ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

DOI: 10.5336/nurses.2021-82037

Causal Attribution Training to Help Nurses Identify Causes of Medical Errors: A Randomized Controlled Trial

Nedensel Yükleme Kuramı Doğrultusunda Verilen Eğitimin Hemşirelerin Tıbbi Hata Nedenlerini Belirlemelerine Etkisi: Randomize Kontrollü Çalışma

Fatma ER[a], Behice ERCİ[b]

[a]Department of Nursing Management, İnönü University Faculty of Nursing, Malatya, TURKEY
[b]Department of Public Health Nursing, İnönü University Faculty of Nursing, Malatya, TURKEY

This study was presented as a poster at 5th International and 16th National Nursing Congress, 5-8 November 2017, Ankara, TURKEY.

ABSTRACT Objective: This research was conducted to determine the effect of the training given in line with the causal attribution theory on the nurses' determination of the causes of medical errors. **Material and Methods:** The population of this study, which was performed by using pre-test-post-test controlled randomized real trial method consisted of nurses working in inpatient treatment units of Bingöl State Hospital and Elazığ Training and Research Hospital (n=675). In the power analysis performed to determine the sample size of the study, the minimum sample size was determined as 176 nurses (88 in the experimental group, 88 in the control group). The experimental group was provided training on "Determination of the Causes of Medical Errors by Nurses" in line with Causal Attribution Theory. The data were collected using a Personal Information Form and the Causal Dimension Scale II. **Results:** An intergroup comparison of the mean post-test scores of the experimental and control groups revealed that there was a statistically significant difference between the groups. **Conclusion:** While there was no significant change between the groups in the pre-test evaluation of the experimental and control group mean scores, it was determined that there was a significant difference between the groups in the experimental group compared to the control group in the post-test evaluation. After the training given to the experimental group in line with the Causal Attribution Theory, it was determined that there is consistency in the uploads of the nurses regarding the causes of medical errors.

Keywords: Causal attribution theory; medical errors; nurse

ÖZET Amaç: Bu araştırma, nedensel yükleme kuramı doğrultusunda verilen eğitimin, hemşirelerin tıbbi hata nedenlerini belirlemelerine etkisini belirlemek için yapılmıştır. **Gereç ve Yöntemler:** Ön-test ve son-test kontrol gruplu gerçek deneme modeli olarak yapılan bu araştırmanın evrenini, Bingöl Devlet Hastanesi ve Elazığ Eğitim ve Araştırma Hastanesinin yataklı tedavi birimlerinde görev yapan hemşireler oluşturmuştur (n=675). Araştırmanın örneklem büyüklüğünü belirlemek için yapılan güç analizinde minimum örneklem büyüklüğü 176 hemşire (deney grubunda 88, kontrol grubunda 88) olarak belirlenmiştir. Deney grubuna Nedensel Yükleme Kuramı doğrultusunda "Tıbbi Hataların Nedenlerinin Hemşireler Tarafından Belirlenmesi" eğitimi verilmiştir. Verilerin elde edilmesinde Kişisel Bilgi Formu ve Nedensel Boyutlar Ölçeği II kullanılmıştır. **Bulgular:** Deney ve kontrol grubu son test puan ortalamalarının gruplar arası karşılaştırılmasında; gruplar arasındaki farkın istatistiksel olarak önemli olduğu belirlenmiştir. **Sonuç:** Deney ve kontrol grubu puan ortalamalarının ön-test değerlendirilmesinde gruplar arasında önemli bir değişim görülmezken, son-test değerlendirilmesinde gruplar arasında deney grubunda kontrol grubuna göre önemli bir farkın olduğu belirlenmiştir. Deney grubuna Nedensel Yükleme Kuramı doğrultusunda verilen eğitim sonrasında, hemşirelerin tıbbi hataların nedenlerine yönelik yaptıkları yüklemelerde tutarlılık olduğu belirlenmiştir.

Anahtar Kelimeler: Nedensel yükleme kuramı; tıbbi hatalar; hemşire

Medical errors occur when healthcare professionals, in performing their occupational practices, fail to provide necessary service and care, provide them insufficiently or incorrectly, or perform procedures they are not supposed to perform. Such errors may result in harm to patients and even death.[1,2] At

Correspondence: Fatma ER
Department of Nursing Management, İnönü University Faculty of Nursing, Malatya, TURKEY/TÜRKİYE
E-mail: fatma.er@inonu.edu.tr

Peer review under responsibility of Turkiye Klinikleri Journal of Nursing Sciences.

Received: 03 Feb 2021 ***Received in revised form:*** 06 Jul 2021 ***Accepted:*** 13 Jul 2021 ***Available online:*** 19 Aug 2021

2146-8893 / Copyright © 2021 by Türkiye Klinikleri. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

the same time, the length of time spent in the hospital and the prolongation of the treatment may cause an increase in cost and medical errors cause great economic impact on the health system, society and patients.[3,4] Medical errors generally occur due to imprudence, carelessness, negligence, insufficient professional knowledge and skills, inexperience, lack of diligence, lack of patient care and failure to adhere to orders and regulations, and may result in undesired outcomes including patient death, disability, longer hospitalization, and decrease in the patient's quality of life.[1,2,5] A report published by the International Institute of Medicine states that 44,000-98,000 people lose their lives every year in the United States because of medical errors.[6] A report titled "Preventing Medication Errors" published by the International Institute of Medicine in 2006 stated that 1,5 million people are injured every year due to medication errors.[7] Although the extent of medical errors in Turkey is not known exactly, it is stated that they show parallelism with the countries of the world.[2,8,9] In Turkey, a total of 101,841 error notifications were made to the Security Reporting System in 2017. Laboratory errors constitute 84.60% (86,155) of these notifications. These errors are followed by surgical errors, medication errors and patient safety errors. It is stated that 2,269 of a total of 5,092 medication errors reported in 2017 were caused by nurses.[10]

Medical errors concern all healthcare personnel. But, constitute a much more important issue for nurses becomes because they have diverse duties both under surveillance and independently, are directly in charge of patient care, and are the first healthcare staff consulted by patients.[8,9,11-15] Excessive workload and shift work, long working hours, inexperience in the profession, insufficient number of nurses, highly stressful conditions, high numbers of patients per nurse, ambiguous physician requests (difficult-to-understand verbal and written expressions), difficult working conditions, and unfavorable physical environments all increase the likelihood of nurses to make errors.[3,9,16,17] Nurses have a very important role in the prevention of medical errors and patient safety.[18] To prevent these errors, it should first be understood why nurses make medical errors, and then necessary measures should be taken to address them. An investigation of causal attributes made by nurses when identifying medical errors contributes to an understanding of how nurses react to such errors.[19] Causal Attribution Theory helps us better understand individuals' behaviors.[20] In order to prevent medical errors, a major problem today for both patients and healthcare employees, it is necessary to investigate in detail the factors causing such errors. To this end, it is important to identify the real causes of medical errors by using Causal Attribution Theory and to determine to what extent nurses are involved in situations leading to medical errors.

MATERIAL AND METHODS

AIM

This study was conducted to determine the effect of causal attribution training provided to nurses in terms of making correct causal attributions concerning medical errors.

Hypothesis

1. Training provided in line with Causal Attribution Theory positively affects the causal attributions relating to medical errors in the experimental group as compared to the control group.

DESIGN AND SETTING

This study used the pre-test-post-test controlled real trial method. The study consisted of nurses working in inpatient treatment units of a state hospital in Bingöl and a training and research hospital in Elazığ.

STUDY POPULATION AND SAMPLE

The study population consisted of nurses working in inpatient treatment units of Bingöl State Hospital and (n=125) Elazığ Training and Research Hospital (n=550). The power analysis carried out to determine the study sample size indicated a minimum of 176 nurses (88 in the experimental group and 88 in the control group) with 5% error, 95% confidence interval, and 0.5 effect size at a two-sided significance level. From the probability sampling methods, the simple random sampling method was used to include the nurses in the sample group. Since participation in the study was on a volunteer basis, 80 nurses were included in the experimental group and 80 in the

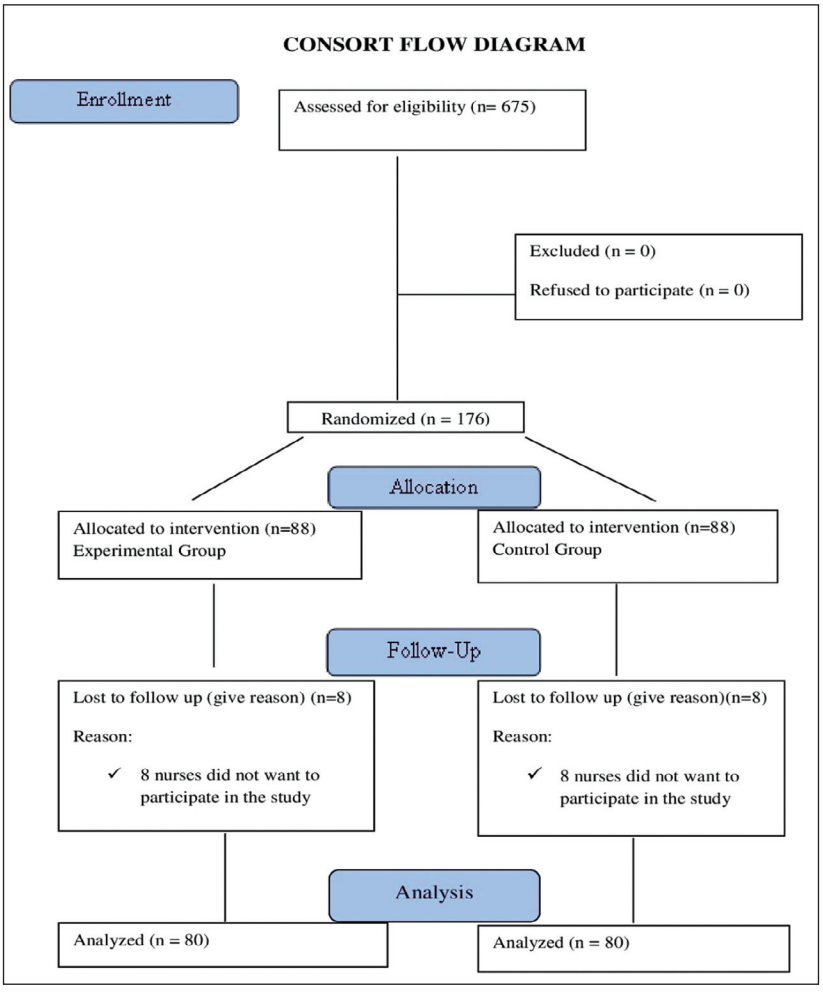

FIGURE 1: Consort flow diagram.

control group, as some nurses declined to take part (Figure 1).

DATA COLLECTION INSTRUMENTS

The data were collected using a Personal Information Form and the Causal Dimension Scale II as data collecting instruments.

Personal Information Form

The Personal Information Form consisted of fifteen questions concerning the descriptive and professional characteristics of the nurses.

Causal Dimension Scale II

Used for determining causal attribution dimensions related to the reasons why nurses make medical errors, the Causal Dimension Scale was developed by Russell in 1982, and revised by McAuley, Duncan and Russell in 1992.[21,22] The revised, improved version of the scale is the Revised Causal Dimension Scale II, which was adapted to Turkish and tested for validity and reliability by Yapıcı and Koçyiğit.[23] The Turkish version of the scale consists of twelve items and measures causal attributions under four sub-dimensions: Locus of Causality, External Control, Stability and Personal Control.[22,23]

There are two opposite expressions in each item that are scored from 1 to 9 in the scale and the participant is asked to rate the expression that appealed to them by selecting a figure between 1 and 9. The maximum score obtainable from the 3 items in each sub-dimension is 27 and the minimum score 3. High scores obtained from these sub-dimensions indicate that the cause is internally, stably and personally con-

trollable. The participant is asked in the scale to classify the answer given to the open-end question in line with these expressions.[22,23] Reliability Coefficients of Causal Dimension Scale II Sub-Dimensions in the successful attributions in the adapted version of the scale; it was found to be 0.66 for Causality Focus, 0.56 for Stability, 0.77 for Personal Control and 0.75 for External Control. Reliability Coefficients of Causal Dimension Scale II Sub-Dimensions were found to be 0.71 for Causality Focus, 0.65 for Stability, 0.77 for Personal Control and 0.74 for External Control in attributions to failure.[23] The Cronbach Alpha Reliability Coefficients of the scale in this study were found to be 0.69 for the total scale score. It was determined as 0.78 for Causality Focus, 0.71 for Stability, 0.83 for Personal Control and 0.78 for External Control.

DATA COLLECTION

The study data were collected by the researcher through face-to-face interviews with nurses working a state hospital in Bingöl and a training and research hospital in Elazığ between January and April 2016. The data were collected at hospital settings in the clinics where the nurses worked at times when the nurses were available. The Personal Information Form and the Causal Dimension Scale II were administered to the nurses in the experimental group and control group as a pre-test. A month after the experimental group completed training, the Causal Dimension Scale II was administered as the post-test and the causes of medical errors were asked once more.

NURSING INTERVENTION

Training Program

The training involved teaching nurses how to determine whether medical errors arise from internal or external causes, whether the causes of medical errors would change in time, and whether nurses have control over these causes in accordance with Causal Attribution Theory. The purpose of the training was to enable nurses to attribute correct causes to medical errors. The training on "Determination of the Causes of Medical Errors by Nurses," prepared in line with Causal Attribution Theory, was provided to the nurses in groups of twenty in convenient training rooms at the clinics. The initial training was conducted immediately after the pre-test data were collected. The session lasted forty-five minutes on average. A training leaflet on "Determination of the Causes of Medical Errors by Nurses," prepared in line with Causal Attribution Theory, was given to the nurses immediately following their initial training. No intervention was applied to the control group.

Training Leaflet

The training focused on nurses' finding the correct causes of medical errors in line with Bernard Weiner's Causal Attribution Theory. The topics included definition and importance of medical errors, factors that cause nurses to make medical errors, identifying the real sources of medical errors, nurses' assessments of medical errors according to their causal perceptions, determining whether the causes of medical errors made by nurses were stable, and determining whether nurses have control over the causes of medical errors.

DATA ANALYSIS

The data were analysed using SPSS Version 16.0 software. In the statistical analysis of the study data, the Cronbach alpha coefficient was used to determine the reliability and internal consistency of the scale and its sub-dimensions. The descriptive and professional characteristics of the nurses were analyzed using numbers, percentages, means, and standard deviations, and the results of the extent to which the nurses made medical errors were analyzed using numbers and percentages. To determine the difference between the mean pre-test and post-test scores of the experimental and control groups, the t-test was used in independent groups; for comparing the difference between the mean pre-test and post-test scores of the experimental and control groups within themselves, the t-test was used in dependent groups.

ETHICAL CONSIDERATIONS

An ethics committee approval (decision no: 2015/10-13, decision date: 01.12.2015) was obtained for the study from the İnönü University Health Sciences Scientific Research and Publication Ethics Committee. Written permissions were obtained from the Elazığ

Provincial Public Hospitals Association General Secretariat and the Bingöl Provincial Public Hospitals Association General Secretariat.

RESULTS

Table 1 shows the comparison of the control variables of the experimental and control groups. Since the nurses in the experimental and control groups are from different provinces, they differ in terms of control variables. They were taken from different provinces to prevent contamination between the experimental and control groups.

The distribution of the descriptive and professional characteristics of the nurses included in the study is seen in Table 2. Of the nurses in the experimental group, 65% were female, 56.2% married, 37.5% had an associate degree, and 46.2% worked in special units (intensive care, operating room etc.). Their mean age was 29.76±6.44 and mean working years was 8.36±5.97; their mean number of weekly working hours was 41.88±4.11. Of the nurses in the control group, 86.2% were female, 76.2% married, 42.5% had an associate degree, and 50.0% worked in internal diseases clinics. Their mean age was 35.56±7.86 years and mean working years was 13.37±7.70; their mean number of weekly working hours was 41.11±2.60. When the results of the prior medical error making statuses of the nurses were reviewed, 75.0% of the nurses in the experimental group were found to have made no prior medical errors, while 25% of them had made prior medical errors; they stated that 65.0% of those errors had originated from themselves and that 51.2% of their other friends in the profession had also made prior medical errors (Table 2).

Table 3 shows the intergroup comparison of the mean pre-test and post-test scores obtained from the experimental and control groups. According to these

TABLE 1: Comparison of control variables of experimental and control group.

Control variables	Experimental group (n=80) Number percentage		Control group (n=80) Number percentage		Tests and materiality
Gender					
Female	52	65.0	69	86.2	X^2=9.799
Male	28	35.0	11	13.8	p=0.002
Marital status					
Married	45	56.2	61	76.2	X^2=7.156
Single	35	43.8	19	23.8	p=0.007
Education level					
Vocational school of health	19	23.8	14	17.5	
Associate degree	30	37.5	34	42.5	
Undergraduate	28	35.0	31	38.8	X^2=2.160
Post graduate/doctorate	3	3.7	1	1.2	p=0.540
Clinic					
Internal diseases	25	31.3	40	50.0	
Surgery	18	22.5	18	22.5	X^2=7.275
Special unit (Intensive care, operation room, etc.)	37	46.2	22	27.5	p=0.026
			X±SD		
Age	29.76±6.44		35.56±7.86		t=-5.104 p=0.000
Years worked	8.36±5.97		13.37±7.70		t=-4.595 p=0.000
Weekly working hours	41.88±4.11		41.11±2.60		t=1.423 p=0.157

SD: Standard deviation.

TABLE 2: Distribution of descriptive and professional characteristics and medical error making statuses of nurses in experimental and control groups.

	Experimental group (n=80)		Control group (n=80)	
Descriptive and professional characteristics	**Number**	**Percentage**	**Number**	**Percentage**
Gender				
Female	52	65.0	69	86.2
Male	28	35.0	11	13.8
Marital status				
Married	45	56.2	61	76.2
Single	35	43.8	19	23.8
Education level Vocational school of health	19	23.8	14	17.5
Associate degree	30	37.5	34	42.5
Undergraduate	28	35.0	31	38.8
Post graduate/doctorate	3	3.7	1	1.2
Position				
Nurse	67	83.8	72	90.0
Nurse in charge	13	16.2	8	10.0
Clinic				
Internal diseases	25	31.3	40	50.0
Surgery	18	22.5	18	22.5
Special unit (Intensive care, operation room, etc.)	37	46.2	22	27.5
		X±SD		
Age	29.76±6.44		35.56±7.86	
Years worked	8.36±5.97		13.37±7.70	
Weekly working hours	41.88±4.11		41.11±2.60	
*Sufficiency of nurses in their clinic				
Sufficient	41	51.2	22	27.5
Insufficient	39	48.8	58	72.5
*Environment for providing safe care to patients in their clinic				
Appropriate	36	45.0	33	41.2
Inappropriate	44	55.0	47	58.8
	Experimental group (n=80)		**Control group (n=80)**	
Medical error assessments	**Number**	**Percentage**	**Number**	**Percentage**
Making any prior medical errors				
Yes	20	25.0	7	8.8
No	60	75.0	73	91.2
**Cause of the error made	13	65.0	4	57.1
Originated from me	2	10.0	1	14.3
originated from the clinic	2	10.0	1	14.3
originated from the doctor ***Other	3	15.0	1	14.3
Medical error making statuses of your other nurse friends				
Yes	41	51.2	25	31.2
No	39	48.8	55	68.8

*Nurses' own statements were considered.

**Calculated by the number of nurses answering "yes."

***Others included patient load, wording errors, and long working hours.

SD: Standard deviation.

TABLE 3: Comparison of mean pre-test and post-test scores obtained by nurses in experimental and control groups from Sub-Dimensions of Causal Dimension Scale II.

	Pre-test				Post-test			
	Experimental (n=80)	Control (n=80)			Experimental (n=80)	Control (n=80)		
Scale Sub-Dimensions	X±SD	X±SD	t value	p value	X±SD	X±SD	t value	p value
Locus of causality	11.31±6.71	11.23±6.21	0.073	0.942	16.23±10.43	12.16±7.40	2.849	0.005
External control	15.30±7.30	16.71±6.50	-1.292	0.198	14.93±9.90	16.36±6.58	-1.071	0.286
Stability	9.06±6.29	8.37±4.27	0.808	0.420	6.17±5.57	10.91±4.72	-5.799	0.000
Personal control	15.67±7.68	13.22±7.03	2.103	0.037	17.16±10.17	12.75±7.77	3.082	0.002

SD: Standard deviation.

results, there was no statistically significant difference between the groups with respect to the mean scores obtained from the Focus of Causality, External Control, and Stability sub-dimensions of the Causal Dimension Scale II (p>0.05). An intergroup comparison of the mean post-test scores of the experimental and control groups revealed a statistically significant difference between the groups with respect to the Stability sub-dimension of the Causal Dimension Scale II (p=0.000). A significant difference was also found between the groups with respect to the mean post-test scores obtained by the experimental and control groups from the Focus of Causality and Personal Control sub-dimensions (p=0.005 and p=0.002).

Table 4 shows the comparison of the mean pre-test and post-test scores obtained by the nurses in the experimental group from the sub-dimensions of the Causal Dimension Scale II. As a result of the training provided, the mean Locus of Causality sub-dimension score of the nurses was found to be 11.31±6.71 in the pre-test and 16.23±10.43 in the post-test. The mean post-test Locus of Causality sub-dimension score of the nurses increased, and the difference between the two scores was statistically significant (p=0.000). The mean Stability sub-dimension score of the nurses was 9.06±6.29 in the pre-test and 6.17±5.57 in the post-test. The mean post-test Stability sub-dimension score of the nurses decreased, and the difference between the two scores was statistically significant (p=0.001). The mean pre-test and post-test scores obtained by the nurses in the control group from the sub-dimensions of the Causal Dimension Scale II are given in Table 4. The mean Locus of Causality sub-dimension score of the nurses was 11.23±6.21 in the pre-test and 12.16±7.40 in the post-test. The mean post-test Locus of Causality sub-

TABLE 4: Comparison of mean pre-test and post-test scores obtained by nurses in itself experimental and control group from Sub-Dimensions of Causal Dimension Scale II.

	Experimental group			Control group		
	Pre-test	Post-test		Pre-test	Post-test	
	X±SD	X±SD	t and p	X±SD	X±SD	t and p
Locus of causality	11.31±6.71	16.23±10.43	t=-3.797 p=0.000	11.23±6.21	12.16±7.40	t=-10.13 p=0.314
External control	15.30±7.30	14.93±9.90	t=0.277 p=0.783	16.71±6.50	16.36±6.58	t=0.424 p=0.673
Stability	9.06±6.29	6.17±5.57	t=3.44 p=0.001	58.37±4.27	10.91±4.72	t=-3.555 p=0.001
Personal control	15.67±7.68	17.16±10.17	t=-1.159 p=0.250	13.22±7.03	12.75±7.77	t=0.492 p=0.624

dimension score of the nurses increased, but the difference between the two scores was not statistically significant (p>0.05). The mean External Control sub-dimension score was found to be 16.71±6.50 in the pre-test and 16.36±6.58 in the post-test. The difference between the two External Control sub-dimensions scores of the nurses was not statistically significant (p>0.05). The mean Stability sub-dimension score of the nurses was 8.37±4.27 in the pre-test and 10.91±4.72 in the post-test. The mean post-test Stability score of the nurses increased, and the difference between the two scores was statistically significant (p=0.001). The Personal Control sub-dimension score of the nurses was 13.22±7.03 in the pre-test and 12.75±7.77 in the post-test. The mean post-test Personal Control score of the nurses decreased, but the difference between the two scores was not statistically significant (p>0.05).

DISCUSSION

Numerous factors cause nurses to make medical errors. Many studies are available in the literature that explore these factors in Turkey.[16,24-28] Unlike those studies, the present study aimed to determine the causes to which nurses mostly attributed their medical errors, and, moreover, this study is the first experimental study in Turkey that applied Causal Attribution Theory to the field of nursing. The results of this study, which was conducted for the purpose of determining the effect of training provided in line with Causal Attribution Theory on the ability of nurses to determine the causes of their medical errors, are discussed alongside the relevant literature.

It was found in the study that the majority of nurses in the experimental and control groups had not made any medical errors in their careers. We think that increased quality assurance works in hospitals, increased regulations on patient safety, the introduction of in-service training, and patients and their relatives becoming more conscious of their rights have all been effective in reducing the rates of medical errors in Turkey. We also think that university-level nursing education has increased nurses' knowledge and skills, giving them the tools to act more carefully and diligently in patient care, which in turn reduces their medical errors. In a study conducted by Al Saleh and Ramadan, 51.9% of nurses were found not to have made any prior medical errors.[29] The literature reveals that nurses do not expressly state their medical errors because there is usually no medical error notification system, and they are afraid to be punished or to lose their jobs because of them.[12,13,26] In a study conducted in 2021 by Jang et al., it is stated that the rate of appropriate medication error reporting by nurses is still low.[30]

There did emerge, however, a statistically significant difference between the experimental and control groups with respect to their mean post-test Locus of Causality, Personal Control, and Stability sub-dimension scores (p<0.05). We think that this difference was due to the training provided to the experimental group. While the mean scores of the experimental and control groups were very close to each other in the pre-test, there was an apparent difference between their mean post-test scores. The Locus of Causality sub-dimension score of the experimental group increased markedly in the post-test. The Stability sub-dimension score of the experimental group decreased in the post-test. The increase in the Locus of Causality sub-dimension score and the decrease in the Stability sub-dimension score indicate that the training was effective, as the increase in the Locus of Causality sub-dimension score shows that the cause is more personal.[22,23]

The cause being personal indicates that it may change in time, and that the mean Stability sub-dimension score of the experimental group decreased in the post-test. The Personal Control sub-dimension score of the experimental group also increased in the post-test. While the mean pre-test Personal Control scores of the experimental and control groups were very close to each other, an apparent difference appeared in the post-test, whereas the mean pre-test and post-test scores of the control group did not change much. We think that the training was effective in creating this difference. This result supports the previously-stated hypothesis that "the training provided in line with Causal Attribution Theory positively affects the causal attributions relating to medical errors in the experimental group as compared to the control group."

It was found in the study that the mean post-test scores obtained from the experimental group from the Locus of Causality and Personal Control sub-dimensions of the Causal Dimension Scale II increased, and that the difference between the mean pre-test and post-test Locus of Causality scores was statistically significant (p=0.000). High scores obtained from the sub-dimensions of the scale indicate that the cause is controllable internally, stably, and personally.[22,23]

The responses given by the nurses to the open-ended question showed that they attributed the causes of medical errors more to external factors (excessive workload, insufficient education etc.) in the pre-test and more to internal factors (carelessness, lack of communication, inexperience etc.) in the post-test. Carelessness is an internal cause, but since situations that cause carelessness may arise from external factors (long working hours, excessive workload etc.), there were many attributions to this factor prior to training. The changes in the causal attributions and the increase in the mean post-test Locus of Causality score of the experimental group with the effect of the training point to an increase in the attributions to internal factors in the post-test. This result, again, supports the hypothesis.

The mean post-test Stability sub-dimension score of the experimental group was found to decrease, and the difference between the mean pre-test and post-test scores was statistically significant (p=0.001). The decrease in the mean post-test Stability sub-dimension score is an expected outcome because an increase in the internal causes in the post-test indicates that the cause is not stable. Since internal causes (carelessness, insufficient knowledge, tiredness etc.) originate from the person herself, they may be corrected in time. Therefore, this result supports the hypothesis by showing that the training provided was effective and its results were consistent with each other.

In a study made by Meurieret al., two groups of nurses were presented with a medical error: the first group with an error that produced serious outcomes and the second with an error that did not lead to serious outcomes.[20] In that study, the researchers found that nurses in both groups assessed the cause of the error as being internal, unstable, and controllable. The results obtained from the present study are similar to those of Meurieret al. the nurses in both studies stated that, in their causal attributions of medical errors, causes were more internal, unstable, and controllable.[20] This result suggests that nurses tend to think that medical errors originate more from themselves than from external factors, and, as such, are controllable and will decrease over time.

The mean External Control sub-dimension score of the experimental group decreased in the post-test. This decrease in the External Control sub-dimension score in the post-test indicates that, owing to the training given them, the nurses thought that the causes of medical errors originated more from themselves, which in turn increased their control over that cause which is to say they had increased personal control. This is because increased attributions to internal causes will also increase personal control and decrease external control. Increases in attributions to internal causes and in the mean Personal Control sub-dimension score support the hypothesis. The mean Stability sub-dimension score increased in the post test, and the difference between the nurses' mean pre-test and post-test scores was statistically significant (p=0.001). Since no training on Causal Attribution Theory was provided to the control group, the causal attributions they made to the causes of medical errors in the pre-test and those they made in the post-test were almost the same, with very little increase or decrease in their mean post-test scores. This suggests that their knowledge on this subject is inadequate, and, as such, the difference between their pre-test and post-test scores was not significant, as no intervention was made for the control group.

The training provided in line with Causal Attribution Theory was found to contribute positively to the nurses in finding causes of medical errors. Consistent post-test results in the experimental group enabled this finding, which shows that training was effective, as we believed in the hypothesis.

LIMITATIONS

In this study, because the assessments of the nurses about the medical errors are measured by scale, they are limited only to the individual declarations of the nurses. The results obtained from this study can be generalized for the population.

CONCLUSION

As a result of the study, which was conducted in a pre-test post-test controlled real trial model for the purpose of discovering the effect of training given in line with Causal Attribution Theory on nurses' ability to determine the causes of medical errors, the hypothesis was accepted, and the training on "Determination of the Causes of Medical Errors by Nurses," which was prepared in line with Causal Attribution Theory, was found to be effective. The following summarizes the results obtained from this study:

- While there was no significant variance between the groups in the pre-test assessment of the mean scores of the experimental and control groups, a significant difference was found between the groups in favor of the experimental group in the post-test assessment.

- After training given in line with Causal Attribution Theory to the experimental group, there was consistency in the attributions made by the nurses to the causes of medical errors (increase in the score of Locus of Causality sub-dimension of the Causal Dimension Scale II, decrease in the Stability sub-dimension score etc.).

Based on the results of this study, it is recommended that:

- In order to raise awareness of the professional practices of nurses, training on nursing practices, research, nursing education, and health policies should be provided more frequently;

- Training should be provided to nurses on causal attributions to the causes of medical errors; and

- Further studies should be conducted using Causal Attribution Theory in the field of nursing.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Fatma Er, Behice Erci;* ***Design:*** *Fatma Er, Behice Erci;* ***Control/Supervision:*** *Fatma Er, Behice Erci;* ***Data Collection and/or Processing:*** *Fatma Er;* ***Analysis and/or Interpretation:*** *Fatma Er, Behice Erci;* ***Literature Review:*** *Fatma Er, Behice Erci;* ***Writing the Article:*** *Fatma Er, Behice Erci;* ***Critical Review:*** *Fatma Er, Behice Erci;* ***References and Fundings:*** *Fatma Er, Behice Erci;* ***Materials:*** *Fatma Er, Behice Erci.*

REFERENCES

1. İşci N. The effect of occupational professionalism level of the nurses working in a hospital upon their tendency towards making a medical mistake [Postgraduate thesis]. Erzurum: Atatürk University; 2015. [Link] [accessed October 2016].
2. Güven Ş, Şahan S, Ünsal A. Hemşirelerin tıbbi hatalara yönelik tutumları [Nurses' attitudes for medical errors]. İzlek Akademik Dergi. 2019;2(2):75-85. [Link]
3. Özen N, Onay T, Terzioğlu F. Hemşirelerin tıbbi hata eğilimlerinin ve etkileyen faktörlerin belirlenmesi [Determination of nurses' tendency to make medical errors and affecting factors]. HSP. 2019;6(2):283-92. [Link]
4. Dorothy A, Yadesa TM, Atukunda E. Prevalence of medication errors and the associated factors: A prospective observational study among cancer patients at mbarara regional referral hospital. Cancer Manag Res. 2021; 13:3739-48. [Crossref] [Pubmed] [PMC]
5. Ulusoy H, Tosun N. Hekim ve hemşirelerin tıbbi hata tutumlarının belirlenmesine yönelik bir çalışma [A study on determination of medical error attitudes of physicians and nurses]. BMIJ. 2020;8(1):969-80. [Crossref]
6. Kohn L, Corrigan J, Donaldson M. To Err is Human Building a Safer Health System. 1st ed. Editors Committee on Quality of Health Care in America, eds. Washington: National Academy Press; 2000. p.26-48. [Link] [accessed 09 August 2015].
7. Anderson P, Townsend T. Medication errors: Don't let them happen to you Mistakes can occur in any setting, at any step of the drug administration continuum. Here's how to prevent them. American Nurse Today. 2010;5:23-8.
8. Birgili F, Köse F. Hemşirelerin tıbbi hatalara eğilimleri [Tendencies of nurses to medical errors]. Journal of Current Researches on Health Sector. 2018;8(2):249-66. [Link]
9. Sivikaya S, Kara A. Hemşirelerin tıbbi hata yapma eğilimlerinin incelenmesi [Determination the tendency of the nurses to make medical mistake]. Balıkesir Sağlık Bil Derg. 2019;8(1):7-14. [Link]
10. Güvenlik Raporlama Sistemi [Internet]. [Cited: 30 June 2021]. 2017 Yılı İstatistik ve Analiz Raporu. Sağlık Bakanlığı. Ankara: 2018. [Link]

11. Cebeci F, Gürsoy E, Tekingündüz S. Hemşirelerin tıbbi hata yapma eğilimlerinin belirlenmesi [Determining the level of tendency in malpractice among nurses]. Journal of Anatolia Nursing and Health Sciences. 2012;15(3): 188-195. [Link]
12. Özata M, Altunkan H. Hastanelerde tıbbi hata görülme sıklıkları, tıbbi hata türleri ve tıbbi hata nedenlerinin belirlenmesi: Konya örneği [Frequency of medical errors in hospitals, determination of medical error types and medical errors: Konya sample]. Medical Research Journal. 2010;8(2):100-11. [Link]
13. Ersun A, Başbakkal Z, Yardımcı F, Muslu G, Beytut D. Çocuk hemşirelerinin tıbbi hata yapma eğilimlerinin incelenmesi [A study of the malpractice trends in pediatric nurses]. Journal of Ege University Nursing Faculty. 2013;29(2):33-45. [Link]
14. Öztürk Y, Özata M. Hemşirelerde örgütsel vatandaşlık davranışı ile tıbbi hataya eğilim arasındaki ilişkinin araştırılması [The research of the relation between organizational citizenship behavior and malpractice trend in nurses]. Journal of Süleyman Demirel University Faculty of Economics and Administrative Sciences. 2013;18(3):365-81. [Link]
15. Dığın F, Özkan Z. Cerrahi kliniklerde çalışan hemşirelerin tıbbi hataya yönelik tutumlarının belirlenmesi [Determination of attitudes of nurses working in surgical clinics towards medical errors]. Lokman Hekim Dergisi. 2020;10(1):64-9. [Crossref]
16. npr [Internet]. [Cited: 9 November 2015]. How many die from medical mistakes in U.S. hospitals? Available from: [Link]
17. Karadağ G, Ovayolu Ö, Parlar Kiliç S, Ovayolu N, Göllüce A. Malpractic in nursing: The experience in Turkey. Int J Nurs Pract. 2015; 21(6):889-95. [Crossref] [Pubmed]
18. Musharyanti L, Claramita M, Haryanti F, Dwiprahasto I. Why do nursing students make medication errors? A qualitative study in Indonesia. J Taibah Univ Med Sci. 2019;14(3): 282-8. [Crossref] [Pubmed] [PMC]
19. Dikmen Y, Yorgun S, Yeşilçam N. Hemşirelerin tıbbi hatalara eğilimlerinin belirlenmesi [Identification the level of tendency in malpractice among nurses]. Journal of Hacettepe University Nursing Faculty. 2014;1(1):44-56. [Link]
20. Meurier CE, Vincent CA, Parmar DG. Nurses' responses to severity dependent errors: a study of the causal attributions made by nurses following an error. J Adv Nurs. 1998; 27(2):349-54. [Crossref] [Pubmed]
21. Russell D. The causal dimension scale: A measure of how individuals perceive causes. J Pers Soc Psychol. 1982;42(6):1137-45. [Crossref]
22. McAuley E, Duncan TE, Russell DW. Measuring causal attributions: The revised causal dimension scale (CDSII). Pers Soc Psychol B. 1992;18:566-73. [Crossref]
23. Yapıcı Ş, Koçyiğit M. Üniversite öğrencilerinin nedensel yüklemeleri [Causal attributions of university students]. The Journal of Academic Social Science Studies. 2012;5(2):349-68. [Crossref]
24. Alemdar KD, Aktaş YY. Medical error types and causes made by nurses in Turkey. TAF Preventive Medicine Bulletin. 2013;12:307-14. [Link]
25. Canatan H, Erdoğan A, Yılmaz S. Hastanelerde yapılan tıbbi hataların türleri ve nedenleri üzerine bir araştırma: İstanbul ilinde özel bir hastane ile ilgili anket çalışması ve konuya ilişkin çözüm önerileri [A research on sorts and reasons of medical errors made in hospitals: suggestions for solutions and a questionnaire study in a private hospital in Istanbul]. Health Academicians Journal. 2015;2(2):82-9. [Crossref]
26. Güneş ÜY, Gürlek Ö, Sönmez M. Factors contributing to medication errors in Turkey: nurses' perspectives. J Nurs Manag. 2014; 22(3):295-303. [Crossref] [Pubmed]
27. Işık O, Akbolat M, Çetin M, Çimen M. Hemşirelerin bakış açısıyla tıbbi hataların değerlendirilmesi [The causes of medical error from the perspective of nurses]. Taf Preventive Medicine Bulletin. 2012;11(4): 421-30. [Crossref]
28. Saygın T, Keklik B. A research on causes of medical errors: An example from Isparta. Hacettepe Health Management Journal. 2014;17(2):99-118. [Link]
29. Al-Saleh KS, Ramadan MZ. Studying medical errors among hospital-staff at saudi health providers. Journal of Materials Science and Engineering A. 2012;2(1):41-52. [Link]
30. Jang SJ, Lee H, Son YJ. Perceptions of Patient Safety Culture and Medication Error Reporting among Early-and Mid-Career Female Nurses in South Korea. Int J Environ Res Public Health. 2021;18(9):4853. [Crossref] [Pubmed] [PMC]