more prevalent echo the concerns noted earlier. This is exacerbated by increasing expectations from both technology and health systems. Research findings and literature suggest that effective strategies for managing the implementation of artificial intelligence should not only focus on technological benefits. They should also consider the psychosocial aspects that affect health professionals' acceptance and trust in these systems.

The research data show that demographic variables such as organizational structure, gender, age, education level, occupation, duration of experience, artificial intelligence application status and knowledge level do not create a statistically significant difference on perceptions about artificial intelligence in radiological imaging (p >0.05). This result suggests that healthcare professionals' perceptions of artificial intelligence in radiologic imaging are shaped more by common factors such as shared professional experiences, organizational culture and education level rather than individual demographic differences. This finding may be contextually explained by the professional and cultural characteristics of the Turkish healthcare system. In Turkey, radiologic services are highly standardized and centrally regulated, which may minimize perceptual differences across demographic groups.

Moreover, most healthcare professionals—regardless of age, gender, or institution type—are exposed to similar educational curricula and workplace technologies. Such homogeneity in professional training and institutional culture could explain why demographic factors do not significantly differentiate perceptions. There are results consistent with these findings in the literature. Mirza et al. [53] and Abuzaid et al. [54] stated that although awareness about artificial intelligence increased, positive attitudes developed independently of demographic characteristics. However, Tarsuslu et al. [55], Petersson et al. [56] and Neri et al. [43] suggest that some demographic variables may affect the level of anxiety about artificial intelligence. Yet, these differences are generally balanced by technological competence and education. In this context, it is understood that the attitudes of healthcare professionals towards artificial intelligence applications are determined by the influence of professional environment and experiences rather than demographic characteristics. This situation is important for the integration and adoption of artificial intelligence technologies in radiological imaging in healthcare. Therefore, to enhance healthcare professionals' readiness and confidence, structured interventions are required. This can be achieved through continuous professional development programs, simulation-based training, interdisciplinary workshops, and the inclusion of artificial intelligence modules in medical and health sciences curricula. Institutional support—such as providing resources, mentorship, and ethical guidance—can further facilitate informed and confident adoption of artificial intelligence technologies in radiologic imaging.

The study shows that there is a significant and positive relationship between the level of artificial intelligence literacy and health professionals' perceptions of artificial intelligence in radiologic imaging. In particular, the result reveals that increasing artificial intelligence literacy is associated with more positive attitudes towards artificial intelligence ($\beta = 0.270$; $p < 0.001$). This finding suggests that increasing artificial intelligence literacy among healthcare professionals is crucial to promote positive perceptions and attitudes towards the integration of artificial intelligence into radiology. Although the regression models explained a modest portion of the variance (7–9%), this is not uncommon in perception-based studies where psychological, contextual, and organizational factors interact. The relatively low explanatory power may indicate that additional unmeasured variables—such as institutional readiness, organizational culture, and individual motivation—also influence healthcare professionals' perceptions of artificial intelligence. Future research incorporating these broader variables may yield a more comprehensive understanding of the predictors of perception. Laupichler et al. [57] found a strong relationship between artificial intelligence literacy and positive attitudes towards artificial intelligence technologies in medical students. The study shows that increasing knowledge of artificial intelligence brings with it optimism about the potential of these technologies in medical applications. This emphasizes the critical role of artificial intelligence education in shaping the attitudes of healthcare professionals. Similarly, Su and Yang [58] found that structured training programs create positive perceptions towards technologies, which can be reflected in the healthcare field. However, the level of knowledge alone is not enough. Abou Hashish and Alnajjar [59] emphasized that there may be a mismatch between awareness and actual knowledge and attitude. Benda et al. [60] drew attention to skepticism about ethics and practical applications. This situation reveals the need for more targeted trainings focusing on ethical and practical dimensions of artificial intelligence.

When the effects of artificial intelligence literacy dimensions on the perception of artificial intelligence in radiologic imaging were analyzed, only the evaluation ($\beta = 0.241$; $p < 0.001$) dimension had a significant effect. On the other hand, no significant effect was found for awareness, utilization and ethics dimensions. The strong predictive role of the evaluation dimension may reflect healthcare professionals' tendency to rely on critical judgment rather than basic awareness when assessing artificial intelligence applications. Evaluation encompasses the ability to interpret and appraise the reliability, performance, and clinical utility of artificial intelligence tools, which are skills directly relevant to clinical decision-making. In contrast, awareness and ethical knowledge, while important, may not yet be deeply internalized or operationalized in daily radiologic practice. This gap likely stems from limited formal training on the ethical and legal aspects of artificial intelligence within current healthcare education programs. Therefore, increasing education that integrates ethical reflection with applied evaluation skills could foster a more balanced and comprehensive literacy profile among healthcare professionals. Biagini [61] stated that artificial intelligence literacy requires a multidimensional approach and emphasized the strong effect of the evaluation dimension on positive attitude. Still, the limited effect of awareness, usage and ethical dimensions suggests that lack of ethical knowledge and experience may increase hesitations towards artificial intelligence, as expressed by Özçevik Subaşı et al. [62] and Derakhshanian et al. [63]. This suggests that in order to develop a positive and informed attitude towards artificial intelligence in healthcare professionals, it is not enough to gain knowledge. There is also a need for multidimensional training programs that provide critical evaluation skills and ethical awareness. In this way, it will be possible to integrate artificial intelligence into healthcare services effectively and responsibly.

Limitations and future research

Although this study makes significant contributions to understanding healthcare professionals' perceptions of artificial intelligence in radiology, several limitations should be acknowledged. First, the data were collected through self-reported questionnaires, which may introduce response bias due to participants' subjective perceptions or social desirability tendencies. Second, the study was conducted within a single-country context (Turkey), where healthcare structures and cultural dynamics may differ from other settings. As such, the findings may not be directly generalizable to healthcare systems with different technological infrastructures or professional norms. Third, the cross-sectional design of the study limits the ability to capture changes in perceptions over time. Future research using longitudinal or mixed-method designs could provide more robust insights into how healthcare professionals' attitudes evolve as artificial intelligence technologies become more widespread. Additionally, expanding the study across different countries and clinical specialties would further enhance its external validity and comparative value.

Conclusion

This study developed and validated the "Perception Scale for Artificial Intelligence in Radiologic Imaging" and demonstrated that healthcare professionals in Turkey hold a moderately positive view toward the use of artificial intelligence in radiology. Artificial intelligence literacy was found to be a significant factor shaping these perceptions, highlighting the importance of enhancing professionals' evaluative and ethical competencies. No major demographic differences were observed, suggesting that shared professional experiences may play a greater role than individual characteristics. To promote effective and responsible artificial intelligence integration in clinical practice, healthcare institutions should invest in continuing education and establish ethical and regulatory frameworks. The findings provide a foundation for further research exploring interdisciplinary training models and international comparisons of artificial intelligence perception in radiology.

Supplementary Information

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Supplementary Material 1.

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Authors' contributions
All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by AG, GA, HE and AD. The first draft of the manuscript was written by AG and all authors commented on previous versions of the manuscript. 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

Ethics approval and consent to participate
This research was conducted in full compliance with the principles of scientific research and publication ethics. Within the scope of the study, ethics committee approval was obtained from Hatay Mustafa Kemal University Social and Human Sciences Scientific Research and Publication Ethics Committee with the decision dated 17.02.2025 and numbered 08. Informed consent was obtained from the participants prior to participation in the survey through the consent text at the beginning of the questionnaire form. Ethical principles were observed throughout the research process and the study was conducted in accordance with the provisions of the Declaration of Helsinki.

Consent for publication
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