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Original article

Artificial Intelligence Anxiety of Family Physicians in Turkey

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Abstract. *Study Objectives:* Artificial intelligence (AI) is a computer system or a robot under the control of this system performing tasks similar to humans. In this study, it was aimed to evaluate the artificial intelligence anxiety of family physicians in Turkey. *Method:* Artificial Intelligence Anxiety Scale, which was developed by Wang, which Turkish validity and reliability study was conducted by Terzi, was preferred as the data collection tool. The universe was identified as Family Physician in Turkey (N=23,992). The sample size was calculated as 378 (n=378), regional populations were stratified according to gender and age groups. *Results:* Within the scope of the study, Family Physicians / Family Medicine Specialists were included in the study (n.402). In evaluating the scale scores, the mean total score was 76.30±27.87, the learning sub-dimension average score was 24.83±11.46, the job change sub-dimension mean score was 21.51±8.68, and the sociotechnical subscale mean score was 18.95±6.44. The mean score of the artificial intelligence configuration sub-dimension was 6.44, and 10.99 ± 5.96. *Conclusions:* Since most physicians have not received training on AI applications and their anxiety levels are low, we believe that structured training programs and artificial intelligence applications in family medicine can be integrated into decision support systems and contribute to patient safety.

Key words: Family medicine, Family physicians, Artificial intelligence, Anxiety

Introduction

Artificial intelligence (AI) is a computer or a robot under the control of the computer to complete tasks as if it were a human. In other words, AI is the ability of a computer to do tasks that would require human intelligence. The idea of AI was first put forward by Alan Mathison Turing with the question "Can machines think?" Research on AI in health started in the 1950s. There is a rapid increase of information in health as in all fields of science. With new technologies, this load of information is concentrated and comprehended at a speed that is not possible for health professionals. AI applications are known to coordinate and integrate patient centered care services. For this reason, although the potential of acceptance for AI applications in health services was high and there were a lot of success stories, their performance in the last five years and acceptance in medicine saw a quantum leap. When the use of AI applications in health record data is considered, its contribution not only in health service but also in health statistics and health research is seen to be undeniably high (1).

AI has its cons as much as it has its pros. These can damage the population differences by exaggerating race, class, and gender classifications. These applications don't take responsibility, provide trust and guarantee an uninterrupted workflow (1). Algorithms designed

for AI are only as good as the codes and data that manages it. Facial recognition in patients for example can name black people differently and may not recognize women with makeup. So, it can cause damage by exaggerating race, class, and gender differences. Although responsibility, trust, and uninterrupted workflow are among concerns, doctors' future assistants may be Al (1). AI, can scan patients, diagnose and suggest optimal treatments. In addition, it can prioritize patients and process patient anamnesis. And it can perfect electronic registration systems. With better electronic registration systems, workflow efficiency, lower mistakes, patient safety, and communication between doctors and patients would be greatly improved. AI applications foreseen in first stage health services can be used in both clinical treatment and electronic registration and administrative functions (2,3).

There is thought to be great potential in preventing diseases and improving health in the first stage. People can be educated through repetitive messages for physical activity or diet based on their risk category (4). When the fact that a doctor spends twice as much time on registration than to patient is considered, with AI time allowed to the patient can be doubled. For example, it can scan patient data through test results and other health records. It can collect information from protocols, clinical studies, and suggestions to specify a patient's status, which tests are necessary, and which medicine should prefer. It can collect and analyze patient data from more than one source therefore helping stage one family doctors about the patient's general condition (2,3).

In the future, it is predicted to help doctors have insight rather than only data. What is more, it is predicted to allow stage one doctors to attend precision medicine by analyzing and adjusting care protocols, patient conditions, genetic structure, and even social conditions to patients gathered by large scale studies. For example one of the annual controls for patients diagnosed and followed with Diabetes Mellitus is transfer to a further center for diabetic retinopathy and an AI designed for this can prove very helpful for both the patient and the stage one doctor (5).

Despite these technological advancements AI's use as robotic doctors is seen as a very distant future. Especially that they will not have the cognitive function and high-level decision capacity. It is also can be called an increased intelligence, a technology that can help doctors with basic and routine tasks (4,5).

Studies about health and medicine were mostly done in stage two and three health services in which the disease spectrum is much wider and clinicians have more intense diagnostic tools and tests(1). Despite the optimism of using artificial intelligence in stage one health services, there is no extensive study in the literature about artificial intelligence's contribution and personnel's remarks and concerns about this matter. To fill this gap, our purpose is to define and evaluate the attitudes and behaviors of family doctors working in Turkey against the application of AI in medicine and their level of concern.

This study aimed to evaluate attitude and behaviors and concern levels of family doctors actively working in Turkey towards artificial intelligence applications in medicine. Another aim of this study is to analyze whether the family doctor's perspective towards artificial intelligence application in medicine is affected by the region they work in, their experience in their profession, and sociodemographic attributes.

Materials and Methods

The study was designed as cross-sectional descriptive in quantitative research pattern. For the study, written consent was taken from writers who studied the scale's Turkish acceptance and credibility, on 30.12.2020 (6). Approval was obtained from Suleyman Demirel University, Faculty of Medicine Clinical Research Ethics Committee for the study. (Decision numbered 18.01.2021/5) "Artificial Concern Scale" which was designed by Wang and studied to be accepted and credited in Turkish by Terzi, was preferred as a data collection tool (6,7). The scale has 4 sub-dimensions that are named; Learning (questions 1,2,3,4,5,6,7,8, and 9), changing work (questions 10,11,12,13, and 14), sociotechnical blindness (questions 15,16,17, and 18) and configuration of artificial intelligence (questions 19,20, and 21). The scale consists of 21 questions in total. There are no negative questions in the scale. Scale in pointed based on septet Likert type scale. Thus, a minimum 35 and maximum 175 points can be obtained from the scale.

Target location was defined as Family Doctors Working in Turkey (N= 23.992). For sample selection, sample selection in the 95% trust range was calculated as 378 (n=378). The sample size was classified according to region population and gender. Participants from each region and gender were determined based on this classification. The participants were divided into three age groups. 18-45 young family doctors, 45-65 middle aged family doctors and +66 were evaluated as old family doctors.

The fact that the study's data collection method was online and voluntary doctors' opinion was evaluated as elective bias.

Actively working as a family doctor, actively working as a family doctor specialist, and being a volunteer were determined as criteria to be included in the study. Preferring not to share their opinion, not being on active duty despite being a family doctor were determined as reasons not to be included in the study. Data from family doctors were collected for the study between the dates 11-22 January.

For statistical analysis of data MS Excel, EduG JASP, and SPSS 24 were used as packaged software. Analysis was made after lost and missing information was eliminated. Frequency analyses were conducted for descriptive analyses. Average and standard deviation of scale items. Credibility analysis of scale was made according to generalizability. Average and standard deviations for scale points and sub-dimensions were calculated. In comparison tables, ANOVA test was applied to regions and age groups, t-test for genders. In the confirmatory test $p<0.05$ was considered statistically significant.

Results

Totally 402 Family Doctor/Family Doctor specialist was included in the study. Participants' age average was calculated as 34.56±8.83 (Min=25, Max=58). Participants' experience in their profession was calculated as 9.86±9.00 (Min=1, Max=33) (Figure 1). It was determined that 95% (n=400) of participants have not received education about artificial intelligence.

When participants' regional participation was evaluated, appropriate participant count was reached as aimed in sample selection.

In the descriptive analysis of the scale, participants were observed to give answers in compliance with scale items.

In the evaluation of the scale points, total average point was detected as 76.30±27.87, learning sub-dimension average point as 24.83±11.46, changing work sub-dimension average point 21.51±8.68, socio-technical sub-dimension average point as 18,95±6,44, artificial intelligence configuration sub-division as 10.99±5.96 (Table 3).

In the comparative analysis of the scale, it was seen that there was no meaningful difference between genders, experience and regions. Despite there was a difference in artificial intelligence configuration based on gender, since the effect was too low, it was dismissed as unimportant.

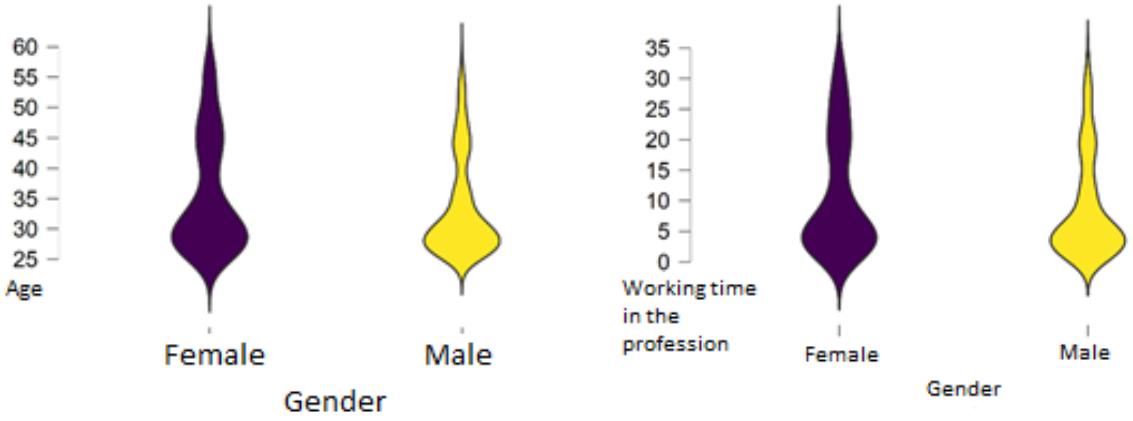

Figure 1. Distribution of age and working time in the profession by gender

Table 1. Regional distribution of the participants

	Sample selection targeted	Reached during the data collection process	
Geographical Regions	n	n	%
Marmara Region	113	119	29.60
Aegean Region	47	55	13.68
Central Anatolia Region	57	62	15.42
Black Sea region	37	39	9.70
Eastern Anatolia Region	35	36	8.95
Southeastern Anatolia Region	40	41	10.19
The Mediterranean region	49	50	12.43
Total	378	402	100.00

Table 2. Descriptive analyzes of the scale

		I strongly disagree (1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**I strongly agree (7)**		
Sub-dimensions of the scale	**Items**	**n %**	**/ n %**	**n %**	**n %**	**n %**	**n %**	**n %**	**Mean**	**SD (±)**
Learning Job replacement Sociotechnical Blindness	Ö1	130/ 32.3	108/26.9	56/13.9	40/10.0	32/8.0	20/5.0	16/4.0	2.65	± 1.71
	Ö2	156/38.8	93/23.1	60/14.9	40/10.0	20/5.0	22/5.5	11/2.7	2.46	± 1.65
	Ö3	146/36.3	98/24.4	66/16.4	39/9.7	22/5.5	21/5.2	10/2.5	2.49	± 1.62
	Ö4	168/41.8	93/23.1	56/13.9	40/10.0	20/5.0	17/4.2	8/2.0	2.33	± 1.57
Learning Job replacement Sociotechnical Blindness	Ö5	137/34.1	93/23.1	67/16.7	50/12.4	25/6.2	10/2.5	20/5.0	2.60	± 1.68
	Ö6	184/45.8	115/28.6	38/9.5	30/7.5	14/3.5	7/1.7	14/3.5	2.13	± 1.51
	Ö7	182/45.3	113/28.1	39//9.7	28/7.0	19/4.7	6/1.5	15/3.7	2.17	± 1.54
	Ö8	80/19.9	48/11.9	33/8.2	70/17.4	81/20.1	48/11.9	42/10.4	3.83	± 1.98
	Ö9	63/15.7	41/10.2	38/9.5	71/17.7	73/18.2	59/14.7	57/14.2	4.13	± 1.98
Job replacement Sociotechnical Blindness Learning Job replacement	İ10	42/10.4	37/9.2	29/7.2	64/15.9	64/15.9	72/17.9	94/23.4	4.64	± 1.98
	İ11	70/17.4	38/9.5	54/13.4	56/13.9	56/13.9	60/14.9	68/16.9	4.09	± 2.08
	İ12	50/12.4	32/8.0	37/9.2	57/14.2	53/13.2	86/21.4	87/21.6	4.58	± 2.03
	İ13	68/16.9	62/15.4	62/15.4	71/17.7	49/12.2	44/10.9	46/11.9	3.71	± 1.95
	İ14	47/11.7	35/8.7	47/11.7	59/14.7	52/12.9	90/22.4	72/17.9	4.47	± 1.98
Sociotechnical Blindness Learning Job replacement	S15	22/5.5	22/5.5	21/5.2	33/8.2	74/18.4	93/23.1	137/34.1	5.34	± 1.77
	S16	29/7.2	29/7.2	33/8.2	62/15.4	85/21.1	97/24.1	67/16.7	4.75	± 1.77
	S17	34/8.5	26/6.5	37/9.2	56/13.9	82/20.4	88/21.9	79/19.7	4.75	± 1.84
	S18	62/15.4	59/14.7	34/8.5	62/15.4	53/13.2	68/16.9	64/15.9	4.10	± 2.07
Sociotechnical Blindness	Y19	81/20.1	57/14.2	56/13.9	61/15.2	51/12.7	39/9.7	57/14.2	3.71	± 2.05
	Y20	81/20.1	67/16.7	57/14.2	52/12.9	47/11.7	47/11.7	51/12.7	3.65	± 2.05
	Y21	77/19.2	66/16.4	59/14.7	71/17.7	37/9.2	43/10.7	49/12.2	3.62	± 2.00

Discussion and Conclusion

Artificial intelligence (AI), is human like automation with a certain intelligence level that provides a lot of benefits on every stage of health service starting from health education (2,5,8). Although, inevitably, AI will eventually take the place of humans, doctors have an irreplaceable role in the presentation of health

Table 3. Scale total scores and subscale scores

Sub-dimensions of the scale	Score Mean± SD	Median	Min	Max
Learning	24,83±11.46	22	9.00	63.00
Job replacement	21.51±8.68	22	5.00	35.00
Sociotechnical Blindness	18.95±6.44	20	4.00	28.00
Artificial Intelligence Configuration	10.99±5.96	10	3.00	21.00
Total	76.30±27.87	76	21.00	147.00

services. However, all doctors and especially family doctors should follow developments on AI and prepare for a transition period. This situation concerns the doctors because with AI technologies they have to adapt themselves to the evolving world around them. AI concern can be described as panic and concern caused by unknown aspects of AI products (7,9,10). There are no previous studies in the literature related to the level of concern by family doctors about AI in this transition period. In the literature, there are studies about the first stage and AI that are usually done in high income countries and to diagnose chronic diseases or to support treatment decisions (1).

In our study, sample selection was designed to sample all of Turkey, and aimed sample count was reached. In the analyses of the Artificial Intelligence Concern Scale for population, it was shown that the scale is valid and credible for this population and could be generalized to study target. In the descriptive analysis of the scale, participants were observed to give answers in compliance with scale items.

When the scale scores of the family doctors who participated in our study were evaluated, the level of concern in the total score and sub-dimensions was shown to be close to the median value.

In our study, it was also found that the scale scores and concern levels in the sub-dimensions did not vary according to gender, the regions they worked, and the experience of the family doctors.

It has been reported in the literature that there is concern that medical AI technology may

put some physicians at risk of diagnostic skill erosion or may leave some doctors unemployed (9). In a study conducted in England, family doctors stated that they have serious doubts about the use of technology in diagnostic processes (11). In a study conducted with medical students in our country, the rate of students who stated that they would like to use AI applications

Table 4. Comparative analysis of scale scores

		Learning	Job replacement	Sociotechnical Blindness	Artificial Intelligence Configuration	Total score avg.
Gender	Female	23.81±10.85	21.15±8.82	18.46±6.32	10.40±5.81	73.83±26.93
	Male	25.94±12.02	21.92±8.82	19.49±6.54	11.63±6.06	78.99±28.70
	p value	0.063	0.375	0.110	**0.039**	0.064
	Cohen's d	0.186 (small)	0.089 (small)	0.160 (small)	0.207 (small)	0.186 (small)
Working time in the profession	p value	0.190	0.520	0.275	0.303	0.227
	η kare	0.008 (very small)	0.003 (very small)	0.006 (very small)	0.006 (very small)	0.007 (very small)
Geographical Regions	p value	0.410	0.344	0.631	0.224	0.380
	η square	0.015 (very small)	0.016 (very small)	0.010 (very small)	0.020 (small)	0.015 (very small)

in their professional life was 85% (12). A significant majority of those who do not intend to use AI applications in the field of health stated that they are afraid of medical errors that may arise from these applications (12). In our study, it is important that the concern levels of family doctors in Turkey are low. The fact that the majority of family doctors regarding AI health practices have not received training shows that prejudices are low and the process can be improved with education.

Factors increasing AI concern in the literature; fear of changing jobs, socio-technical ignorance, and practices structured by specific AI. It is understood that these fears have changed in the process of AI application and are affected by negative representation and the environment discussed (13). Among the reasons for the low concern of family doctors in our study, the lack of fear of losing a job and the high level of technological knowledge used in family medicine can be considered.

In Johnson and Verdicchio's study, clarifying the real status of artificial intelligence will reduce fears and concerns (10). These results are not surprising, because while being able to draw the boundaries of technology and setting its limits in practice is expected to reduce AI concern, discussing its potential can increase fears.

While the concern level of family doctors who have not been educated on this subject is expected to be high in the results of our study, it is not compatible with the literature.

Studies in the literature have revealed that the gender of the people using AI applications can be variable due to the reactive difference (14). Ken Masters's research with medical students showed that concerns about AI practices do not change depending on gender and age, and hesitations about AI use in both genders can be overcome through the education process (3). When our study is evaluated in the literature and knowledge, the lack of difference between the genders shows that all physicians start the process at a similar level of behavior and remain similar unless they are trained on AI.

When it is considered that first stage AI studies are usually in countries with high income, the fact that there is no difference between regions shows that in a developing country such as Turkey all family doctors, regardless of the region, are in an early stage of maturity (1).

It seems that Artificial Intelligence applications are at an early maturity stage for primary health care. In this case, it means that more research is needed to assess the effects on the first stage health services and family doctors both in Turkey and in the world. Before artificial intelligence applications are integrated into healthcare, more studies should be done and training programs structured according to the results of these studies should be designed. We believe that with structured training programs, artificial intelligence applications in the field of family medicine can be integrated into decision support systems and contribute to patient safety.

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Conflicts of interest: There is no conflict of interest between the authors of this study.

Ethical approval: The study was approved by Süleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee.

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