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Smoke-Free Campus Awareness Scale: A Validity and Reliability Study

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Main Points

- Smoke-Free Campus Awareness Scale (SCAS) was determined that the scale was compatible at an acceptable level.
- The total value of Cronbach's alpha was found to be .89.
- In the item-subdimension total score correlation of each question of the scale, 11 questions have a significant effect on the single dimension of the SCAS.
- The fact that there is no statistically significant relationship ($p > .05$) between SCAS and the demographic characteristics of the participants shows that the scale has a similar level of perception in all demographic structures.

Abstract

Our team conducted this study to develop the Smoke-Free Campus Awareness Scale and to test the validity and reliability of this scale. The study took place between November 2022 and January 2023 with individuals studying and working at a university after obtaining institutional permission and ethics committee approval. The study sample comprised 211 participants. We collected the data using the questionnaire prepared by the researchers and the Smoke-Free Campus Awareness Scale, which was content validated. Our team evaluated the scale's validity and reliability via IBM Statistical Package for the Social Sciences 25 (IBM SPSS Corp.; Armonk, NY, USA) and AMOS (Analysis of Moment Structures) 25 programs. Kendall's analysis and Barlett's test of sphericity ($p < .001$) were significant in the study. To verify the construct validity of the Smoke-Free Campus Awareness Scale, we applied the confirmatory factor analysis and the exploratory factor analysis. After the Smoke-Free Campus Awareness Scale's exploratory factor analysis, we concluded that there was a single factor for 11 items. In the fit indices model, it was determined that the scale was compatible satisfactorily. The scale's Cronbach's alpha coefficient was 0.898. Test – retest reliability analysis was found significant. We determined that the Smoke-Free Campus Awareness Scale is a valid and reliable measurement tool.

Keywords: Reliability, scale development, smoke-free campus, smoking, validity

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Introduction

Smoking is a public health problem that should be addressed with priority due to its multidimensional harm to the goal of protecting and improving the health of the individual, family, and society. Tobacco products rank first among preventable causes of death. Globally, 175 million women and 942 million men aged 15 and up smoke, and smoking is prevalent in Türkiye, with 3.9 million female and 10.6 million male smokers (WHO, 2019; Turan et al., 2022; Kutlu & Demirbaş, 2020). In addition to the use of tobacco products, exposure to second- and third-hand smoke causes health problems in individuals and society. Among the steps taken with the priority of protecting and improving public health, the Smoke-Free Air Zone (SAZ) Campaign was first presented to the public in 2008 by the Ministry of Health within the framework of the "National Tobacco Control Program and Action Plan." With

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the implementation of the SAZ, the tobacco products usage was restricted by regulations, inspection activities were increased, and many support mechanisms were created for individuals wanting to quit (SB, 2017). Studies emphasize that the fight against tobacco cannot be carried out with individual initiatives and that it is necessary to initiate smoke-free campus practices, especially in universities, to accelerate the adaptation process at the social level (Han et al., 2012; Kekliktepe & Göğcegöz, 2020). Within the framework of the Tobacco Control Action Plan 2018 – 2023, educational activities and activities on the harms of tobacco products and protection from them in higher education institutions were included in the activities section (SB, 2017). Despite practices such as SAZ, smoke-free campuses, fight against tobacco, and support mechanisms for those who want to quit, the prevalence of smoking among university students in Türkiye varies between 20% and 48%, and the smoking or initiation rates of young people increase when they start university (Vatansev et al., 2019; Kurcer & Erdogan, 2020).

Individual, institutional, and social strategies for tobacco control in universities should increase, and legal and administrative regulations regarding smoke-free campuses should be made (Kekliktepe & Göğcegöz, 2020; Baştürk et al., 2018; Sözen et al., 2021). While making regulations, it is important to take the opinions of those who study and work on university campuses for a smoke-free campus in order to adapt to the implementation and sustainability. There is no material in the literature measuring knowledge about smoke-free campuses in higher education institutions. This study's motive is to present a knowledge measurement tool to the literature. Due to these requirements, the study aims to develop a Smoke-Free Campus Awareness Scale (SCAS) (Annex 1) and test its reliability and validity.

Methods

Drafting the Scale and Obtaining Expert Opinions

While developing the SCAS, aligned with the literature (Koh et al., 2011; Banoğlu, 2011; Hahn et al., 2012; Kekliktepe & Göğcegöz, 2020; Sözen et al., 2021), we created a question pool 20-item. In order to determine whether the 5-point Likert-type scale items represent the area to be measured and whether they contain different expressions other than the desired one, we presented them to nine faculty members (medicine, nursing, and social services faculty members) for their expert opinion in January 2023. The experts rated the items on a scale of 1 – 5, as 1: strongly disagree, 2: disagree, 3: undecided, 4: agree, and 5: strongly agree. After the expert opinions, Kendall's analysis was performed for content validity. The experts agreed on the content of the items and that the scale items represented the area to be measured (Kendall's $W = 2.554$, $p = .004$).

Ethical Approval

Prior to the study, we obtained written permission and Ethics Committee permission (decision no: 0518) from the institutional administration of the university where we collected the sample. We provided explanations about the study to the participants, obtained their consent, and filled out the forms in accordance with the principle of voluntariness.

The research was conducted with employees and students studying at the university. The number of planned scale items was 20. It was determined that the study should reach a power of 80.181% with a minimum of 195 people (Bonett, 2002a). The smokeless campus awareness scale form was applied to 224 individuals, and the study was completed with a total of 211 participants because 13 people filled out the form incompletely and incorrectly.

Statistical Analysis

In this study, we used the Statistical Package for the Social Sciences (SPSS) 25 packaged software (IBM SPSS Corp.; Armonk, NY, USA) for the exploratory factor analysis (EFA) of the obtained data set. In the EFA, the definition of a factor is a dimension acquired as a linear combination of observed variables. Factors are variables that are hypothetical and made up of observed variables (Rencher, 2002). The correlation matrix should be examined to assess the data fitness for factor analysis. While inspecting the coefficients in the correlation matrix, if a significant fraction of them is not greater than 0.30, the factor analysis would be futile and inapplicable (Hair et al., 1998). The fitness of the variables for the analysis derives from the null hypothesis's rejection. Furthermore, the Kaiser – Meyer – Olkin (KMO) criterion, which is derived using both partial and complete correlation coefficients, is crucial for determining whether the data are suitable for factor analysis. The sample adequacy criterion, or KMO, accepts a value between 0 and 1. The relevant data set is not appropriate for factor analysis if the KMO value is less than 0.5 (Kaiser, 1970). With the purpose of acquiring the factors, our team used the principal component analysis. To determine the appropriate number of factors, the criteria that we followed were to include as many factors as the number of eigenvalues greater than one. Moreover, factor rotation was carried out to specify the variables involved in creating each common component. For this procedure, our team employed the Varimax rotation. The factors' fitness discovered by EFA with hypothetical or theoretical factor structures was also tested using confirmatory factor analysis (CFA). Exploratory factor analysis is typically used prior to constructing validity analysis and scale formulation.

Confirmatory factor analysis serves to verify the structure or theoretical factor structure obtained as a result of EFA (Brown, 2015). In EFA, the number of factors suitable for defining the basic structure is determined using a 2-d-code, while in CFA, the number of factors is known in advance. IBM SPSS Statistics for Windows version 25.0 (IBM SPSS Corp.; Armonk, NY, USA) and AMOS (version 24.0) package programs were used for CFA.

The number of units (n), percentage (%), mean and standard deviation (SD), median (M), minimum (min), and maximum (max) values were used to represent the descriptive statistics for the study's variables. The "Shapiro – Wilk" test was also used to verify the normality assumption, which is one of the prerequisites for parametric testing. To compare the scale scores, our team employed the Mann – Whitney U test for variables with two categories and the Kruskal – Wallis H test for variables with more than two categories. We used the Dunn – Bonferroni test to make multiple comparisons in cases where the Kruskal – Wallis H test result was significant. The Spearman correlation coefficient was used to assess the relationships between numerical variables, and a statistically significant value of .05 was used.

Results

Table 1 shows that the median age of the 211 participants was 20 years, 190 (90%) were students, 150 (71.1%) were female, and 61 (28.9%) were male. Of the participants, 22 (10.4%) were from physical sciences, 158 (74.9%) from health sciences, and 31 (14.7%) from social sciences departments; 81 (38.4%) were first-year, 29 (13.7%) second-year, 56 (26.5%) third-year, 13 (6.2%) fourth-year, 18 (8.5%) master's, and 14 (6.6%) doctoral students.

Table 2 shows that an item pool of 20 questions was created for the smokeless campus awareness scale and questions 1, 3, 5, 8, 10, 13, 14, 15, and 16 were removed from the scale because they did not fit the factor structure. The single dimension scale explains 54% of the total variance. The scale's Cronbach alpha reliability coefficient (.898) is also at a high level. The scale is a valid and reliable measurement tool due to the results of EFA.

Table 3 shows that 11 items in the scale were formed in a 5-point Likert type (strongly disagree, disagree, undecided, agree, and strongly agree). The mean of the scale was found to be 3.79 ± 0.90 points.

Table 1.
The Demographic Characteristics of the Participants

	Statistics
Age	
Mean ± SD	23.28 ± 7.98
M (minimum – maximum)	20 (18 – 58)
Group	
Student	190 (90%)
Employee	21 (10%)
Gender	
Female	150 (71.1%)
Male	61 (28.9%)
Marital status	
Single	185 (87.7%)
Married	26 (12.3%)
Department	
Physical sciences	22 (10.4%)
Health sciences	158 (74.9%)
Social sciences	31 (14.7%)
Grade	
First grade	81 (38.4%)
Second grade	29 (13.7%)
Third grade	56 (26.5%)
Fourth grade	13 (6.2%)
Masters	18 (8.5%)
PhD	14 (6.6%)

Note: Summary statistics were given as mean ± standard and median (minimum, maximum) for numerical data and number (percentage) for categorical data.

Table 4 shows that the model obtained as a result of the factor analysis (χ^2 = 73.368 df = 41) has a single dimension belonging to the smokeless campus awareness scale. The fit indices showed that the model was fit at an acceptable level.

The 11-item, one-dimensional SCAS was subjected to CFA and the model is presented visually in Figure 1.

Table 5 shows that 11 questions that make up the smokeless campus awareness scale have a statistically significant effect on the score ($p < .05$). While question 7 had the highest effect, question 11 had the lowest effect.

Table 6 shows that the mean score of the SCAS does not show a statistically significant difference according to demographic characteristics ($p > .05$).

Smoke-Free Campus Awareness Scale is a 5-point Likert type with 11 items. The scale questions should be answered with the appropriate answer from the statements "strongly disagree, disagree, undecided, agree, agree, strongly agree." The maximum score that can be obtained from the scale from a single dimension is 55 and the minimum score is 11. The mean score of the scale was 41.72 ± 9.93 points.

Discussion

Smoke-free campus implementations have been increasing in our country for the last few years, and studies have been carried out to determine the smoking status of students and to quit smoking (Şahiner et al., 2020; Uğur, 2022; Kutlu & Demirbaş, 2020; Kurcer & Erdogan, 2020; Kılıç et al., 2021; Terzi et al., 2019; Turan et al., 2022). Although there are a limited number of studies (Durusoy et al., 2011; Koh et al., 2011; Keklikteppe & Göğcegöz, 2020; Karayiğit, 2021) in which they take the opinions of students and employees about the smoke-free campus that will contribute to protecting and improving the health of students and employees in universities, there is no scale study for smoke-free campus awareness.

In our research, we tried to determine the awareness of university students and employees about a smoke-free campus. Whether the items in the question pool created to determine the opinions and awareness of individuals about the smoke-free campus are appropriate for the purpose of the scale, whether they are related to the situation to be measured, and whether they reflect the situation to be measured comprehensively were evaluated according to expert opinion. Aligned to expert opinions, the content validity of the scale is sufficient according to Kendall's coefficient of concordance (W = 2.554, p = .004) (Kendall & Babington, 1939).

In the literature, it is stated that items with factor loadings below .30 should be removed from the scale (Tezbaşaran, 1997). Items 1, 3, 5, 8, 10, 13, 14, 15, and 16 with factor loadings below .30 were removed from the scale. In general, it is shown that the other 11 items with a total item correlation score of .30 and above differentiate the individuals well; the items reflect similar characteristics and have high internal consistency, and the items are sufficient for purposeful measurement (Field, 2005; Allen & Yen, 2002; Bland & Altman, 1997; Bonett, 2002b; Bonett, 2003; Cronbach & Shavelson, 2004).

Table 2.
The Validity and Reliability Results of the Smoke-Free Campus Awareness Scale

Name of the Item	Item No.	Factor Loadings	Total Correlation	Explained Variance %	Cronbach Alpha
Smoke-free air zone should be implemented both indoors and outdoors	2	0.796	0.718		
Smoke-free campus should be implemented in every university	4	0.835	0.763		
Smoke-free air zone is an incentive to quit smoking	6	0.771	0.700		
The number of smoke-free air zones should be increased	7	0.849	0.784		
A smoke-free campus reduces passive smoking	9	0.729	0.646		
I do not go out to smoke alone on campus between classes and work	11	0.366	0.304	54.00	.898
In a smoke-free campus, there should be more non-smoking areas	12	0.828	0.769		
Smoking in universities encourages individuals to smoke	17	0.567	0.486		
Smoke-free campus implementation increases smoking cessation rates	18	0.749	0.692		
It will be easy to adapt to a smoke-free campus	19	0.645	0.579		
Training/events on smoke-free campus should be organized at the university	20	0.803	0.732		
KMO = 0.919, $df = 55$, $\chi^2 = 1293.628$ $p < .001$					

Note: *df* = Degrees of freedom; KMO = Kaiser – Meyer – Olkin test.

Table 3.
The Distribution Table of Smoke-Free Campus Awareness Scale Questions

Name of the Item	Item No.	Statistics	Frequency (n = 211)				
			1	2	3	4	5
Smoke-free air zone should be implemented both indoors and outdoors	2	3.91 ± 1.34	19 (9%)	22 (10.4%)	17 (8.1%)	53 (25.1%)	100 (47.4%)
Smoke-free campus should be implemented in every university	4	4.23 ± 1.15	12 (5.7%)	12 (5.7%)	12 (5.7%)	54 (25.6%)	121 (57.3%)
Smoke-free air zone is an incentive to quit smoking	6	3.71 ± 1.33	22 (10.4%)	21 (10%)	30 (14.2%)	62 (29.4%)	76 (36%)
The number of smoke-free air zones should be increased	7	4.28 ± 1.04	9 (4.3%)	9 (4.3%)	11 (5.2%)	66 (31.3%)	116 (55%)
A smoke-free campus reduces passive smoking	9	4.36 ± 1.02	9 (4.3%)	9 (4.3%)	4 (1.9%)	64 (30.3%)	125 (59.2%)
I do not go out to smoke alone on campus between classes and work	11	3.11 ± 1.66	58 (27.5%)	31 (14.7%)	26 (12.3%)	21 (10%)	75 (35.5%)
In a smoke-free campus, there should be more non-smoking areas	12	4.07 ± 1.24	15 (7.1%)	14 (6.6%)	23 (10.9%)	48 (22.7%)	111 (52.6%)
Smoking in universities encourages individuals to smoke	17	3.19 ± 1.43	42 (19.9%)	28 (13.3%)	35 (16.6%)	60 (28.4%)	46 (21.8%)
Smoke-free campus implementation increases smoking cessation rates	18	3.56 ± 1.33	23 (10.9%)	26 (12.3%)	37 (17.5%)	60 (28.4%)	65 (30.8%)
It will be easy to adapt to a smoke-free campus	19	3.15 ± 1.29	27 (12.8%)	43 (20.4%)	50 (23.7%)	54 (25.6%)	37 (17.5%)
Training/events on smoke-free campus should be organized at the university	20	4.14 ± 1.13	12 (5.7%)	11 (5.2%)	16 (7.6%)	69 (32.7%)	103 (48.8%)
General		3.79 ± 0.90					

Note: Summary statistics were given as mean ± standard deviation for numerical data and as number (percentage) for categorical data.

Table 4.
The Statistical Values for the Fit of the Smoke-Free Campus Awareness Scale Model

Measurement	Good Fit	Acceptable Fit	Model Fit Index Values
(χ^2/SD)	≤3	≤4 – 5	1.798**
RMSEA	≤0.05	0.06 – 0.08	0.060**
IFI	≥0.95	0.94 – 0.90	0.975**
CFI	≥0.95	0.94 – 0.90	0.974**
GFI	≥0.90	0.89 – 0.85	0.939**
TLI	≥0.95	0.94 – 0.90	0.966**

Note: *Acceptable fit; **good fit. RMSEA: Root Mean Square Error of Approximation, IFI= Incremental Fit Index, CFI: Comparative Fit Index, GFI= Goodness-of-fit Index, TLI= Turker-Lewis Index

In the EFA of the scale, it is stated that the KMO value should take a value between 0 and 1 and that it is perfect as it approaches 1 (Kaiser, 1958; Kaiser, 1970; Cerny & Kaiser, 1977). In our study, the KMO value of 0.919 and the high Cronbach's alpha reliability coefficients (.898) indicate that the scale is a valid and reliable measurement.

As a result of the EFA, we performed the CFA for the theoretical structure of the scale (Brown, 2015) and the fit indices that form the basic structure of the scale show that the scale model is compatible.

In the item-subdimension total score correlation of each question of the scale, 11 questions have a significant effect on the single dimension of the SCAS. The results of the analysis show the validity of the scale.

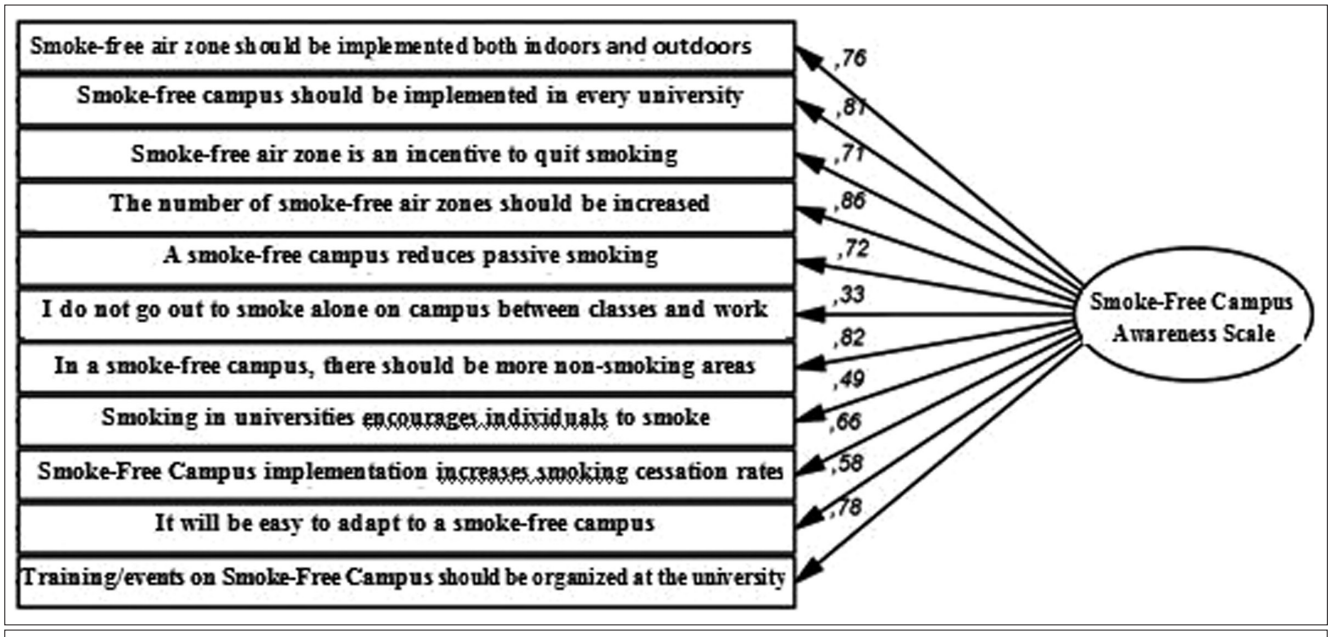

Figure 1. The Confirmatory Factor Analysis Model of Smoke-Free Campus Awareness Scale.

Table 5.
The Evaluation of the Effects Between Scale Questions and Sub-Dimensions

			zβ	*β*	SE	*t*	*p*
SCAS-20	⇓	Total score	0.776	1	–	–	–
SCAS-19	⇓	Total score	0.575	0.847	0.100	8.451	**<.001**
SCAS-18	⇓	Total score	0.661	1.003	0.102	9.871	**<.001**
SCAS-17	⇓	Total score	0.492	0.807	0.113	7.114	**<.001**
SCAS-12	⇓	Total score	0.820	1.165	0.091	12.793	**<.001**
SCAS-11	⇓	Total score	0.335	0.637	0.134	4.743	**<.001**
SCAS-9	⇓	Total score	0.722	0.842	0.077	10.964	**<.001**
SCAS-7	⇓	Total score	0.858	1.020	0.075	13.529	**<.001**
SCAS-6	⇓	Total score	0.711	1.078	0.100	10.753	**<.001**
SCAS-4	⇓	Total score	0.812	1.067	0.085	12.609	**<.001**
SCAS-2	⇓	Total score	0.761	1.161	0.100	11.626	**<.001**

Note: β = Regression coefficient; SE = Standard error; $z\beta$ = Standardized regression coefficient. SCA: Smoke-Free Campus Awareness, S: Question
Bolded sections are statistically significant ($p < .05$).

Table 6.
The Comparison of Smoke-Free Campus Awareness Scale According to Demographic Characteristics

	Smoke-Free Campus Opinion Scale			
	Mean ± SD	***M* (Minimum – maximum)**	**Test**	***p***
Group				
Student	3.78 ± 0.9	4 (1 – 5)	$z = -0.566$	.573
Employee	3.87 ± 0.93	4 (1 – 5)		
Gender				
Female	3.85 ± 0.78	4 (1 – 5)	$z = -0.234$	.815
Male	3.66 ± 1.14	4 (1 – 5)		
Age				
≤24	3.78 ± 0.92	4 (1 – 5)	$z = -0.251$	.802
≥25	3.84 ± 0.84	4 (1 – 5)		
Marital status				
Single	3.8 ± 0.91	4 (1 – 5)	$z = -0.304$	.761
Married	3.76 ± 0.88	4 (1 – 5)		
Department				
Physical sciences	4.06 ± 0.81	4.3 (2 – 5)	$H = 2.707$	.258
Health sciences	3.76 ± 0.91	4 (1 – 5)		
Social sciences	3.76 ± 0.94	3.8 (1 – 5)		
Grade				
First grade	3.78 ± 0.77	3.9 (2 – 5)		
Second grade	3.76 ± 1.1	4 (1 – 5)		
Third grade	3.77 ± 0.99	4 (1 – 5)	$H = 7.311$	.198
Fourth grade	3.82 ± 1.06	4.2 (2 – 5)		
Master's	3.6 ± 0.86	3.7 (1 – 5)		
PhD	4.25 ± 0.69	4.5 (2 – 5)		

Note: z = Mann – Whitney U test; H = Kruskal – Wallis H test; M = Median (Minimum – Maximum).
Summary statistics are given as mean ± standard deviation and median (minimum, maximum) values.

The fact that there is no statistically significant relationship ($p > .05$) between the SCAS and the demographic characteristics of the participants such as being a student or employee, gender, age, marital status, the department they are studying or working in, and their class shows that the scale has a similar level of perception in all demographic structures.

As a result, it was determined that the SCAS is a valid and reliable scale that can measure the opinions and awareness of individuals about smoke-free campus implementation and smoking in campus areas. The SCAS is an 11-item, 5-point Likert-type (strongly disagree, disagree, undecided, agree, strongly agree) unidimensional scale. A minimum of 11 and a maximum of 55 points are obtained from the scale, and as the score increases, the level of smoke-free campus awareness of individuals increases. The 11-item scale will increase the functionality of the scale in terms of reaching individuals more easily and quickly despite the limited personal time due to course and work intensity on campuses.

It is predicted that the scale will help to determine and increase the opinions and awareness of individuals in campus life on the subject and reduce exposure to first-, second-, and third-hand smoke on campuses. In addition, it is recommended that the scale be adapted to different languages and that studies be conducted in universities that have implemented or are in the process of implementing the smoke-free campus, and that it be tested with different variables.

Limitations and Directions/Suggestions for Future Research

Our study sample comprised a public university's enrolled students and employees. Students made up the majority of the participants. Repeating the experiment in various groups can boost the generalizability of the findings. It is necessary to conduct additional research with increased student and employee participation.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of İzmir Katip Çelebi University (Approval no: 0518, Date: 24.11.2022).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

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