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Computer Anxiety in Nursing: An Investigation from Turkish Nurses

Mehmet Top · Ali Yılmaz

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Abstract The purpose of this study was to determine and analyze levels of computer anxiety in nurses at a public university hospital in Turkey. This study investigated the dimensions of computer anxiety in terms of computer literacy, self-efficacy, physical arousal, affective feelings, positive beliefs, and negative beliefs. Moreover in this study it was aimed to analyze relationships among computer anxiety and some characteristics of nurses (age, gender etc.). This study based on Beckers and Schmidt's computer anxiety model. The Beckers and Schmidt's Computer Anxiety Scale (BSCAS) was used for data collection. BSCAS comprises six factors: computer literacy, self-efficacy, physical arousal in the presence of computers, affective feelings towards computers, positive beliefs, and negative beliefs. At the end of the data collection period, 175 nurses were received from the population. The response rate was 43.75 %. This study showed that a majority of nurses had medium levels of computer anxiety. Overall computer anxiety means score was 12.11±1.72. Computer anxiety has significant relationship with age (r=−.153; p<.05), personal computer ownership (r=.171; p<.05). The highest correlation was between overall computer anxiety and self efficacy (r=−.859), the lowest correlation was between overall computer and negative beliefs (r=−.653). Multiple regression analysis revealed that computer anxiety of nurses was predicted significantly by self efficacy, affective feelings, physical arousal, computer literacy, positive beliefs, and negative beliefs, respectively.

Keyword Computer anxiety · Nurses · Health sector · Health informatics

Introduction

Physicians, nurses, medical secretaries and other health personnel are challenged to practice in an environment that is technologically advanced [1, 2]. Computers have made a dramatic impact on the contemporary society and health care systems. Almost all aspects of our lives and health services are affected by computers to a significant degree. It is even difficult to imagine a job or a task that we can complete without using computers [3]. As the use of electronic health records continues to grow, it is imperative that nurses gain competency and confidence with computers and computer software applications [4]. So, computer anxiety has become a problem for health personnel especially physicians and nurses.

Nurses' tasks like reviewing clinical records, stock of medicines and other procedures are nowadays done in a matter of minutes with the aid and use of computers and software technology. The advantages of computers in nursing and patient care are virtually endless, and their inclusion in the medical field and health sector cannot be challenged anymore. One of the major advantages of computers in nursing is that a basic system permits the nurses to have an updated record of the pharmaceuticals the hospital have in stock. Computers allow nurses to get the patient's clinical records in a matter of minutes [5]. Computerization of health care delivery includes computerization of the medical records / informatics popularly known as the *Electronic Medical Record System* (EMR), *Electronic Prescriptions, Personal Digital Assistants, Computer Automated Cancer Detection and Computerized Theatre Management Applications*. However, negative attitudes toward computers ("computer attitudes") and anxiety of physicians and nurses about their use (computer anxiety) represent a potential barrier to computerization of the medical record and health informatics [6]. Computers can help nurses set up a plan of care in minutes [7].

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M. Top (✉)
Faculty of Economics and Administrative Sciences, Department of Health Care Management, Hacettepe University, Ankara, Turkey
e-mail: mtop@hacettepe.edu.tr

A. Yılmaz
Faculty of Economics and Administrative Sciences, Department of Health Care Management, Kirikkale University, Kirikkale, Turkey

Nurses often use computers to take full notes on how a treatment is progressing and planning. Having a computer help you choose a plan of care, suggest interventions, set up a neat, tidy plan in minutes does not negate the fact that it is still a nursing plan of care [7]. By placing notes on the patient dosage, with reminders about giving medicines, nurses ensure the proper treatment of a patient according to treatment plans. If a medication has not been released, the computer makes a notification so that the nurses can address this issue in a timely manner. Computers in nursing today contain huge medical libraries open to research and study. Nurses, during their college years and when working in a hospital, need to keep updated constantly. Online data bases of medical cases from all around the world, medicine researches, and treatment comparisons are essential to their professional growth [5, 8]. In summary *"the quality of nursing will improve exponentially with computer-aided diagnosis and management. Many medical establishments have already computerized medical reports, billing system, inventory, financial accounting and several other fields of medicine"* (Selvasekaran, 2008, p.1) [9]. However several studies have reported the presence of computer anxiety among computer users including nurses in various organizations included health and hospital organizations [10].

There are many definitions of computer anxiety, and researchers have not agreed upon a standardized one [11]. Oetting (1983, p. 1) [12] stated that computer anxiety is a concept-specific anxiety because it is a feeling that is associated with a specific situation, in this case when a person interacts with computers. He elaborated by saying that computer anxiety is *"the anxiety that people feel they will experience when they are interacting with computers–the anxiety associated with the concept of computers"* [12]. Howard and Smith (1986) defined computer anxiety as *"the tendency of a particular person to experience a level of uneasiness over his or her impending use of a computer"* (p. 18) [13]. Computer Anxiety is the "negative emotions and cognitions evoked in actual or imaginary interaction with computer-based technology" (Boionelos, 2001, p. 213–214) [14]. Technology anxiety, "defined as a fear of working with medical equipment and medical computers". (Kjerulff et al., 1992, p. 7) [15].

Some research has shown that factors such as computer experience, gender, education, and computer ownership and computer education are related to computer anxiety [10, 16, 17]. Igbaria and Parasuraman (1989) revealed that education as having a negative relationship to computer anxiety, but a positive association with computer attitudes [18]. Howard and Smith (1986) [13] found that the lack of education and knowledge of computers could cause computer anxiety. They found that an increase in education decreased computer anxiety and fostered a feeling of self-efficacy [13]. Brodt & Stronge (1986) [19] stated that there would be no significant difference in nurses' attitudes toward computerization as indicated by educational preparation, gender, age, and length of employment in the particular hospital, length of service in the nursing profession, hospital units. Cohen and Waugh (1989) [20] found computer anxiety was significantly and negatively correlated with the total amount of experience the subjects' had with computers.

There were correlations between computer use, perceived ease of use and perceived usefulness; and behavioral intention [21]. Even Wilfong (2006) revealed in her study that self-efficacy beliefs, computer experience and computer use were strong predictors of computer anxiety. Saadé & Kira (2007) [22] reported that computer experience, ease of use from technology acceptance model were strong predictors for computer anxiety.

Previous studies revealed that there are significant relationship computer self efficacy and computer anxiety. Busch (1995) [23] and Houle (1996) [24] found that increased computer self-efficacy relates to decreased computer anxiety and increased computer experience. The development of computer self-efficacy can be related to anxiety, whereby the lack of knowledge about computers and technology can create a psychological fear, hence dampening the development of confidence for computer and technology usage [11]. Igbaria and Parasuraman (1989) [18] found that with respect to the anticipated relationships between attitude toward computer use and anxiety toward usage, attitude is negatively correlated with anxiety. Hsu et al. (2006) [8] revealed that computer experience of nurses and personal innovations in information technology were both factors associated with computer literacy and computer anxiety.

Nowadays, many health care organizations have adopted information technology, clinical information systems, health informatics to help nurses in their practice; therefore, computers have become critical instruments for nurses and nursing care. Many researchers have studied what information literacy or computer competencies a nurse should possess, but less research has focused on the types of factors associated with computer literacy and computer anxiety [8]. Little research has focused on computer anxiety of nurses in health sector. This study was the first step in computer anxiety in nurses in Turkey. Therefore, getting to know the level of computer anxiety among nurses in the current study will add to the body of knowledge as the study was conducted for a public university hospital located in Ankara, Turkey.

The purposes of this study was to determine levels of computer anxiety in nurses; to analyze relationship between computer anxiety and some characteristics of nurses (gender, marital status, education status, employment status, tenure of use of computer etc.); to examine the relationships among computer anxiety dimensions (computer literacy, self-efficacy, physical arousal, affective feelings, positive beliefs, and negative beliefs), and to investigate predictors of computer anxiety in nurses.

Method

A non-experimental, cross-sectional, descriptive, correlation and regression design was used in this study.

Participants and data collection

This study was conducted in a public university hospital in Ankara, Turkey. After obtaining permission to enter the hospital from the directors of nursing following explanation of the study, two researchers distributed questionnaires to the departments. A cover letter was attached with each of the questionnaires before distribution was administered by nurses. All participants (nurses) provided were written informed consent and they were informed that their involvement was completely voluntary. This study conducted and planned on 175 nurses between May 1, 2011 and July 1, 2011. At the end of the data collection period, 175 nurses were received from the population (400 nurses). The response rate was 43.75 %. The characteristics of the respondents are shown in Table 1.

Table 1 Characteristics of participants

Characteristics	*f*	%
Gender		
- Female	152	86.9
- Male	23	13.1
Marital status		
- Single	73	41.7
- Married	102	58.3
Education status		
- High school (college) degree	29	16.6
- Prebachelor degree	89	50.9
- Bachelor degree	52	29.7
- Postgraduate degree	5	2.8
Employment status		
- Regular public servant	47	26.9
- Contracted public personnel	128	73.1
Personal ownership		
- Yes	141	80.6
- No	34	19.4
Computer education attendance		
- Yes	144	82.3
- No	31	17.7
Age		
- Mean: 30.95; Std. Deviation: 7.45; Maximum: 53; Minimum: 20; Range: 33		
Tenure of computer use		
- Mean: 10.78; Std. Deviation: 3.86; Maximum: 20; Minimum: 2; Range: 34		

Instrument

This study utilized anonymous self-reported questionnaires. The Beckers and Schmidt Computer Anxiety Scale (BSCAS) were used for data collection. BSCAS comprises six factors [25, 26]. *Computer literacy* (in terms of acquired computer skills), *self-efficacy* (confidence in one's capacity to learn to use computers), *physical arousal in the presence of computers* (such as sweaty hand palms, shortness of breath), *affective feelings towards computers* (like or dislike of computers), *positive beliefs* about the benefits for society of using computers, and *negative beliefs* about the dehumanizing impact of computers. Computer literacy was referred to by items such as "I find it easy to make computers do what I want", "I have difficulty in understanding the technical aspects of computers". Self-efficacy was referred to by items such as "Everyone can learn to use a computer, as long as one is patient and motivated", and "I am confident that I can learn computer skills". Affective feelings toward the computer were measured by items such as "Life will be easier and faster with computers" and "Computers are nice to work with". Examples of physical arousal items are "I feel suffocated when I am in front of the computer", "My heart beats faster when I think about working with a computer". Beliefs on the dehumanizing power of computers were measured using items such as "Soon our lives will be controlled by computers", and "People are becoming slaves to computers". Beliefs on the benefits of personal computers especially for the good of society, were measured by items such as "Computers are bringing us into a bright new era", "Computers create economic stability" (Beckers et al., 2007, p.2854) [27]. The overall reliability coefficient of the total instrument was .783 while the coefficients for the sub-scales, computer literacy, self-efficacy, physical arousal in the presence of computers, affective feelings towards computers, positive beliefs, and negative beliefs were .767, .728, .718, .800, .760, and .736 respectively. Consequently, the survey instrument was finalized and used to conduct our research.

The computer anxiety scale is composed of 32 Likert-type items, consisting of statements on computers that could be scored between 1 (entirely disagree) and 5 (entirely agree). So, all items can be scored between value 1 (low) and value 5 (high). A number of items are worded in such manner that a high degree of agreement indicates a high level of computer anxiety, e.g. the statement "When I work with a computer, my hands are sweaty." Other items are worded in such manner that agreement indicates a lack of anxiety, e.g. "I find computers easy to work with". Furthermore, each item is part of a factor. The scale comprises six factors: Computer literacy (8 items, *3 items were reversed*), self-efficacy (4 items), affective feelings (4 items), and positive beliefs (4 items), and physical arousal (9 items), and negative beliefs (items). High scores on the items of the first 4 factors indicate a low level of anxiety or

no anxiety. High scores on the items of the last two factors indicate a high level of computer anxiety. The average score per factor is computed by adding up the scores of the individual items that are part of this factor and to divide the sum total by the number of items. The last step is to calculate the overall score by the following formula:

$$\textbf{\textit{Computer Anxiety}}\ (\textbf{\textit{for 32 items}}) = SUM(Arousal\ Score,\ Negative\ Beliefs\ Score) - SUM(Computer\ Literacy\ Score,\ Self\ Efficacy\ Score,\ Affective\ Feelings\ Score,\ Positive\ Beliefs\ Score) + 18$$

A person who has no computer anxiety would score a value of 1 on the two factors Arousal and Negative Beliefs and the value 5 on the factors Literacy, Self Efficacy, Affective Feelings, Positive Beliefs. This would generate a total of −18 points. In order to arrive at a zero as starting point of the scale, indicating no computer anxiety at all, the value 18 has been added to the formula. The highest score an individual can reach is 24, indicating the maximum level of computer anxiety [25–28].

Data analysis

Several statistical techniques were used to analyze the data with SPSS 21.0. Descriptive statistics and frequencies were employed to describe the population and determine levels of computer anxiety in nurses. Correlation analysis was used to analyze relationships computer anxiety with subscales of computer anxiety and gender, age, education status, marital status, employment status, use of computer etc. Multiple regression and Pearson's correlation analysis were used to predict computer anxiety as a dependent variable, and the independent variables consisted of computer literacy, self-efficacy, physical arousal in the presence of computers, affective feelings towards computers, positive beliefs, and negative beliefs. In multiple regression models the Durbin-Watson statistics (less than 2.50) did not reveal autocorrelation among residuals, confirming the suitability of using regression for analysis. Furthermore, variance inflation factors (VIFs) were all below 5, indicating the absence of multicollinearity [29]. An alpha level of .05 was used to test for significance since this was an exploratory study. Also internal reliability of BSCAS was analysis with Cronbach's Alpha test.

Results

Table 1 shows the summary of responses received based on several general characteristics such as gender, levels of education, marital status, employment status, and age. Of 175 respondents, 86.9 % were female and 13.1 % were male. 89 (50.9 %) nurses graduated from prebachelor programs. 32.53 % of 175 nurses had bachelor's degree. Of 292 respondents, %73.1 (128 nurses) were contracted public personnel. 141 nurses had a personal computer and 144 nurses participated in a computer education. Mean age of nurses was calculated as 30.95±7.45. Mean for tenure computer use was 10.70 years.

Descriptive statistics were calculated for overall computer anxiety and subscales of computer anxiety (Table 2). Overall computer anxiety mean score was 12.11±1.72; Mean score for computer literacy was 3.66; for self efficacy was 4.34; for affective feelings was 3.61; for arousal was 2.07; for positive beliefs was 3.94; and negative beliefs was 3.93. Self efficacy has the highest mean score in subscales of computer anxiety. As already stated, the highest score of computer anxiety an individual can reach is 24, indicating the maximum level of computer anxiety. So, the mean score (12.11) for computer anxiety revealed that nurses in this study had computer anxiety levels that are nearly at the midpoint of the computer

Table 2 Descriptive statistics for computer anxiety

Computer anxiety and dimensions		Median	Mode	Std. deviation	Range	Minimum	Maximum
Computer literacy	3.66	3.62	3.88	.61	3.13	1.88	5.00
Self efficacy	4.34	4.50	5.00	.71	3.75	1.25	5.00
Affective feelings	3.61	3.75	2.11	.74	4.00	1.00	5.00
Arousal	2.07	2.00	4.00	.64	3.67	1.00	4.67
Positive beliefs	3.94	4.00	2.11	.72	4.00	1.00	5.00
Negative beliefs	3.93	4.00	4.00	.73	4.00	1.00	5.00
Total computer anxiety	12.11	11.88	12.53	1.72	9.97	9.44	19.42

anxiety scale. Median for overall computer anxiety was 11.88; mode for computer anxiety was 4.00 in our study.

Table 3 indicates that the correlations among overall computer anxiety and subscales of computer anxiety of nurses (computer literacy, self-efficacy, physical arousal, affective feelings, positive beliefs, and negative beliefs). There were significant relationships among dimensions of the computer anxiety in our study. Overall computer anxiety has significant relationship with all subscales of computer anxiety. The highest correlation was between overall computer anxiety and self efficacy (r=−.859), the lowest correlation was between overall computer and negative beliefs (r=−.653). In this study we found that the correlations between computer anxiety and its subcategories were all significant. There was a negative correlation computer anxiety of nurses with computer literacy, self efficacy, and affective feelings, and positive beliefs. On the other hand, there was positive relationship computer anxiety with arousal and negative beliefs in our study. Correlations among sub-categories of computer anxiety were all significant (p<0.01). There are positive intercorrelations among computer literacy, self efficacy, affective feelings, and positive beliefs. However there was not a significant correlation between arousal with positive beliefs and affective feelings.

Table 4 indicates that the correlations among overall computer anxiety, subscales of computer anxiety of nurses (computer literacy. self-efficacy. physical arousal. affective feelings. positive beliefs. and negative beliefs) and some characteristics of nurses. Overall computer anxiety has significant relationship with age (r=−.153; p<.05), personal computer ownership (r=.171; p<.05). However in our study it was found that overall computer anxiety has not a significant relationship with gender, marital status, education status, employment status, computer education, and tenure of computer use. Computer literacy has a significant correlation with education status (r=.152; p<.05), personal computer ownership (r=−.313; p<.01), tenure of computer use (r=.198; p<.01). Computer self efficacy has a significant interaction with employment status (r=.211; p<.01) and personal computer ownership (r=−.151; p<.05). There is a significant relationship physical arousal and age (r=.190; p<.05). On the other hand,

Table 5 shows that 60.8 % (Adjusted R square=.59, F=32.056, p=<.00001) of the variance in the dependent variable (overall computer anxiety of nurses) was explained by the independent variables (8 items of computer literacy). Multiple regression analysis revealed that Item 5 (st. ß=−.430; t=−6.382; p<.05) and Item 6 (st. ß=−.251; t=−3.502; p<.05) of computer literacy have a significant effect on computer anxiety. On the other hand it was found that other Items of computer literacy (Item 1, 2, 3, 4, 7 and 8) have not a significant effect on computer anxiety of nurses in this study. In this study the significant predictors for computer anxiety were Item 5 and 6 of computer literacy respectively (pls. see Table 5). These results revealed that computer literacy is a significant regressor for computer anxiety in terms of "I find computers easy to work with" and "I find it easy to make a computer do what I want".

Table 6 shows that 75.6 % (Adjusted R square=.74, F=130.666, p=<.00001) of the variance in the dependent variable (overall computer anxiety of nurses) was explained by the independent variables (4 items of self efficacy). Multiple

Table 3 Correlation matrix for computer anxiety

Computer anxiety and dimensions		Computer literacy	Self efficacy	Affective feelings	Arousal	Positive beliefs	Negative beliefs	Computer anxiety
Computer literacy	r	1						
	p							
Self efficacy	r	.614**	1					
	p	<.0001						
Affective feelings	r	.571**	.574**	1				
	p	<.0001	<.0001					
Arousal	r	−.512**	−.549**	−.396**	1			
	p	<.0001	<.0001	<.0001				
Positive beliefs	r	.504**	.578**	.623**	−.401**	1		
	p	<.0001	<.0001	<.0001	<.0001			
Negative beliefs	r	.502**	.595**	.616**	−.399**	.984**	1	
	p	<.0001	<.0001	<.0001	<.0001	<.0001		
Computer anxiety	*r*	−.692**	−.859**	−.818**	.772**	−.663**	−.653**	1
	p	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

**Correlation is significant at the 0.01 level (2-tailed)

Table 4 Correlation matrix between computer anxiety and some characteristics

		Age	Gender	Marital status	Education status	Employment status	Personal computer ownership	Computer education	Tenure of computer use
Computer literacy	r	−.144	−.090	.024	.164*	.152*	−.313**	−.122	.198**
	p	.064	.238	.752	.031	.046	.000	.109	.009
Self efficacy	r	−.173*	−.030	.089	.036	.211**	−.151*	−.120	.003
	p	.025	.694	.249	.639	.006	.047	.115	.971
Affective feelings	r	−.056	−.130	−.074	.046	−.019	−.156*	−.093	.001
	p	.470	.089	.337	.547	.800	.040	.223	.992
Arousal	r	.190*	−.006	.014	−.034	−.098	.108	.089	−.029
	p	.014	.934	.860	.659	.199	.155	.247	.707
Positive beliefs	r	−.113	−.026	.026	.095	.080	−.110	−.103	−.065
	p	.147	.735	.733	.214	.299	.148	.178	.396
Negative beliefs	r	−.130	−.028	.033	.095	.111	−.124	−.103	−.089
	p	.095	.716	.671	.217	.146	.102	.178	.245
Computer anxiety	r	−.153*	.080	.019	−.047	−.103	.171*	.116	−.027
	p	.049	.297	.802	.537	.180	.024	.130	.721

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

regression analysis revealed that Item 1 (st. ß=−.315; t=−6.650; p<.05), Item 2 (st. ß=−.285; t=−5.811; p<.05), Item 3 (st. ß=−.305; t=−7.044; p<.05), and Item 4 (st. ß=−.261; t=−6.120; p<.05) of self efficacy have a significant effect on computer anxiety. So all items of self efficacy significantly affect computer anxiety. In this study the significant predictors for computer anxiety were Item 1, 3, 2, 4 of self efficacy respectively (pls. see Table 6). R and R Square values in this regression model revealed that self efficacy is the most significant regressor for computer anxiety of nurses.

Table 7 shows that 71.5 % (Adjusted R square=.69, F=92.356, p=<.00001) of the variance in the dependent variable

Table 5 Predictors of computers anxiety in term of computer literacy

	Unstandardized coefficients		Standardized coefficients	t	Sig. (p)	VIF	95.0 % confidence interval for ß	
	Beta (ß)	Std. error	Beta (ß)				Lower bound	Upper bound
Constant	19.762	.549		35.977	.000*		18.677	20.846
Item 1. My friends ask me frequently for advice when they have problems with their computer.	−.020	.088	−.012	−.229	.819	1.246	−.195	.154
Item 2. I understand how computers function.	−.247	.128	−.134	−1.936	.055	2.013	−.499	.005
Item 3. I find it difficult to understand how a computer program functions.	−.166	.089	−.105	−1.855	.065	1.339	−.342	.011
Item 4. I have difficulty in understanding the technical aspects of computers.	.031	.089	.020	.351	.726	1.409	−.145	.208
Item 5. I find computers easy to work with.	−.847	.133	−.430	−6.382	<.0001*	1.914	−1.109	−.585
Item 6. I find it easy to make a computer do what I want.	−.453	.129	−.251	−3.502	.001*	2.159	−.708	−.197
Item 7. I feel that I will be able to keep up with the advances happening in the computer field.	−.130	.113	−.075	−1.157	.249	1.789	−.353	.092
Item 8. I seldom understand the explanation of a computer expert.	−.056	.091	−.031	−.622	.535	1.081	−.235	.123
Model summary R=.780; R^2=.608; F=32.056; p=< .00001; **Durbin – Watson (DW)**=2.111								

*: p<0.05 Significant predictor

Table 6 Predictors of computers anxiety in term of self efficacy

	Unstandardized coefficients		Standardized coefficients	*t*	Sig. (p)	VIF	95.0 % confidence Interval for ß	
	Beta (ß)	Std. error	Beta (ß)				Lower bound	Upper bound
Constant	21.274	.407		52.270	<.0001*		20.471	22.078
Item 1. I am confident that I can learn computer skills.	−.600	.090	−.315	−6.650	<.0001*	1,552	−.778	−.422
Item 2. Everyone can learn to use a computer, as long as one is patient and motivated.	−.525	.090	−.285	−5.811	<.0001*	1,659	−.703	−.347
Item 3. Learning to operate computers is like learning any new skill: the more you practice, the better you become.	−.523	.074	−.305	−7.044	<.0001*	1,298	−.670	−.376
Item 4. I am sure that I could learn computer applications.	−.458	.075	−.261	−6.120	<.0001*	1,261	−.605	−.310
Model summary R=.869; R^2=.756; F=130.666; p=< .00001; **Durbin – Watson (DW)**=1.880								

*: p<0.05 Significant predictor

(overall computer anxiety of nurses) was explained by the independent variables (4 items of affective feelings). Multiple regression analysis revealed that Item 1 (st. ß=−.430; t=−9.497; p<.05), Item 2 (st. ß=−.171; t=−3.614; p<.05), Item 3 (st. ß=−.191; t=−4.092; p<.05), and Item 4 (st. ß=−.367; t=−7.453; p<.05) of affective feelings have a significant effect on computer anxiety. So all items of affective feelings significantly affect computer anxiety in this study. In our study the significant predictors for computer anxiety were Item 1, 4, 3, 2 of affective feelings respectively (pls. see Table 7). These results revealed that affective feelings are significant regressors for computer anxiety.

Table 8 shows that 64.0 % (Adjusted R square=.62, F=35.944, p=<.00001) of the variance in the dependent variable (overall computer anxiety of nurses) was explained by the independent variables (9 items of physical arousal in the presence of computers). Multiple regression analysis revealed that Item 2 (st. ß=.197; t=2.756; p<.05), Item 3 (st. ß=.173; t=2.476; p<.05), Item 5 (st. ß=.180; t=3.065; p<.05), Item 7 (st. ß=.174; t=2.937; p<.05), and Item 8 (st. ß=.168; t=2.820; p<.05) of arousal have a significant effect on computer anxiety. However Item 1 of arousal has not a significant predictor for computer anxiety in this study. In our study the significant predictors for computer anxiety were Item 2, 5, 7, 3, 8 of arousal respectively (pls. see Table 8). These results revealed that physical arousal is a significant regressor for computer anxiety.

Table 9 shows that 52.9 % (Adjusted R square=.51, F=46.331, p=<.00001) of the variance in the dependent variable (overall computer anxiety of nurses) was explained by the

Table 7 Predictors of computers anxiety in terms of affective feelings

	Unstandardized coefficients		Standardized oefficients	*t*	Sig. (p)	VIF	95.0 % confidence interval for ß	
	Beta (ß)	Std. error	Beta (ß)				Lower bound	Upper bound
Constant	19.441	.368		52.841	<.0001*		18.715	20.167
Item 1. Computers are nice to work with.	−.754	.079	−.430	−9.497	<.0001*	1.215	−.910	−.597
Item 2. The challenge of learning about computers is exciting.	−.267	.074	−.171	−3.614	<.0001*	1.333	−.414	−.121
Item 3. Computers and everything related to them fascinate me.	−.322	.079	−.191	−4.092	<.0001*	1.294	−.477	−.166
Item 4. Working with a computer has made my life more enjoyable.	−.615	.083	−.367	−7.453	<.0001*	1.439	−.778	−.452
Model summary R=.846; R^2=.715; F=92.356; p=< .00001; **Durbin – Watson (DW)**=1.949								

*: p<0.05 Significant predictor

Table 8 Predictors of computers anxiety in term of arousal

	Unstandardized coefficients		Standardized coefficients	*t*	Sig. (p)	VIF	95.0 % confidence interval for ß	
	Beta (ß)	Std. error	Beta (ß)				Lower bound	Upper bound
Constant	8.253	.303		27.278	.000		7.655	8.850
Item 1. I am reticent in the use of computers.	.123	.076	.080	1.621	.107	1.096	−.027	.273
Item 2. I feel suffocated when I am in front of the computer.	.344	.125	.197	2.756	<.007*	2.291	.098	.591
Item 3. I tense up when I am behind the screen.	.320	.129	.173	2.476	<.014*	2.187	.065	.574
Item 4. When I work with a computer, my hands are sweaty.	.154	.087	.098	1.768	.079	1.383	-.018	.327
Item 5. Computers are difficult to understand and frustrating to work with.	.285	.093	.180	3.065	<.003*	1.535	.102	.469
Item 6. My heart beats faster when I think about working with a computer.	−.073	.087	−.043	−.841	.401	1.158	−.244	.098
Item 7. I stay away from everything that has to do with computers.	.289	.098	.174	2.937	<.004*	1.562	.095	.483
Item 8. Computers are wasted on me.	.283	.100	.168	2.820	<.005*	1.587	.085	.480
Item 9. I have avoided computers because they are unfamiliar and somewhat intimidating to me.	.219	.111	.121	1.970	.051	1.685	-.001	.438
Model summary R=.800; R^2=.640; F=35.944; p=< .00001; **Durbin – Watson (DW)**=2.148								

*: p<0.05 Significant predictor

independent variables (4 items of positive beliefs). Multiple regression analysis revealed that Item 2 (st. ß=−.545; t=−7.267; p<.05), Item 3 (st. ß=−.124; t=−2.208; p<.05), and Item 4 (st. ß=−.155; t=−2.692; p<.05), of positive beliefs have a significant effect on computer anxiety. In this study the significant predictors for computer anxiety were Item 2, 4, 3 of positive beliefs respectively (pls. see Table 9). These results revealed that positive feelings (3 items of this subscale) have significant regressors for computer anxiety. However Item 1 of positive beliefs subscale was not a significant variable in predicting computer anxiety in our study.

Table 10 shows that 19.5 % (Adjusted R square=.18, F=32.891, p=<.00001) of the variance in the dependent variable (overall computer anxiety of nurses) was explained by the independent variables (3 items of negative beliefs). Multiple regression analysis revealed that Item 1 (st. ß=−.392; t=−5.455; p<.05), Item 2 (st. ß=.185; t=2.301; p<.05), and Item 3 (st. ß=.176; t=2.237; p<.05) of negative beliefs have a significant effect on computer anxiety respectively (pls. see Table 10). These results revealed that negative feelings have significant regressors for computer anxiety in our study.

In summary, multiple regression analysis revealed that computer anxiety was predicted significantly by self efficacy

Table 9 Predictors of computers anxiety in terms of positive beliefs

	Unstandardized coefficients		Standardized coefficients	*t*	Sig. (p)	VIF	95.0 % confidence Interval for ß	
	Beta (ß)	Std. error	Beta (ß)				Lower bound	Upper bound
Constant	18.897	.524		36.061	.000		17.862	19.932
Item 1. Computers are bringing us into a bright new era.	−.176	.144	−.093	−1.22	.223	2.004	−.459	.108
Item 2. Life will be easier and faster with computers.	−1.023	.141	−.545	−7.267	<.0001*	1.973	−1.301	−.745
Item 3. Computers create economic stability.	−.200	.091	−.124	−2.208	.029*	1.113	−.380	−.021
Item 4. Computers are essential in education.	−.229	.085	−.155	−2.692	.008*	1.155	−.396	−.061
Model summary R=.727; R^2=.529; F=46.331; p=< .00001; **Durbin – Watson (DW)**=2.299								

*: p<0.05 Significant predictor

Table 10 Predictors of computers anxiety in terms of negative beliefs

	Unstandardized coefficients		Standardized coefficients	*t*	Sig. (p)	VIF	95.0 % confidence interval for ß	
	Beta (ß)	Std. error	Beta (ß)				Lower bound	Upper bound
Constant	12.512	.450		27.778	<.0001*		11.622	13.401
Item 1. Soon our lives will be controlled by computers.	−.536	.098	−.392	−5.455	<.0001*	1.065	−.730	−.342
Item 2. Computers turn people into just another number.	.284	.123	.185	2.301	.023*	1.339	.040	.528
Item 3. People are becoming slaves to computers.	.234	.105	.176	2.237	.027*	1.283	.027	.440
Model summary R=.441; R^2=.195; F=13.891; p=< .00001 **Durbin – Watson (DW)**=2.149								

*: p<0.05 Significant predictor

(R^2=.756), affective feelings (R^2=.715), physical arousal (R^2=.640), computer literacy (R^2=.608), positive beliefs (R^2=.529), and negative beliefs (R^2=.195) respectively. So, the most significant subscale in predicting computer anxiety of nurses was self efficacy, on the other hand, the lowest significant subscale in predicting computer anxiety was negative beliefs about computers.

Conclusion

This study was conducted and planned on computer anxiety of nurses at a public university hospital in Ankara, Turkey. It is first study about computer anxiety of nurses in Turkish health care services. Also this study is a first research to analyze predictors of computer anxiety in nurses according to items in six dimensions of Beckers and Schmidt's Computer Anxiety Scale. Our study was conducted on 175 nurses with Beckers and Schmidt's Computer Anxiety Scale. In this study the mean score for computer anxiety revealed that nurses had computer anxiety levels that are nearly at the midpoint of the computer anxiety scale. Self efficacy has the highest mean score in subscales of computer anxiety. Correlation analysis showed significant relationships among dimensions of the computer anxiety in our study. Overall computer anxiety has significant relationship with all subscales of computer anxiety. The highest correlation was between overall computer anxiety and self efficacy (r=−.859; p<.01), the lowest correlation was between overall computer and negative beliefs (r=−.653; p<.01). Overall computer anxiety of nurses has significant relationship with age (r=.153; p<.05), personal computer ownership (r=.171; p<.05). However in our study it was found that overall computer anxiety has not a significant relationship with gender, marital status, education status, employment status, computer education, and tenure of computer use. Multiple regression analysis revealed that computer anxiety was predicted significantly by self efficacy, affective feelings, physical arousal, computer literacy, positive beliefs, and negative beliefs respectively.

In this study it was found that there were inter correlations among overall computer anxiety and subscales of computer anxiety. These results are consistent with previous studies. Beckers & Schmidt (2001, 2003), Beckers et al. (2006, 2007) revealed that there were significant correlations among overall computer anxiety and six dimensions of computer anxiety. Research is available relating computer anxiety to computer self-efficacy. Studies have found that increased computer self-efficacy relates to decreased computer anxiety and increased computer experience [23, 24]. Şimşek (2011) [3] found that the overall correlation coefficient between computer anxiety and computer self-efficacy was negative but significant (r=−0.52; p<.01). In study of Embi (2007) [11] the stepwise multiple regression analysis was carried out to assess the relative contributions of computer-self efficacy, computer applications usage, and the selected characteristics to the explanations and predictions of the levels of computer anxiety. Embi (2007) [11] found that computer self-efficacy was the best predictors of computer anxiety. Computer self-efficacy alone explained 36.1 % of the variance in computer anxiety. In our study it was found that self efficacy was the most significant predictor of computer anxiety. Brosnan (1998) [30] found that computer anxiety was responsible for a significant amount of self-efficacy (R=.39, p<.001).

Several studies have reported the presence of computer anxiety among computer users in various organizations included health and hospital organizations [10]. There were correlations between computer use, perceived ease of use and perceived usefulness; and behavioral intention [21]. Wilfong (2006) [31] revealed in her study that self-efficacy beliefs, computer experience and computer use were strong predictors of computer anxiety. Saadé & Kira (2007) [22] indicated that computer experience was strong predictor for computer anxiety.

We found that there was a significant relationship computer anxiety and gender. This is in line with Brosnan & Davidson (1996) [32], Bowers & Bowers (1996) [33], North & Noyes (2002) [34], Gaudron & Vignoli (2002) [35], and Lavasani (2002) [16], and Mazloumiyan, Akbari, Rastegar, Jahromi's (2011) [36] results. However, some researchers have stated that females have significantly more computer anxiety than males [30, 37–40]. Moreover, Brosnan & Lee (1998) [41], and Rosen & Maguire (1990) [42], and Rosen & Weil (1995) [43] found that males had more computer anxiety than females. In our study we found that levels of education were a significant variable for anxiety. Embi (2007) [11] found that levels of education were a significant variable in predicting computer anxiety. An inverse relationship exists between computer anxiety and computer self-efficacy.

Campbell and McDowell (2011) [4] found that a moderately positive correlation was seen between year of birth and computer literacy. The correlation between nurses' educational level and computer literacy was found to be statistically significant. However, Embi (2007) [11] found that levels of education were a significant variable in predicting computer anxiety. An inverse relationship exists between computer anxiety and computer self-efficacy. Kjerulff et al. (1992) [15] found that nurses working on psychiatric units were found to be most anxious about working with medical equipment, while nurses working on surgical and adult intensive care units were least anxious. Calhoun et al. (1989) [44] revealed that statistically significant results were obtained indicating that age, level of education, and length of employment affect the degree of positive response to both computers and change. Their results suggest that demographic variables such as age, level of education, and employment duration must be taken into consideration when planning for the implementation of computer systems in the health care setting. Mikkelsen et al. (2002) [45] concludes that job training is negatively related to computer anxiety. Experience with computers was found to directly relationship compute anxiety and to have a positive impact on computer literacy [14, 26, 46]. Moreover more computer experience leads to higher computer literacy in nursing [21, 47].

This research provides a starting point for other research that should include consideration of computer anxiety in hospital organizations and its potential implications for health information management, health informatics and health services management.

Limitations of the study

This study was limited by several factors. First, we surveyed only nurses at a public university hospital for our study which prevents generalizability to health personnel and nurses in other hospital organizations. Therefore, the findings of this study cannot be generalized to represent all nurses at public, private and military hospitals in Turkish health system. A broader sample might reveal differences among different regions of the country. This sampling bias may limit the generalisability of the study results. This study used subjective, self-reported measures of computer anxiety in nurses; hence, the results are a measure of how the respondents perceived their competence and not an actual demonstration of competence. 86.9 % of participants were female. Because nursing is based on females.

Directions for future research

To date, little research on computer anxiety of health personnel has been conducted in Turkey. Future researchers wish to make glittering generalities; they should first randomize their sample in health care services to include other health personnel nationalities and geographical areas besides Turkey.

Computer anxiety is a problem that has been identified in high school graduates, college students, psychology students, faculty members, physicians, medical secretaries, and nurses [2, 6, 46].

As the literature suggests minimizing the computer anxiety could be done by the business and health care sector organizations focusing on computer training, teaching health information systems (national and international clinical informatics), computer-supported collaborative learning, promoting social interaction, implementing some innovative learning methods and avoiding negative consequences [10, 48, 49]. Health care organizations could optimize the benefit of a general computer and technology educational offering by encouraging attendance by executive and administrative support nurses.

Nurses who have increased computer self-efficacy and decreased computer anxiety will be more likely to learn computer and electronic information systems, clinical information systems and effectively utilize them for patient care in health care systems. [1, 2].

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