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THE PREDICTION OF HEALTH LITERACY OF PARENTS WHO HAVE CHILDREN WITH CANCER ON THEIR HEALTHCARE SATISFACTION

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ABSTRACT

Purpose: This study was a descriptive and cross-sectional study to examined the prediction of health literacy of parents having children with cancer on the healthcare satisfaction.
Material and Methods: The descriptive and cross-sectional study was conducted between January and May 2019 and included 207 parents who had children treated at the pediatric hematology-oncology unit of a university hospital. A parental information form, the Health Literacy Index, and the Pediatric Quality of Life (PedsQL) Inventory Healthcare Satisfaction Hematology/Oncology Module parental report was used to collect the data. Percentage calculations, mean values, Pearson's correlation analysis, linear regression analysis, and multiple correlation analysis were used to analyze the data.
Results: According to the relationship between variables in regression analysis, five models were created. Each subscale in the Health Literacy Index was identified as a separate model. In the last model, the effect of the total score of the Health Literacy Index on PedsQL Healthcare Satisfaction Hematology/Oncology Module was determined. According to these models, healthcare satisfaction increased as the health literacy subdimension scores and total scores increased. Increased scores of the Health Literacy Index were found to promote healthcare satisfaction.
Conclusion: The ability of parents to manage their children's disease process and daily life activities becomes better as their health literacy levels increase.

Keywords: cancer, health literacy, healthcare satisfaction, parents

INTRODUCTION

The decisions taken by patients and their relatives about diseases such as cancer significantly affect the effectiveness and quality of the healthcare services they receive. These decisions are a result of their health-related skills, capacities, and knowledge. This situation is termed "health literacy" in the literature (1). Health literacy is a cognitive and social skill related to the individual's access to, understanding, and use of health information for maintaining and developing the health (1,2). Health literacy increases the span and quality of life and assists healthcare recipients to participate in care-related decision-making processes (1). Nearly half of the European population have low health literacy and 35% had problematic health literacy (3). The general health literacy index in

Turkey is 30.4%, 24.5% of the population is incompetent in health literacy, and 40.1% has poor health literacy levels (4). The low level of health literacy results in several negative effects both at individual and health system levels. These negative effects include healthcare use and costs, increased complications and number of deaths, non-compliance to treatment, decreased quality of life, and dissatisfaction with the healthcare system (1). Therefore, determining the level of health literacy is important. Health literacy level measurement tools differ in terms of application and evaluation. These tools vary depending on the purpose of the practitioner or the extent of health literacy to be evaluated. For example, the Test of Functional Health Literacy in Adults, the Newest Vital Sign, Europe SOY Scale, the Turkish version of the European Health Literacy Scale, and Turkey Health Literacy Adults Scale-32 are used in performing a comprehensive evaluation. More than 20 scales are available to measure the health literacy level (5–7).

Health literacy in patients with cancer is important in managing the symptoms and achieving self-care using preventive healthcare services, thus increasing healthcare satisfaction and the quality of life. Low health literacy in children with cancer and parents and relatives leads to an inadequate search for medical care in symptomatic periods, reduced healthcare satisfaction, inadequate self-care, and inadequate management of the chronic disease (8). Especially in cancer populations and their caregivers, health literacy level is positively associated with the quality of healthy life. Low health literacy levels can lead to misconceptions about the disease and its prognosis, causing dissatisfaction and anxiety in terms of care (8). Therefore, it is essential to increase the health literacy levels of patients with cancer and their parents and relatives (1). A high health literacy level does not indicate the dissemination of the right information. To achieve this, it is necessary to reach the right resources and evaluate the information appropriately. Thus, getting the right health literacy is important for parents of children with cancer. While providing care, pediatric nurses can play an important role as an education provider and counselor by considering the health literacy levels of children and their parents, and by planning and implementing customized care. This acts as a crucial factor in increasing patient healthcare satisfaction (9).

One of the criteria for healthcare quality is patient satisfaction. Patient satisfaction is a conclusion derived from a comparison between expectations and the perceived circumstances. A performance above expectations is evaluated positively by individuals, whereas a performance below expectations is perceived negatively. This degree of acceptance has a decisive and direct effect on healthcare satisfaction (10). If the expectation level of patients is low, and their minimum expectations are being met, their satisfaction level will be high. In contrast, if patients have little expectations and their health literacy level is low, and they have little knowledge about healthcare, they will be more satisfied with the healthcare service they are provided (10).

Healthcare satisfaction is influenced by individual characteristics of the person, the physical structure of the institution providing the healthcare, medical competence, reliability and communicative capacity of the healthcare personnel, attitude and behavior of the healthcare personnel toward patients, whether adequate information is provided to patients, and health literacy levels of patients and their parents and relatives (11). Determining the healthcare satisfaction levels of patients and their relatives is essential in planning and evaluating the healthcare and provision of more qualified services to meet their expectations (12). This can be achieved by increasing the number of studies on the importance of the relationship between patient satisfaction and health attitude and behavior.

Health satisfaction and health literacy levels of parents with children with cancer are an important issue in child nursing. One of the important factors that prevent parents from gaining knowledge and awareness about childhood cancers is stigmatization. Due to stigma, parents find it difficult to get information from people other than healthcare professionals and from learning resources about cancer-confusing issues (8). Therefore, adequate health literacy levels of these families are an important requirement. Increasing the level of health literacy in these individuals can contribute to reducing health inequalities. Also, the awareness and awareness of the parents about the cancer process is increasing, with the health literacy level increasing. Pediatric nurses must pay attention to their health literacy levels in their education to parents. Because the content and technique of education will change according to the knowledge of the parents (8).

An analysis of studies handling several cancer types on the effect of health literacy on the healthcare satisfaction of parents having children with cancer

was conducted that revealed that there exists no study showing the relationship between health literacy and healthcare satisfaction. Therefore, studies investigating the effects of health literacy on healthcare satisfaction of parents having children with cancer are necessary (11,12).

MATERIAL AND METHODS
Objective
This present study was a descriptive and cross-sectional study to examined the prediction of health literacy of parents having children with cancer on the healthcare satisfaction.

Population and Sample
The calculation of the sampling required for the study was performed using the G*POWER 3.0 statistical analysis software based on a 0.05 significance level, 95% power, and 0.15 effect size, eight variables in regression analysis. The effect size was taken as 0.15 in this study. The effect size was taken as 0.15 because regression analysis was used in this study. In the literature, it is stated that if there is not enough data on the subject in calculating the sample size, the relevant test should use the medium effect size (13). Since regression was used in this study, 0.15 was used in the sample size calculation, since the medium effect size corresponded to 0.15 in the regression analysis. Thus, the sample size required for regression analysis was determined as 74 subjects. Although at least 74 people were required to determine the minimum relationship in this study, all parents who agreed to participate in the study were included in order to clearly demonstrate the strength of the relationship between the variables and to increase the generalizability of the results. The study was conducted between January and May 2019 and included 207 parents having children treated at the pediatric hematology-oncology unit of a university hospital. Parents who were older than 18 years, and whose child had been receiving treatment in the pediatric hematology-oncology unit, and who volunteered to participate in the study were enrolled in the study. Parents of all children with cancer who came to be treated between January and May 2019 were invited to participate in the study. All of these parents participated in the study and the rate of participation and filling in surveys is 100%.

Ethical Considerations
Ethical approval was received from the Non-Invasive Clinical Studies Ethics Committee of the University (Date: 30.01.2019, Decision no: 2019/02–03). The researcher informed the parents about the aim of the study and obtained written consent forms from them.

Data Collection Tools
The data were collected using a parental information form, the Health Literacy Index, and the Pediatric Quality of Life Inventory (PedsQL) Healthcare Satisfaction Hematology/Oncology Module parental report.

The Parental Information Form
The form consisted of seven items. The first five items included questions on socio-demographic characteristics of patients (age, gender, educational status, income status, and employment status), whereas the remaining two items included questions on who the caregiver was and how often the participants used social media, because social media websites, such as Facebook, YouTube, and Twitter, also serve as a growing source of health care information. Social media is a preferred source of health information for those who frequently use social media sites for health purposes.

Health Literacy Index
The 47-item Health Literacy Index in Europe Questionnaire was developed by Sorensen in 2012 (14). It was later simplified by Tochi, Bruzari, and Sorenson (2013) and was given the final form (15). The Turkish validity and reliability study of the scale was conducted by Bayik and Aras in 2017 (2). The version of the Health Literacy Index used in this study consisted of 25 items and four subscales. The subdimension "Accessing Information" comprises five items. The "Understanding Information" subdimension includes seven items. The subdimension "Appraising" contains eight items. The "Applying" subdimension contains five items. Besides, the minimum and maximum scores that can be obtained from the entire scale are 25 and 125, respectively. The responses to items are in Likert type as follows: "5: I have no difficulty; 4: I have little difficulty; 3: I have some difficulty; 2: I have many difficulties; 1: I am not able to do it/I have no ability/

impossible." All items of the scale are positive, and there is no inversed item. The scale-level internal consistency coefficient (Cronbach's alpha) is 0.92, and Cronbach's alpha coefficients for the subdimensions range from 0.62 to 0.79. Low scores indicate that health literacy is inadequate, problematic, and poor, whereas high scores show that health literacy is adequate and very good. Increased scores indicate increasing the health literacy level of the individual (2,15). The Cronbach alpha reliability coefficient of the total scale was found to be 0.90 and of the subdimensions range from 0.68 to 0.81 in this study.

The Pediatric Quality of Life Inventory Healthcare Satisfaction Hematology/Oncology Module Parental Report
This inventory was developed by Varni et al. (2000). The authors also conducted its reliability and validity study. The Turkish validity and reliability study of the scale was conducted by Tanır and Kuğuoğlu (2012). The scale consists of 25 items and six subscales: overall satisfaction (three items); information (five items); inclusion of family (four items); communication (five items); technical skills (four items); and emotional needs (four items). The inventory has a parental module only. The responses in the 5-point Likert type inventory are as follows: 1 = Never satisfied; 2 = Not satisfied; 3 = Undecided; 4 = Satisfied; and 5 = Always satisfied. With the increase in the scores obtained from the scale, healthcare satisfaction increases. Cronbach's alpha coefficient of the total scale is 0.974 and Cronbach's alpha coefficients for the subdimensions range from 0.86 to 0.95 (16,17). The Cronbach alpha reliability coefficient of the total scale was found to be 0.94 and of the subdimensions range from 0.88 to 0.95 in this study.

Data Collection
The researchers collected the data during daily visits to the pediatric oncology clinic. After they interviewed the parents who met the inclusion criteria, researchers asked the parents to fill in the data collection forms in the clinic's single-patient rooms. The parents took approximately 10 to 20 min to fill out the data collection forms.

Data Analysis
Mean and percentage calculations were used for evaluating descriptive data. The significance level

was accepted as 0.05. The Shapiro–Wilk test was used for the normal distribution of scale mean scores according to the variables included in the regression model. Pearson's correlation analysis was used to analyze the relationship between health literacy and healthcare satisfaction. Linear regression analysis was used to determine the extent to which health literacy status predicted healthcare satisfaction, and multicollinearity examined by Variance Inflation Factor (VIF) and tolerance analysis. The skewness and kurtosis values were between - 2 and + 2. Residual values are between -0.894 and 3.624.

RESULTS
The mean age of children was 10.83 + 4.46 years, and the mean diagnostic time of children was 11.03 + 4.86 months. The length of stay of children in the hospital was 8.62 + 3.36 days; 50.8% of children were male, and 49.2% of children were female. Among them, 63.8% of them were in remission, and 40% were diagnosed with hematologic cancer types. As part of the treatment, 55.4% underwent all types of treatments (chemotherapy, radiotherapy, surgery, and bone marrow transplantation). The mean age of parents was 37.31 + 6.69 years, and 73.4% of them were female, and 56.5% were high school graduates. Further, 72% of them were unemployed, and 73.4% of them had low socioeconomic level. The use of social media tools was frequent in 30.4% of parents. Also, the percentage of different social media use by parents was Facebook, 30.4%; Instagram, 27.5%; YouTube, 26.1%; and Twitter, 23.7%. The mean score of the parents on the Health Literacy Scale is 95.29 + 32.95 (Minimum = 25.00; Maximum: 125.00) and the mean score on the Health Care Satisfaction Scale is 98.02 + 25.97 (Minimum = 25.00; Maximum: 125.00). Table 1 presents the effect of the characteristics of parents on their health literacy and health care satisfaction levels. As a result of the analysis, there is a statistically significant relationship between the age, educational status, economic situation and social media frequency of the parents, and health literacy and health care satisfaction (p <0.05, Table 1). By using the Mann Whitney U test with Bonferroni correction, it was determined which measurement resulted from the difference in the age, educational status, economic status and frequency of social media use of the parents. As a result of the test, it was determined that there was a difference between the parents in the 20-29 and 30-39 age groups according to age, and there was a difference

Table 1. The Effect of The Characteristics of Parents on Their Health Literacy and Health Care Satisfaction Levels

Characteristics of Parents		Health Literacy		Health Care Satisfaction	
		Mean	**SD**	**Mean**	**SD**
Gender	Female	97.72	33.11	99.90	26.90
	Male	88.60	31.83	92.83	22.65
	Test value	*t: 1.802*		*t: 1.882*	
	p	*p: 0.075*		*p: 0.062*	
Marital Status	Married	95.23	33.55	97.86	26.55
	Single	95.89	27.03	99.63	19.91
	Test value	*t: -0.098*		*t: -0.357*	
	p	*p: 0.923*		*p: 0.724*	
Age	20-29	120.29	5.98	117.52	8.41
	30-39	107.60	25.97	105.59	22.55
	40-49	71.00	31.54	81.82	25.38
	50 and above	51.25	6.78	71.00	18.13
	Test value	*F: 42.174*		*F: 24.655*	
	p	*p: 0.000**		*p: 0.000**	
Educational status	Literate	46.11	6.48	67.64	17.26
	Primary school	78.75	34.54	79.48	26.25
	Middle school	84.55	38.64	86.66	29.10
	High school	107.49	23.23	108.04	19.31
	University and higher education	115.48	15.87	117.38	14.47
	Test value	*F: 26.593*		*F: 20.892*	
	p	*p: 0.000**		*p: 0.000**	
Working status	Working	92.18	32.95	95.10	23.63
	Not working	96.51	32.98	99.16	26.82
	Test value	*t: -0.847*		*t: -1.067*	
	p	*p: 0.399*		*p: 0.288*	
Economic status	Less than income	91.55	32.93	95.88	26.43
	Equal to income and expense	105.63	31.00	103.94	23.89
	Income more than expenses	-	-	-	-
	Test value	*F: 7.607*		*F: 3.947*	
	p	*p: 0.006**		*p: 0.048**	
Parents status	Mother	96.31	34.29	98.83	27.70
	Father	92.26	28.65	95.59	20.02
	Other	-	-	-	-
	Test value	*F: 0.586*		*F: 0.605*	
	p	*p: 0.445*		*p: 0.437*	
Social Media Usage Frequency	Never	59.39	30.01	74.66	20.11
	Rarely	61.73	31.31	68.26	26.14
	Sometimes	91.77	22.48	87.61	17.29
	Often	110.78	20.35	108.11	15.71
	Always	116.24	18.02	118.67	12.50
	Test value	*F: 51.769*		*F: 63.442*	
	p	*p: 0.000**		*p:0.000**	

SD: Standart Deviation; t: Student t Test; F: Oneway ANOVA Test; *p<0.05

between high school graduates and university graduates according to education level. In addition, it has been determined that there is a difference in parents with equal income-expenditure levels according to their economic status, and there is a difference in parents who use social media frequently or always according to the frequency of use of social media ($p < 0,05$, Table 1).

As the health literacy scale total score and sub-dimensions increase, health care satisfaction increases ($p < 0.001$, Table 2). Similarly, As the frequency of social media usage increases, health care satisfaction increases ($p < 0.001$, Table 2).

According to the relationship between variables in univariate regression analysis, five models were created (Table 3, Figure I). Each subscale in the

Health Literacy Index was identified as a separate model. In the last model, the effect of the total score of Health Literacy Index on PedsQL Healthcare Satisfaction Hematology/Oncology Module was determined. The health literacy of parents increased with the increase in the total score obtained from the Health Literacy Index. As the total score obtained from the healthcare satisfaction scale increased, the healthcare satisfaction of the parents increased. In the first model, while accessing the information subscale affected 76.1% of the healthcare satisfaction of parents, as accessing the information subscale of health care literacy increases by one unit healthcare satisfaction increases by 0.872 times (95% Confidence Interval [CI] 3.123 to 3.750). In the second model, understanding the information
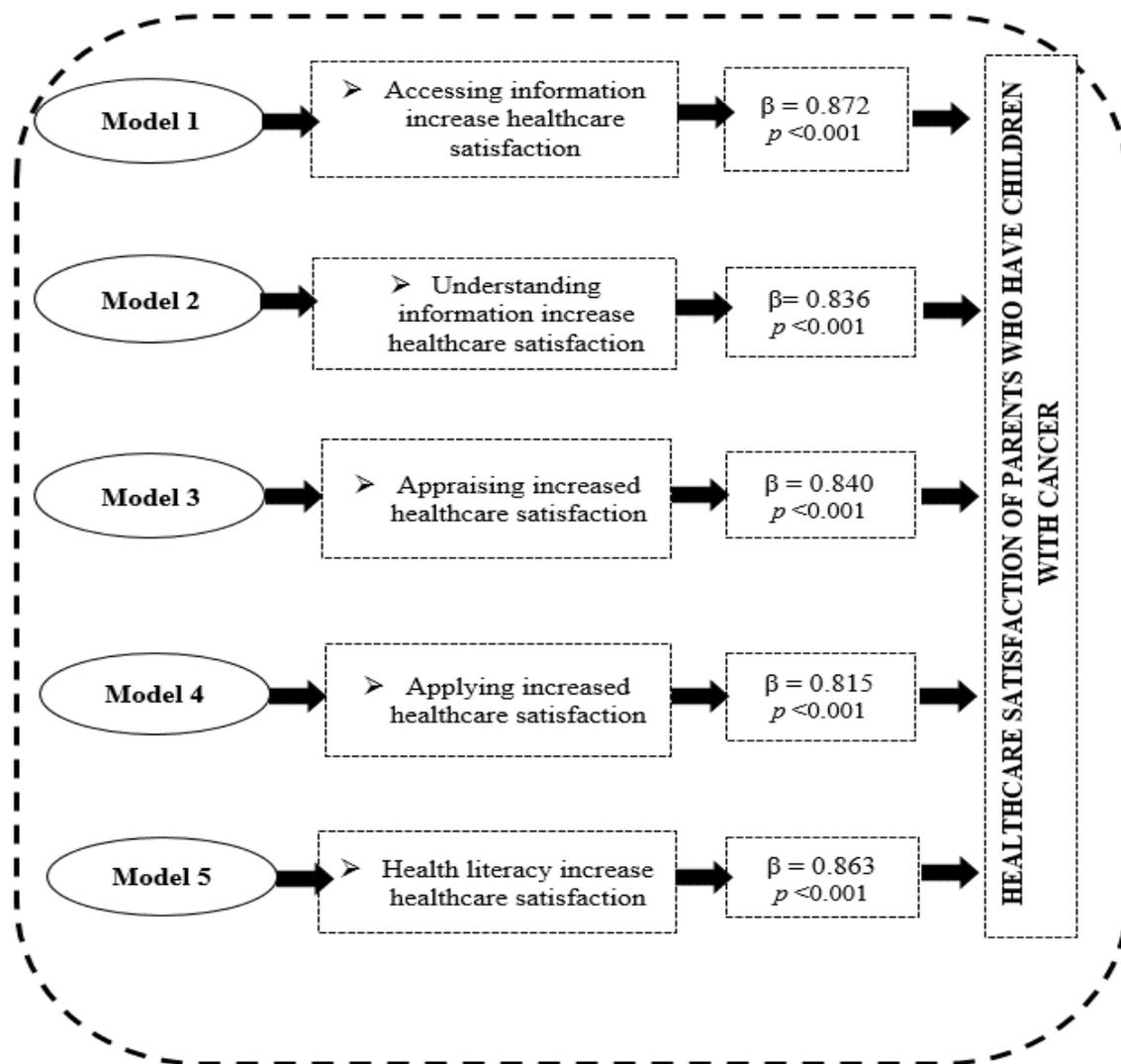
Figure 1. Model of factors impacting healthcare satisfaction of parents with children having cancer

Table 2. Correlation between Health Literacy and Healthcare Satisfaction

		1	2	3	4	5	6	7
1.	**PedsQL Healthcare Satisfaction Hematology / Oncology Module**	1						
2.	**Health Literacy Index (HLI)**	0.863*	1					
3.	**HLI Accessing Information Subdimension**	0.872*	0.975*	1				
4.	**HLIUnderstanding Information Subdimension**	0.836*	0.983*	0.945*	1			
5.	**HLI Appraising Subdimension**	0.840*	0.990*	0.946*	0.974*	1		
6.	**HLI Applying Subdimension**	0.815*	0.933*	0.906*	0.873*	0.918*	1	
7.	**Frequency of Use of Social Media**	0.714*	0.690*	0.700*	0.668*	0.658*	0.673*	1

*p<0.01 significant level

subscale affected 69.9% of the healthcare satisfaction of the parents, as understanding the information subscale of health care literacy increases by one unit healthcare satisfaction increases by 0.836 times (95% CI 2.018 to 2.419). In the third model, the "Appraising" subdimension was found to affect 70.6% of healthcare satisfaction, as the appraising subscale of health care literacy increases by one unit healthcare satisfaction increases by 0.840 times (95% CI 1.815 to 2.169). In the fourth model, the "Applying" subdimension was found to affect 66.5% of healthcare satisfaction, as applying the subscale of health care literacy increases by one unit healthcare satisfaction increases by 0.815 times (95% CI 2.935 to 3.572). In the fifth model, health literacy, along with accessing information, understanding information, and applying subdimensions, were found to affect 74.5% of healthcare satisfaction, as health care literacy increases by one unit healthcare satisfaction increases by 0.863 times (95% CI 0.626 to 0.735). The effect of all factors on healthcare satisfaction was statistically significant (p <0.05).

DISCUSSION

In this study, it was thought that the health literacy level of the parents of children with cancer may affect health care satisfaction. As a result of further analysis in this study, it was found that the parents who have 20-40 years of age, high school or higher education level, income and expense equal, use social media often and always have higher health literacy and health care satisfaction levels. In the literature, it is stated that the studies examining the health literacy and health care satisfaction of parents are affected by variables such as age, gender, educational status, economic status, employment status, frequency of social media, and internet use (18,19). In the study of Terp et al. (2021), it is emphasized that health literacy increases as age decreases (19). In addition, in the study of Papavasiliou et al. (2021), it is emphasized that the health literacy level of young people, those with a medium perceived economic level and those with a high education level are higher (18). In two studies examining the factors affecting satisfaction in terms of health, it is stated that it is affected by variables such as age, education level and income level (20,21).

Our study found a positive and high-level relationship between healthcare satisfaction and health literacy total and subdimension scores and between healthcare satisfaction and frequency of social media use (p <0.001). Similar to our study, other studies have shown that increased health literacy levels affected the healthcare satisfaction of parents (18,19). Besides, the use of social media increased the communication between parents of children with cancer and directed each other to the right resources. Thus, parents can gain access to the right literature via social media, which increases their health literacy levels. In addition, when the literature is examined, it is emphasized that the correct use of technology affects health literacy positively (22). In addition, it is stated that the use of social media has an effect on health care satisfaction (21).

Based on the correlations between the variables, five models were formed in the study. In these five models that examined the health literacy level of parents of children with cancer, the importance of dimensions of

Table 3. The Prediction of Health Literacy of parents raising children with cancer, on the Healthcare Satisfaction

Healthcare Satisfaction *	Health Literacy Index (HLI)											
	Model 1				Model 2				Model 3			
	B	SE	β	p	B	SE	β	p	B	SE	β	p
	3.482	0.136	0.872	0.000	2.219	0.102	.836	0.000	1.992	0.090	0.840	0.000

R	0.872	0.836	0.840
R²	0.761	0.699	0.706
F	652.456	476.110	491.977
P	0.000	0.000	0.000
DW	2.468	2.610	2.411

Healthcare Satisfaction *	Model 4					Model 5		
	B	SE	SE	β	p	B	SE	β
	3.253	0.161	0.815	0.000		0.681	0.028	0.863	0.000

R	0.815	0.863
R²	0.665	0.745
F	406.063	599.332
P	0.000	0.000
DW	2.369	2.541

* PedsQL Healthcare Satisfaction Hematology / Oncology Module; B: Unstandardized Coefficients Beta; SE: Coefficients Standard Error; β: Standardized Coefficients Beta; DW: Durbin Watson

access to information, understanding, evaluation, and application of information on healthcare satisfaction were revealed (Figure 1). Model 1 shows that healthcare satisfaction increased as the "Assessing Information" subdimension of the Health Literacy Index scores increased (β = 0.872). It was determined that the parents who had easy access to information had higher levels of healthcare satisfaction. Health literacy is important in accessing information regarding correct health applications. Parents with a high level of health literacy are more eager to have access to the right information (11). Moreover, they are aware of practices that have low reliability for their children's health. Thus, parents with high health literacy access the right sources for their children's treatment and care and are satisfied with the information they receive from health professionals and their satisfaction is positively affected (23). It is

stated that reaching effective treatment and care with correct information and information is an important variable in determining health care satisfaction. It is believed that parents' knowledge of how to access the right source of information increases their healthcare satisfaction as they become satisfied with the care and treatment that they expect from healthcare workers (11,12,23). Literature supports the findings in Model 1 that healthcare satisfaction increased as the scores obtained from the "Accessing Information" subdimension of the Health Literacy Index increased (18,19).

Model 2 indicates that healthcare satisfaction increased as the "Understanding Information" subdimension of the Health Literacy Index scores increased (β = 0.836). Parents of children with cancer who had high health literacy levels found it easier to understand the information about their child's care

than those with a low level of health literacy. The healthcare satisfaction of parents with children with cancer increases as their level of understanding of the information increases. Factors such as frequent and repeated training sessions held by healthcare professionals, accessing the right resources in a digital medium, high health literacy of parents regarding diseases and treatment facilitated parents' understanding of information (20). It is stated in the literature that the level of health literacy of people who understand, absorb, and apply the information is higher. The education of the parents of children with cancer is given by healthcare professionals and directed to the right resources. It is emphasized that repeated information about the disease and its management is important (22). Also, parents who are directed to the right resources by healthcare professionals can access correct information about disease and treatment management themselves. These practices are thought to increase satisfaction by increasing health literacy (20,21). Thus, it was observed that the healthcare satisfaction of parents with a high level of skills for recognizing misinformation increased. The literature supports the finding that healthcare satisfaction increases as the scores for the "Understanding Information" subdimension of the Health Literacy Index increases (11,19,23).

Model 3 shows that healthcare satisfaction increased as the scores of the "Appraisal" subdimension of the Health Literacy Index increased (β = 0.840). Parents evaluating and making sense of the information they learned through health literacy improves their health care satisfaction. The awareness among parents created by cancer diagnosis and treatment helps them seek healthy lifestyle behaviors, exhibit healthy life behaviors, avoid harmful behaviors, and take a rational stand against health/disease states. To demonstrate these behaviors, parents access information from several health-related sources, receive information and support from health professionals, and question whether the information and support they receive are meaningful and correct. It is believed that the information, guidance, and support that parents receive from health professionals increase their health care satisfaction (24). The literature supports the finding that healthcare satisfaction increases as the scores for "Appraisal" subdimension of the Health Literacy Index increases in Model 3 (11,19,23).

Model 4 demonstrates that healthcare satisfaction increases as the scores of the "Applying" dimension of the Health Literacy Index increase (β = 0.815). Parents of children with cancer spend efforts to access a variety of health information, especially for getting support for symptom management. Parents receive support from health-related sources (such as health personnel, books, and data in the digital environment) to identify the interventions to reduce the symptoms of their children, to access appropriate nutrition sources for their children, and to manage disease-related complications. The information and support provided to parents help them give better care to their children; it becomes easier for them to cope with the condition. The health literacy levels of parents who accessed and used accurate and reliable health resources increased (23). It is believed that thanks to the information and support they receive from the health professionals, parents can easily access and apply health information, which includes effective interventions to reduce the symptoms experienced by their children, and this situation increases health care satisfaction. In model 4, the literature supports the finding that healthcare satisfaction increased as the scores for "Applying" subdimension of the Health Literacy Index increased (11,19,23).

Model 5 shows that healthcare satisfaction increased as the scores for the Health Literacy Index increased (β = 0.863). In this study, the mean total score of the Health Literacy Index was found to affect healthcare satisfaction by 74.5%. Several factors affect parents' healthcare satisfaction, including individual characteristics, sustainable communication, making people feel valuable, presentation and sustainability of the service, adequate supply of information, and health literacy. For this reason, 74.5% of the influence of health literacy on healthcare satisfaction of parents whose children were hospitalized for a long time for intensive care, who had to cope with various symptoms, and whose healthcare satisfaction was influenced by several variables is believed to be considered good. The literature supports the finding that healthcare satisfaction increased as the total scores of the Health Literacy Index increased in model 5 (1,11,19,23).

Limitations
Despite the many strengths of this study, it is limited by the use of the convenience sample, which may

affect the generalizability of the study. The second limitation of this research is; participants may be affected by other conditions in the clinic during data collection.

Implications for Nursing Practice

Because of the healthcare satisfaction of parents having children with cancer and who need information and support for the disease and treatment process is affected by several factors, conducting studies that investigate these factors is important. Besides, conducting interventional studies aiming to increase health literacy, which is one of these factors, is recommended. Furthermore, understanding the relationship between knowledge and behaviors of parents is important so that our interventions can affect behaviors that are most closely associated with positive health outcomes. Therefore, pediatric healthcare providers should consider tailoring education or treatment plans or utilizing universal measures for parents with low health literacy. The creation of websites by health professionals where the parents of children with cancer can access the correct information and which refer the parents to these information tools will increase both health literacy and healthcare satisfaction.

CONCLUSION

Healthcare satisfaction of parents with a high overall score from the Health Literacy Index and high scores from its subdimensions were found to be positive. Health literacy, along with accessing information, understanding information, and applying subdimensions, increased parents' healthcare satisfaction. Also, a highly positive, advanced level significant relationship between healthcare satisfaction and health literacy was observed. Attempts to enhance the health literacy of parents having children with cancer, improving the symptom management of parents, reducing their caregiving burdens, and guiding them to preventive services are significant initiatives to increase and improve the quality of life of patients and healthcare satisfaction.

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INVESTIGATION OF ENCOUNTERED PROBLEMS AFTER LAPAROSCOPIC SURGERY IN CHILDREN

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ABSTRACT

Purpose: This study was planned to determine the problems and affecting factors that children encounter at hospital and at home after laparoscopic surgery.

Materials and Methods: This study was conducted in accordance with the descriptive cross-sectional study type in order to determine the post-operative conditions in hospital and home problems and factors affecting the operation of the study. The study was carried out on the patients of pediatric service of whom had laparoscopic surgery. Pre-operative and post-operative descriptive features form, which was developed according to literature by researchers as data collection tool, was collected by using a diagnosis form for problems occurred at home after discharge and for problems occurred in hospital after surgery.

Results: It was found in the study that 54.5% of the children were male, 90.9% were gastrointestinal system surgeons and 65.4% were acute appendectomies. It was determined that most of the problems the children lived in hospital and at home was pain.

Conclusion: This study will contribute to the planning of nursing interventions that will be useful for the identification, prevention and early identification of the problems that children experience both at home and in the hospital, after the surgery, and to determine the maintenance criteria.

Keywords: Child, laparoscopic surgery, postoperatıve problems, nursing

INTRODUCTION

Laparoscopic surgery is most commonly used in fields such as urology, gynecology, general surgery and pediatric surgery (1,2). As a result of the increase in minimally invasive surgical applications, laparoscopic surgery, which is now widely used, has often been used in children. The latest developments are robotic surgery and single port laparoscopic surgery (3-6).

Laparoscopic surgery is more advantageous and beneficial than open surgery in children. (3,7). The children undergoing surgery with this method have less surgical damage due to small incisions and bleeding, a lower infection rate, a quicker return to daily activities, a faster post-operative recovery and a shorter hospital stay. As a result, treatment and follow-up costs are low and patient satisfaction is high. (3,6-8).

The problems experienced by children undergoing laparoscopic surgery are similar to adults (8,9. Although the incidence of postoperative complications in children is unknown, the most common complications are nausea-vomiting and respiratory problems. Children with cardiac problems are generally reported to have congenital heart disease. Children undergoing anesthesia develop

urinary retention due to the effects of anesthetics, with tremors, restlessness and delirium often observed (3,10,11).

The success of open or laparoscopic surgery in children depends on technical knowledge and skills, as well as the identification of pre- and post-operative problems and the management of these problems. In children undergoing laparoscopic surgery, a comprehensive systemic and physical assessment in the postoperative period is essential for the prevention and early diagnosis of potential complications (12-14). After discharge, many children experience various problems in the first weeks at home and return to hospital (15).

The recovery process can be accelerated by providing comprehensive and detailed discharge education to the child and their family, followed by continued follow-up at home. It is important to identify the problems that children experience in the hospital during the postoperative period and at home in the early stages, so that the content of the discharge education can be updated and qualified, and the child and family can be prepared for home care (15-17). As a result of the development of technology and increasing experience, laparoscopic surgery has become a technique that has gained a wide area of application in the pediatric patient group as well as in adults (3,6,8). Therefore, this study was conducted to determine the problems experienced by children in hospital and at home after laparoscopic surgery.

Research Questions

- What are the problems that the child has encountered at the hospital after the surgery?
- What are problems that the child has experienced at home in the early period just after discharge?
- Do the characteristics of the child's surgery (type of surgery, length of the surgery, exigency or permissiveness of the surgery) effect child's having problems after laparoscopic surgery?

MATERIAL AND METHODS
Study Design and Participants
This study was conducted using a descriptive and cross-sectional research design. The population of the study consisted of all pediatric patients who underwent laparoscopic surgery in the pediatric surgery service of a university hospital between April 2015 and March 2016. According to the study sampling data, 110 patients who met the inclusion criteria were included in the study. Inclusion criteria for the study are children aged 0-18 years who underwent surgery and who stayed in hospital for at least one night after surgery. Exclusion criteria for the sample are children with metabolic and genetic diseases and children who have undergone thoracic surgery such as pectus excavatum. At the end of the study, the power analysis using G-Power 3.1.9.2 software to check if the sample size is sufficient showed 0.99 at the 95% confidence interval.

Data Collection Tools
The data for the study were collected by means of the "Pre- and Postoperative Descriptive Characteristics Questionnaire", the "Diagnosis Sheet for Postoperative Problems in the Hospital" and the "Diagnosis Form for Post discharge Problems at Home", which were prepared by the researchers and developed in accordance with the relevant literature.

Pre- and Post-Surgery Descriptive Characteristics Questionnaire
This questionnaire includes socio-demographic characteristics (sex of the child, age of the child, number of children in the family, family type of the child, age of the mother and father, level of education of the mother and father, occupation of the mother and father, social security of the family, location, family income), characteristics related to surgery (duration, necessity or permissiveness/electiveness of the surgery, type), invasive procedures in the child, length of hospital stay, previous surgery, preoperative information, fasting time and enteroclysis status.

The Diagnosis Form for Post-Surgery Problems at Hospital
This form, developed by the researchers in accordance with the literature, consists of questions to determine the problems experienced by children in hospital during the first 24 hours after laparoscopic surgery (10,18,19). The form consists of seven chapters as general problems (pain, hypothermia, hyperthermia, etc.), diseases of the respiratory system (cough, atelectasis, sputum, etc.), circulatory system problems (hypertension, edema, tachycardia, etc.), gastrointestinal system problems (hypertension, edema, tachycardia, etc.).), gastrointestinal system problems (nausea, vomiting, bloating, etc.), urinary system problems (urinary retention, burning during urination, density, etc.), surgical incision problems (abscess at the incision site, discharge, hematoma, bleeding, etc.), and mood changes (agitation, anxiety, fear, etc.).

The Diagnosis Form for Post-Discharge Problems at Home

This form consists of questions to assess the problems experienced by children discharged from laparoscopic surgery during the first 48-72 hours at home. It includes problem statements related to breathing, circulation, elimination, pain control, surgical site, diet, exercise and emotional state and was developed in accordance with the literature (20) and based on the clinical experience of the researchers.

Prior to data collection, the parents of the children were informed of the purpose of the study and their written/verbal consent was obtained. Data were collected by the researchers through face-to-face interviews with the families and from patient records. The administration of the instruments both in the hospital and at home took approximately 10-15 minutes.

Ethical Approval

To conduct the study, the necessary permission was obtained from the Chief Physician of the University Hospital, Department of Pediatric Surgery (No: 89089531/073, date: 27.04.2015) and Dokuz Eylul University, Non-interventional Researches Ethics Committee (Decision No: 2015/13-13, Date: 14.05.2015). In preparation for the study, informed consent was obtained from the families of the children.

Statistical Analysis

Data from the study was analyzed using SPSS 15.0 (Statistical Package for Social Sciences). Descriptive statistics (numbers and percentages) were used to determine the problems experienced both in hospital and at home.

Table 1. Descriptive Features Regarding Surgery

	n	%
Exigency or permissiveness of the surgery		
Exigence	95	86.4
Optional	15	13.6
Type of Surgical Intervention		
Gastrointestinal system (GIS)	100	90.9
Genitourinary System (GUS)	10	9.1
Operations Performed		
Acute appendectomy	72	65.4
Perforated appendectomy	18	16.4
Cholecystectomy	8	7.3
Other (ovarian cyst, ovarian torsion, pyeloplasty, splenectomy, pyloric stenosis)	12	10.9
Invasive Interventions of the Patient		
Intravenous catheter	86	78.2
Intravenous catheter, naso-gastric catheter	13	11.8
Intravenous catheter, urinary catheter	7	6.4
Intravenous catheter, urinary catheter, naso-gastric catheter	4	3.6
Previous Surgery Status		
Had surgery*	18	16.4
No surgery	92	83.6
Being Informed Before Surgery		
Informed	104	94.5
Uninformed	6	5.5
Length of Hospital Stay		
24-35 hours	15	13.6
36-47 hours	34	30.9
48-71 hours	32	29.1
72 hours or more	29	26.4
TOTAL	110	100

*Patients who had previous surgery had tonsillectomy, inguinal hernia, hypospadias, cleft lip, appendectomy, ovarian cyst surgeries.

RESULTS

The study showed that 86.4% (n:95) of the operations performed on the children participating in the study were performed as an emergency measure. It was stated that 90.9% (n:100) of these operations were gastrointestinal operations and 65.4% (n:72) of these operations were acute appendectomies. It was found that 83.6% (n:92) of the children had no previous surgery. When the preoperative information status of the families was examined, it was found that 94.5% (n:104) of the families were informed. Before surgery, 78.2% (n:86) of the children had an intravenous catheter as an invasive procedure. The length of hospital stay of the children showed that 30.9% (n:34) of the children stayed in hospital for 36-47 hours (Table I).

The study also showed that maximum 3.6% (n:4) of the children (n:8) with general problems had

hyperthermia; children (n:5) who had problems with the surgical wound, the highest wound discharge was 1.8% (n:2); maximum 78. 2% (n:86) of children (n:257) with gastrointestinal problems had dry mouth, 55.5% (n:61) nausea, 39.1% (n:43) vomiting; up to 14.5% (n:16) of children (n:33) with respiratory problems had secretions; incision-related pain in a maximum of 82. 7% (n:91) and shoulder pain in 56.4% (n:62) of the children (n:322) who experienced pain; at most 33.6% (n:37) of the children (n:40) with circulatory system problems had tachycardia; the children (n:76) with urinary system problems had more than 31. 8% (n:35); it was found that at most 38.2% (n:42) of the children (n:129) with mood problems experienced anxiety (Table II).

Descriptive statistics showed that of the children who had general problems at home after discharge, 2.7% (n:3) of the children with general problems had fever;

Table 2. Distribution of Postoperative Problems Experienced in Hospital (N:110)

	N	%		n	%
General Problems			**Surgical Wound Problems**		
Hyperthermia	4	3.6	Gleet	2	1.8
Hypothermia	2	1.8	Hemorrhage	1	0.9
Aphonia	2	1.8	Rubescence at wound site	2	1.8
Gastrointestinal System Problems			**Respiratory System Problems**		
Xerostomia	86	78.2	Cough	9	8.2
Constipation	5	4.5	Atelectasis	1	0.9
Diarrhea	20	18.2	Decrease in oxygen saturation	1	0.9
Nausea	61	55.5	Increase in respiratory rate	6	5.5
Vomiting	43	39.1	Sputum	16	14.5
Anorexia	29	26.4			
Dysphagia	4	3.6			
Distension	6	5.5			
Hickock	3	2.7			
Pain Problems			**Circulatory System Problems**		
Shoulder pain	62	56.4	Hypotension	1	0.9
Chest pain	23	20.9	Tachycardia	37	33.6
Back pain	24	21.8	Bradycardia	2	1.8
Sore throat	21	19.1			
Abdominal pain	56	50.9			
Pain due to incision site	91	82.7			
Pain due to invasive procedures	43	39.1			
Headache	1	0.9			
Neck pain	1	0.9			
Urinary System Problems			**Mood Change Problems**		
Urinary burning	26	23.6	Agitation	31	28.2
Urinary retention	13	11.8	Somnolence	30	27.3
Urine density higher than1020	35	31.8	Fear	42	38.2
Urine density less than 1005	1	0.9	Anxiety	26	23.6
Urinary incontinence	1	0.9			

*Children have experienced more than one problem.

Table 3. Distribution of Problems at Home After Discharge (N:110)

	N	%		n	%
General Problems			**Pain**		
			Headache	2	1.8
Fewer	3	2.7	Pain regarding wound site	50	45.5
			Shoulder, back pain	1	0.9
Nutrition			**Respiratory System Problems**		
Anorexia	19	17.3	Secretion	6	5.5
Nausea-Vomiting	4	3.6	Cough	2	1.8
Intestinal gas	10	9.1			
Weight loss	1	0.9			
Surgery Area			**Circulatory System**		
Wound infection	6	5.4	No problem		
Urinary System			**Mood**		
Constipation-diarrhea	7	6.4	Disturbed sleep	1	0.9
Burning in the urinary tract	3	2.7	Fear	23	20.9
Difficulty urinating	4	3.6	Agitation	4	3.6
Stool incontinence	1	0.9			
Activity Status			**Medication Use**		
Difficulty in walking	37	33.6	Side effects	9	8.1
Fatigue	16	14.5	Allergic reaction	1	0.9
Dizziness	6	5.5			
Asthenia	40	36.4			

* Children experienced more than one problem

up to 45.5% (n:50) of the children (n:53) with pain-related problems had pain at the wound site; up to 17.3% (n:19) of the children (n:34) with feeding problems had anorexia; a maximum of 5. 5% (n:6) of the children (n:8) with respiratory problems had secretions; 5.4% (n:6) of the children (n:15) with surgical site problems had wound infections; a maximum of 6.4% (n:7) of the children (n:15) with excretory problems had constipation- diarrhea; anxiety; fatigue; a maximum of 8.1% (n:9) of the children (n:10) with drug-related problems had drug-related side effects. It was found that the children did not have any problems related to the circulatory system at home (n:0) (Table III).

DISCUSSION

In this study, which was carried out to determine the problems experienced both in hospital and at home after laparoscopic surgery in children, it was found that 86.4% of laparoscopic surgery was performed on an emergency basis, of which 90.9% was related to the gastrointestinal system and 65.4% was acute appendectomy. Based on the data obtained in our

study, the rate of emergency surgery was high as 81.8% of the children who underwent surgery had appendicitis. The study by Divarcı et al (2014) reported that laparoscopic appendectomy is frequently performed. Although there was no difference between open and laparoscopic appendectomy in terms of complications, they found that laparoscopic appendectomy could be preferred in terms of postoperative pain and return to normal activities in a short time. They also found that the hospital stay of the children was 2.4±0.5 days. On the other hand, the mean postoperative hospital stay of children in our study was 3.68±1.01 days. It has been reported that laparoscopic surgery has better postoperative recovery and shorter hospital stay (21,22). In this study, the different types of surgery, the high rate of emergency surgery, the variety of care and procedures applied to children, and the differences in postoperative problems according to the developmental stage of each child brought to mind that the length of hospital stay is affected.

The study showed that all children experienced one or more problems in hospital after surgery. Of these

problems experienced by children in hospital, 82.7% were related to the incision site and 86.4% were gastrointestinal problems, of which 78.2% were dry mouth, 55.5% nausea and 39.1% vomiting. Although the exact incidence of postoperative complications in children is not known, it has been reported that the complication rate reported in studies of pediatric surgical patients is between 3.5-23% (4). Studies have shown that 30-70% of surgical patients complain of moderate to severe pain (23,24). It has been reported that the most common problems are nausea and vomiting and respiratory problems (10). In the study by Mattioli et al (2012), the complication rate after laparoscopic surgery in 1803 children was 0.9%, and they stated that laparoscopic surgery is safer and more effective, the level of pain in children is lower and the return to daily activities is faster. In some other studies, the most common postoperative complications were respiratory problems, gastrointestinal problems, bowel obstruction and wound infection (18,25). The fact that the complication rates found in this trial differ from other trials may be related to the different types of surgery performed and the care and procedures given to patients before, during and after surgery. It has been shown that the use of expedited care protocols for postoperative pain management, early mobilization, early nutrition and use of medications minimizes problems in children discharged from hospital after laparoscopic cholecystectomy (14). Therefore, appropriate pain management, early mobilization and early nutrition in the early postoperative period may minimize the problems that children experience after surgery.

It was found that all children who underwent laparoscopic surgery had one or more problems at home after discharge. The results showed that children had problems with pain and activity status after discharge; 45.5% of them had wound pain, 36.4% had asthenia, 33.6% had difficulty walking and 14.5% had fatigue. In a study of problems experienced at home after surgery, 70.9% of patients had pain problems, 40.8% had circulatory problems, 32.1% had problems with exercise and activity, and 40.8% had problems with self-care (20). Studies have shown that 80% of children have pain problems at home in the first two weeks after discharge, and this situation negatively affects their return to daily activities and quality of life (15,23). In the study conducted by Rabbitts et al (2015), children were found to have pain problems at home for approximately one month after discharge. As shown in the literature and the results of our study, patients investigated many problems at home after surgery. Especially after laparoscopic surgery, where the length of hospital stay is shorter, these problems may be more common. Therefore, it is thought that patients and their families may need professional support to deal with these problems. In a study of children and families, it was suggested that nurses should make regular home visits or telephone counselling to identify problems experienced by families at home after discharge, and it was noted that identifying the problems experienced would help to prepare the content of discharge education (27).

Study Limitation

In this study, all data of the study is limited to patients' files were accessed by researchers. The children were well-versed about the purpose of the study and only their verbal consent was obtained.

CONCLUSION

As a result, children who have undergone laparoscopic surgery have many problems in hospital and at home after discharge. In order to minimize the problems experienced by children and their families after laparoscopic surgery, it is important to establish databases to facilitate the diagnosis and follow-up of children's postoperative problems, to provide discharge training specific to the child and the family, and to provide regular telephone counselling to reduce problems at home. In addition, it may be useful to carry out studies in larger sample groups and in different institutions to determine the problems and causes after laparoscopic surgery in children in order to determine the incidence.

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VALIDITY AND RELIABILITY OF THE TURKISH VERSION OF THE SELF-CARE ACTIVITIES SCREENING SCALE DURING COVID-19 LOCKDOWN

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ABSTRACT

Purpose: The aim of this study was to adapt the Self-Care Activities Screening Scale in Turkish and to determine its validity and reliability.
Material and Methods: The sample of this methodological study conducted during Covid-19 lockdown consists of 140 individuals. For the adaptation of the Self-Care Activities Screening Scale in Turkish, it was translated into Turkish and culturally adapted. Then, the psychometric properties of the scale were evaluated by exploratory factor analysis and confirmatory factor analysis.
Results: The Self-Care Activities Screening Scale consists of 14 items and four dimensions. The fit indices were found to be satisfactory in the confirmatory factor analysis. The intraclass correlation coefficient of the test-retest reliability was 0.81 and the Cronbach's alpha coefficient was 0.85.
Conclusion: The Turkish version of the Self-Care Activities Screening Scale is a valid and reliable tool that can be used to screen self-care activities in the general population.

Keywords: Reliability, scale, self-care activities, validity

INTRODUCTION

The self-care concept is defined as activities initiated and performed by individuals to promote health and well-being. According to another definition, self-care is all behaviors learned and experiences gained in terms of education and health (1). While the first definitions of the self-care concept date back to the mid-1800s, today the self-care concept is attributed to Orem (2001). Orem defines self-care as an individual's care through the maturation of controlled, continuous, effective, and intentional behaviors. According to Orem, when basic human needs are met effectively, self-care shows that an individual is healthy (2).
Orem (2001) defines all self-care activities that an individual must perform to maintain and promote

health as therapeutic self-care requisites. Therapeutic self-care requisites consist of developmental self-care requisites, universal self-care requisites, and health deviation self-care requisites. When universal self-care requisites are met effectively, self-care supports health and well-being concepts. Eight universal self-care requisites were defined as air, water, food, elimination, activity and rest, solitude and social interaction, hazard prevention, and promotion of normality for an individual to maintain life and well-being (3). Self-care requisites and activities of individuals are affected by the epidemic, endemic and pandemic events. A pandemic occurs when an infectious disease spreads quickly to more people than expected across continents (4).

Covid-19 infection caused by SARS-CoV-2 first broke out in China's Wuhan city with a population of 11 million at the end of December 2019 and quickly spread through other countries (5). On March 11, 2020, the World Health Organization has declared the outbreak a global pandemic (6). The Turkish Ministry of Health has declared the first Covid-19 case in the country on March 11, 2020. Various measures have been taken in Turkey on January 22 based on suggestions of the Scientific Advisory Board (7). Lockdown measures taken due to the pandemic involved working from home, online education, and curfew, which restricted the physical activities of people. It is believed that increased stay-at-home during the lockdown, continuous media coverage of the pandemic, increased fear, stress, and anxiety affect the physical and psychological health of individuals (8).

Common reactions of people affected by Covid-19 may include, both directly and indirectly, feelings of loneliness and depression, fear of getting sick and dying, and fear of losing loved ones due to the virus (9). In summary, all these fears and concerns lead to changes in sleep patterns or diet, difficulties falling asleep or concentrating, exacerbation of chronic health problems (if any), and increased use of alcohol, tobacco or other drugs (10). Covid-19 infection and the treatment process may negatively affect the quality of life and vital functions of individuals who cannot meet their self-care needs and perform self-care activities. Therefore, it is important to improve the quality of life and maintain self-care during the Covid-19 process.

Studies show that the age range of Covid-19 patients is 30 to 79 years with a median age of 59 years.

Therefore, it is believed that the use of self-care activities could be a useful solution to cope with Covid-19 infection (11). It is usually recommended to maintain a healthy lifestyle as a protective factor against Covid-19 complications and to engage in self-care activities to relieve stress during the pandemic (12).

The evaluation of self-care activities is extremely important for the improvement of care services. The scales identified in the literature review are as follows: Self-Care Assessment Tool to measure cognitive and functional skills in self-care of individuals with the spinal cord injury (13), Self-Care Behaviours Scale to measure self-care behaviours in patients receiving chemotherapy (14), Self-Care Management Process in Chronic Disease to determine self-care management process in chronic diseases (15), Adolescent Dysmenorrhoea Self-Care Scale (16), Mindful Self-Care Scale (17) and Self-Care Agency Exercise Scale (18). However, there is no specific scale to assess self-care activities in the general population in Turkey.

The aim of this study was to adapt the Self-Care Activities Screening Scale in Turkish and to determine its validity and reliability.

MATERIAL AND METHODS
Design and Participants
This methodological study was conducted on individuals residing in a city in northwestern Turkey in April-May 2021. In the literature, it is stated that a sample size equivalent to 10 times higher than the number of items is ideal for scale validity and reliability studies (19). The Self-Care Activities Screening Scale, which will be adapted in this study, consists of a total of 14 items. Therefore, a sample size corresponding to at least 10 participants for each scale item was calculated for the present study. Accordingly, a sample of 140 participants was selected. The researchers randomly sent the online data collection tools to 152 individuals from their contacts who used the WhatsApp application. Since ten individuals wanted to withdraw from the study and two individuals could not speak or understand Turkish, the study was completed with 140 individuals.

Individuals who can speak, read and understand Turkish, have a smartphone, use the WhatsApp application, and have agreed to participate were included in the study. Individuals with psychiatric

diseases or physical disability were excluded from the study.

Instrument

Data were collected through online data collection instruments (Participant Description Questionnaire and Self-Care Activities Screening Scale) created using the software "Google Forms".

Participant Description Questionnaire

The Participant Description Questionnaire was developed by the researchers in line with the literature to determine the individuals' sociodemographic, medical, and Covid-19-related characteristics (20,21). The form consists of 11 questions questioning the characteristics of individuals such as age, sex, education, family type, chronic disease, and Covid-19 diagnosis.

Self-Care Activities Screening Scale (SASS-14)

The SASS-14 was developed by Martín Martínez et al. in 2021 to screen self-care activities in the general population, and a study on its validity and reliability was conducted (22). The scale consists of 14 items and 4 dimensions. Its dimensions are "Health Consciousness" (HC, items 1, 2, 3, 4, and 5), "Nutrition and Physical Activity" (NPA, items 6, 7, 8, and 9)", "Sleep" (SLP, items 10 and 11) and "Interpersonal and Intrapersonal Coping Skills" (IICS, items 12, 13 and 14). The scale items are scored from 1 to 6. The total score on the scale is 14 to 84 (HC=5-30, NPA=4-24, SLP=2-12, IICS=3-18). While each dimension is scored individually, the sum of all items in the scale gives a "total scale score". Higher total scale scores indicate higher participation in self-care activities (22). Cronbach's alpha value was found to be 0.80 in the original study (20). In this study, Cronbach's alpha value of the SASS-14 was calculated as 0.85.

Process of Translation and Cultural Adaptation of SASS-14

For the adaptation of the SASS-14 scale in Turkish, its translation into Turkish and its cultural adaptation was performed. Language validity, content validity, and a pilot study were conducted for the scale's translation into Turkish and cultural adaptation.

Language validity

The adaptation of a scale in a different language differentiates the nature of that scale. Thus, it is necessary to examine the scale items in detail and make sure that the post-translation version of the scale is the same as the original version in order to minimise the differences. Otherwise, the validity and reliability of the scale may be low. In adaptation studies, there are "one-way translation, group translation and back translation" methods. "Back translation method" is mostly used to ensure cultural equality of the scale (23). In this study, back translation method was used to ensure the language validity of SASS-14. During the adaptation of the SASS-14 in Turkish, the original scale was translated into Turkish by three academic members who were fluent in both Turkish and English. Then, these translations were combined by a faculty member who was fluent in English and specialization in nursing and a single translation was obtained. In the back translation stage, the scale was back-translated into the original language, English, by an specialist faculty member in the field of nursing who was bilingual, native English speaker and had no prior knowledge of the SASS-14 scale. The back-translated version was compared with the original SASS-14 scale to assess conceptual equivalence. As a result of the comparison, it was found that the translation of the SASS-14 scale was similar to the original English version and accurately conveyed the original meaning in the English version. Accordingly, no changes were required for the final translation. Then, the final translation of the SASS-14 was reviewed by three faculty members specialised in the field of nursing to eliminate any possibility of inconsistency.

Content validity

The scale was assessed by 13 faculty members specialized in nursing to evaluate the equivalence of the original items of the SASS-14 and items of the translated scale. Lawshe technique was used to assess specialist opinions (24). According to this technique, each item is assessed as "essential", "useful but not essential" and "not necessary". The Content Validity Ratio (CVR) and Content Validity Index (CVI) were calculated after obtaining specialist opinions. The minimum CVR value required for 13 specialist is 0.54 in the Lawshe technique. A CVI value higher than CVR (CVI>CVR) shows that the content validity of the remaining scale items is statistically significant (24,25). In this study, the CVI value of the scale was calculated as 0.79.

Pilot study

After the content validity analysis, a pilot study was conducted to determine whether scale items are

comprehensible. A range of 5–15 interviews is considered ideal for a pilot study (19). Accordingly, a pilot study was conducted on eight individuals. The SASS-14 was sent to these individuals via WhatsApp and they were asked to complete the scale and provide feedback on the comprehensibility of scale items in Turkish. No revision was made to the scale items at the end of the pilot study. This group was not included in the main study.

Process of Psychometric Properties of SASS-14
Validity and reliability analysis of the SASS-14 scale was performed at this stage.

Validity
Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) was administered to evaluate the structural validity of the scale. Kaiser-Mayer-Olkin (KMO) and Barlett Sphericity Test were administered to test the suitability of the sample size for factorization in EFA. For a data set to be suitable for factor analysis, the KMO value must be over 0.50 and the χ2 value after Bartlett's test of sphericity must be lower than 0.05 (26). Principal Component Analysis and Varimax Rotation were used to examine the factor structure of the SASS-14 scale. According to the literature, each factor should have at least 1 eigenvalue, the factor load should be a minimum of 0.50, and the explained variance ratio should be above 32% in a rotated principal component analysis (27).

CFA performs the processes of testing the constructs determined by EFA and reviewing their validity or checking/verifying the previous scale results with new data structures. The fit indices of CFA should be at the desired level. χ²/sd ≤3 is considered a good fit. In addition, GFI≥0.90, CFI≥0.95, TLI≥0.95 and RMSEA≤0.05 values also indicate a good fit. However, values of 0.90<NFI<0.94 and 0.06<SRMR<0.08 indicate an acceptable fit (28-30).

Reliability
The reliability of the SASS-14 was reviewed by calculating Cronbach's alpha internal consistency coefficient and test-retest reliability coefficient. Considering the calculated internal consistency coefficient, 0.00< α ≤0.40 shows that the scale is not reliable; 0.40≤ α ≤0.60 shows that the scale has low reliability; 0.60≤ α ≤0.80 shows the scale is very reliable; 0.80≤ α ≤1.00 shows the scale is highly reliable (31). In the test-retest technique, while the

correlation value between two measurements must be at least 0.70 and above, >0.80 is the preferred value (32).

Procedure
Since the study was conducted during Covid-19 lockdown, face-to-face interviews could not be conducted. Therefore, the data collection instruments link was sent to individuals via WhatsApp. An informed consent form was added to the introduction section of this link, and individuals who agreed to participate in the study were able to continue with the survey. It took approximately 10 to 15 minutes for each participant to complete the data collection instruments.

The participants were asked to write nickname to assess the reliability of SASS-14's test-retest. It was stated that the same scale would be administered again, therefore, they had to use the same nickname in the second administration of the scale. The scale was readministered to 70 individuals who were selected randomly from the sample two weeks after the first data collection.

Data Analysis
SPSS for Windows Version 26.0 (SPSS Inc., Chicago, IL, USA) statistical software was used for data analysis. Descriptive data included numbers, percentages, and mean with standard deviations. Varimax Rotation and Principal Component Analysis were used for exploratory factor analysis in the statistical assessment of data obtained. Confirmatory Factor Analysis was administered to confirm the original structure of the scale through AMOS 21 software. Cronbach's Alpha and intraclass correlation values were calculated for the reliability analysis and test-retest results, respectively. The margin of error was determined to be 0.05 for all analyses.

Ethical Considerations
Scientific research permission to carry out the research was obtained from the Ministry of Health of the Republic of Turkey. Afterward, an application was made to the Istinye University Human Research Ethics Committee for ethical compliance approval and application permission, and the ethics committee approval was obtained (Date: 28.02.2021/Protocol Number:21-13). The study was conducted in line with the principles of the Declaration of Helsinki. Consent was obtained from the participants before the study
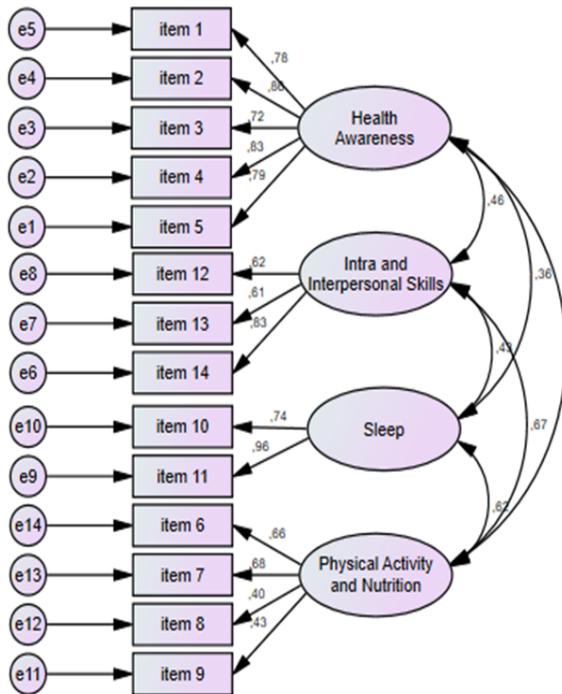
Figure 1. Measurement model of Self-Care Activities Screening Scale

through an online subject consent form after information was provided.

RESULTS

Sociodemographic, medical, and COVİD-19-related characteristics of individuals during the Covid-19 lockdown

The distribution of the sociodemographic, medical, and Covid-19 related characteristics of individuals is given in Table 1. The mean age of the individuals in the study was 26.52±11.59 and 62.9% of them were female. Of the individuals, 77.1% were university graduates, 46.4% were employed (56.3% on an online basis, 28.2% on a hybrid basis, 15.5% on an office basis) and 43.6% had an income lower than expenditures. 70.7% of the individuals were single and 81.4% had a nuclear family. It was determined that 22.9% of the individuals had a chronic disease. Furthermore, 24.3% of the individuals reported that they were diagnosed with Covid-19 and 32.9% stated that they neglected the health check-ups during the Covid-19 lockdown (Table 1).

Validity

The SASS-14 was found to have a KMO value of 0.83 and a p-value of <0.001 according to Bartlett's test

(X2: 818.598, SD: 92). These values indicate that data can be used to administer the factor analysis.

EFA results of the scale are shown in Table 2. As a result of the Principal Component Analysis, the scale had four dimensions and no item needed to be removed from the 14-item scale. Furthermore, it was determined that factor loadings of the scale ranged from 0.54 to 0.90, and the scale had an explained variance of 66.44% (Health Consciousness (25.21%), Nutrition and Physical Activity (14.57%), Sleep (13.81%) and Interpersonal and Intrapersonal Coping Skills (12.84%)) and a minimum eigenvalue of 1.80 (Table 2).

χ^2/sd was calculated as 1.379 based on the CFA results of the scale. As for the other fit indices, the following values were found: GFI 0.911, CFI 0.965, NFI 0.885, TLI 0.955, RMSEA 0.052, and SRMR 0.050. Accordingly, the four dimensions structure was confirmed. The path diagram of the confirmed model is given in Figure 1.

Reliability

While Cronbach's alpha value calculated for the reliability of SASS-14 was 0.85, values of dimensions ranged from 0.61 to 0.89. The intraclass correlation coefficient was calculated through the SASS-14 total scores and the retest score was 0.81. The intraclass correlation coefficient was calculated through the dimensions and retest scores were 0.70-0.82. Furthermore, there was a positive, strong, and statistically significant correlation between the test-retest scores of the scale (p<0.001; Table 3).

The mean SASS-14 total score obtained by the participants in the study was calculated as 59.57±12.00. The mean SASS-14 dimension scores obtained by the participants were Health Consciousness 24.36±5.17, Nutrition and Physical Activity 14.25±4.33, Sleep 8.62±2.84 and Interpersonal and Intrapersonal Coping Skills 12.32±3.87.

DISCUSSION

Although there are measurement tools that assess self-care activities in specific areas, there is no measurement tool that assesses self-care activities in the general population in Turkey. In this study, it was aimed to adapt the SASS-14, which is used to screen self-care activities in the general population, in Turkish and to test its Turkish validity and reliability. The results regarding the construct validity of the scale were obtained by EFA and CFA. As a result of

Table 1. Sociodemographic, medical and Covid-19 related characteristics of individuals (n=140)

Mean age (x̄±SD)	26.52±11.59 (min=18-max=73)	
	n	**%**
Sex		
Female	88	62.9
Male	52	37.1
Level of education		
Primary/secondary school	8	5.8
High school	24	17.1
University	108	77.1
Working status		
Working	65	46.4
Not working	75	53.6
Way of working*		
From home/online	40	56.3
Hybrid	20	28.2
In office	15	15.5
Income status		
Income less than expenses	61	43.6
Income more than expenses	41	29.3
Equal income and expenses	38	27.1
Marital status		
Single	99	70.7
Married	41	29.3
Family type		
Nucleus	114	81.4
Extended	7	5.0
Divorced family	11	7.9
Living alone	8	5.7
Presence of chronic disease		
No	108	77.1
Yes	32	22.9
Covid-19 diagnosis		
Was diagnosed	34	24.3
Not diagnosed	106	75.7
Neglected health checks during Covid-19 lockdown		
Yes	46	32.9
No	94	67.1

x̄=Mean; SD= Standard deviation, * Working individuals responded.

EFA, it was found that the scale had four dimensions and there were no items that needed to be removed from the 14-item scale. In addition, it was observed that the factor loadings of SASS-14 explained the variance and the item eigenvalues were in accordance with the standard values required for

Table 2. Exploratory factor analysis results of Self-Care Activities Screening Scale

		Factor loading	Eigenvalue	Explained variance ratio
Health Consciousness	I am usually aware of my health.	0.86		
	I know my inner feelings about my health.	0.85		
	I am constantly examining my health.	0.81	3.52	25.21
	I reflect about my health a lot.	0.77		
	I am alert to changes in my health.	0.75		
Nutrition and Physical Activity	I think I am eating better than I used to (less sugar, salt, fried snacks or pre-cooked food).	0.73		
	I'm drinking an average of 8 glasses of water a day.	0.59	2.04	14.57
	I do physical activity (some sport, yoga or dance) for at least 30 min a day.	0.57		
	I eat three servings of fruit and two of vegetables daily.	0.54		
Sleep	I sleep 7–8 h a day.	0.89	1.93	13.81
	I think that my rest is of quality.	0.85		
Interpersonal and Intrapersonal Coping Skills	I actively participate in the initiatives of my community (eg: clapping, singing, playing music, offering my support in what I could help, etc.).	0.81		
	I am learning to do new things like: playing an instrument, practicing a new language, cooking, painting, new apps, video games, etc.	0.81	1.80	12.84
	I am finding moments to be more connected to myself (I observe, write or reflect on my thoughts, emotions or behaviors).	0.65		

construct validity (Table 2; Figure 1). Similarly, Martínez et al. did not find a value below the lower limit for the factor loadings of the scale items (20). Likewise to the original scale, it can be said that the factor loadings in the Turkish scale support the construct validity of the scale. CFA was then applied to the items whose construct validity was proved by EFA. CFA is one of the methods that examines the compatibility of the theoretical structure and the data obtained. The fit indices obtained after the analysis show the fit of the model to the theory. As a result of the study, χ^2/sd, GFI, CFI, TLI and RMSEA values were found to have good fit, while NFI and SRMR values were found to have acceptable fit. According to these results, the four-dimensional scale obtained from CFA has adequate fit index values.

The reliability of the scale was determined through internal consistency and test-retest methods. The internal consistency coefficient determines if all aspects of the scale have the same measuring ability. Cronbach's alpha reliability coefficient is one of the most common methods to determine internal consistency (32). A Cronbach's alpha coefficient of 0.70 obtained for all items has often been regarded as an acceptable threshold for reliability; however, 0.80 and 0.95 are preferred for the psychometric quality of scales (19). In this study, the scale is determined to be highly reliable. Furthermore, Cronbach's alpha coefficients of the scale dimensions ranged from very reliable to highly reliable. Similarly, Martínez et al. (2021) reported that the scale was highly reliable. However, Cronbach's alpha

Table 3. Review of reliability and test-retest results of Self-Care Activities Screening Scale and its dimensions

	Cronbach's alpha	Test-retest intraclass correlation coefficient (r)
Self-Care Activities Screening Scale	0.85	0.81*
Health Consciousness	0.89	0.73*
Nutrition and Physical Activity	0.61	0.82*
Sleep	0.83	0.81*
Interpersonal and Intrapersonal Coping Skills	0.74	0.70*

coefficients of the scale dimensions had low to high reliability (20). Accordingly, the Turkish scale had high consistency and reliability similar to the original scale. Furthermore, it can be suggested that the dimensions of the Turkish scale had higher consistency and reliability than the original scale.

The time invariance of the scale is tested through the test-retest method. In this method, the scale is administered to the same group at different times to assess the correlation coefficient after the measurements. The fit between the first test and repeat test administered in this study was high with statistical significance. These results suggest that the scale gave consistent results over time. Internal consistency coefficient and test-retest analyses showed that SASS-14 was a reliable measurement instrument.

The Covid-19 pandemic and associated lockdown practices may cause changes in the self-care activities of individuals. In this study, the mean score of SASS-14 was determined to be 59.57±12.00. This situation could have been caused by disruptions in the supply chain such as food and medicine, restricted access to health services, increased sedentary lifestyle behaviors, and negatively affected motivation during the Covid-19 lockdown (33).

Limitations

This study involves a sample from only a specific region of Turkey. Therefore, the results are specific to this sample group and cannot be generalized for individuals in other cities in Turkey.

CONCLUSION

It was determined that the SASS-14 is a valid and reliable measurement tool that can be used to screen self-care activities in a general population of Turkey. The Turkish version of the scale consists of 14 items and four dimensions similar to the original scale. Accordingly, the SASS-14 can be used for different

studies on the general population. Furthermore, larger field studies can be conducted to assess the self-care activities of society. It is recommended to be administered to determine the individuals with low self-care activities in these studies and to plan training and counseling on self-care activities.

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PSYCHOMETRIC PROPERTIES OF THE ORAL MUCOSITIS DAILY QUESTIONNAIRE IN TURKISH CHILDREN WITH CANCER

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ABSTRACT

Purpose: The Oral Mucositis Daily Questionnaire (OMDQ) can be used in pediatric cancer patients. This study aimed to investigate the Turkish validity and reliability of the OMDQ in children aged 8 - 18 years diagnosed with cancer at two university hospital pediatric hematology/oncology clinics.
Material and Methods: Children's International Mucositis Evaluation Scale (ChIMES) and the World Health Organization (WHO) Oral Mucositis Grading Scale were used in parallel form reliability. Thirty children with oral mucositis were included in the study at the inter-rater and test-retest reliability on the 14th and 15th days of chemotherapy treatment. Ninety-two children were included for the construct validity. Kappa Compliance Analysis, Spearman's correlation coefficient, and Cronbach's alpha were evaluated.
Results: The content validity index was calculated for the scores given by the experts and the items were changed between .90 and 1.00. On the 14th and 15th days of chemotherapy treatment, the correlation values for each item of OMDQ were found to be over .64. In the construct validity, the patient's mean age was 11.7±3.3, and 46.7% diagnosed with Acute Lymphoblastic Leukemia. Cronbach Alpha value of OMDQ was .92. The OMDQ items showed a positive correlation with each other except for diarrhea questions. According to the WHO Oral Mucositis Grading Scale, 55.4% of the patients had grade 1 mucositis. The similar items of OMDQ and ChIMES had a positive significant relationship (p < .001).
Conclusion: The Turkish version of the OMDQ was a valid and reliable instrument in children aged 8 - 18 years diagnosed with cancer.

Keywords: Cancer, children, mucositis, reliability, validity

INTRODUCTION

Most childhood cancers can be treated with combined forms of treatment, including various cytotoxic drugs, surgery, and radiotherapy (1). Mucositis, which is a common complication of chemotherapy, radiotherapy, bone marrow, and stem cell transplantation, is defined as inflammatory and/or ulcerative lesions of the oral and/or gastrointestinal tract [2]. Oral mucositis (OM) is the most common oral complication of cancer therapy and affects more than 75% of pediatric patients (3). OM is associated with acute and chronic symptoms that negatively affect the patient's quality of life. Pain associated with mucositis and mucositis causes difficulties with swallowing and speech, problems with communication, problems with sleep, and oral intake (2). Mucositis is associated with poor nutritional status, and nutrition problems such as anorexia, cachexia, dehydration, and malnutrition can develop in many cancer patients. Most children require enteral or parenteral nutrition. It is seen that patients with mucositis have difficulties in eating, swallowing, and speaking because of pain. Fluid/food

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intake may be painful and inadequate in patients with OM (4-6). Depending on this, dehydration and malnutrition are observed. Mucositis creates a basis for the development of infection and decreases the quality of life of the patient and his family (4-8).

Before starting and during chemotherapy or radiotherapy, the oral mucosa should be evaluated for signs and symptoms of OM. The findings begin with erythema, and the pain may reach a level that affects the patient's chewing and swallowing with burning. There are many methods to determine the nature of changes in the oral cavity such as the National Cancer Institute Common Toxicity Criteria, and the WHO mucositis grading scale (6,8). The World Health Organization (WHO) Oral Mucositis Grading Scale mostly uses and includes subjective and objective criteria (8). It is very important to evaluate mucositis in children with cancer. There are observational scales to determine the change and quality of the oral mucosa (9-15). The Children's International Mucositis Evaluation Scale (ChIMES) evaluates the pain/soreness in the mouth and throat and related swallowing, drinking, eating, and medication (12-14). The Oral Mucositis Daily Questionnaire (OMDQ) evaluates the overall health, the amount of mouth and throat pain, the effect of mouth and throat soreness on swallowing, drinking, eating, talking, sleeping, and also the amount of diarrhea (10,14). The ChIMES had already been translated into Turkish and validated in children with cancer (16). The OMDQ includes the amount of diarrhea, although it is not correlated with other items (10). An important and debilitating symptom of intestinal mucositis is diarrhea, chemotherapy-associated mucositis can manifest as diarrhea, pain, and rectal bleeding (5,10). The OMDQ also evaluates the effect of mouth and throat soreness on sleeping and talking (10), ChIMES and OMDQ have differences. Mucositis assessment scales can be preferred according to healthcare professionals.

Symptoms of discomfort and pain often appear in the mouth and throat, preceding tissue changes (4). They can often be ignored in clinics, or the subjective and objective symptoms can be identified after the findings increase. In this regard, introducing existing scales into other languages, and making daily diagnoses in children receiving chemotherapy treatment through valid and reliable scales can prevent the exacerbation of mucositis (1,4,5,11-16). This study aimed to investigate the Turkish validity and reliability of the "Oral Mucositis Daily Questionnaire" in children aged 8-18 years diagnosed with cancer.

MATERIAL AND METHODS

This descriptive, cross-sectional, and methodological study was conducted to adapt the original version of OMDQ into Turkish. This study included pediatric cancer patients aged 8 - 18 years who had undergone chemotherapy for at least one month at the two university hospital's pediatric hematology/oncology clinics in Izmir, Turkey. Patients were recruited from February 2019 to May 2019. The sampling in methodological studies is stated to be at least fivefold the number of the items in the scale (17). OMDQ consisted of 6 items, and the sample size was determined as 30 pediatric cancer patients with OM for the test-retest reliability. Ninety-two pediatric cancer patients were taken at the construct validity to increase the power of the study using the purposeful sampling method. Inclusion criteria were; able to read and understand Turkish, had provided their written consent. Patients in the terminal stage, with neurologic or psychiatric disorders and who refused to participate in the study, were not included. Patients were recruited at their inpatient wards and outpatient clinics. Interviews were performed in patients' rooms and private rooms for outpatients.

Translation and Cultural Adaptation

OMDQ was translated into Turkish for language equivalence. The scale was translated from English into Turkish by six translators who are fluent in English. These translators were 2 Ph.D. nurses, 2 MDs, and 2 RN at the pediatric hematology/oncology department. The resulting version of OMDQ was back-translated into English by two native English speakers who are fluent in Turkish. The authors assessed the back translation to establish the meanings of items. No important differences in meaning were found. Ten experts analyzed the semantic/idiomatic, conceptual, and cultural equivalence of the prefinal version of the scale. Scores changed from 1 (nonrepresentative) to 4 (representative) for each item. The content validity index (CVI) was calculated (17).

Data Collection Instruments

These instruments were rated by the researcher based on child reports in this study. The Oral Mucositis Daily Questionnaire was administered to 30 children who were included in inter-rater and test-

Table 1. Children Demographics (n=92)

	n (%)
Age Group	
8-12 years	56 (60.9)
13-18 years	36 (39.1)
Gender	
Girl	38 (41.3)
Boy	54 (58.7)
Stage of the disease	
New Diagnosis	19 (20.7)
Remission	47 (51.1)
Relapse	26 (28.3)
Diagnosis	
Acute Lymphoblastic Leukemia	43 (46.7)
Acute Myeloid Leukemia	14 (15.2)
Lymphoma	9 (9.8)
Central Nervous System Tumors	10 (10.9)
Other Solid Tumors	16 (17.4)
Treatment Period (months)	
1-4 months	21 (22.8)
5-9 months	16 (17.4)
10 months and more	55 (59.8)
Presence of Previous Mucositis	
Yes	89 (96.7)
No	3 (3.3)

retest reliability by the nurse as well as the researcher. All participants included in the construct validity completed the following questionnaires: The Oral Mucositis Daily Questionnaire, the WHO Oral Mucositis Grading Scale, and the Children's International Mucositis Evaluation Scale.

Oral Mucositis Daily Questionnaire (OMDQ)
In this study, we used the original version of OMDQ (10). This questionnaire is used for the assessment of mucositis in patients. A final 6-item version measured the overall health (Q1) (0 = Worst possible, 10 = Perfect health), the amount of mouth and throat pain (Q2) (0 = No soreness, 1 = A little soreness, 2 = Moderate soreness, 3 = Quite a lot of soreness, 4 = Extreme soreness), the effect of mouth and throat soreness (MTS) on swallowing (Q3a), drinking (Q3b), eating (Q3c), talking (Q3d), sleeping (Q3e), (0 = Not

limited, 1 = Limited A Little, 2 = Limited Some, 3 = Limited A Lot, 4 = Unable To Do), overall MTS (Q4), (0 = No soreness, 10 = Worst possible), amount of diarrhea (Q5), (0 = No diarrhea, 1 = little diarrhea, 2 = Moderate diarrhea, 3 = Quite a lot of diarrhea, 4 = Severe diarrhea) and overall diarrhea (Q6), (0 = No diarrhea, 10 = Worst possible) (10).

WHO Oral Mucositis Grading Scale
The presence of oral mucositis is assessed based on clinical manifestations and ranges from 0 (the absence of symptoms) to 4 (oral feeding is impossible) (8).

Children's International Mucositis Evaluation Scale (ChIMES)
The ChIMES is a self-reported scale that consists of six items assessing oral mucositis in children aged 8-18 years. Items 1-4 are scored from 0 (best) to 5 (worst). The remainder of items 5-6 are answered with a yes/no and assigned scores of 1 and 0, respectively. The maximum total score is 23 (12,13). Turkish version of ChIMES is valid and reliable (16).

Psychometric Properties
Pretest: In this period, ten children aged 8 - 18 years diagnosed with cancer were included, and they confirmed that the OMDQ items were clear and precise. All of the items were well understood by the respondents, who did not suggest any changes. These children were not included in the study.

Inter-rater and test-retest reliability
The OMDQ was administered to thirty children by a researcher and nurse in the hematology/oncology clinic separately. The nurse in this study was a registered nurse who had worked in the hematology/oncology units for at least 5 years and had an oncology nursing certification. The researchers trained the nurse who collected data with OMDQ, and the researcher and the nurse administered OMDQ to 5 patients. Both of them rated the same score in these practices based on child reports.
For the test-retest reliability, children had to have oral mucositis. The OMDQ was administered to thirty children aged 8 - 18 years with OM on the 14th and 15th days of chemotherapy by the researcher and nurse separately. OMDQ was measured 24 hours apart with two separate evaluations on days 14 – 15th of chemotherapy by the researcher and nurse based

Table 2. Oral Mucositis Daily Questionnaire Items (n=92)

						Min-Max Score	M ± SD
Q1 – Overall health during the past 24 hours						0-10	1.2±1.6
Q2 – MTS during the past 24 hours	No soreness	A little soreness	Moderate soreness	Quite a lot of soreness	Extreme soreness	0-4	1.3±0.8
	n (%)	n (%)	n (%)	n (%)	n (%)		
	11(12.0)	48 (52.2)	24 (26.1)	8 (8.7)	1 (1.1)		
During the past 24 hours, MTS limited at	Not limited	Limited a little	Limited some	Limited a lot	Unable to do		
	n (%)	n (%)	n (%)	n (%)	n (%)		
Q3a – Swallowing	58 (63.0)	28 (30.4)	3 (3.3)	3 (3.3)	-	0-4	0.4±0.7
Q3b – Drinking	41 (44.6)	38 (41.3)	9 (9.8)	4 (4.3)	-	0-4	0.7±0.8
Q3c – Eating	28 (30.4)	45 (48.9)	14 (15.2)	5 (5.4)	-	0-4	0.9±0.8
Q3d – Talking	46 (50.0)	34 (37.0)	8 (8.7)	4 (4.3)	-	0-4	0.6±0.8
Q3e – Sleeping	68 (73.9)	17 (18.5)	4 (4.3)	3 (3.3)	-	0-4	0.4±0.8
Q4 – Overall MTS						0-10	1.4±1.0
Q5 – Diarrhea during past 24 hours	No diarrhea	A little diarrhea	Moderate diarrhea	Quite a lot diarrhea	Severe diarrhea		
	n (%)	n (%)	n (%)	n (%)	n (%)		
	71 (77.2)	21 (22.8)	-	-	-	0-4	0.2±0.4
Q6 – Overall diarrhea						0-10	0.2±0.5

MTS= Mouth and throat soreness

on the child report. Inter-observer agreement was evaluated with Kappa Compliance Analysis. The relationship between the two measurements was evaluated by the Spearman correlation coefficient.

Construct validity
In this period, we included 92 children (Table 1), and they answered the OMDQ and ChIMES. The researcher filled out the WHO Oral Mucositis Grading Scale. Cronbach's alpha assessed for internal consistency. Spearman's correlation coefficient was used for the assessment of convergent validity between similar items of OMDQ and ChIMES.

Statistical Analysis
The data were subjected to descriptive and inferential analyses using SPSS, version 22.0, software (IBM,

Armonk, NY). The significance level was $p < .05$. For the OMDQ cultural adaptation, CVI was used. Kappa Compliance Analysis, Spearman's correlation coefficient, and Cronbach's alpha were evaluated for reliability and validity. Correlation coefficients were defined as 0 – 0.25 negligible or not correlated, 0.25 – 0.50 fair correlation, 0.50 – 0.75 moderate to good correlation, and > 0.75 very good to excellent correlation (17).

Ethical Considerations
Permission to use the scale in Turkey was obtained from the scale's writers. Ethical approval was received from the Non-Invasive Clinical Studies Ethics Committee of the university (Date: 13.02.2019, Decision no: 2019/03-55).). The researcher informed children and parents about the aim of the study and

Table 3. Correlation of Oral Mucositis Daily Questionnaire Items (n=92)

	Q1	Q2	Q3a	Q3b	Q3c	Q3d	Q3e	Q4	Q5	Q6
(Q1) Overall Health	1.00									
(Q2) MTS	0.688**	1.00								
(Q3a) MTS-swallowing	0.654**	0.744**	1.00							
(Q3b) MTS-drinking	0.633**	0.728**	0.835**	1.00						
(Q3c) MTS-eating	0.636**	0.733**	0.703**	0.806**	1.00					
(Q3d) MTS-talking	0.643**	0.711**	0.810**	0.820**	0.782**	1.00				
(Q3e) MTS-sleeping	0.592**	0.620**	0.719**	0.715**	0.682**	0.737**	1.00			
(Q4) Overall MTS	0.792**	0.795**	0.726**	0.741**	0.729**	0.746**	0.655**	1.00		
(Q5) Diarrhea	0.119	0.176	0.333	0.176	0.155	0.251	0.202	0.182	1.00	
(Q6) Overall diarrhea	0.131	0.080	0.294	0.140	0.126	0.230	0.218	0.185	0.888**	1.00

**p < .001 , MTS= Mouth and throat soreness.

obtained written consent forms from children and parents.

RESULTS
Test-retest reliability results (n=30)
The average age of the patients who were included in the test-retest reliability was 12.6 ± 3.1, all of them were inpatients and received chemotherapy treatment, 53.3% were girls (n=16), 26.7% were diagnosed with Acute Lymphoblastic Leukemia (n=8), 16.7% were Acute Myeloid Leukemia (n=5), 13.3% were Lymphoma (n=4), 43.3% were oncological tumors (n=13), and 33.3% were relapsed patients (n=10). Of the patients, 66.7% had Grade 1 mucositis (n=20), 30.0% had Grade 2 mucositis (n=9), 3.3% had Grade 3 mucositis (n=1) to the WHO Oral Mucositis Grading Scale on the 14th day of chemotherapy.

For test-retest reliability, the Pearson correlation coefficient was calculated on the 14th and 15th days of chemotherapy treatment for each OMDQ item. The scale was applied to children by the researcher and a nurse working in the clinic. There was no total score for the OMDQ, inter-observer compliance between researcher and nurse was evaluated with the Kappa Compliance Analysis for each item (0.87-1.00). OMDQ was applied to 30 children on the 14th and 15th days of chemotherapy treatment, and the inter-rater agreement for OMDQ items was determined between 0.64 and 1.00. According to the OMDQ results rated by the researcher, the general health mean score during the last 24 hours was 1.8 ± 1.7 on the 14th day and 2.1 ± 1.8 on the 15th day (r = 0.86, p = .000); the mouth and throat pain mean score was 1.1 ± 0.8 on the 14th day and 1.3 ± 0.8 on the 15th day (r = 0.64, p = .000). Mouth and throat pain during the last 24 hours were 0.3 ± 0.5 on the 14th day, 0.4 ± 0.6 on the 15th day while swallowing (r = 0.89, p = .000); 0.8 ± 0.7 on the 14th day, 1.0 ± 0.7 on the 15th day while drinking (r = 0.82, p = .000); 1.0 ± 0.7 on the 14th day, 1.2 ± 0.7 on the 15th day while eating (r = 0.73, p = .000); 0.6 ± 0.8 on the 14th day, 0.7 ± 0.9 on the 15th day while talking (r = 0.94, p = .000) and 0.3 ± 0.6 on the 14th day, 0.3 ± 0.6 on the 15th day while sleeping (r = 0.96, p = .000). During the last 24 hours, the mouth and throat pain mean score was 1.5 ± 1.3 on the 14th day and 1.7 ± 1.4 on the 15th day (r = 0.85, p = .000). The mean score for amount of diarrhea was 0.2 ± 0.6 on the 14th day and 0.2 ± 0.6 on the 15th day (r = 0.85, p = .000). The mean score for overall diarrhea was 0.2 ± 0.6 on the 14th day and 0.2 ± 0.6 on the 15th day (r = 1.00, p = .000). Correlations were evaluated for each item of OMDQ on the 14th and 15th days of chemotherapy treatment. The correlation values of the OMDQ items applied to children by the researcher and nurse were above 0.64 (p < .001).

Construct validity and reliability results (n=92)
In the construct validity, 92 children were included. All scores were rated by the researcher. The average age of the patients was 11.7 ± 3.3, 60.9% of them were 8-12 years old, 58.7% were boys, 46.7% were diagnosed with Acute Lymphoblastic Leukemia and 51.1% were in the remission stage (Table 1). All of the patients were receiving chemotherapy treatment only, and 71.7% were inpatients (n=66), 4.3% were feeding with a nasogastric tube because of mucositis (n=4), and 51% were requiring IV hydration (n=47).

Table 4. Relationship between OMDQ and ChIMES, OMDQ, and WHO Oral Mucositis Grading Scale (n=92)

	M±SD	r	*p*
OMDQ - Q2	1.34±0.84	0.809	.000
ChIMES Item 1	1.35±0.90		
OMDQ - Q3a	0.46±0.71	0.879	.000
ChIMES Item 2	0.59±0.77		
OMDQ - Q3c	0.95±0.82	0.876	.000
ChIMES Item 3	1.01±0.88		
OMDQ - Q3b	0.73±0.81	0.900	.000
ChIMES Item 4	0.81±0.83		
OMDQ - Q2	1.34±0.84	0.642	.000
WHO Oral Mucositis Grading Scale	1.11±0.75		

OMDQ= Oral Mucositis Daily Questionnaire, ChIMES= Children's International Mucositis Evaluation Scale, Q2= The amount of mouth and throat pain, Q3a = Swallowing, Q3b = Drinking, Q3c = Eating

According to the WHO Oral Mucositis Grading Scale, 55.4% of patients were evaluated as Grade 1, 21.7% as Grade 2, 4.3% as Grade 3, and 18.5% as Grade 0. None of the patients had Grade 4 mucositis.

The mean score received for overall health during the past 24 hours was 1.2 ± 1.6 (min:0, max:7). It was observed that 12% of patients had no soreness, 52.2% had a little soreness, 26% had moderate soreness, 8.7% had quite a lot of soreness and 1.1% had extreme soreness for the past 24 hours. During the past 24 hours, 30.4% limited a little while swallowing, 41.3% limited a little while drinking, 48.9% limited a little while eating, 37% limited a little while talking and 18.5% limited a little while sleeping. Patients with no soreness (n=11) had been evaluated as 'Not limited' in the MTS questions for the past 24 hours. The average score for MTS during the past 24 hours was 1.4 ± 1.0 (min: 0, max: 6). During the past 24 hours, 77.2% of patients had no diarrhea. The average score received for overall diarrhea during the past 24 hours was 0.27 ± 0.53 (min: 0, max: 3) (Table 2). The Cronbach Alpha value of OMDQ was .923.

We also evaluated the correlation between the items of OMDQ. Item Q1, Q2, Q3a, Q3b, Q3c, Q3d, Q3e, and Q4 positively correlated with each other (p < .001). Item Q5 and Q6 were correlated with each other, while not correlated with other items (Table 3). The ChIMES and WHO Oral Mucositis Grading Scale were used for construct validity. The OMDQ, ChIMES, and WHO Oral Mucositis Grading Scale measured the same or similar constructs (i.e. OMDQ MTS-related items, ChIMES Items 1 - 4). The correlation analysis between similar items of OMDQ (Q2, Q3a-3b-3c) and ChIMES (1 - 4) was evaluated. The OMDQ- Q2 and WHO Oral Mucositis Grading Scale ranged from 0 to 4 and evaluated the amount

of mouth and throat pain. The correlation analysis between OMDQ- Q2 and the WHO Oral Mucositis Grading Scale was also evaluated.

In ChIMES Item 1, patients described the pain in their mouth and throat, 50% rated a little pain and 13% rated no pain. In ChIMES Item 2, patients described swallowing because of the mouth and throat pain, 50.4% stated "not hard" and 34.8% "little hard". In ChIMES Item 3, patients described eating because of the mouth and throat pain, 31.5% stated "not hard" and 42.4% "little hard". In ChIMES Item 4, patients described drinking because of the mouth and throat pain, 41.3% stated "not hard" and 40.2% "little hard". Patients of 73.9% had no pain medication and 26.1% needed medicine for mouth and throat pain (ChIMES Item 5). In ChIMES Item 6, 63% of patients had a mouth sore. The total average score of ChIMES was 4.6 ± 4.0 (0-16).

There was a positive significant relationship between the OMDQ-Q2 and ChIMES Item 1 (pain in their mouth and throat), OMDQ 3a and ChIMES Item 2 (swallowing), OMDQ 3c and ChIMES Item 3 (eating), OMDQ 3b and ChIMES Item 4 (drinking), and OMDQ-Q2 and WHO Oral Mucositis Grading Scale (p < .001) (Table 4).

DISCUSSION

Tomlinson et al. (15) adapted the original OMDQ for the pediatric oncology/hematology population, they made minor changes, and the OMDQ is appropriate for use in pediatrics. Parent report of a modified version of OMDQ was reliable for children receiving intensive chemotherapy (13). Manji et al. (5) examined the psychometric properties of the self-report OMDQ in children aged ≥ 12 years diagnosed with leukemia/lymphoma or undergoing stem cell

transplantation. This study suggested that the OMDQ is valid and reliable and that MTS-related questions on swallowing, drinking, eating, and talking are valid assessments of mucositis in children aged 8 - 18 years. In this study, OMDQ was applied to 30 children with oral mucositis on the 14th and 15th days of chemotherapy treatment by the researcher and a nurse working in the clinic for the test-retest reliability analysis. Children had to have mucositis for test-retest reliability. It was seen that the correlation values of the scale items evaluated by the researcher and nurse were above 0.64. The test-retest reliability measured for OMDQ items were above the acceptable level (18). The mouth and throat pain mean score correlation value was 0.64. It had been questioned for the last 24 hours, a change between the 14th and 15th days can be considered normal. Manji et al. (5) found the test-retest reliability of the OMDQ when measured 24h apart on days 14 and 15 had a moderate correlation. The test-retest method is one of the most preferred reliability analyses that examine the invariance of the scale. It is recommended to evaluate the means and standard deviations of the scores obtained as a result of two measurements. Both measurement results should be similar. The correlation coefficient between the test-retest scores on the scales is to be at least 0.70 (18,19). The OMDQ was applied for two consecutive days, and there was no statistical difference between the two measurements. In this study, based on the study investigated by Manji et al. (5), the test-retest method was applied and found a high correlation for all OMDQ items.

The Cronbach Alpha value of OMDQ was .923, it was concluded that it was a highly reliable scale (18). Similarly, Cronbach's alpha coefficient of ChIMES was found to be 0.91 in the Turkish reliability study (16). Manji et al. (5) examined the psychometric properties of OMDQ. In their study, OMDQ revealed at least a moderate correlation with the WHO Oral Mucositis Grading Scale, Pain Visual Analog Scale, and Functional Assessment of Cancer Therapy Esophageal Cancer Subscale for questions regarding pain, swallowing, drinking, and eating in the construct validity. Sleeping and talking had lower correlations and the diarrhea question of the OMDQ did not correlate with other items. In our study, OMDQ items (Q1-2-3a-3b-3c-3d-3e-4) were correlated with each other, and OMDQ's diarrhea items (Q5-6) were correlated with each other but did not correlate with others. The questions related to diarrhea (Q5-6) were

removed in the Turkish version. The Q1-2-6 questions can make no sense to have such low values on these items when the ratings of mucositis were quite low. The Q1-2 did not need to be removed as correlated with other items.

We also used the WHO Oral Mucositis Grading Scale and ChIMES for construct validity. There was a positive significant relationship between the OMDQ and ChIMES items that measured the same situation. OMDQ- Q2 and WHO Oral Mucositis Grading Scale had also a positive significant relationship. The WHO Oral Mucositis Grading Scale is based on the ability to eat and drink, which is the most commonly used one-dimensional scale, not provide an adequate evaluation (8). Similar to the WHO Oral Mucositis Grading Scale, the Oral Mucositis Assessment Scale (OMAS) evaluates the ulceration and erythema in the mouth and is a valid one-dimensional scale for pediatric cancers (11). The ChIMES focused on the pain/soreness in the mouth and throat and related the swallowing, drinking, eating, and medication (12,13). The OMDQ focused on the mouth and throat pain/soreness related the swallowing, drinking, eating, talking, sleeping, and also diarrhea (10,15). The OMDQ can be called a comprehensive scale. OMDQ was also validated in Chinese pediatric cancer patients aged 6 - 18 years (1). The OMDQ adds only the relationship of mucositis to talking and sleeping and data on diarrhea. These questions can not be beneficial for mucositis. Questions related to diarrhea were removed because they did not correlate with other questions in the Turkish version. The OMDQ provides only subjective data and does not provide data on the presence of ulcers.

The original OMDQ was used in this study. In the modified OMDQ for use with children by Tomlinson et al. (15), there were no questions about overall health and diarrhea, minor changes had been made, and stated that its use is suitable for the pediatric population. In ChIMES, speaking and sleeping because of mouth and throat pain was not questioned. Children with mucositis may have trouble speaking and may not be able to sleep due to mouth and throat pain. OMDQ can be used to determine the development of mucositis, not the presence of ulcers, and its effect on the daily life activities of mouth and throat pain, and it can also be used in studies aimed at reducing pain associated with mucositis.

This study included 92 children who had undergone chemotherapy for at least one month. Children were at different treatment stages, many of them were in

remission, and more than half were receiving chemotherapy for more than 10 months. Many patients come to the clinic on the first day of the cycle at which point little to no mucositis is expected. The study could have been improved by assessing patients at a time when mucositis was most likely to occur or by following patients daily to capture a full range of OMDQ scores. In addition to the mucositis assessment, we could also use symptom screening scales and evaluate other accompanying symptoms. The OMDQ was applied to 30 children with OM on the 14th and 15th days of chemotherapy treatment for the test-retest assessments, this time is quite simple to have an agreement with a score of zero and those might be peak times of mucositis. This time cannot be generalized for every child with cancer. These are a limitation of this study.

The limited study focused on the development and evaluation of oral mucositis in pediatric cancer patients. Modified adult oral mucositis instruments were used in these patients (10,15). Oral mucositis in children with cancer should be evaluated mainly on observational self-reports. Our study described the psychometric properties of the OMDQ in pediatric cancer patients aged 8-18 years.

CONCLUSION

The MTS-related questions of the OMDQ are valid and reliable and can be completed by pediatric cancer patients aged 8 - 18 years daily to obtain more observations of OM. The OMDQ provides a simple method for self-assessment of mouth and throat pain and is effective as a validated clinical assessment tool. The questions related to diarrhea were removed from the OMDQ Turkish version. This scale item may need to be re-evaluated in more samples. The daily use of the OMDQ in addition to clinical assessment tools may enable clinicians to identify and manage OM more rapidly.

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DEPRESSION IN PREGNANT WOMEN: RELATIONSHIP FACTORS AND EFFECT OF BODY IMAGE ON DEPRESSION

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ABSTRACT

Purpose: Depression is an important problem that needs to be taken into consideration, since it affects maternal and infant health. This study was conducted to determine the depressive symptoms of pregnant women and investigate their body image and some related factors.
Material and Methods: A cross-sectional design was used in the study, and it was conducted with the participation of 520 pregnant women in Türkiye. The data collection tools included the Personal Information Form, Beck's Depression Inventory, and Body Cathexis Scale.
Results: In the study, 24.6% of the pregnant women have depressive symptoms. Pregnant women's low educational level, poor income, chronic diseases, "low" BMI, and whether they smoke or not were found to be related factors to depressive symptoms (p<0.05). Besides, pregnant women with depressive symptoms have lower body image satisfaction (p<0.05). The study found that body image affects depressive symptoms in the ratio of 0.971 times (Beta: -0.029; p<0.05).
Conclusion: This study presented that one-fourth of pregnant women have depressive symptoms. It was found that pregnant women's low educational level, poor income, chronic diseases, and low BMI score and whether they smoke or not are the factors related to the depressive symptoms. Besides, body image is a risk factor affecting the depressive symptoms for pregnant women.

Keywords: Body image, depression, pregnant women

INTRODUCTION

Pregnancy is an important period which has been associated with physiological and psychological changes in women. Many pregnant women have difficulties in adapting to the changes in pregnancy and experience psychological problems. Depression is one of the most common psychological problems during pregnancy. Epidemiological studies presented that the frequency of depression increases among pregnant women. According to the results of studies conducted among different countries with high, middle, and low income levels the prevalence of depression in pregnant women was between 9.2-81%

(1-6). Many factors can affect depression during pregnancy. Influencing factors include hormonal and physiological changes, as well as sociodemographic and obstetric factors (1, 5).

Body image is an internal presentation of appearance and a universal issue. Pregnancy is an important period in which the perception of body image is affected. Dissatisfaction with the body image can lead to depression in pregnant women (7). Depression and dissatisfaction with the body image during pregnancy can spoil the process of pregnancy. Depression is an important psychological problem that needs to be taken into consideration since it affects both maternal

and infant health. For this reason, this study aimed to determine the depressive symptoms of pregnant women and investigate their body image and some related factors.

MATERIAL AND METHODS
Study design and sample
This cross-sectional study was conducted with pregnant women who applied to a state university's training and research hospital, obstetrics and gynecology clinics in Türkiye between April 28 and August 31, 2016.

Power analysis was used to determine the sample of the study. A pre-application was executed and data were computed to the G-power 3.1.9.2 software. When the effect size ($|\rho|$) = 0.28, I. type error probability α = 0.05 and the power of test 1-β = 0.95 (%95) were acquired, the minimum number of pregnant women to be included in the study was calculated as 312. The study was completed with 520 pregnant women considering the probabilities of lost cases, pregnant women's unwillingness to participate, or their status of having unacceptable inclusion criteria.

Measures and procedure
In this study, the Beck Depression Inventory (BDI), the Body Cathexis Scale (BCS) and the Personal Information Form (consisting of the questions about the pregnant women's sociodemographic and obstetric characteristics) were used as data collection tools.

BDI: The BDI was developed in 1961 by Beck. Hisli (1989) conducted its reliability and validity study in Turkish. Those with a total score of 17 points or more are considered to have 'depressive symptoms' and those below 17 points are considered to have 'no depressive symptoms' (8).

BCS: This scale was developed by Secord and Jourard in 1953. Its validity and reliability study was done by Hovardaoglu (1993) in Turkey. The scale measures satisfaction with a person's body. It consists of 40 questions with 5-point Likert type. The lowest and highest scores that can be taken from the scale are 40 and 200, respectively. A higher score means a higher positive body image (9).

In the study, the fact that pregnant women were older than the age of 35 is considered a risk factor for maternal and infant health. Those who smoke 1 cigarette per day were considered as regular smokers; those who consume alcohol at least once a

week were considered to be using alcohol. Nuclear family was defined as the mother, father and their children living in the same house. Extended family was defined as a family consisting of two parents, their children, and their relatives such as grandparents all living in the same house. Gestational weeks were divided into trimesters. The first trimester is from week 1 to 12. The second trimester is from week 13 to 26. The third trimester is from week 27 to the birth. As for, concerning the status of exercise, it was accepted to exercise for 30 minutes at least 3 times a week. Number of pregnancies was used to define pregnant women, and the ones who would give birth for the first time were considered as primiparous, and those who had more than one birth were considered as multiparous. Data collection forms were filled in the form of face to face interview by the researcher. This process took about 30 minutes.

Statistical analysis
We analyzed the study data on the SPSS (version 22.0). Numerical variables were presented as frequency and percentage. Scores of the pregnant women which were taken from the scales were presented as mean and standard deviation. For the categorical variables, the chi-square test and the independent samples t-test were used. The relationships between the scores obtained from the scales were assessed by Binary logistic regression analysis. Statistical significance was accepted as $p<0.05$.

Ethical statement
The study was approved by a state university's ethics committee (Date: 27.04.2016, No: 2016-05/06). Additionally, the written informed consent forms were obtained from the pregnant women included in the study.

RESULTS
The average age of the pregnant women was 25.82 ± 5.29 and 94% were below 35 years old. Also, 61.2% of the pregnant women were in the third trimester, 57.5% were multiparous, and 86.0% had planned pregnancy. The number of pregnant women having depression symptoms in the study group was determined as 128 (24.6%) according to the BDI score. Distribution of the pregnant women having depressive symptoms according to the socio-demographic and obstetric characteristics was given in Table 1-2. Pregnant women who indicated their low

Table 1. Distribution of the pregnant women' depressive symptoms according to sociodemographic characteristics

Characteristics	Depressive Symptom		Total	Test; p
	Absent (BDI Score<17)	Present (BDI Score≥17)		
	n (%)[†]	n (%)[†]	n (%)[††]	x^2; p
Total	392 (75.4)	128 (24.6)	520 (100.0)	
Age				
≤34	368 (75.3)	121 (24.7)	489 (94.0)	0.003; 0.955
≥35	24 (77.4)	7 (22.6)	31 (6.0)	
Educational level				
Primary school	160 (72.7)	60 (27.3)	220 (42.3)	
High school	147 (73.5)	53 (26.5)	200 (38.5)	**6.202; 0.045**
Bachelor's degree	85 (85.0)	15 (15.0)	100 (19.2)	
Employment				
Unemployed	314 (79.6)	108 (20.4)	98 (18.8)	0.889; 0.346
Employed	78 (74.4)	20 (25.6)	422 (81.2)	
Economic level				
Income is less than expenses	12 (57.1)	9 (42.9)	21 (4.0)	
Income is equal to expenses	257 (73.6)	92 (26.4)	349 (67.1)	**7.877; 0.019**
Income is more than expenses	123 (82.0)	27 (18.0)	150 (28.9)	
Family type				
Nuclear family	299 (75.7)	96 (24.3)	395 (76.0)	0.086; 0.769
Extended family	93 (74.4)	32 (25.6)	125 (24.0)	
Health insurance				
Absent	47 (73.4)	17 (26.6)	64 (12.3)	0.053; 0.817
Present	345 (75.7)	111 (24.3)	456 (87.7)	
Inhabitation				
City	270 (75.6)	87 (24.4)	357 (68.7)	0.037; 0.847
County/ village	122 (74.8)	41 (25.2)	163 (31.3)	
Duration of the marriage				
0-5 years	258 (75.4)	84 (24.6)	342 (65.8)	1.703; 0.427
6-10 years	79 (79.0)	21 (21.0)	100 (19.2)	
11≤ years	55 (70.5)	23 (29.5)	72 (15.0)	
Smoking				
Smoker	15 (50.0)	15 (50.0)	30 (5.8)	**9.810; 0.002**
Non-smoker (stopped /never smoked)	377 (77.1)	112 (22.9)	490 (94.2)	
Alcohol use				
Absent	391 (75.8)	125 (24.2)	517 (99.4)	--; 0.150
Present	1 (33.3)	2 (66.7)	3 (0.6)	
Exercise				
Absent	264 (76.1)	83 (23.9)	347 (66.7)	0.272; 0.602
Present	128 (74.0)	45 (26.0)	173 (33.3)	

The percentages were calculated according to [†]Row Total, [††]Column Total; x^2: chi-square test

education level, poor income and whether they smoke or not had a significantly higher incidence of depressive symptoms (p <0.05 for each) (Table 1). Also pregnant women who indicated their chronic disease, "low" BMI and negative body perception had a significantly higher incidence of depressive symptoms (p < 0.05 for each) (Table 2).

In the study, it was found that BCI score affects depressive symptoms 0.971 times (Beta: -0.029; p< 0.001). According to the regression analysis between the BCS scores averages of pregnant women and depressive symptom condition, pregnant women with lower body image have more risk of having depression symptoms (Table 3).

DISCUSSION

This study spotted that one-fourth of the pregnant women has depressive symptoms. Similar results have been reported from our country and the different countries. According to these results, the prevalence

Table 2. Distribution of the pregnant women' depressive symptoms according to obstetric characteristics and some variables that may be related

Characteristics	Depressive Symptom		Total	Test; p
	Absent (BDI Score<17)	Present (BDI Score≥17)		
	n (%)[†]	n (%)[†]	n (%)[††]	x^2; p
Total	392 (75.4)	128 (24.6)	520 (100.0)	
Gestational week				
First trimester	47 (78.3)	13 (21.7)	66 (12.6)	0.417; 0.812
Second trimester	86 (76.1)	27 (23.9)	136 (26.2)	
Third trimester	259 (74.6)	88 (25.4)	318 (61.2)	
Number of pregnancies				
Primiparous	169 (76.5)	52 (23.5)	221 (42.5)	0.244; 0.621
Multiparous	223 (74.6)	76 (25.4)	299 (57.5)	
Status of the pregnancy				
Unplanned	49 (67.1)	24 (32.9)	73 (14.0)	2.627; 0.105
Planned	343 (76.7)	104 (23.3)	447 (86.0)	
Chronic disease				
Absent	172 (81.0)	40 (19.0)	211 (40.6)	**6.126; 0.013**
Present	221 (71.5)	88 (28.5)	309 (59.4)	
Previous abortion				
Absent	335 (76.1)	105 (23.9)	440 (84.6)	0.628; 0.428
Present	57 (71.2)	23 (28.7)	80 (15.4)	
Body mass index (BMI) during pregnancy				
Low (<18.5)	2 (33.3)	4 (66.7)	6 (1.2)	
Normal (18.5-24.99)	120 (82.2)	26 (17.8)	146 (28.1)	**12.748; 0.005**
Over weight (25.0-29.99)	158 (76.6)	48 (23.4)	205 (39.4)	
Obese (30 and higher)	113 (69.3)	50 (30.7)	163 (31.3)	
Change in the body perception during pregnancy				
Negative	181 (69.3)	80 (30.7)	261 (50.2)	**10.288; 0.001**
Positive	211 (81.5)	48 (18.5)	259 (49.8)	

The percentages were calculated according to [†]Row Total, [††]Column Total; x^2: chi-square test

of depressive symptoms among the pregnant women is between 12% and 51%, and depression is a frequently encountered health problem in pregnancy (3, 10-17). For the maternal and infant health during pregnancy, depression is a common health problem that should not be neglected.

In this study, pregnant women with low educational levels and poor income showed higher depressive symptoms. Studies presented that there is a strong relationship between low education level and low income (2, 5, 18, 19). Low education level causes women not to benefit from job opportunities and poor income. Poor income makes living conditions difficult, and these difficulties can cause depression.

Smoking is a substance that pregnant women should avoid in order to protect the health of their baby. In this study, pregnant women who smoke regularly demonstrated higher depressive symptoms. Studies reported that smoking during pregnancy and depression are related (20-23). Smoking may be a

way that pregnant women use to cope with their psychological problems. Additionally, smoking may be a risk factor for depression during pregnancy.

Pregnant women who expressed that they have chronic disease in this study had a higher incidence of depressive symptoms. The presence of a disease in pregnant women's lives makes it difficult to carry on daily life, and may cause them to experience more difficulties in pregnancy. Our study's results are compatible with the literature (2, 11, 19).

Pregnant women, who perceive their body change negatively showed higher depressive symptoms in this study. While it is thought that depression seen in pregnancy is caused by the negative life experiences, similar results were reported in different studies, as well (10, 11, 24). Moreover, pregnant women who have lower BMI had a significantly higher incidence of depressive symptoms. This result in our study suggested that pregnant women with low BMI might be experiencing stress and anxiety about body image

Table 3. Comparison and regression analysis of the pregnant women' BCS scores according to depressive symptoms

Depressive symptoms	BCS		Test‡	p
	Mean (± S.D.)	Median (Min-Max)		
Absent	141.10 (23.77)	138.00 (88.00-198.00)		
Present	125.11 (22.18)	129.00 (99.00-157.00)	6.714	**0.001**
Total	136.73 (21.78)	135.50 (88.00-198.00)		
	β	S. E.	Wald	df	OR (%95 CI)	p
BCS score	-0.029	0.005	38.017	1	0.971 (0.962-0.980)	**0.001**
Invariant	2.798	0.629	19.815	1	16.416	**0.001**

-2 Log likelihood = 536.999
Cox & Snell R Square = 0.080
Nagelkerke R Square = 0.119
Accuracy Rate = %74.8

‡ Independent samples t-test; S.D.: Standard deviation; β: Beta; S.E.: Standard Error; df: degree of freedom; OR: Odds ratio; CI: Confidence interval

and the development of their baby. Studies have also reported that BMI negatively affects the psychology of pregnant women (6,11,13, 25). In addition, having low BMI may lead to dissatisfaction with body image and depression.

Pregnant women's satisfaction with the body image is positively higher than the average in this study. Similar results were reported from Türkiye and the different countries. (7, 17, 25-27). Changes in a woman's body in pregnancy can affect body image positively or negatively. It is generally thought that increase in the body weight and change in body form would affect body image negatively in pregnancy. However, pregnancy is a unique time when the woman is aware that she is going to gain weight with the baby she carries.

In this study, pregnant women with depressive symptoms have lower-level satisfaction with the body image. Psychological wellbeing can be effective on body image perception. In the other studies, it was stated that there is a negative relationship between the body image perception and depression (7, 12, 13, 25, 26, 28, 29). Pregnant women's dissatisfaction with the body image may increase the incidence of depression.

In this study, it was also found that satisfaction with the body image is a factor affecting the frequency of depressive symptoms. Similar results to our study's results were reported in another study (17). According to the result of this study, it can be said that satisfaction with the body image is a risk factor for depression in pregnancy. The relationship between satisfaction with the body image and depression can be two-sided. While negative body image might

cause depression in pregnancy, existing depression might affect satisfaction with the body image negatively, as well (7, 26, 30).

CONCLUSION

In the study, one-fourth of the pregnant women have depressive symptoms. Pregnant women' low educational level, poor income, chronic diseases, low BMI, and whether they smoke or not were found to be related factors to depressive symptoms. The study found that body image affects depressive symptoms, and it is a risk factor. As a result, depression during pregnancy may cause poor obstetric outcomes. For this reason, healthcare professionals should closely monitor pregnant women psychologically and evaluate their satisfaction with the body image, recognize the factors that may be related with depression, and be able to guide them correctly.

Limitations

The data of this study is limited with the participation of the pregnant women of the center where the study was conducted. In order to improve the generalization, multi-centered studies with larger samples are necessary. The results of the study are also limited with the results of the scales used in the study.

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DOES SMARTPHONE ADDICTION IMPAIR MAXIMAL EXERCISE CAPACITY IN YOUNG ADULTS?

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ABSTRACT

Purpose: Smartphone addiction may reduce the time allocated for physical activity participation. However, it is not known if there is a direct association between smartphone addiction and reduced exercise capacity. Our aim was to investigate whether smartphone addiction impairs maximal exercise capacity, as well as analyze its influence on the perceived benefits of exercise and physical activity habits in young adults.
Material and Methods: Forty-six volunteers were evaluated by a symptom-limited incremental exercise test. Smartphone addiction of volunteers was evaluated using Smartphone Addiction Scale- Short Form. Physical activity participation and perceived benefits of physical activity participation were evaluated using International Physical Activity Questionnaire- Short Form and Exercise Benefits/Barriers Scale, respectively.
Results: The prevalence of smartphone addiction was 65% in young adults. No significant association was detected between smartphone addiction and any of maximal exercise capacity metrics including test duration, maximum workload achieved in watts or maximum heart rate ($p>0.05$). Smartphone addiction did not correlate to physical activity participation either ($p>0.05$). Univariate linear regression revealed Exercise Benefits/Barriers Scale score was able to explain 41% of variance in exercise test duration and 37% of variance in maximal workload ($p<0.01$), and it was also correlated to physical activity level ($r=0.424$; $p<0.01$)
Conclusion: Smartphone addiction did not directly translate into lower physical activity participation or worse exercise capacity. However, perception of the benefits of exercise had a great influence on physical activity and exercise capacity, which highlights the importance of increasing the awareness of the benefits of physical activity among young adults for maintaining physical health.

Keywords: Addiction, exercise capacity, exercise perception, physical activity, smartphone

INTRODUCTION

The maximum exercise capacity of an individual is directly associated with overall and cardiovascular mortality, independent of age, sex, comorbidities or documented cardiovascular diseases. It is reported that every 1-MET increase in the maximum exercise capacity reduces mortality risk by 12% (1). Consequently, it is recommended that healthcare professionals should encourage both the patients and the general population to achieve and maintain high levels of exercise capacity (2). This also highlights the importance of regular monitoring of exercise capacity,

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especially in the risky populations. On the other hand, physical activity level is one of the major contributors to maximum exercise capacity, which makes it equally important for maintaining good health. However, physical inactivity and sedentary lifestyle are spreading worldwide, and the penetration of television, smartphones and video entertainment devices in daily life poses a major risk for such behavior (3).

Smartphones made daily life more convenient since they provide various additional functions such as cameras, navigation systems, internet access, gaming and social media services. However, excessive usage of these devices may have many side effects including a decrease in real-life social interactions, lower academic performance, anxiety problems and a decline in relationships (4, 5). In addition to psychological and social problems, excessive smartphone use may also result in physical inactivity since sending and receiving messages, watching videos and browsing the web or social networking sites are considered sedentary behaviors (6). Younger individuals are especially at risk for developing smartphone addiction. Studies show that smartphone addiction is very common among university students, and individuals tend to be less physically active in their lives as the hours of smartphone use increase (7, 8). Considering that the long-term use of smartphones reduces the time allocated for physical activity, we hypothesized that it may also impair the physical fitness and maximal exercise capacity of individuals.

Studies investigating the direct association between smartphone addiction and exercise capacity are lacking in the literature. It is not known whether smartphone addiction in young individuals translates into impairment of maximal exercise capacity. On the other hand, individuals' understanding of the benefits of exercise greatly influences their attitude toward physical activity, and it is reported that smartphone addiction may adversely affect the perceived benefits of exercise in young individuals as well (9). Accordingly, we hypothesized to detect significant associations among smartphone usage, exercise capacity, physical activity level and exercise perception. Our aim in this study was to investigate whether smartphone addiction impairs exercise capacity, as well as analyze its influence on the perceived benefits of exercise and physical activity habits in young adults.

MATERIAL AND METHODS
Study design and participants
A prospective, cross-sectional study was conducted. 46 university students aged between 18-25 years were included in the study. Brochures were posted on various noticeboards throughout the university for inviting volunteers for the current study. Among 74 volunteers who met the inclusion criteria, 46 volunteers were included in the study cohort using simple random sampling approach. Most of the volunteers were students at faculty of health sciences, however, there were volunteers from the faculties of engineering and social sciences as well. Inclusion criterion was having a smartphone with continuous internet access. Exclusion criteria was having any diagnosed chronic disease that may impede exercise capacity, such as cardiac, pulmonary or neurological diseases, and history of any recent orthopedic injury such as sprains or fractures. The study was approved by the ethics committee of Izmir Bakircay University (Study No: 566, Approval Number: 586) and performed in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants before being included in the study.

Outcome measures
Smartphone addiction was evaluated using Smartphone Addiction Scale- Short Form (SAS-SF). SAS-SF consists of 10 items, each scored on a six-point likert scale. Total score ranges from 10 to 60, and higher scores indicate a greater risk for smartphone addiction. Cut-off score of 31 for males, and 33 for females is indicative of smartphone addiction (10). Turkish version of the scale was used in the study, which was adapted by Noyan et al. Turkish version of SAS-SF has Cronbach's alpha coefficient of 0.867 and test/retest reliability coefficient of 0.926, both indicating high reliability. Concurrent validity is confirmed by its significant correlations with Internet Addiction Scale (0.320-0.555) (11).

Maximal exercise capacity was measured using a symptom-limited incremental exercise test on a clinical cycle ergometer (E100 bike, COSMED, Italy). World Health Organization (WHO) stress test protocol was used for the testing (12, 13). The initial load was set at 25 watts and increased by 25 watts every 2 minutes until volitional exertion or age-predicted maximal heart rate is reached. Participants were instructed to maintain a cadence of 65-70 rpm during

Table 1. Demographical features and the results of smartphone addiction, maximal exercise capacity, physical activity level and perceived exercise benefits assessments (n=46)

Demographics	
Age (years)	21.02±1.47
Gender, female (n)	29 (63%)
Body mass index (kg/m^2)	21.53±2.76
Smartphone addiction	
SAS-SF total score	34.02±8.81
Smartphone addicts (n)	29 (63%)
Maximal exercise capacity	
Test duration (sec)	494±148
W_{max} (watt)	120±33
HR_{max} (bpm)	166±12
HR_{max} (pred%)	83.30±5.94
IPAQ-SF (MET.min/wk)	3295±3134
EBBS total score	131±13

EBBS= Exercise Benefits/Barriers Scale; HR_{max}=maximum heart rate; IPAQ-SF= International Physical Activity Questionnaire- Short Form; SAS-SF= Smartphone Addiction Scale- Short Form; W_{max}=Maximal workload

testing. Heart rate and blood pressure were measured and recorded at rest and at the end of the testing, as well as every 3 minutes during testing. Rating of the perceived exertion was also monitored during testing using the Borg RPE scale (6-20) for ensuring maximal effort is put forth by the participant. Test duration, maximum workload achieved in watts (Wmax) and maximum heart rate achieved (HRmax) were recorded as indicators for maximal exercise capacity.

Physical activity participation was evaluated using The International Physical Activity Questionnaire- Short Form (IPAQ-SF). IPAQ-SF consists of 7 items questioning the frequency and duration of the participation in physical activities at low, moderate and vigorous intensities during the past week. It yields a numeric score for total activity participation as MET-min/week and a categorical score for the level of physical activity as low, moderate or high activity level (14). Turkish version of the questionnaire was used in the study, which was adapted by Saglam et al. It is a valid and reliable questionnaire according to its good agreement with objective accelerometer data and acceptable test-retest reliability (0.7) (15).

Perceived benefits of physical activity participation and exercise were evaluated using Exercise Benefits/Barriers Scale (EBBS). The exercise benefits component of the questionnaire includes 29 items and the exercise barriers component includes 14 items; all are scored based on a 4-point likert scale. The instrument may be scored and used in its entirety or as two separate scales. Scores on the total instrument can range from 43 to 172. The higher the score, the more positively the individual perceives exercise (16). Turkish version of the scale was used in the study, which was adapted by Ortabag et al. Turkish version of EBBS is valid and reliable scale as indicated by its validity coefficient of 0.87 and test-retest coefficient of 0.85 (17).

Statistical analysis and sample size

SPSS v.21 software program (IBM Corp., USA) was used for the analysis. The normality of the data was explored using Kolmogorov-Smirnov test. Relationships among smartphone addiction, maximum exercise capacity, physical activity level and perceived benefits of exercise were evaluated with Pearson or Spearman correlation analysis depending on the distribution properties of the data. Regression models were created to explore independent predictors of maximum exercise capacity. In addition, the participants were classified as those with and without phone addiction according to the cut-off values of SAS-SF, then maximal

Table 2. Relationship of smartphone addiction and perceived benefits of exercise with indicators of maximal exercise capacity and physical activity level (n=46)

	EBBS	Exercise test duration	W_{max}	IPAQ-SF
SAS-SF	0.058	-0.066	-0.086	0.017
EBBS		0.651*	0.607*	0.424*

Correlation coefficients (r values) are shown

* $p < 0.01$

EBBS= Exercise Benefits/Barriers Scale; IPAQ-SF= International Physical Activity Questionnaire- Short Form; SAS-SF= Smartphone Addiction Scale- Short Form; W_{max}=Maximal workload

Table 3. Univariate linear regression for the prediction of maximal exercise test duration and W_{max}

Independent variable	Dependent variable	R	R^2	B	SE	p
EBBS total score	Test duration	0.651	0.423	7.146	1.257	<0.001
	W_{max}	0.607	0.369	1.480	0.290	<0.001

EBBS= Exercise Benefits/Barriers Scale; W_{max}=Maximal workload

exercise capacity, physical activity level and perceived benefits of exercise were compared between the groups using the Independent-samples T-test or Mann−Whitney U test depending on the distribution properties of the data.

G-power 3.1 software (Universitat Dusseldorf, Germany) was used for determining the sample size (18). In the literature, we were unable to find a study that investigates the association between smartphone addiction and maximal exercise capacity. However, a study reports that a regression model including "total cell phone use" was able to predict maximal exercise capacity measured by VO2max, having an effect size (f2) of 0.30 (19). Accordingly, we hypothesized the detect a similar association between smartphone addiction and Wmax with a similar effect size (f2=0.30). Then, it was calculated that minimum of 40 participants are needed for the study to detect such significant association with 90% of power at 95% confidence level.

Ethical statement

The study was approved by the Ethics Committee of Izmir Bakircay University (Date: 29.04.2022, Decision Number: 586) and conducted in accordance with Helsinki Declaration.

RESULTS

Demographical features and the assessment results of the participants are shown in Table 1. The sample consisted of mostly females. According to SAS-SF, 67% of the participants were "smartphone addicts". In the maximal exercise test, participants exercised for 494±148 seconds and reached %83±6 of their predicted HRmax. 39% of participants were classified as having a "high" physical activity level, while 44% as "moderate" and 17% as "low" physical activity level.

Correlation analysis revealed that smartphone addiction indicated by SAS-SF total score was not associated with maximal exercise capacity or physical activity level. However, perceived benefits of exercise indicated by EBBS total score significantly correlated to maximal exercise capacity metrics and physical activity level. There was no significant association between SAS-SF and EBBS total scores (Table 2). A univariate linear regression model including EBBS total score as independent variable was able to explain 41% of variance in exercise test duration and 37% of variance in Wmax (p<0.001). EBBS total score was found to be an independent predictor for both exercise test duration and Wmax. It was found that every 1 unit increase in EBBS total score results in an increase of 7.2 seconds in exercise test duration and an increase of 1.5 W in Wmax during maximal exercise testing (Table 3).

Table 4. Comparison of demographics and the results of maximal exercise capacity physical activity level and perceived exercise benefits assessments between the individuals with and without smartphone addiction

	Smartphone addicts (n=29)	Not smartphone addicts (n=17)	p value
Age (years)	21.31±1.37	20.53±1.55	0.081
Gender, female (n)	18 (62%)	11 (65%)	0.858
Body mass index (kg/m^2)	21.49±2.35	21.60±3.43	0.905
Exercise testing duration (sec)	497±140	481±161	0.421
W$_{max}$ (watt)	122±31	114±35	0.449
HR$_{max}$ (pred%)	83.55±6.40	82.88±5.21	0.669
IPAQ-SF (MET.min/wk)	3570±3426	2826±2590	0.443
EBBS total score	132±14	130±14	0.464

EBBS= Exercise Benefits/Barriers Scale; HRmax=maximum heart rate; IPAQ-SF= International Physical Activity Questionnaire- Short Form; SAS-SF= Smartphone Addiction Scale- Short Form; Wmax=Maximal workload

A subgroup analysis revealed that age, body mass index, exercise capacity metrics, physical activity level and the perceived benefits of exercise did not differ between the participants classified as "smartphone addicts" and "not smartphone addicts" according to SAS-SF (p>0.05) (Table 4).

Since gender may greatly influence smartphone usage habits, physical activity level and exercise perception, another subgroup analysis was conducted by comparing SAS-SF total score, IPAQ-SF (MET.min/wk) and EBBS total score between females and males. SAS-SF total score was similar in females and males (35.55±33.12 vs 33.12±8.98; p=0.602); however, females had worse physical activity participation (2704±2952 vs 4304±3264 MET.min/wk; p=0.032) and worse EBSS score (126±11 vs 140±13; p<0.001).

DISCUSSION

In this study, we demonstrated that more than half of the young adults are classified as smartphone addicts; however, smartphone addiction was not related to either maximal exercise capacity or physical activity participation. Our main hypothesis was that the smartphone addiction may impair individual's maximal exercise capacity by reducing the physical activity participation in daily life. However, this hypothesis was refuted according to our findings. On the other hand, an individual's perception of the benefits of exercise was a major predictor for physical activity participation and maximal exercise capacity, which was another hypothesis of the study. Individuals with a better

perception of exercise benefits were more likely to participate in physical activity and had higher maximal exercise capacity, which confirmed our secondary hypotheses. On the other hand, we also found that prevalence of smartphone addiction is similar in genders, whereas females have worse physical activity participation and worse perception of exercise benefits compared to men.

Digital addiction, which incorporates internet, gaming, social media and digital device addictions has spread around the world in the past decade because of the rapid penetration of internet and digital technologies in our lives. COVID-19 has also exacerbated the increasing trend of digital addiction worldwide. Smartphone addiction is the most common type of digital addiction and is reported to have prevalence of 27% worldwide and 20% in Europe (20). Smartphone addiction is more common in young adults. A recent study reports a prevalence of 39% for smartphone addiction in United Kingdom in young population (21). For young Turkish population, Buke et al. (8) report the prevalence of smartphone addiction as 42% and Erdoğanoğlu et al. (22) as 53%. In our study, we found that 67% of the participants were smartphone addicts. The prevalence of smartphone addiction seems to be higher in the Turkish population compared to other regions, which is a concerning finding. Smartphone addiction is more common in developing countries, with a prevalence ranging from 30% to 60%. It is reported that individuals with economic or social disadvantages are more likely to use social media and digital devices to self-medicate, reduce stress, and alleviate mood as an escape from

the unsatisfied outer environment (20). Similarly, the fact that Turkey is among the developing countries may explain our current findings on smartphone addiction. Gender may also have an influence on smartphone addiction. A recent study conducted in young Turkish population reports that females have worse smartphone addiction score compared to men and emphasizes the need for awareness training in female students (23). Smartphone addiction level was similar in genders in our study. However, we found that physical activity participation and perception of the benefits of exercise were significantly worse in females, which is a worrying finding from another perspective considering their direct influence on the maximal exercise capacity of an individual. Association of perception of the benefits of exercise with physical activity participation and exercise capacity will be discussed further in the text.

It may be assumed that smartphone addiction may result in lower physical activity participation, since it will reduce the time to be used to perform physical activities. However, the literature has conflicting findings regarding this topic, and it may not be appropriate to generalize this assumption to the whole young population. In a young Turkish sample, Buke et al. (8) report that degree of smartphone addiction is inversely related to physical activity level. Another recent study including over 50.000 youngsters reports smartphone addiction is associated with a lower participation ratio in regular physical activity (24). On the other hand, in another Turkish sample, physical activity level was not found to be related to smartphone addiction (22). Similarly, a study from Europe did not report a direct association between physical activity and smartphone addiction (25). In our study, we did not detect a significant relationship between smartphone addiction and physical activity level as well. A recent review reports that the most common problems associated with smartphone addiction include musculoskeletal pain and sleep problems; however, mental health is particularly affected due to smartphone addiction (26). It is undeniable that smartphone addiction poses great risks to physical and mental health. However, concerning physical activity, it may not be always accurate to directly associate smartphone addiction with lower physical activity participation. Physical activity participation has several major determinants including individual factors, social environment and physical environment. Individual factors include perceived

enjoyment, perceived benefits of exercise, beliefs, self-discipline and time management (27). Smartphone or digital addictions may also be considered individual factors since behavioral features are part of the individual theme as well (28). Considering social and physical environments are the major determinants of physical activity participation as well, smartphone addiction may not necessarily translate into sedentary behavior or physical inactivity. This may explain why we did not detect a significant association between smartphone addiction and physical activity level in our study.

We hypothesized that smartphone addiction may impair an individual's maximal exercise capacity, because the smartphone addicts may tend to be less active during daily life. However, we did not detect an association between smartphone addiction and physical activity level in young adults. This may also explain the lack of a relationship between maximal exercise capacity metrics and smartphone addiction in our study. Literature is extremely limited regarding whether smartphone addiction results in impaired exercise capacity. We were able to find only 2 studies that investigate the association between smartphone use and exercise capacity. Lepp et al. (19) report that the total amount of smartphone use is inversely related to VO2max in college students. Authors state that high frequency smartphone users are more likely to forgo opportunities for physical activity participation. In addition, high-frequency smartphone users were found to be exhibiting more sedentary leisure time behaviors as well such as watching television, playing video games and using the computer compared to low-frequency users. Our results seem to be contradicting the results of Lepp et al. However, it should be noted that a relatively weak correlation is present between smartphone use and VO2max (β = −0.25; p = 0.047) in their study, which may decrease the generalizability of their results. In addition, they measured the duration of smartphone use in their study, not smartphone "addiction" as in our study. Duration of smartphone usage may not exactly reflect the smartphone addiction of an individual, which may be one of the explanations for differences between their results and ours. The results of the study of Erdoğanoğlu et al. (22) support our assumptions. In their study, no significant association was detected between smartphone addiction measured by SAS-SF as in our study and six-minute walk test. They did not find a significant relationship between smartphone addiction and

physical activity level as well. We believe smartphone usage habits of young adults do not directly translate into physical inactivity or lower exercise capacity. However, cardiorespiratory fitness is one of the major determinants of cardiovascular and general health even from a young age (29). Thus, it is important to promote physical activity for maintaining cardiorespiratory endurance in young populations, independent from whether it is associated with smartphone addiction.

In our study, we found that perception of the benefits of exercise was a significant predictor for both physical activity level and maximal exercise capacity. In other words, individuals with a better perception of the benefits of exercise were more likely to participate in physical activity, and consequently had better exercise capacity. It is not surprising to detect a strong association between the perceived benefits of exercise and physical activity participation. As we discussed above, individual factors including perception and beliefs towards the benefits of exercise play a major role in physical activity participation. Being aware of the benefits of exercise on physical performance, body image and general health is a very important motivational factor for exercising (30, 31). A study from our country reports similar findings as ours. It was found that individuals with more physical activity participation had a better perception of the benefits of exercise (32). However, the benefits of physical activity are poorly understood in general population. It's reported that only 35% of Americans were aware of the physical activity guidelines and understands the benefits of exercise (33). Similarly, %15 of population was able to answer questions related to physical activity and its benefits in United Kingdom (34). These results suggest that the individuals' motivation to exercise may be increased by improving their understanding of the benefits of physical activity. Schools and universities are especially important places to develop such understanding. Young individuals should be educated on the benefits of physical activity and exercise during these eras. This may not only improve physical activity participation but may also improve maximal exercise capacity of young individuals according to our results. Our study also suggests that even a modest amount of increase in the perceived benefits of exercise translates into significant improvements in maximal exercise capacity, which emphasizes the importance of providing such awareness on the exercise benefits. It

is also important to note that females had worse perception of the benefits of exercise in our study, which may explain their lower participation in physical activity as well. This emphasizes the fact that females may especially benefit from the awareness programs on the benefits of exercise.

The main limitation of our study was that we were unable to objectively measure and record the duration of smartphone use. Participants were using smartphones from a wide variety of brands and some brands were not recording the duration of use by default. Measuring the duration of smartphone use or recording the time spent in specific applications could help better examine the influence of smartphone usage habits on physical activity and exercise capacity. In addition, considering our study population consists of young and healthy individuals, metabolic rate measurements including maximum oxygen consumption (VO2max) would have provided more precise evaluation of maximal exercise capacity for this population. Unfortunately, we did not have the means to measure it in our laboratory. Addictions and habits vary considerably according to the cultural features of populations. Although we included the minimum number of participants in the study as calculated by a priori power analysis, this type of studies examining cultural phenomena greatly benefit from larger sample sizes. Our relatively small sample size may be considered as another limitation for the present study.

CONCLUSION

Smartphone addiction is common in the young adult population. However, it does not directly translate into lower physical activity participation or worse maximal exercise capacity. On the other hand, an individual's perception of the benefits of exercise has a great influence on physical activity level and exercise capacity. These results suggest the importance of increasing the awareness of the benefits of physical activity among young adults for maintaining and improving exercise capacity and consequently, general physical health.

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EFFECT OF ANKLE DISTORTION TAPING ON BALANCE, GAIT, FUNCTION, SPASTICITY AND QUALITY OF LIFE IN CEREBRAL PALSY CASES WITH VARUS DEFORMITY: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Purpose: The aim of the study was to investigate the effect of ankle distortion taping on balance, gait, function, spasticity and quality of life in cerebral palsy cases with varus deformity.
Material and Methods: A two-armed randomized controlled trial was carried out in rehabilitation center. A total of 32 children with CP were randomized into taping plus conventional therapy (T+CG) and conventional therapy group (CG). The children in the T+CG group were given distortion taping for 3 days in addition to CG. Participants were assessed before the treatment, in the immediate period after the first session, and in the acute period after the third session. The Timed Up and Go Test (TUG) and Single Leg Stance Test (SLST) were used to assess the physical performance-based function. The Modified Ashworth Scale (MAS) was measured the spasticity degree of individuals. Wisconsin Gait Scale (WGS) and Child Health Questionnaire (CHQ) were used to evaluate the gait and quality-of-life, respectively.
Results: The mean ages of the children in CG and T+CG were 9.62±2.50 and 10.0±1.63, respectively. In immediate and acute periods, plantar flexor muscle spasticity decreased significantly in individuals with T+CG (p=0.0001). TUG and SLST scores improved significantly in the T+CG group, both in immediate and acute term (p=0.0001). In acute and immediate term, there was a statistically significant improvement for WGS in both groups (p<0.05). The quality of life of T+CG was improved in the acute period (p<0.05).
Conclusion: The results showed the effectiveness of distortion taping in reducing the spasticity of ankle plantar flexor muscles and improving function, balance and gait. However, taping was not superior to control group.

Keywords: ankle varus, cerebral palsy, deformity, distortion method, kinesio taping

INTRODUCTION

Muscle tone problems occur as a result of neurological problems. Cerebral palsy (CP) is one of the most common neurological pathologies causing muscle tone problems. CP is the most specific cause of disability, which induces postural deficits and mobility problems (1, 2). Non-progressive lesions in the brain affect the musculoskeletal system and disrupt muscle architecture in individuals with CP (3). These effects include altered motor function and somatosensory integration, decreased muscle strength, and regular movement pattern (4).

Children with unilateral spastic monoplegic or hemiplegic CP generally have a high degree of physical function [Gross Motor Function Classification System I or II (GMFCS I or II)], and most can walk without assistive devices (5). Previous research has focused more on gait and related therapy for the affected extremity (5, 6). However, in unilateral CP, we can expect gait abnormality with the unaffected side leg due to asymmetry. Investigators encountered a calcaneal deformity with excessive dorsiflexion and valgus in the ankle of children with CP (7, 8).

Surgery, restrained movement, and ergotherapy are commonly utilized during CP therapy. In addition, investigations have highlighted the effect of new methods, including Kinesio Taping (KT) (4). Taping is becoming a more widespread application due to its easy-to-use and inexpensive-to-apply manner. In addition, it can be effortlessly released or replaced to allow other treatment applications. Researchers stated that the purposes of taping in CP are to repair posture disorder, increase the equilibrium of joints, strengthen muscles, reduce spasticity and increase proprioception. However, its clinical evidence is insufficient in children with CP (9).

Kinesio taping helps to increase the sense of proprioception, decrease muscle spasticity and strengthen muscles by affecting the skin, vascular system and motor responses (9, 10). Taping decreases excessive contracture by decreasing spasticity (9). Kinesio Taping also improves joint movement; therefore, it can be used effectively in children with cerebral palsy (11). Decreased spasticity also positively affects functionality, gait, quality of life, and balance in children with cerebral palsy (12).

The deterioration of ankle posture due to varus in the foot causes severe disability in children with CP (13). An ankle distortion taping application aims to improve varus deformity by creating traction towards the neutral position of the ankle with an elastic band. The specific focus of single joint-crossing KT on correction of varus deformity may provide a more effective clinical application compared to other KT methods (14). In this study, we investigated the positive effect of ankle distortion taping on clinical outcomes in individuals with CP. The purpose of the study was to investigate the effect of ankle distortion taping on balance, gait, function, spasticity and quality of life in cerebral palsy cases with varus deformity.

MATERIAL AND METHODS

Study Design

A two-armed randomized controlled trial was carried out in the Fethiye Private Son Atılım Special Education and Rehabilitation Center between March and August 2022. The "CONsolidated Standards of Reporting Trials (CONSORT)" and "Statement of Recommendations for Interventional Trials (SPIRIT)" guidelines were considered during the trial process (15, 16).

Participants

A total of 32 children with monoplegic and hemiplegic spastic CP were included in the study. All patients had an ankle varus deformity. Inclusion criteria of the study were; (1) children with unilateral hemiplegic or monoplegic spastic CP aged 4-12 years, (2) cases at level I or II in the Gross Motor Function Classification System (GMFCS), (3) being able to understand simple commands, and (4) having signed the consent form. Exclusion criteria of the study were; (1) presence of equine deformity, (2) lack of cooperation, (3) history of lower extremity surgery, (4) botulinum toxin administration in the last six months, and (5) allergic reaction on the skin to the taping. Figure 1 summarizes the flowchart of the study.

Sample Size

The sample size calculation was conducted with G-Power 3 software (17) regarding the effect size derived from the similarly designed study's reference values (18). The effect size value was determined as 1.05 according to the changes in the similar parameters of both groups. A total of 24 patients were calculated to be adequate with "80% power and 95% confidence level". At least 12 cases were found to be sufficient for both groups.

Ethical Consideration

The study was carried out in accordance with the ethical principles and the Helsinki Declaration. Informed consent of the patients was obtained. The study protocol was approved by the clinical research ethics committee of Muğla University (Date: 02.03.2022, Decision No: 5/III). The study protocol was registered (ClinicalTrials.gov Identifier: NCT05251532).

Recruitment Process

Among the children with CP who had varus deformity in the rehabilitation center, those who met the exclusion criteria were informed about the study. The scope of the study, the method, the interventions and the potential benefits and possible side effects of Kinesio Taping were explained. Children and their families who gave their consent were referred to the evaluator therapist.

Randomization and Blinding

A total of 32 children with CP were randomized into taping (conventional therapy applications plus kinesio taping) and control (conventional therapy) groups. "An allocation scheme using the asymptotic maximal procedure" were used in the randomization method (19). "National Institutes of Health National Cancer Institute Clinical Trial Randomization Tool" were used to carry out the randomization (20). No blinding was carried out in the research.

Interventions

All interventions were conducted by a single therapist who is experienced in pediatric rehabilitation and KT for 15 years. Participants were already attending the same conventional rehabilitation before and during the trial. The intervention details of the groups were given below.

Control Group (CG)

Stretching exercises for spastic muscles and cold therapy were applied to manage with spasticity in the CG. In addition, strengthening exercises were applied to the antagonist of spastic muscles. Passive stretches were applied to the peroneus longus and brevis muscles for 40-60 seconds with ten repetitions. Cold packs were also applied to the same muscle group with a dry towel for 10 min. Gait pattern education, strengthening of trunk muscles and joint range of motion exercises were also applied. All
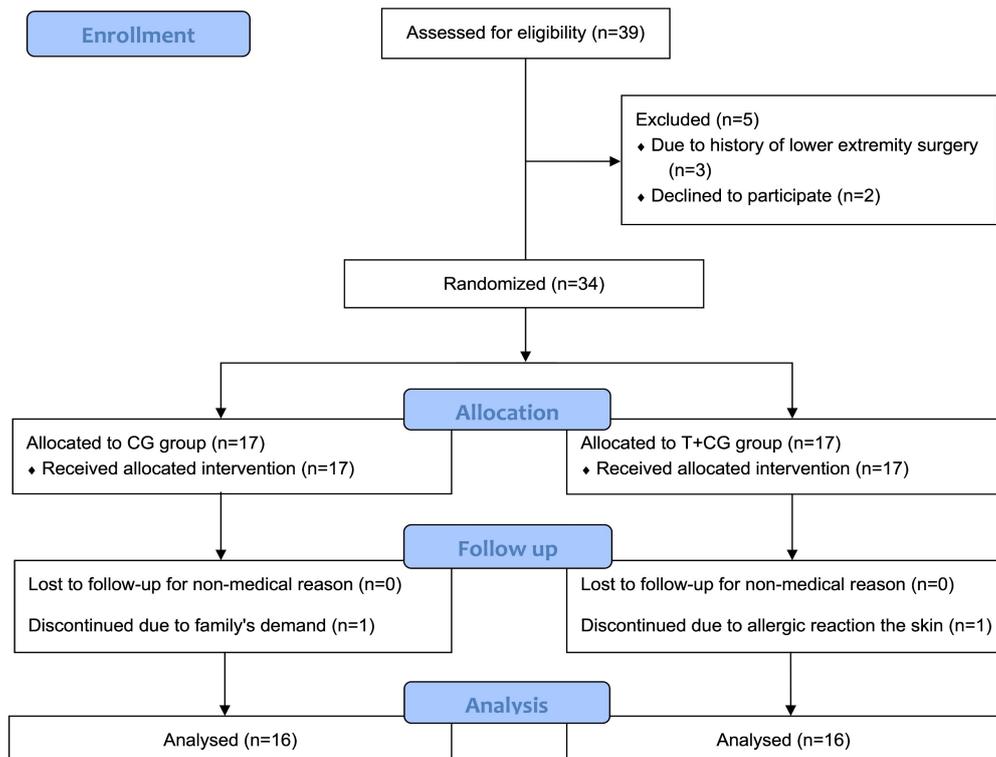
Figure 1. CONSORT Flow chart of the study

applications were performed within a 1-hour rehabilitation session for 3 days.

Taping Plus Conventional Therapy Group (T+CG)
The children in the T+CG group were given additional distortion taping to all the treatments in the CG group. Taping (Kinesio Tex Gold) was applied at the beginning of the first session of the 3-day treatment. Distortion taping protocol was applied to the ankle as previously described. In the first step, while the foot is in the neutral position, the tape is adhered to the anterior capsule with 50% tension. In the second step, the tape is adhered to the malleolus at maximum tension over the calcaneus in neutral foot. If it is desired to prevent abnormal movement directions, corrective pulling is applied in the lateral or medial direction. In the third step, the tape is adhered around the ankle with a half-eight-shaped ligament application. The tape is adhered to the medial

Figure 2. Distortion taping application using kinesio taping

malleolus starting from the lateral malleolus around the ankle joint with 70% tension (Figure 2) (14). Taping was removed in the last treatment session on the 3rd day.

Data Collection
Participants were assessed before the treatment, in the immediate period after the first session, and in the acute period after the third session. The Timed Up and Go Test (TUG), Single Leg Stance Test (SLST), Modified Ashworth Scale (MAS), Wisconsin Gait Scale (WGS), and Child Health Questionnaire (CHQ) were used in the evaluations.

Timed Up and Go Test (TUG)
Participants sat in a chair adjusted for their height. They asked to stand up and walk 3 meters forward. Individuals walked the 3-meter pathway again after a 180-degree turn back. Children were then asked to sit on the chair, again. The test time was recorded in seconds. To avoid the effect of fatigue, patients were evaluated at one time and at usual walking speeds (21).

Single Leg Stance Test (SLST)
A secure setting was assembled for the participants near the parallel bar. The child was asked to hold on to the parallel bar and to stand on the unaffected lower extremity. The participant was then asked to remove the hand support from the parallel bar. They asked to maintain balance on one leg. The test time was recorded in seconds. The protocol was completed with a single repetition to avoid the fatigue effect (22).

Modified Ashworth Scale (MAS)
The MAS is a rating scale used to evaluate spasticity in CP. It provides a 6-point rationale to measure muscle resistance with passive movement. The MAS is scored from 0 to 4. A low score represents normal muscle tone, and a high score represents increased muscle tone (23).

Wisconsin Gait Scale (WGS)
WGS provides an assessment with 14 items divided into four subscales based on multi-factor gait analysis. The therapist concludes the results by considering the gait parameters with observational video analysis. The scoring ranges from 13.35 to 42.0. Higher scores indicate higher impairment in gait (24).
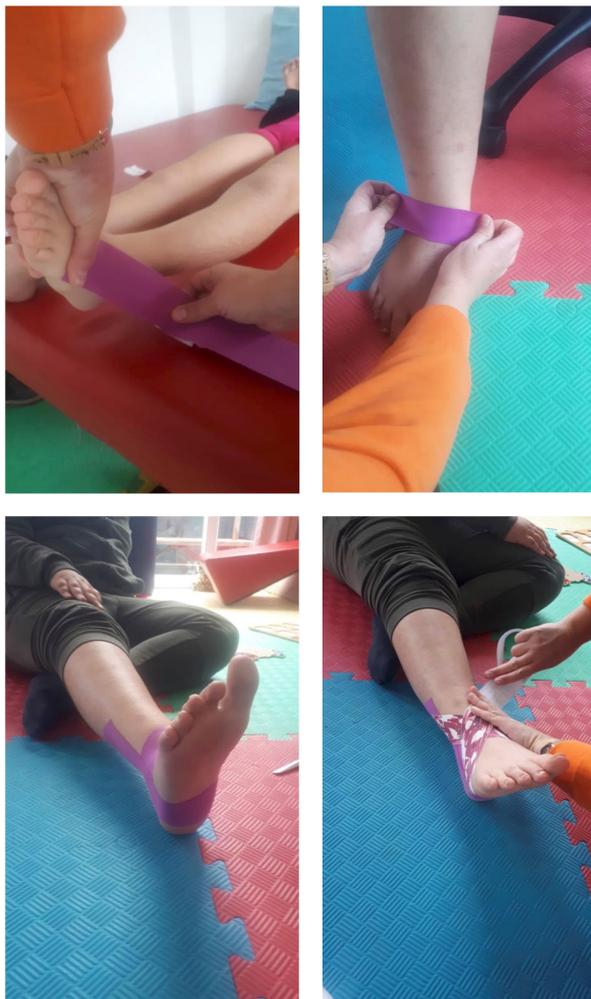
Child Health Questionnaire (CHQ)
The CHQ is a standardized multidimensional tool that assesses children with cerebral palsy's functional status and well-being. CHQ's score range is between 0 to 100. Higher scores demonstrate more satisfactory health status in children (25).

Statistical Analysis
Statistical Package for Social Sciences (SPSS) Version 25.0 (SPSS inc, Chicago, IL, USA) was used for the analysis of clinical data. Statistical significance (p) was accepted as 0.05. Continuous variables were presented as mean ± standard deviation. Categorical variables were given as numbers and percentages. One-Sample Kolmogorov-Smirnov Test and Histogram were used to determine the data distribution. Regarding the normality, parametric or non-parametric statistical significance tests were considered the between-group or in-group differences.

RESULTS
Characteristics of the participants
The mean ages of the children in CG and T+CG were 9.62±2.50 and 10.0±1.63, respectively. The individual characteristics of the participants are presented in Table 1. There was no significant difference between the groups (p>0.05). Groups were homogeneous in terms of individual characteristics.

Spasticity
There was no difference in the MAS-based hip flexor, hip adductor, hip internal rotator and knee flexor muscle spasticity between the groups and in-group analysis (p>0.05). In addition, plantar flexor spasticity was not different between the groups. Plantar flexor muscle spasticity decreased significantly in individuals with T+CG (p=0.0001). Detailed post-hoc analysis (Dunn's test) revealed that the significance was due to the pairwise between baseline and 3rd day evaluations (p=0.024) (Table 2).

Function-Balance-Gait
TUG and SLST scores did not differ between groups (p>0.05). TUG and SLST scores improved significantly in the T+CG group (p=0.0001). Post-hoc Dunn test-based difference was significant between baseline and 3rd day (p=0.0001), also 1st day and 3rd day (p=0.014). On the other hand, the post-hoc Dunn test for SLST was significant between baseline and 3rd day (p=0.0001), 1st day and 3rd day (p=0.018). In-group change for CG was not statistically significant (p>0.05). There was a statistically significant difference in both in-group and between-group evaluations of WGS (p<0.05). The difference between baseline and 3rd day (p=0.0001), 1st day and 3rd day (p=0.0001) evaluations for T+CG was significant in the post-hoc test (Table 3).

Table 1. Characteristics of the participants

	CG (n=16)	T+CG (n=16)	p
Age (years, mean±SD)	9.62±2.50	10.0±1.63	0.897[a]
Gender (women/men)	8/8	9/7	0.500[b]
BMI (kg/m², mean±SD)	19.37±4.58	17.43±3.22	0.381[a]
GMFCS (level I/II, %)	62.5/37.5	81.3/18.8	0.238[b]
Residency (urban/rural, n)	12/4	15/1	0.166[b]
CP type (hemiplegic/monoplegic, n)	13/3	16/0	0.113[b]
Affected side (right/left, n)	6/10	9/7	0.240[b]
Other chronic disease (yes/no, n)	1/15	1/15	0.758[b]

SD: standard deviation, n: number of patients, BMI: Body Mass Index, GMFCS: Gross Motor Function Classification System, a: Mann–Whitney U test, b: Pearson Chi-Square test

Quality of Life
There was no difference between the groups regarding the quality of life at baseline (p>0.05). In the intragroup evaluation, an increase was observed in the CG group over time (p=0.002). On the other hand, the quality of life of the participants in T+CG improved over time (p<0.05). Post-hoc Dunn test results were significant for the following pairwise; baseline with 3rd day (p=0.024), and 1st day with 3rd day (p=0.024) (Table 3).

DISCUSSION
The present study focused on the effectiveness of distortion taping on ankle varus in children with CP. The participants' changes in balance, gait, function, spasticity and quality of life were investigated after the taping application. The results showed the efficiency of taping with reduced spasticity of the ankle plantar flexor muscles and improved function, balance and gait. However, taping was not superior to control group. General rehabilitation practice aims to reduce spasticity and increase functionality in the short term with several conventional methods (e.g., stretching,

cold) in children with cerebral palsy (26). Therefore, children's balance and gait ability improve during daily life activities (27). On the other hand, these clinical and physical advancements can enhance individuals' quality of life (28). In the present study, we aimed to demonstrate the effectiveness of distortion taping on these parameters (spasticity, function, gait, and balance) by decreasing ankle varus deformity. In other words, our primary hypothesis was to improve conventional applications' advances in the immediate and acute period. Many studies have applied KT to the lower extremity for several purposes (10). However, no study focused on the varus deformity of the ankle by distortion taping application.
A trial in children with hemiplegic cerebral palsy focused on the effectiveness of KT on gait and balance. Özmen et al. applied KT to the gastrocnemius and tibialis anterior muscles. The authors emphasized that KT did not affect plantar flexor muscle spasticity and joint range of motion but showed significant gains in balance and walking during immediate and acute periods. Their results on walking and balance were similar to our study (29).

Table 2. Char In-group and between-group comparison of spasticity

		CG (n=26)	T+CG (n=26)	p (between group)
MAS hip flexor	**Baseline**	0.56±0.60	0.68±0.65	0.590[a]
	1st day	0.56±0.60	0.68±0.65	0.590[a]
	3rd day	0.56±0.60	0.68±0.65	0.590[a]
	p (within group)	1.000[b]	1.000[b]	
MAS hip adductor	**Baseline**	1 (IQR 25/75: 0-1)	0.78±0.68	0.287[a]
	1st day	1 (IQR 25/75: 0-1)	0.78±0.68	0.287[a]
	3rd day	1 (IQR 25/75: 0-1)	0.78±0.68	0.287[a]
	p (within group)	1.000[b]	1.000[b]	
MAS hip internal rotator	**Baseline**	1 (IQR 25/75: 0-1.5)	0.90±0.66	0.128[a]
	1st day	1 (IQR 25/75: 0-1.5)	0.90±0.66	0.128[a]
	3rd day	1 (IQR 25/75: 0-1.5)	0.84±0.62	0.224[a]
	p (within group)	1.000[b]	0.135[b]	
MAS knee flexor	**Baseline**	1.21±0.36	1.31±0.35	0.445[a]
	1st day	1.21±0.36	1.28±0.31	0.491[a]
	3rd day	1.21±0.36	1.25±0.31	0.669[a]
	p (within group)	1.000[b]	0.223[b]	
MAS plantar flexor	**Baseline**	1.34±0.85	1.56±0.25	**0.029[a]**
	1st day	1.34±0.85	1.50±0.31	0.086[a]
	3rd day	1.34±0.85	1.25±0.31	0.867[a]
	p (within group)	1.000[b]	**0.0001[b, c]**	

SD: standard deviation, n: number of patients, MAS: Modified Ashworth Scale, a: Mann–Whitney U test, b: Friedman test, c: post-hoc Dunn test was significant between baseline and 3rd day (p=0.024)

Table 3. In-group and between-group comparison of gait, balance and function

		CG (n=26)	T+CG (n=26)	p (between group)
TUG	**Baseline**	11.03±3.75	12.04±4.63	0.402[a]
	1st day	11.06±3.79	11.58±4.28	0.515[a]
	3rd day	10.96±3.72	11.11±4.33	0.956[a]
	p (within group)	0.939[b]	**0.0001[b, c]**	
SLST	**Baseline**	2 (IQR 25/75: 0-3.96)	1.93±1.60	0.590[a]
	1st day	2.27 (IQR 25/75: 0.25-4.76)	2.24±1.62	0.838[a]
	3rd day	2.34 (IQR 25/75: 1.12-4.57)	2.79±1.70	0.809[a]
	p (within group)	0.562[b]	**0.0001[b, d]**	
WGS	**Baseline**	23.29±7.16	33.44±4.28	**0.0001[a]**
	1st day	23.25±7.14	32.94±4.29	**0.0001[a]**
	3rd day	22.67±6.90	27.60±4.95	**0.011[a]**
	p (within group)	**0.003[b]**	**0.0001[b, e]**	
CHQ	**Baseline**	63.50±17.56	52.70±15.28	0.094[a]
	1st day	63.50±17.56	52.70±15.28	0.094[a]
	3rd day	61.79±17.38	65.95±17.49	0.445[a]
	p (within group)	**0.002[b]**	**0.0001[b, f]**	

SD: standard deviation, n: number of patients, **TUG:** Timed Up and Go Test, **SLST:** Single Leg Stance Test, WGS: Wisconsin Gait Scale, **CHQ:** Child Health Questionnaire, **a:** Mann–Whitney U test, **b:** Friedman test, **c:** post-hoc Dunn test was significant between baseline and 3rd day (p=0.0001), 1st day and 3rd day (p=0.014), **d:** post-hoc Dunn test was significant between baseline and 3rd day (p=0.0001), 1st day and 3rd day (p=0.018), **e:** post-hoc Dunn test was significant between baseline and 3rd day (p=0.0001), 1st day and 3rd day (p=0.0001), **f:** post-hoc Dunn test was significant between baseline and 3rd day (p=0.0001), 1st day and 3rd day (p=0.0001)

Oppositely to Özmen et al., KT also reduced plantar flexor muscle spasticity in our study after three days of treatment (acute effect). The results might have been different due to the differences in the KT methods regarding the obvious sample characteristics similarity of the two studies. Future studies may focus on the advantage of distortion taping in reducing spasticity using computerized analysis to provide more factual data.

In another study, 12-week results of KT to both the upper and lower extremities in children with unilateral spastic CP were investigated. The researchers applied KT with an "I" shape technique with facilitation and correction methods. They reported that KT constructed significant contributions to proprioception, physical fitness, gross motor function and activities of daily living (30). Compared to our study, functional gains were monitored, and positive effects of KT were demonstrated for 12 weeks.

A recent placebo-controlled study showed that KT increases rectus femoris muscle activity and ankle joint range of motion in children with unilateral CP. Although this application was performed on the knee with a different technique and application area, the results should still have an essence in increasing muscle activity and ROM in the immediate period (31). The functional gains achieved in our study may have been achieved through muscular activation, especially in the foot-ankle muscles and tendons in this context. On the other hand, in another recent study, the application of Y tape to the gluteus maximus muscle in children with CP improved gait parameters in the acute period, suggesting that KT may provide significant advantages in increasing muscular activation in the general context (32).

A recent randomized controlled study reported a positive effect of KT combined with lower extremity orthoses on gait parameters in children with spastic CP during four weeks of follow-up. The authors supported the spatiotemporal parameters with the GAITRite System with objective data (33). Our study also provided the positive gains of KT in the immediate and acute period on the walking parameters by WGS. Considering that WGS is a subjective tool, the objective-subjective outcome agreement revealed the positive effect of KT on walking more solidly. In particular, the 4-week long-term gain relative to the shorter-term follow-up in our

study enabled us to interpret that the distortion-taping technique can also provide promising long-term results.

The pilot study in 2019 focused on the immediate effectiveness of KT, similar to our study. The authors emphasized that the neuromuscular taping technique affects static balance positively, but there was an insufficient advancement in dynamic balance (34). These results obtained in children with hemiplegic CP at GMFCS level I emphasized significant gains in TUG, likewise our TUG and SLST score improvements. Actually, TUG also includes dynamic balance tasks (e.g., gait and turns) (21). A sensor-based measurement can reveal the improvements in static and dynamic balance more clearly. However, available data have revealed that KT can provide positive effects in both static and some dynamic activities requiring balance in the acute period.

One aspect that assembles our study unique is the quality-of-life assessment. KT may not affect an individual's quality of life in the short term. However, we envisioned that KT intervention during the 3-day can positively affect the individual's vital activities related to some quality-of-life parameters. Our results showed that KT could contribute more (although not statistically significant) to the quality of life compared to conventional applications. Future studies should incorporate a more comprehensive assessment of the impact of KT on the quality of life in children with CP.

Limitations

First, our study merely investigated KT's immediate and acute period efficacy. A long-term follow-up may focus on the follow-up of 3-6 months of KT administration, repeated at 3-day intervals. Second, blinding was not possible due to the current practical conditions and the nature of the study. Future studies could address assessor and therapist blindness to avoid methodological bias. Finally, sensor-based and computerized devices could provide more sensitive data for spasticity and balance measurement.

CONCLUSION

The results showed the effectiveness of distortion taping in reducing the spasticity of ankle plantar flexor muscles and improving function, balance and gait. However, taping was not superior to control group. In clinical practice, KT may be a simple and low-cost complementary method for children with ankle varus deformities.

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THE EFFECT OF SOCIOECONOMIC STATUS AND ENVIRONMENTAL FACTORS ON HEALTH TECHNICIAN STUDENTS' USE OF TOBACCO PRODUCTS

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ABSTRACT

Purpose: This study was conducted to investigate health technician students' behaviors regarding the use of tobacco and tobacco products and levels of tobacco dependence and to reveal the effects of socioeconomic and environmental factors on the use of these products.
Material and Methods: The study consisted of 1118 first- and second-year students from Dokuz Eylül University Vocational School of Health Services in the 2021-2022 academic year. These students were applied a questionnaire that was developed to determine their sociodemographic, individual, family characteristics, habits, and opinions on tobacco use and the Fagerström Test for Nicotine Dependence (FTND).
Results: It was determined that 34.5% of the students used tobacco products, 14.0% smoked water pipe (WTS), 3.0% used electronic cigarettes (EC), and that the average age of starting smoking was 15.6±2.4 years. Of the students, 18.1% stated that they wanted to quit smoking and 1.9% had received professional help to quit smoking. It was found that 64.5% did not want tobacco product advertisements to be banned and that 61.9% did not want a smoking ban in public/indoor areas. According to 64.0% of the students, university education had no effect on tobacco use. The mean score of smokers on the FTND was 3.43±2.20, and 3.9% of them had a high level of dependence. It was determined that a low level of tobacco addiction was more prevalent in students whose mothers had low education and who lived with their parents (p<0.05). However, a high level of tobacco addiction was found to be more prevalent in those who started smoking at the age of ≤16 (p<0.01).
Conclusion: Our research indicated the factors that affected the health technician students' behaviors of tobacco and tobacco product use, level of tobacco dependence, and desire to quit smoking. It was also found that the age of starting smoking, maternal education level, and family unity played a role in students' smoking behavior.

Keywords: environmental factors, smoking behavior, socioeconomic status, students

INTRODUCTION

The use of tobacco and tobacco products is one of the most important causes of death globally, in addition to its unfavorable effects on health and the economy (1-2). According to the data of research conducted worldwide in 2019, the use of tobacco and

tobacco products accounts for 15.4% of deaths (3). These products are widely used in Turkey as well as all over the world and are seen as a critical public health problem (4). According to the data of the global adult tobacco survey conducted in Turkey in 2016, 31.6% of the society uses tobacco products, and 25.4% of this proportion consists of young people between the ages of 15 and 24 (4-6). According to the World Health Organization (WHO), the prevalence of smoking in adults older than 15 years is 26.0% globally and 35.3% in Europe (7). Although it is stated that the age of starting to use tobacco and tobacco products is decreasing in developing countries(4,8), studies have indicated that the rate of smoking among university students is increasing rapidly and that young people whose friends smoke are more likely to start smoking over time(9,10). In addition, socio-demographic, environmental, and psychosocial characteristics, parental smoking, low parental education, and media advertisements have been shown to be contributing factors (11,12).

Although there are different types of tobacco and tobacco products, cigarettes are the most widely used form of tobacco (5). Since tobacco is highly addictive, quitting is very difficult and most of those who try smoking can become addicted in a short time (4). As age and the number of cigarettes smoked increases, the severity of tobacco dependence increases, as well (4,5,13). Conducting interventions for smoking cessation at an early age is critical in terms of reducing the risk of diseases, such as lung cancer, chronic obstructive pulmonary disease, ischemic heart disease, and cerebrovascular disease, and death due to these diseases (14).

Turkey's fight against the use of tobacco and tobacco products continues in line with evidence-based tobacco control measures and policies determined to be effective by the WHO (5,6). According to studies conducted in our country, people generally start smoking during their youth (4,6,8). For this reason, preventive studies are needed. It is necessary to examine young people's attitudes toward smoking addiction to plan preventive studies. In the literature, there are studies on smoking behaviors and addiction levels of university students studying health. (15-17). Smoking by health professionals is one of the biggest barriers to community participation in ongoing tobacco control efforts. In this context, it is important to determine the factors related to smoking frequency, desire to quit, and tobacco dependence of health technician students, who will be a part of the health team in the future in the fight against smoking. The university education period for health technician students is two years. Evaluation of students' tobacco dependence levels and their desire to quit smoking during this period is very important in terms of shedding light on the planning of primary prevention interventions before graduation.

This study was carried out to investigate the tobacco and tobacco products use behaviors of health technician students and their tobacco dependence levels and to reveal the effects of socioeconomic and environmental factors on the use of these products. Socioeconomic and environmental factors less studied in Turkiye addressed studies. One of the aim of this study is this.

Research hypotheses:

H0 Hypothesis: There is no significant difference between the students' sociodemographic and family characteristics and the level of their tobacco dependence.

H0 Hypothesis: There is no significant difference between the students' cigarette and waterpipe tobacco smoking (WTS) habits and the level of their tobacco dependence.

H0 Hypothesis: There is no significant difference between the students' sociodemographic and family characteristics and their desire to quit smoking.

H1 Hypothesis: There is a significant relationship between the gender and age of the students and their tobacco use habits.

MATERIAL AND METHODS
Design and Sample of the Study
The population of the research consisted of 1392 first- and second-year students in Dokuz Eylül University (DEU), Vocational School of Health Services (VSHS) in the 2021-2022 academic year. The study was carried out in the VSHS between November 1, 2021 and December 31, 2021. In this study, it was aimed to reach the entire population, so no sample selection procedure was carried out. Data were collected using a questionnaire (Data Form) created by the researchers following a review of the literature (15,16,18) and the Fagerström Test for Nicotine Dependence. The questionnaire was applied to 1118 (80.3%) students who agreed to participate in the study and gave consent. The questionnaires did not involve any questions about the names or identities of the students. The students filled out the

Table 1. Students' characteristics regarding the use of tobacco and tobacco products (n=1118)

Characteristics		n	%
Tobacco smoking status *	Non-smokers	732	65.5
	Smoking cigarettes	386	34.5
	Hookah smoker	157	14.0
	Electronic cigarette smoker	33	3.0
Reason for e-cigarette smoking (n=33)	To quit smoking	8	24.2
	Envy and curiosity	14	42.4
	Peer influence	2	6.1
	The impact of electronic cigarette advertisements	9	27.3
Age of starting smoking (n=386) (Mean±SD=15.59±2.39) min= 10 max=25	≤16	245	63.5
	≥17	141	36.5
Reason for starting smoking (n=386)	Envy and curiosity	133	34.5
	Peer influence	155	40.2
	Environmental pressure	18	4.6
	Other	80	20.7
Smoking duration (n=386) (Mean±SD=4.45±2.27) min= 1 max= 17	≤5 years	255	66.1
	≥6 years	131	33.9
Number of cigarettes smoked per day (n=386)	≤10	192	49.7
	11-20	169	43.8
	21-30	19	1.7
	≥31	6	1.6
Smoking in a friendly environment	Never	231	20.7
	Occasionally	517	46.2
	Always	370	33.1
Smokers in the family *	No smokers	380	34.0
	Father	481	43.0
	Mother	238	21.3
	Siblings	200	17.9
	Grandpa/Grandma	35	3.1
Smoking place at home	No field	317	28.4
	In the House	117	10.4
	Open balcony	684	61.2

*Students marked more than one option. All those who smoked other products were cigarette smokers.

questionnaires in the classroom under the supervision of the researchers.

Data collection tools and variables
The data form
This form consisted of 25 questions about students' sociodemographic, individual, and family characteristics and their tobacco use habits and opinions.
The Fagerström Test for Nicotine Dependence (FTND)
This scale was developed by Fagerström (18) in 1989 to determine the level of physical dependence on smoking. High scores on the scale indicate a high level of tobacco dependence. The Turkish validity and reliability study of the six-item scale was conducted in 2004 by Uysal et al. (19), and Cronbach's alpha coefficient was calculated as 0.56. Two of the items on the scale are scored between 0 and 3 and four items are scored between 0 and 1, and the range of total scores on the scale varies between 0 and 10. According to the total scale score, tobacco dependence is classified into five groups: very low dependence (0-2 points), low dependence (3-4 points), moderate dependence (5 points), high dependence (6-7 points), and very high dependence (8-10 points) (18).

Research variables
The dependent variables of the study are i) use of tobacco products, ii) tobacco addiction level and iii) desire to quit smoking. The independent variables are

Table 2. The relationship between some sociodemographic characteristics of students and their use of tobacco products (n=1118)

		Using Tobacco Products n (%)	No Tobacco Products n (%)	p#
Gender	Male	163 (52.4)*	148 (47.6)	**<0.001**
	Female	223 (27.6)	584 (72.4)	
Year	1st year	184 (33.3)	369 (66.7)	0.383
	2nd year	202 (35.8)	363 (64.2)	
Place of residence	City	200 (36.3)	351 (63.7)	0.170
	Town	137 (34.7)	258 (65.3)	
	Village	49 (28.5)	123 (71.5)	
Father's education	Literate	23 (50.0)*	23 (50.0)	**0.003**
	Primary education	197 (30.9)	440 (69.1)	
	High school	121 (36.1)	214 (63.9)	
	University	45 (45.0)	55 (55.0)	
Mother's education	Literate	55 (40.4)	81 (59.6)	**<0.001**
	Primary education	213 (29.8)	502 (70.2)	
	High school	101 (45.5)*	121 (54.5)	
	University	17 (37.8)	28 (62.29)	
Employment status of the father	Employed	224 (31.8)*	481 (68.2)	**0.041**
	Retired	114 (39.2)	177 (60.8)	
	Unemployed	48 (39.3)	74 (60.7)	
Employment status of the mother	Employed	103 (38.6)	164 (61.4)	0.273
	Retired	16 (34.8)	30 (65.2)	
	Unemployed	267 (33.2)	538 (66.8)	
Coexistence of mother and father	Together	302 (32.5)*	628 (67.5)	**0.005**
	Separated	55 (43.7)	71 (56.3)	
	One of the parents is dead	29 (46.8)	33 (53.2)	
Family monthly income	Below minimum wage	41 (27.9)	106 (72.1)	0.184
	Minimum wage	172 (36.0)	306 (64.0)	
	Above minimum wage	173 (35.1)	320 864.9)	

#Pearson's Chi-square test. *The group that makes the difference. Significant p values were shown in bold.

the student's age, gender, school year, place of residence during childhood, parents' education, their status of employment and living together, economic status of the family, family history of smoking, smoking status of the student, age at onset of smoking, the reason for starting smoking, number of daily cigarette consumption, type of tobacco smoked, length of the smoking experience, trying quitting smoking, getting help to quit smoking, and opinions about tobacco control policies and the use of tobacco.

Inclusion and exclusion criteria
This study included students who were aged ≥18 years, continued their education at VSHS in the spring semester of the 2021-2022 academic year, and agreed to participate in the research. Those who were under the age of 18 and did not agree to fill out the questionnaire were excluded from the study.

Statistical analysis
Statistical analysis was performed using IBM SPSS 22.0 statistical software package. For descriptive findings, categorical variables were presented with frequency and percentage values, and continuous variables with mean, standard deviation, minimum and maximum values. Kolmogorov-Smirnov test of normality was used to determine whether the data showed a normal distribution. As our data were not normally distributed (p<0.05), we used non-parametric tests. Categorical variables were summarized using percentages and compared using the Pearson's chi-square test.

Pearson's chi-square test was used to determine the relationship between some sociodemographic characteristics of students and their use of tobacco products, and to determine the relationship between tobacco addiction level and desire to quit according

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Table 3. Attitudes and behaviors of smoker students toward quitting (n= 386)

Characteristics		n	%
Wanting to quit smoking (n= 386)	Yes	70	18.1
	No	316	81.9
Trying to quit smoking (n= 386)	Yes	257	66.6
	No	129	33.4
How many times have you tried to quit smoking (n= 257)	1	147	57.2
	2	87	33.9
	≥3	23	8.9
Professional help when quitting smoking (n= 257)	Received	5	1.9
	Not received	252	98.1

Table 4. Opinions of students who smoked on tobacco products and applications (n= 386)

Opinions	Yes n (%)	No n (%)
Does electronic cigarette contain nicotine?	45 (11.7)	341 (88.3)
Do you think the studies against smoking are edequate?	58 (15.0)	328 (85.0)
Do you support banning advertising of tobacco products?	137 (35.5)	249 (64.5)
Do you support banning of smoking tobacco products in public/indoor areas?	147 (38.1)	239 (61.9)
Do you think your university education has an effect on tobacco use?	139 (36.0)	247 (64.0)
Do you think smoking cessation techniques should be taught in university education?	166 (43.0)	220 (57.0)
Would you like to receive professional support to quit smoking during your university education?	76 (19.7)	310 (80.3)

to the sociodemographic and smoking characteristics of smokers. The statistical significance level was accepted as p<0.05. The level of students' tobacco dependence was evaluated in 5 groups (very low dependence, low dependence, moderate dependence, high dependence, and very high dependence) based on their total scores on the FTND. However, they were evaluated in 3 groups (low, moderate, and high) in analyses.

Ethical approval
Written permission was obtained from the Non-Interventional Research Ethics Committee of DEU (Date: 27/05/2021, Decision no: 2021/16-07) to conduct this study. Before the data collection process was initiated, the students were informed about the purpose of the study and that participation was voluntary. They were also informed that the data would be kept confidential within the scope of the research, and then their informed consent was obtained.

RESULTS
The mean age of participants was 19.9±1.9 (min= 18 and max= 39), 50.5% of them were second-year students, the place of the longest residence of 49.3% was a province, and 34.5% stated that they used tobacco products. In addition, 14.0% of the students smoked WTS and 3.0% smoked electronic cigarettes (EC).
Regarding the reason for starting smoking, 84.9% of EC smokers and 40.9% of cigarette smokers had started smoking out of curiosity and 40.2% started using tobacco products or EC due to peer influence. The mean age at starting smoking was 15.6±2.4 years (min= 10 and max= 25), and the average smoking time was 4.5±2.3 years (min: 1 max: 17). Of the participants in the research, 34.0% stated that there was no smoker in their family, 43.0% stated that their father, 21.3% their mother, and 17.9% their siblings smoked. A large proportion of those who stated that they smoked at home (61.2%) stated that they smoked on the open balcony of the house (Table 1).
The relationship between some sociodemographic characteristics of the students and their use of tobacco products was shown in Table 2. The use of tobacco products was significantly higher in male students than in female students (p<0.001). The use of tobacco products is higher in students with uneducated fathers and students whose mothers have a high school education (p<0.01). The use of tobacco products is lower in students whose fathers work and whose parents live together (p<0.05) (Table 2).
When the attitudes and behaviors of students who smoked toward quitting were evaluated, only 18.1% said that they wanted to quit smoking. Of the students, 66.6% had tried quitting before, 42.8% had tried quitting more than once, and only 1.9% of those who had tried quitting had received professional help while quitting smoking (Table 3).
According to the findings, 88.3% of the students stated that EC did not contain nicotine, 85.0% did not find campaigns and studies against smoking

Table 5. Level of tobacco dependence and desire to quit according to the sociodemographic and smoking characteristics of smoker students

Characteristics (n=386)		Level of tobacco dependence				Desire to quit smoking		
		Low n (%)	Moderate n (%)	High n (%)	p#	Yes n (%)	No n (%)	p#
Gender	Male	111 (68.1)	20 (12.3)	32 (19.6)	0.199	39 (17.5)	184 (82.5)	0.700
	Female	166 (74.4)	16 (7.2)	41 (18.4)		31 (19.0)	132 (81.0)	
Age	≤20	194 (72.9)	20 (7.5)	52 (19.5)	0.188	49 (18.4)	217 (81.6)	0.828
	≥21	83 (69.2)	16 (13.3)	21 (17.5)		21 (17.5)	99 (82.5)	
Year	1st year	136 (73.9)	17 (9.2)	31 (16.8)	0.600	33 (17.9)	151 (82.1)	0.922
	2nd year	141 (69.8)	19 (9.4)	42 (20.8)		37 (18.3)	165 (81.7)	
Place of residence	City	143 (71.5)	16 (8.0)	41 (20.5)	0.744	36 (18.0)	164 (82.0)	0.676
	Town	97 (70.8)	16 (11.7)	24 (17.5)		23 (16.8)	114 (83.2)	
	Village	37 (75.5)	4 (8.2)	8 (16.3)		11 (22.4)	38 (77.6)	
Father's education	≤Primary	96 (73.8)	16 (12.3)	18 (13.8)	0.237	30 (23.1)	100 (76.9)	0.190
	Middle	63 (70.0)	9 (10.0)	18 (20.0)		15 (16.7)	75 (83.3)	
	≥High	118 (71.1)	11 (6.6)	37 (22.3)		25 (15.1)	141 (84.9)	
Mother's education	≤Primary	141 (72.3)	25 (12.8)	29 (14.9)	**0.044**	37 (19.0)	158 (81.0)	0.901
	Middle	49 (67.1)	6 (8.2)	18 (24.7)		13 (17.8)	60 (82.2)	
	≥High	87 (73.7)*	5 (4.2)	26 (22.0)		20 (16.9)	98 (83.1)	
Employment status of the father	Employed	161 (71.9)	22 (9.8)	41 (18.3)	0.884	33 (14.7)	191 (85.3)	0.051
	Unemployed	116 (71.6)	14 (8.6)	32 (19.8)		37 (22.8)	125 (77.2)	
Employment status of the mother	Employed	226 (70.6)	28 (8.8)	66 (20.6)	0.142	59 (18.4)	261 (81.6)	0.734
	Unemployed	51 (77.3)	8 (12.1)	7 (10.6)		11 (16.7)	55 (83.3)	
Coexistence of mother and father	Together	226 (74.8)*	26 (8.6)	50 (16.6)	**0.036**	55 (18.2)	247 (81.8)	0.940
	Separated/Dead	51 (60.7)	10 (11.9)	23 (27.4)		15 (17.9)	69 (81.2)	
Family monthly income	Below minimum wage	30 (73.2)	2 (4.9)	9 (22.0)	0.817	9 (22.0)	32 (78.0)	0.724
	Minimum wage	121 (70.3)	17 (9.9)	34 (19.8)		32 (18.6)	140 (881.4)	
	Above minimum wage	126 (72.8)	17 (9.8)	30 (17.3)		29 (16.8)	144 (83.2)	
Age of starting smoking	≤16	159 (64.9)	22 (9.0)	64 (26.1)	**0.001**	40 (16.3)	205 (83.7)	0.224
	≥17	118 (83.7)*	14 (9.9)	9 (6.4)		30 (21.3)	111 (78.7)	
Smoking duration (years)	≤5	192 (75.3)	22 (8.6)	41 (16.1)	0.087	52 (20.4)	203 (79.6)	0.108
	≥6	85 (64.9)	14 (10.7)	32 (24.2)		18 (13.7)	113 (86.3)	
Try to quit smoking	Yes	184 (71.6)	29 (11.3)	44 (17.1)	0.107	56 (21.8)*	201 (78.2)	**0.009**
	No	93 (72.1)	7 (5.4)	29 (22.5)		14 (10.9)	115 (89.1)	

Table 5. Level of tobacco dependence and desire to quit according to the sociodemographic and smoking characteristics of smoker students (continue)

Characteristics (n=386)		Level of tobacco dependence			p#	Desire to quit smoking		p#
		Low n (%)	Moderate n (%)	High n (%)		Yes n (%)	No n (%)	
Paternal smoking	Yes	122 (68.2)	18 (8.7)	39 (21.8)	0.324	31 (17.3)	148 (82.7)	0.699
	No	155 (74.9)	18 (8.7)	34 (16.4)		39 (18.8)	168 (81.2)	
Maternal smoking	Yes	69 (65.1)	9 (8.5)	28 (26.4)	0.068	26 (24.5)*	80 (75.5)	**0.045**
	No	208 (74.3)	27 (9.6)	45 (16.1)		44 (15.7)	236 (84.3)	
Sibling smoking	Yes	68 (71.6)	9 (9.5)	18 (18.9)	0.998	26 (27.4)*	69 (72.6)	**0.007**
	No	209 (71.8)	27 (9.3)	55 (18.9)		44 (15.1)	247 (84.9)	

#Pearson's Chi-square test. *The group that makes the difference. Significant p values were shown in bold.

adequate, 64.5% did not support the banning of advertisements of tobacco products, 61.9% did not support the prohibition of smoking in public/indoor areas, 64.0% stated university education had no effect on tobacco use, 57.0% stated that there was no need to teach smoking cessation techniques during university education, and 80.3% did not want to receive professional support for quitting smoking during university education (Table 4).

The mean score of the students on the FTND was 3.43±2.20 (min= 0, max= 10), and according to the cut-off point of the scale, the tobacco dependence rates were as follows: 34.5%, very low dependence; 37.3%, low dependence; 9.3%, moderate dependence; 15.0%, high dependence; 3.9% very high dependence (data not shown).

There was no significant relationship between the smoking and hookah smoking (WTS) habits of the students and their tobacco dependence levels (not shown in the tables). Students whose mothers had high school or higher education and who lived with their parents had a low level of tobacco dependence (p<0.05). Students who started smoking at the age of ≥17 had a lower level of tobacco dependence than those with a smoking initiation age of ≤16 (p<0.01) (Table 5).

The desire to quit smoking was higher in students who had tried quitting smoking before (p<0.05). It was higher in students whose mothers and siblings smoked (p<0.05) (Table 5).

DISCUSSION

Our research revealed health technician students' tobacco and tobacco product use behaviors and tobacco dependence levels. It was shown that the age at starting smoking, the education level of the mother, and the family unity played a role in students' smoking behaviors. In studies conducted among university students in our country, the rate of smoking was found between 27.9 and 35.9% (4,8,15,16), and it was found as 34.5% in our study. The rate of smoking was found as 52.4% in male students and 27.6% in female students. Studies with university students indicated that male students smoked more (15,20). However, recent studies have shown that the rate of smoking in female students has approached that of male students (16). Sharapova et al. (21) reported that men and women tried tobacco products at similar ages. It was also determined in our study that female students smoked at a high rate.

In addition to cigarette smoking, WTS (11-40%) (22-24) and EC (1.5-20%) (25-27) are quite common among university students. Although the prevalence varies by country, WTS and EC are gaining popularity among adolescents and university students around the world. In our study, the rate of smoking WTS and EC among students was found as 14.0% and 3.0%, respectively. Despite the prohibition of EC production and trade in our country, the fact that the usage rates are at a remarkable level even in this group suggests that necessary precautions should be taken to prevent the use of this product in the future. It is widely believed that EC is less harmful than combusted cigarettes, does not contain nicotine, and helps smokers to quit (25,27). It is also seen that EC is becoming more popular among young people than combusted cigarettes day by day, which is due to its visuality, technological design, taste suitable for

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young people, and free of use in non-smoking areas. It is also becoming widespread among those with good economic status, and it is stated that even non-smokers use EC (25-27). In our study, since more than 50% of the students had an economic status at or below the minimum wage, the rate of EC use was found to be 3.0%, and 88.3% of the students stated that EC did not contain nicotine. The absence of odor in EC makes e-cigarettes look less harmful than traditional ones (25,26). We think that health professionals should give accurate information about the dangers of using EC and that the importance of raising awareness should be emphasized with comprehensive education programs. In addition, it is important to prevent online sales sites and the like, which are a means of illegally procuring EC.

In our study, although 64.0% of the students stated that university education did not affect the use of tobacco and tobacco products, the rate of those who started smoking at the age of ≥17 was found to be 36.5%. Erdogan N and Erdogan I (16) stated that students starting university saw smoking as a part of their socialization experience, like drinking tea and coffee. Although the majority of the students (85.0%) stated that studies against smoking were inadequate, the rate of those who did not support the prohibition of tobacco product advertisements (64.5%) and smoking in public/indoor areas (61.9%) was quite high. In addition, 80.3% of the smokers stated that they did not want to receive support for quitting. These conflicting views show us the students' indecision about quitting tobacco products. Aho et al. (28) defined the fear of losing social status and exclusion from a group with similar values and attitudes as barriers to quitting smoking although the harms of smoking are known among students.

In our study, there was a relationship between the level of parents' education and smoking. Some studies suggest that the effect of the mother's education level on smoking status may be greater than that of the father's, which is due to the mother's spending more time on the child's discipline (4). It was found that our students who lived with their parents smoked less. Similar to our findings, many researchers have determined a lower rate of smoking in those living with their parents (4,10). This is because parents are more effective in protecting their children from smoking and the student cannot smoke comfortably due to the environment they live in.

The level of dependence in smokers is very important for quitting success. Considering that most of the students in this study had very low (34.5%), low (37.3%), and moderate (9.3%) tobacco dependence, it can be said that the success of smoking cessation will be high in this group when necessary interventions are implemented. In addition, the rate of those with high scores on the FTND among female and male smokers was quite low. However, those who started smoking before the age of ≤16 were found to have higher scores on the FTND. Our findings are consistent with studies on adolescents who stated that they tried smoking for the first time at the age of ≤16 (21,29). In this study, only 18.1% of smokers stated that they wanted to quit, while 66.6% of smokers stated that they tried quitting once or more. It has been stated that delaying the age at starting tobacco and tobacco products is the most important factor in the prevention of their use and will reduce the level of tobacco dependence (21). Brain cells with high neuroplasticity in childhood and adolescence show an ability to quickly learn and respond to stimuli. Therefore, it has been stated that exposure to nicotine at an early age may lead to the development of nicotine dependence more rapidly in young people than in adults 21,29-31). Although smoking cessation and the continuation of smoking cessation behavior are related to the individual's desire and determination, studies have shown that reducing the visibility of use in the student's environment, smoking-free university policies, and prohibiting smoking throughout the campus prevent students from starting smoking and make it easier to quit (14,16,17). We think that some strategies, such as increasing the price of tobacco products, raising the household income above the hunger limit, developing smoke-free policies and norms throughout the country, restricting advertising and promotions, prohibition of the production and sale of tobacco products, public education at a national level, and media campaigns against smoking, should be developed to reduce the use of tobacco products by young people.

Strengths and Limitations
This study has several limitations. For example, the data were collected based on students' self-reports. Some of the smokers refrained from reporting their smoking status. Also, all of the students included in the study were enrolled in a public university in Izmir. Therefore, the present findings cannot be generalized to the entire population. More research is needed to determine the prevalence, level of dependence, and

willingness to quit smoking among public and private university students. Despite these limitations, our results give a strong message to universities so that they can develop and adopt protocols for the prevention of the use of tobacco products before health technician students start working as health professionals.

Since usage of tobacco is more common in socioeconomically and educationally disadvantaged groups, giving importance to increase the welfare level of the society will be an important intervention to reduce tobacco dependence. In addition, adding courses on tobacco addiction and tobacco control to the curriculum will contribute to increasing students' awareness.

CONCLUSION

In this study, it was determined that one-third of the students used tobacco products and that about one-fifth of them had a high level of tobacco dependence. Students' gender, age, and parents' low education level had an effect on the use of tobacco products. Most of the students thought that studies against the use of tobacco products were not enough. In line with these findings, taking students' views on the development of new and promising strategies that can help reduce the use of tobacco products by young people and involving them in the fight against smoking can play an active role in success. It is recommended to regularly monitor students in terms of tobacco dependence and to provide counseling services for quitting smoking at universities. Intervention programs that will help students to quit smoking can be planned and students with a very high level of dependence can be directed to smoking cessation outpatient clinics.

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PRACTICES OF PHYSIOTHERAPISTS ON THE RISK OF FALLS AND PREVENTION IN CLIENTS AGED 65 AND OLDER: ONLINE SURVEY RESULTS

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ABSTRACT

Purpose: Physiotherapists frequently interact with elderly clients. We aimed to determine the physiotherapists' practices for fall risk and prevention in clients at 65 years and older.
Material and Methods: Seventy-two physiotherapists responded to online survey including questions about demographic and professional characteristics, the awareness and practices of physiotherapists on falling and preventing falls.
Results: Ninety-one point seven percent of physiotherapists reported that fall risk should be determined in all clients at 65 years and older. Thirty point six percent of them stated that they evaluated the risk of falling in case of necessity, 83.3% stated that they did not use a standard assessment-treatment flow chart for risk of falling. In elderly clients with low or no risk of falling, 8.1% of physiotherapists; In elderly clients with high risk of falling 83.3% of physiotherapist applied a preventive physiotherapy approach to prevent falls. The rate of physiotherapists who provide education and advice on fall prevention to elderly clients with low or no fall risk is 67.9%, while 73.5% prefer assistive device reclamation in elderly clients with a high risk of falling.
Conclusion: Interventions should be planned to improve fall risk awareness and practices among physiotherapists by following a standard assessment-treatment flow chart for their clients 65 years and older.

Keywords: falls, health services, preventive, physical therapists

INTRODUCTION

With the advancing age, deterioration of neuromusculoskeletal system and added health problems, balance and mobility difficulties begin to occur, and falls increase. The addition of possible complaints such as inner ear problems, cognitive problems, sedentary lifestyle, some chronic unstabil diseases, multiple drug use, drug side effects, dizziness and sudden blood pressure changes increase the risk of falling [1]. Fall-related injuries are one of the main reasons for hospitalization of the elderly [2]. One third of individuals over the age of 65 years old fall at least once a year, and this rate reaches 50% for individuals over the age of 80 years

old [3]. In studies conducted in our country on falls in the elderly, the prevalence of falls varies between 36.2% and 47.7% [4-6].

Falling can result in adverse health problems, from a simple cut to injuries that may require hospitalization, dependency, deterioration in general physical and mental health, or death [7,8]. Fall prevention is a more cost-effective approach than post-fall health care. Consequently, it is necessary to determine the balance and mobility problems and the risk of falling in the elderly individuals, and to take precautions against risk factors [9,10].

According to the evidence, the risk of falling can be reduced by 30-40% with various interventions such as educating the elderly about fall prevention strategies, medication management, addressing foot problems and enhancement of functional mobility, strength and balance [11,12]. Therefore, it is an effective approach to evaluate the elderly clients who come to the clinic for any reason (diagnosis, treatment, follow-up, rehabilitation-physiotherapy etc.), in terms of falling. The relevant health professional (doctor, nurse, physiotherapist) should be aware of the fall risk factors and should direct the individual to other health professionals when necessary [8,12]. Fall risk assessment tools are categorised as algorithm, the functional mobility assessments and the multifactorial assessment tools in a recent systematic review. The algorithm is often starts with fall history and contains one or more mobility assessments and fall risk identification questions to undertand fall risk severity. The Functional mobility assessments comprises several mobility assessments which may refer to balance, strength and gait assessments (Timed Up and Go Test, Berg Balance Test etc) traditionally administered by physiotherapists. The multifactorial assessment tools contain questions related to intrinsic and/or extrinsic fall risk factors [13].

Individual approach and exercise program is the most effective method in terms of preventing the risk of falling. Evidence from randomized controlled trials suggests that falls can be reduced through exercise. When the fall risk assessment of the elderly client directed to the physiotherapist is completed, the physiotherapist can prepare a program specific to the individual [14-17]. Physiotherapists, who have an important role in preventive public health, encounter clients over the age of 65 years old spend more frequently and longer time compared to other healthcare professionals, due to the nature of their profession. Accordingly, physiotherapists may have opportunities to evaluate the fall risk of the elderly clients, to raise awareness and, when necessary, to engage in practices aimed at improving the physical fitness parameters such as muscle strength, balance and coordination, related to the risk of falling.

In the literature, studies to determine the practices for the risk of falling have been carried out mostly in caregivers of the elderly [18], in nurses [19], in teams consisting of physiotherapists working in institutions such as nursing homes [20,21], in home care [22] or among physiotherapists caring for patients of all ages [23]. In our country, most undergraduate curricula include geriatric physiotherapy courses. In addition, the importance of preventing falls in the elderly within the scope of preventive services is a generally accepted fact. In our country, the approaches and practices of actively working physiotherapists to prevent the risk of falling in clients aged 65 and over are unknown. We think that physiotherapists evaluate the history and risks of falling in clients aged 65 and over and take relevant approaches when necessary. Therefore, this study was planned to determine the practices of physiotherapists for fall risk evaluation and fall prevention in clients aged 65 and above.

MATERIAL AND METHODS

Graduated physiotherapists who actively work as physiotherapists in Turkey were included in the cross-sectional descriptive study. Physiotherapists were reached through social media platforms and the e-mail group of the Turkish Physiotherapy Association, and the study was carried out through an online questionnaire prepared in electronic environment. The survey was open for access for 3 months (February-April 2022). In the statement at the beginning of the questionnaire, physiotherapists who work in fields such as pediatric rehabilitation, sports physiotherapy or physiotherapy with animals and do not have clients aged 65 and above were asked not to answer the questionnaire. The data of all physiotherapists who answered the survey questions were included in the study.

In the first part of the questionnaire, there were questions about demographic (age, gender, education level) and professional characteristics (working area, year and place, etc.). In the second part of the form, the awareness and practices of physiotherapists regarding the risk of falling and preventing falls were evaluated. Physiotherapists encounter with clients 65 years of age were also

Table 1. Characteristics of physiotherapists (n=72)

Variables		n (%)
Education level	Bachelor	34 (47.2)
	Master's degree (n=24)/Philosophy of Doctorate (n=14)	38 (52.8)
Working time (years)	0-9	32 (44.4)
	10-19	14 (19.4)
	20-29	20 (27.8)
	30 and over	6 (8.3)
Type of institution	Public Hospital	19 (26.4)
	University Hospital	14 (19.5)
	Private clinic	11(15.3)
	Nursing home	11(15.3)
	Private physiotherapy and rehabilitation center	8 (11.1)
	Private hospital	8 (11.1)
	Wellness center	1 (1.4)
Work area (multiple marking possible)	Orthopedics	37 (51.4)
	Geriatrics	35 (48.6)
	Neurology	27 (37.5)
	Pediatrics	16 (22.2)
	Cardiopulmonary	13 (18.1)
	Athlete health	13 (18.1)
	Prosthesis-orthotics	6 (8.3)
	Musculoskeletal	3 (4.2)
	General	3 (4.2)
	Rheumatology	2 (2.8)
	Manual therapy	1 (1.4)
	Intensive care	1 (1.4)
	Women's health	1 (1.4)
Physiotherapist clients aged 65 and above	All	10 (13.9)
	Almost all	5 (6.8)
	More than half	12 (16.7)
	Half	19 (26.4)
	Less than half	13 (18.1)
	Very little	13 (18.1)

asked how much they agree with the statement "fall risk should be determined in all clients over the age of 65 years old", the frequency of taking a fall history and assessing fall risk factor, and whether they evaluate the risk of falling or not. In addition, physiotherapists were asked about the fall risk assessment methods (scale, device, questionnaire, test, etc.), their level of knowledge on interpreting the results of these methods, their use of a standard fall risk assessment-treatment flow chart, and their approach to elderly clients with different degrees of fall risk. Barriers to physiotherapists' practice that prevent falls and what types of fall prevention practices physiotherapists find practical were asked. The questionnaire included questions, which was created by utilizing the studies [18,22,23] conducted to understand the practices of physiotherapists and other healthcare professionals regarding the risk of falling and preventing falls. The informed consent form was included at the beginning of the questionnaire.

Statistical Analysis

Descriptive statistics were used to analyze demographic information and answers to survey questions. Results are presented as mean, + standard deviation (+SD), and percentage values. All statistical analyzes were performed using SPSS for Windows v22.0 software (SPSS Inc. Chicago, IL, USA).

Ethical Approval

Ethical approval of the study was obtained from Dokuz Eylül University Non-Interventional Research Ethics Committee (Decision No: 2021/28-07, Date: 13.10.2021)

Table 2. Opinions of physiotherapists on determining fall risk in clients aged 65 and above (n=72)

Variable		n (%)
The risk of falling should be determined in all clients aged 65 and above.	Absolutely agree	47 (65.3)
	Agree	19 (26.4)
	Uncertain	4 (5.6)
	Don't agree	2 (2.8)
	Strongly disagree	0 (0.0)

RESULTS

Seventy-two physiotherapists answered the online questionnaire. The mean age of 47 (65.3%) female and 25 (34.7%) male physiotherapists was 37.3±8.9 years. Professional information of the participants is presented in Table 1. Forty-seven-point two percent (n=34) of the physiotherapists had bachelor's degree and 52.8% (n=38) postgraduate education. The average duration of active working in the profession was 14.51±9.2 years. Physiotherapists working in public hospitals constituted the majority (n=19; 26.4%). Physiotherapists were allowed to mark more than one work area. Fifty-one-point four percent (n=37) of the physiotherapists were working in orthopedics and 48.6% (n=35) were working in geriatrics. Sixty-three-point nine percent (n=46) of the physiotherapists had clients, at least half of whom were 65 years or older (Table 1).

When were physiotherapists asked that "Do you have the knowledge to interpret the results of fall risk assessment methods?"; 63.9% (n=46) of them answered as "I have knowledge"; 36.1% (n=26) of them answered as " I do not know much". The rate of physiotherapists who agreed with the statement "fall risk should be determined in all clients over 65 years of age" was determined as 91.7% (Table 2).

The attitudes of physiotherapists regarding the assessment of falls in clients aged 65 and above are presented in Table 3. Four-point two percent (n=3) of the physiotherapists reported that they almost never question fall history and do not evaluate any fall risk factors. While 52.8% (n=38) of physiotherapists do not assess fall risk, 83.3% (n=60) do not have a standard assessment-treatment flow chart to determine fall risk.

The assessment methods that physiotherapists use and know for fall risk assessment are presented in table 4 in two parts, namely those specified in general statements and specific methods. Forty-one-point seven percent (n=30) and 86.1% (n=62) of

physiotherapists, answered the questions "Which method/methods do you use to assess the risk of falling? and "Can you write what you know about the methods used to assess the risk of falling?" with at least 1 method, respectively.

According to the survey results, 68.1% (n=49) and 83.3% (n=60) of the physiotherapists apply preventive physiotherapy approaches to prevent falls for elderly clients with low or no fall risk and high risk of falling, respectively. While 67.9% (n=38) of physiotherapists provide training and advice on fall prevention for elderly clients with low or no fall risk; 73.5% (n=50) of them evaluate assistive devices for elderly clients with a high risk of falling (Table 5).

The rate of physiotherapists who reported that there was no obstacle in fall prevention practices was 29.2% (n=21). On the other hand, 45.8% (n=33) of the physiotherapists reported insufficient time, and 33.3% (n=24) reported difficulty in changing the clients' behavior as a barrier. In the provision of fall prevention services by physiotherapists, the recommendation of "integrating brief consultations into routine consultations" was in the first place with a rate of 59.7% (n=43). In the second and third place, "separate one-to-one consultations" with 50% (n=36) and "group sessions" with 40.3% (n=29) were ranked (Table 6).

DISCUSSION

In our cross-sectional study conducted through an online questionnaire, we aimed to determine the practices of physiotherapists to determine the risk of falling and prevent falls when they encounter clients aged 65 and above. More than half of the physioterpists, were working with clients those at least half of them were aged 65 and above. Physiotherapists varied widely in terms of field, institution and year of work.

In a study evaluating the knowledge, behaviors and practices of employees in institutions providing elderly care services, 38% of the participants stated that they felt "very knowledgeable" about the fall prevention practices recommended in the guidelines; and 58% stated that they perceived themselves as "somewhat knowledgeable" [19]. In another study conducted only with physiotherapists in Nigeria, when practices for fall risk factors and fall prevention were examined, 89% of physiotherapists evaluated the level of their knowledge and 64% of them evaluated the level of their practice levels as high on preventing falls in elderly [23]. In our study, more than half of the

Table 3. Attitudes of physiotherapists regarding the evaluation of falls in clients aged 65 and above (n=72)

Variables		n (%)
Frequency of getting fall history	Never	0 (0.0)
	Almost never	3 (4.2)
	Sometimes	28 (38.9)
	Often	27 (37.5)
	Almost always	8 (11.1)
	All the time	6 (8.3)
Frequency of identifying fall risk factors	Never	3 (4.2)
	Almost never	10 (13.9)
	Sometimes	24 (33.3)
	Often	20 (27.8)
	Almost always	8 (11.1)
	All the time	7 (9.7)
Do you make a fall risk assessment for your clients 65 years and older?	No, I do not evaluate	34 (47.2)
	No, another healthcare professional at my institution routinely assesses fall risk	4 (5.6)
	Yes, I routinely assess fall risk	12 (16.7)
	Yes, I evaluate when I think it is necessary	22 (30.6)
Do you have a standard assessment-treatment flow chart for determining fall risk?	Yes	12 (16,7)
	No	60 (83.3)

physiotherapists (63.9%) stated that they had knowledge in interpreting the results of methods that assess the risk of falling. Some physiotherapists failed to mention specific assessment methods namely Berg Balance Test, Timed Up and Go etc [24]. When describing the assessment methods used and known in fall risk assessment. Among the specific methods, it was observed that they wrote the Berg Balance Test, Itaki Fall Risk Scale, Tinetti Balance and Walking Test/Fall Activity Scale, Timed Up and Go Test, One-Legged Standing Test and Functional Reach Test. Among the answers, methods that are not directly related to the risk of falling, such as the Romberg Test and the Geriatric Depression Scale, were also written. The Romberg test, a diagnostic test, tests the function of dorsal column medial lemniscal pathway by asking the patient to first take the test position with eyes open, and subsequently with eyes closed. Poor performance on the modified Romberg is associated with a accompanying increase fall rsik [25,26]. The Geriatric Depression Scale touches on the affective and behavioral symptoms of depression and excludes many of the symptoms that may be confused with somatic illness or dementia [27]. Depression and antidepressant use both increase fall risk [28]. Including depression screening for multifactorial fall assessments may

benefit[29]. However, questioning the existence of depression, which is known as an intrinsic risk factor, may be included in the algorithms in the last stages [30].

It is important in terms of preventive rehabilitation in clients aged 65 and above that physiotherapists trust more on their knowledge in practices for the assessment and prevention of fall risk in the elderly clients.

In a multicenter survey conducted with home care professionals including doctors, physiotherapists and nurses, 94.1% of the participants stated that it is important to take falls history in elderly care [20]. In our study, although most of the physiotherapists (91.7%) agreed with the statement "The risk of falling should be determined in all clients aged 65 and above", 47.3% of the participants evaluate the fall risk routinely or when necessary. In a different study, whose participants were only physiotherapists, it was found that they showed moderate practice in the documentation of fall risk factors and treatment planning in the elderly clients [23]. However, when we look at the evaluation frequencies in our study, it is seen that the fall history is evaluated more frequently than the evaluation of the fall risk factors. This may be because most physiotherapists do not have a standard assessment-treatment flowchart to

Table 4. Attitudes of physiotherapists regarding the evaluation of falls in clients aged 65 and above (n=72)

Variables	General statements	n	Specific methods	n
Which method/methods do you use to assess the risk of falling? *(41.7%, n=30 answered the question with at least 1 method,)*	Scale/survey	6	Ittaki fall risk scale	5
	Balance assessment	5	Berg balance test	4
	Observation during gait and balance-coordination training/exercises	4	Tinetti balance and walking test / fall activity scale	4
	Musculoskeletal evaluation (muscle strength, normal range of motion, etc.)	4	Timed get up and go test	4
	Assistive device evaluation	2	Risk factor inquiry (environment, assistive device, multiple drug use, etc.)	4
	Mental assessment	2	Romberg test	2
	Verbal assessment	2	Gait analysis	2
	Fear of falling assessment	1	ProKin balance assessment system	1
	Observation	1	Short physical performance battery	1
	Evaluation of activities of daily living	1	Functional reach test	1
	Proprioceptive assessment	1	Sit to stand test	1
			Stand on one leg	1
Can you write what you know about the methods used to assess the risk of falling? *(86.1%, n=62 answered the question with at least 1 method)*	Balance test	8	Berg balance test	17
	Scale/survey	4	Ittaki fall risk scale	15
	Balance coordination assessment	4	Timed get up and go test	12
	Observation	4	Tinetti balance and walking test/ fall activity scale	9
	Assessment of the environment and home environment	3	Stand on one leg	5
	Musculoskeletal evaluation (muscle strength, normal range of motion, etc.)	3	Functional reach test	5
	Mental/dementia assessment	2	Five Times Sit to Stand Test	4
	Cardiovascular assessment	1	International falling efficiency scale	2
	Neurological assessments	1	Fall history	2
	Cardiovascular assessment	1	6 minutes walking test	2
	Verbal assessment	1	Short physical performance battery	2
	Device	1	Walking speed	2
	Fear of falling assessment	1	Harizmi fall risk assessment scale	2
	Evaluation of activities of daily living	1	Romberg test	2
			DENN fall risk scale	1
			Hendrich II fall risk model	1
			Tandem	1
			Morse fall scale	1
			Biodex	1
			Geriatric Depression scale	1

Table 5. Practices of physiotherapists to prevent the risk of falling in clients aged 65 and above

Variables		n (%)
Do you apply preventive physiotherapy approaches for fall prevention for your elderly clients with low or no risk of falling? (n=72)	Yes	49 (68.1)
	No.	23 (31.9)
What are your approaches to fall prevention for your elderly clients with low or no risk of falling? (multiple marking possible) (n=56)	I provide training and advice	38 (67.9)
	I evaluate assistive device use	33 (58.9)
	I propose regulations for indoor environment	31 (55.4)
	I give a home program	30 (53.6)
	I give supervised exercise program	29 (51.8)
	I refer other healthcare professionals when necessary	12 (21.4)
	I give a brochure	5 (8.9)
	Other: I evaluate the use of shoes and slippers	1 (1.8)
	Other: I tell him to keep his metabolic values under control	1 (1.8)
	I refer to another physiotherapist	1 (1.8)
Do you apply preventive physiotherapy approaches for your elderly clients with high risk of falling? (n=72)	Yes	60 (83.3)
	No	12 (16.7)
What are your approaches to fall prevention for your elderly clients with high risk of falling? (multiple marking possible) (n=68)	I evaluate assistive device use	50 (73.5)
	I give supervised exercise program	43 (63.2)
	I propose regulations for indoor environment	43 (63.2)
	I provide training and advice	40 (58.8)
	I give home program	38 (55.9)
	I refer other healthcare professionals when necessary	25 (36.8)
	I give you a brochure	13 (19.1)
	I refer to another physiotherapist	6 (8.8)
	Other: I optimize the use of shoes and slippers	1 (1.5)

question the fall history. In the study of Asiri F et al., 80.8% of the participants stated that they always or almost always asked about the fall history and 74.5% of them asked about fall risk factors [20]; unlike, in our study, these rates were approximately 20%. This difference may be due to the majority of nurses among the participants, who evaluated falls more in the study. In the aforementioned study, the number of physiotherapists was the lowest, and those who made the least evaluation and spent the least time with the elderly clients compared to nurses and doctors were stated as physiotherapists.

Asiri F et al. reported that 69.2% of the participants always or almost always have interventions to eliminate fall risk factors [20]. In an other study including physiotherapists working in home care, it was determined that most of the participants evaluated the risk of falling in the elderly clients and provided interventions to reduce the risk, but a substantial portion of the interventions were not associated with a specific risk factor. In the same study, while the majority of therapists gave strength exercises, balance and gait training including Tai Chi, more than half of them gave environmental adaptation suggestions and patient education; 25% were referring to other health professionals when necessary [21]. In a study examining fall prevention interventions without distinguishing between low and high risk of falling, it was determined that physiotherapists preferred balance training (85.6%), strengthening exercises (78.8%) and patient education (75.8%) [23]. Differently, in our study, physiotherapists were asked about their practices for the elderly clients with low or no fall risk and high risk of falling, separately. According to the survey results, 68.1% of the physiotherapists, in the no or low risk of falling, 73.5% of them, in high risk of falling, stated that they applied preventive physiotherapy

approaches to prevent falls. Frequently preferred practices, in the absence or low risk of falling, include patient education, assistive device evaluation and advice for the home environment for fall prevention; in high risk of falling, assistive device evaluation, recommendations for the indoor environment, and a supervised exercise program are prefered. Among the approaches that physiotherapists can take part in, as specified in the American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons, are individual fall risk assessment and management, strength, balance, individual exercise program including gait, home assessment and adaptation, assistive device evaluation and education, foot problems and shoe management, education for fall prevention have been reported [14]. In our study, although the approaches preferred by physiotherapists for falling are in parallel with the literature, a low level of practice in referral to other health professionals was reported. In a study conducted with physiotherapists, this rate was found to be 50% [23]. This situation may also be caused by the differences in the functioning of the health system. Among the barriers to the practices of physiotherapists to prevent falls, the lack of time and the thought that they cannot change the client's behavior are among the first, while approximately one third of the physiotherapists reported that there was no barrier. Physiotherapists mostly recommended brief consultations integrated into routine consultations, separate one-on-one consultations, and group sessions, for practices aimed at preventing the risk of falling. Although the lack of time was mentioned as a barrier in the first place, group sessions that ensure effective use of time were suggested after consultations that would require relatively more time. It was shown in a study that when the elderly clients and their companions who come to physiotherapy are given a 2-session training and a reminder brochure containing information on falling, risk of falling and preventing falls at the beginning and end of the physical therapy process; it was observed that awareness of falling risk increased, the number of falls decreased compared to previous years, and more precautions were taken to prevent falls at home [31]. Most falls can be avoided with appropriate approaches following an algorithm including fall assessment and prevention strategies, such as management of fall risk factors, raising awareness of the elderly about falling and exercise training for functional fitness etc. Educating

elderly clients about falls will help them cope with the devastating effects of falls.

In the literature, it is seen that studies to determine the practices of healthcare professionals regarding the risk of falling in the elderly clients are mostly carried out on people responsible for the care of the elderly. In these studies, it is emphasized that caregivers should be made aware of fall prevention and risk of falling [20], and that physiotherapists have an important role in this regard [23].

Limitations

While online survey studies offer a practical means of engaging participants, the response rate from volunteers may sometimes remain modest. Although the number of physiotherapists who participated in the questionnaire was deemed adequate, it still represented a limited proportion relative to the total count of graduated physiotherapists within Turkey. Additionally, the comparability and in-depth analysis of findings have been hindered by the scarcity of studies exclusively focused on physiotherapists. Nonetheless, with the gradual increase in the number of analogous studies over time, the prospects for comprehensive literature discussions and meaningful comparisons are anticipated to expand.

CONCLUSION

The rise in life expectancy has led to a notable increase in the elderly population. Consequently, individuals aged 65 and above are increasingly seeking the services of physiotherapists for treatment due to their coexisting health conditions. Given the prolonged nature of physiotherapy and rehabilitation, interactions between physiotherapists and the elderly clients have become more frequent. While fall prevention strategies continue to hold significance as preventive measures, the insights provided by physiotherapists on this matter are crucial.

Approximately two-thirds of physiotherapists consider themselves proficient in interpreting the outcomes of fall risk assessment methods. Despite a considerable portion recognizing the importance of assessing fall risk, nearly half of them do not actively conduct such assessments. Moreover, many physiotherapists do not employ a standard assessment-treatment flow chart, also known as an algorithm. Although most physiotherapists are acquainted with fall risk assessment techniques, fewer actually integrate them into their practice. The prevalence of reported barriers hindering fall prevention practices among

physiotherapists is noteworthy. In terms of service delivery to prevent the risk of falls, physiotherapists have proposed several suggestions, including the integration of brief consultations into routine sessions, conducting dedicated one-on-one consultations, and organizing group sessions. Consequently, the current findings suggest the potential for interventions aimed at enhancing the practices of physiotherapists. This could involve the implementation of a standardized assessment-treatment flow chart for assessing fall risk in elderly clients, thereby enhancing the efficacy of their interventions and reducing the impact of these barriers.

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BIOPSYCHOSOCIAL ANALYSIS OF IMAGERY IN ELITE ATHLETES

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ABSTRACT

Purpose: The aim of this study was to examine the relationships between elite athletes' imagery abilities and their body awareness, plank stance duration, psychological and social skills.
Material and Methods: The study included 53 healthy elite athletes (female:32, male:21). The imagery abilities of the athletes were evaluated using the Movement Imagery Questionnaire-3. A Body Awareness Questionnaire was used for body awareness assessment. Plank stance duration, psychological and social skill levels were evaluated using Sport Specific Core Muscle Strength and Stability Plank Test, Athletic Psychological Skills Inventory and Social Skills Inventory, respectively.
Results: External and kinesthetic imagery was found to correlate with body awareness (r=0.33, p=0.02; r=0.39, p<0.01). There was a relationship between these imagery abilities and the prediction of body responses (r=0.31, p=0.03; r=0.38, p<0.01) and sleep-wake cycle (r=0.38, p<0.01; r=0.37, p<0.01) sub-dimensions of body awareness. Kinesthetic imagery also was associated with changes in paying attention to changes and reactions in the body process (r=0.30, p=0.03) sub-dimension. There was no relationship between imagery and other parameters (p>0.05).
Conclusion: The external and kinesthetic imagery ability of elite athletes is related to the body awareness level. It should be considered in terms of holistic approach in the performance and rehabilitation processes of the athletes.

Keywords: athletes, imagery, awareness, psychological, social

INTRODUCTION

Motor imagery is central to cognition, perception, action, and emotion and is expressed as thinking mentally without actively performing a task (1,2). This action can be visually focused using an internal and external perspective, or it could be performed kinesthetically, focusing on the feeling of movement (3). According to functional magnetic resonance images, brain activation occurs during imagery actions, and this activation is higher during dynamic tasks rather than static tasks (4). Since dynamic activities are frequently included in sportive tasks, motor imagery has been studied in terms of rehabilitation and performance of athletes, especially in the last decade. Motor imagery combined with action observation increases muscle strength and reduces fear of re-injury, pain perception, and adverse effects on neuromuscular function due to activity restrictions (5-8).Motor imagery is important in terms of sportive performance parameters such as

strength, power, reaction time and coordination (9,10). It improves performance, and this improvement is faster in athletes with good motor imagery ability (11). In terms of the effects of imagery on functional outcomes such as strength performance, individuals' imagery ability, motivation, and self-efficacy are important as well as imagery type (5). Activation of brain parts during imagery is affected by different variables, such as the type of imagined movement, the instructions given, and the visual or kinesthetic type of motor imagery (1). In this context, it is necessary to evaluate the imagery ability of athletes holistically from a biopsychosocial perspective.

Body awareness is the concept of operating mechanisms to continuously monitor, update and provide feedback on the information acquired about the position and movement of one's body in space. It is also the primary process that integrates information for perception, decision-making, and action, managing accurate body information for control of movements (12). Movement harmony is one of the key themes for understanding body awareness. Mental awareness works simultaneously with movement harmony (13). Therefore, kinesthetic perception is an important component of body awareness. In motor imagery, the kinesthetic imagery parameter operates in parallel with these processes. Revealing the place of body awareness in imagery could be explanatory, especially in the processes of developing kinesthetic perception in athletes, but, this relationship has yet to be examined in the literature. Despite the available evidence in the literature on imagery, there is a need for a biopsychosocial examination of imagery, especially in elite athletes. Relational examinations of body awareness, muscle strength, and psychosocial-based indicators with imagination can guide clinicians and trainers in terms of rehabilitation and performance-oriented approaches to elite athletes. In this context, the primary aim of this study was to biopsychosocial examine the relationships between the internal visual, external visual, and kinesthetic imagery abilities of elite athletes and their body awareness levels, plank stance duration, psychological skills, and social control levels. The secondary aim was to compare these imagery parameters of the athletes by gender and previous injury history.

MATERIAL AND METHODS
Participant
All the athletes registered in the center were invited to the research, and all the athletes were informed about the research. Elite athletes who could communicate verbally and in writing were included in the study. Those with orthopedic, neurological, or congenital problems, those who have had an injury or illness in the last two weeks, those who use drugs continuously, those who have systemic diseases such as diabetes, epilepsy, and asthma, and those who have mental and psychiatric problems were excluded. Athletes who met the required criteria and accepted the research invitation read and signed the informed consent form. Permission was obtained from the parents of the athletes under the age of 18.

Procedures
In addition to the imagery abilities of the athletes, their body awareness levels, plank stance duration, psychological and social skill levels were evaluated.

Movement Imagery Questionnaire-3
The questionnaire developed by Williams et al. (14) was used to determine the imagery abilities of athletes (internal consistency coefficient: 0.87). The four different movements in the questionnaire were explained to the athletes in order and they were asked to perform them actively once. They were then asked to imagine each movement from an internal perspective (internal visual imagery), external perspective (external visual imagery), and feeling (kinesthetic imagery). These mental tasks were scored on a seven-point Likert (1: Very hard to see/feel; 7: Very easy to see/feel). The average score of the responses in the four actions was calculated for each imagery type. The Turkish validity and reliability of the questionnaire was carried out by Dilek et al. (15).

Body Awareness Questionnaire
The questionnaire developed by Shields et al. (16) consists of 18 items (Cronbach's alpha: 0.917). In this questionnaire, which aims to determine the normal or abnormal sensitivity level of body composition, there are Likert type scoring from 1 to 7. The questionnaire is evaluated over four sub-dimensions: paying attention to changes and reactions in the body process, prediction of body responses, sleep-wake

cycle, and prediction at the onset of disease. A higher score indicates better body awareness. Turkish validity and reliability were conducted by Karaca and Bayar (17).

Sport Specific Core Muscle Strength and Stability Plank Test

This test, developed by Mackenzie (18), was used to evaluate plank stance duration. Athletes were allowed to try once before the assessment to learn the test. Athletes were asked to perform the following task, respectively. The time the athlete was able to hold the position was recorded. The Turkish validity and reliability (95%, 0.94-0.99%) of the test was carried out by Tong et al. (19),

Stage 1: Immediately after the athlete took the prone plank position, the chronometer was started, and the athlete was asked to maintain this position for 60 seconds.

Stage 2: The athlete was asked to wait 15 seconds by extending his right arm.

Stage 3: The athlete was asked to bring his right arm to the starting position, extend his left arm and wait for 15 seconds.

Stage 4: The athlete was asked to bring his left arm to the starting position, extend his right leg and wait for 15 seconds.

Stage 5: The athlete was asked to bring his right leg to the starting position, extend his left leg and wait for 15 seconds.

Stage 6: The athlete was asked to extend his left leg and right arm simultaneously and wait for 15 seconds.

Stage 7: The athlete was asked to bring his left leg and right arm to the starting position, extend his right leg and left arm and wait for 15 seconds.

Table 1. Descriptive characteristics of the athletes

Parameter		N (%)
Gender	Female	32 (60)
	Male	21 (40)
Sports branch	Wrestle	12 (23)
	Athletics	11 (21)
	Boxing	10 (19)
	Curling	10 (19)
	Karate	5 (9)
	Swimming	3 (5)
	Shooting	2 (4)
Education level	High school	30 (57)
	Associate degree	2 (4)
	Undergraduate	21 (39)
Dominant hand	Right	48 (91)
	Left	5 (9)
Dominant foot	Right	46 (87)
	Left	7 (13)
Sleep duration (hours)	4-6	3 (5)
	6-8	31 (59)
	8-10	17 (32)
	10-12	2 (4)
Weekly sleep quality	Very poor	3 (6)
	Poor	5 (9)
	Moderate	23 (43)
	Good	12 (23)
	Very good	10 (19)
Previous injury history	Yes	18 (34)
	No	35 (66)

Stage 8: The athlete was asked to come to the starting position and wait 30 seconds.

Athletic Psychological Skills Inventory

This scale (internal consistency coefficient 0.85), developed by Smith et al. (20) and validated in Turkish by Erhan et al. (21), was used to determine the psychological skill levels of athletes. The scale, which consists of 28 items and seven sub-dimensions, is scored with a four-point Likert scale according to the expressions "rarely", "sometimes," "often" and "almost always." Items 3, 7, 10, 12, 19, and 23 of the scale are reverse scored.

Social Skills Inventory

The inventory developed by Riggio (22) consists of 90 items. It has six sub-dimensions, each consisting of 15 items: emotional expressivity, emotional sensitivity, emotional control, social expressivity, social sensitivity, and social control. Within the scope of this study, the social control sub-dimension, which measures social role-playing and the ability of the individual to reveal himself socially, was used (internal consistency coefficient 0.81). The inventory has a five-point Likert-type response. Turkish validity and reliability were conducted by Yüksel (23).

Statistical analysis

Data were analyzed using Statistical Package for Social Science (SPSS) 22.0. Whether the data showed normal distribution was evaluated using histogram, coefficient of variation, Kurtosis value, Skewness value, Detrended plot graph, and Shapiro-Wilks test. Since the imagery data did not show a normal distribution, the Spearman correlation coefficient was used in the correlation analysis. The Mann-Whitney U test was used to compare imagery between groups regarding gender and previous injury history. Evaluation of data 95% confidence interval was used. Statistically, results of less than 0.05 were

Table 2. Imagery and biopsychosocial parameters of athletes

	Parameter	Mean±SD
Imagery	Internal visual imagery	5.89±0.96
	External visual imagery	5.74±0.88
	Kinesthetic imagery	5.46±1.06
Body Awareness	Pay attention to changes and reactions in the body process	30.50±5.72
	Prediction of body responses	35.09±7.56
	Sleep-wake cycle	32.39±7.35
	Prediction at the onset of disease	19.24±3.84
	Total score	91.33±16.74
Psychological skill level	Coping with difficulties	6.75±2.47
	Being open to learning	9.22±1.92
	Concentration	6.88±2.01
	Confidence and success motivation	9.05±1.88
	Goal setting and mental preparation	7.88±2.21
	Ability to perform well under pressure	5.32±3.04
	Getting rid of worries	5.77±2.23
	Total score	50.90±9.30
Social skill level		54.05±8.34
Plank stance duration (sec)		55.33±19.31

SD: Standart deviation, sec: second

accepted as an indication of a significant difference (24). According to the post hoc power analysis performed at the end of the study with GPower 3.1.2 (Heinrich-Heine-Universität Düsseldorf, Germany), the power $(1-\beta)$ of the study with a moderate effect size was calculated as 0.87 (N=53, α=0.05).

Ethical Consideration
The research protocol was approved by Karadeniz Technical University Faculty of Medicine Scientific Research Ethics Committee (Date: 27.09.2021; Decision number: 25).

RESULTS
The mean age, height, and body weight of the athletes were 18.13±1.60 years, 168.86±9.18 cm, and 63.79±15.39 kg, respectively. The weekly average of the training sessions was 6.96±2.16, and the weekly average duration of the training sessions was 17.56±6.67 hours. The descriptive characteristics of the athletes are shown in Table 1.

The external visual imagery was associated with the prediction of body responses (r=0.31, p=0.03) and sleep-wake cycle (r=0.38, p<0.01) sub-dimensions as well as the total score of the body awareness (r=0.33, p=0.02). This imagery ability also correlated with the getting rid of worries sub-dimension of psychological skill level (r=0.31, p=0,03). Kinesthetic imagery had a significant relationship with all sub-dimensions and the total score of the body awareness questionnaire, except for the prediction at the onset of the disease sub-dimension (p<0.05). There was no correlation between imagery and other parameters in the study (p>0.05) (Table 3).

In comparison between genders, internal visual imagery (female: 5.88 ±1.08; men: 5.90 ±0.75), external visual imagery (female: 5.88 ±1.08; men: 5.53 ±0.95), and kinesthetic imagery (female: 5.70 ±0.81; male: 5.10 ±1.30) did not show a significant difference (p>0.05).

There was no significant difference between the internal visual imagery (with injury: 6.01±0.96, without

Table 3. Relationships between imagery and biopsychosocial parameters

	Parameter	Internal visual imagery	External visual imagery	Kinesthetic imagery
Body Awareness	Pay attention to changes and reactions in the body process	r=0.19 p=0.18	r=0.23 p=0.10	**r=0.30 p=0.03**
	Prediction of body responses	r=0.21 p=0.13	**r=0.31 p=0.03**	**r=0.38 p<0.01**
	Sleep-wake cycle	r=0.25 p=0.07	**r=0.38 p<0.01**	**r=0.37 p<0.01**
	Prediction at the onset of disease	r=0.20 p=0.15	r=0.08 p=0.55	r=0.20 p=0.15
	Total score	r=0.24 p=0.09	**r=0.33 p=0.02**	**r=0.39 p<0.01**
Psychological skill level	Coping with difficulties	r=0.08 p=0.56	r=-0.06 p=0.66	r=0.24 p=0.08
	Being open to learning	r=-0.05 p=0.72	r=-0.16 p=0.27	r=-0.20 p=0.16
	Concentration	r=0.06 p=0.66	r=0.10 p=0.47	r=0.22 p=0.11
	Confidence and success motivation	r=0.12 p=0.39	r=-0.14 p=0.31	r=0.12 p=0.40
	Goal setting and mental preparation	r=-0.03 p=0.83	r=0.09 p=0.50	r=0.27 p=0.06
	Ability to perform well under pressure	r<0.01 p=0.99	r=0.09 p=0.53	r=0.08 p=0.56
	Getting rid of worries	r=-0.22 p=0.11	**r=-0.31 p=0.03**	r=-0.19 p=0.18
	Total score	r=0.05 p=0.74	r=-0.07 p=0.60	r=0.17 p=0.23
Social skill level		r=0.11 p=0.42	r=0.11 p=0.42	r=-0.11 p=0.43
Plank stance duration (sec)		r=0.03 p=0.83	r=0.03 p=0.83	r=0.02 p=0.90

r:spearman correlation test

injury: 5.82±0.96) and kinesthetic imagery (with injury: 5.59±1.12, without injury: 5.40±1.04) abilities of the athletes with and without a history of injury (p>0.05). External visual imagery ability was significantly higher in favor of athletes with a history of injury (with: 6.04±1.01, without: 5.59±0.78) (p=0.03)..

DISCUSSION
In the study, it was revealed that external visual imagery and kinesthetic imagery were positively related to body awareness in elite athletes, but the imagery was not related to psychosocial skill level, plank stance duration, and social control level. In addition, imagery was not related to gender. Athletes with a history of injury had a better level of external imagery than those who did not.

The positive relationship between motor imagery and body awareness may be due to some similar properties of these two parameters. For example, just like the interoceptive and exteroceptive parts of body awareness, motor imagery has internal and external visual imagery parts. Moreover, previous studies in the literature show that motor imagery can be effective in terms of body awareness, body image and body schema (25,26). Similar to the positive effects of motor imagery training on athlete performance, body awareness is also moderately positively correlated with performance emotional status (11,27). These results support the relationship between motor imagery and body awareness in the current study. However, it needs to be explained that body awareness is related to external and kinesthetic imageries but not to internal imagery. These parts of motor imagery show different effects in improving performance for complex sports skills (28). Internal imagery tends to be more self-focused and independent of the sport type. External imagery involves the visualization of others and the environment. It is important in terms of adapting to the rapidly changing dynamics in branches such as karate, which are described as open sports (29). The significant relationship between external visual/kinesthetic imagery and body awareness in our study may be due to most of the athletes included doing open sports. This result suggests that body awareness is more related to exteroceptive inputs. External factors such as sports grounds, equipment used, light, and ventilation can affect both motor imagery and body awareness. More research is needed.

Motor imagery is an appropriate tool for maintaining and increasing physical performance capacity among professional athletes (30). Dhouibi et al. (31) revealed that sports and physical activity positively affect internal and external motor imagery (31). Although it is known that imagery training increases muscle strength, the relationship between imagery ability and muscle strength has yet to be clearly demonstrated. In our study, it was found that imagery was not associated with plank time. There is a need for branch-specific studies with large samples.

Injury may affect the imagery ability due to negative consequences such as fear of re-injury, anxiety, and depression. To reduce these effects, psychological skills such as imagery and awareness are recommended (32,33). In our study, external visual imagery ability was higher in athletes with a history of injury. This can be caused by athletes' self-protection behaviors and kinesiophobia. This situation may also reflect the awareness of the athletes against external stimuli in terms of preventing re-injury. Finding a significant relationship between body awareness and external imagery also supports this result.

From a psychosocial perspective, imagery is effective on emotional state, self-confidence, emotional self-regulation, depression, and social anxiety levels. (34-36). In our study, unlike these parameters, the relationship between imagery and psychological skill was examined. A relationship was found between the psychological skill parameters of imagery and the sub-dimension of getting rid of worries. This relationship may be since the imagery ability is related to emotional parameters rather than psychological skills.

Strengths and Limitations
The strength of this study is to investigate the relationships between imagery, which has an important place in the rehabilitation and performance of elite athletes, and biopsychosocial parameters. The limitation of the study is that some results cannot be discussed sufficiently due to the limited number of studies related to the aim of the study.

CONCLUSION
As a result, there are positive relationships between external visual/kinesthetic imagery ability and body awareness in elite athletes. Revealing this relationship is important in terms of the holistic perspective of imagery in athletes. There is a need for

branch-specific examination of imagery in future studies with large sample sizes.

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WHAT DO FAMILY PHYSICIANS THINK OF COLORECTAL CANCER SCREENING?

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ABSTRACT

Purpose: The purpose of this study was to evaluate family physician (FP) practice in terms of CRC screening and recommendations for increasing participation in screening programs.
Material and Methods: The population in this descriptive study, conducted between 15 June and 15 July, 2019, consisted of 325 (78.9%) FPs working in Samsun, Turkey and consenting to participate. A questionnaire prepared by the authors based on the relevant literature was applied at face-to-face interviews.
Results: The mean age of the FPs was 44.6±0.4 years, and their mean time in service was 19.7±0.54 years. The most common suggestions were "having a dedicated member of staff of cancer screenings in family health centers", "public education", and "reducing the numbers of patients registered with FPs". FPs most frequently thought that "public education", "health education on the social media and TV", and "reminders issued to patients" might be effective in increasing CRC screening. The methods they regarded as having the least effect were "pamphlets", "reminder leaflets", and "informative texts in newspapers".
Conclusions: Screening programs should be carried out in a multidisciplinary manner, including not only physicians but also other health professionals such as health educators, with a team-based approach.

Keywords: Colorectal cancer, screening, family physician, primary health care

INTRODUCTION

Cancers are a leading cause of death in all countries and one of the main obstacles to rising life expectancies. According to World Health Organization (WHO) estimates for 2019, cancer is the main or second most important cause of death before the age of 70 in 112 out of 183 countries and the third or fourth main cause in another 23 (1). Colorectal cancer (CRC) is a ubiquitous, fatal cancer (2). It is the third most frequently diagnosed cancer in both men and women in Turkey and worldwide. CRCs are the fourth most important cause of cancer-related deaths in Turkey and globally (3, 4). CRCs are a preventable form of cancer with a high likelihood of being treatable

if diagnosed in the early stage. Studies have shown that CRC screening reduces both the incidence and mortality rates (5-9). For example, the incidence of CRC in the USA decreased by 32% between 2000 and 2013, and the mortality rate decreased by 34% between 2000 and 2014 among individuals aged 50 years and older in association with CRC screening (10). Many countries provide screening programs applied at varying age ranges, varying intervals, and using different tests (6, 11-13). In Turkey, all adults aged 50-70 are advised to undergo a fecal occult blood test (FOBT) every two years and a colonoscopy every 10 years for early detection of CRC. It is recommended that individuals with a history of CRC

or of adenomatous polyp in first-degree relatives should start undergoing screening at the age of 40. In addition, individuals with a history of early CRC in first-degree relatives should be screened commencing five years before the age at onset of cancer in those relatives from the age of 40 onward (14). CRC screening is performed free of charge in Turkey under the Health Ministry's 'National Colorectal Cancer Screening Program.' However, the desired levels of CRC screening (70%) have yet to be achieved. Within the scope of the colorectal screening program in the USA, an 80% CRC screening level target was imposed by 2018 (12). However, the CRC screening rate based on all test types (FIT, sigmoidoscopy, colonoscopy, FIT-DNA, and CT colonography) among adults aged 50-75 in 2020 was only 71.6% (15). CRC screening rates have failed to reach adequate levels in many countries, including Turkey. Several possible physician-, patient-, screening test-, or health system-related reasons for this have been reported (16-24).

FPs play an important role in the prevention of cancer, in screening, treatment, and post-treatment and palliative care. FPs serve as "gate-openers/gate-keeper" in the health system (25, 26). Since their recommendations increase the success rates of screening programs, they also play a key role in cancer screening. Due to their long-term relationships with patients, diagnostic errors are reduced, individuals with a low risk of cancer can avoid excessive examinations, and potential costs and damage are reduced to a minimum. One particularly powerful primary factor in the health system is cost-effectiveness. In addition, FP recommendations are a highly important source of motivation in cancer screening (17, 27-29).

The purpose of this study was to evaluate the practices of FPs in terms of CRC screening and their recommendations for improving participation in such programs. FPs' recommendations regarding increasing participation in the CRC screening program are essentially an expression of what they regard as the causes of low participation. Evaluating FPs' opinions regarding CRC screening will be useful in determining measures that can be taken to raise CRC screening rates.

MATERIALS AND METHODS

Approval for the study was granted by the Ondokuz Mayıs University clinical research ethical committee, and all administrative permissions were obtained,

prior to commencement (Date: 24.03.2017, Decision no: OMU KAEK 2017/138). The population of this descriptive type study consisted of 413 FPs working in 143 family health centers in 17 districts of the Turkish province of Samsun. The province of Samsun lies in the north of Turkey and has a population of 1.37 million. The sample was not selected, with all FPs actively working in Samsun during the study period being contacted. The questionnaires were completed at face-to-face interviews. The study was conducted between 15 June and 15 July, 2019. The aim of the study was explained to the FPs prior to commencement. It was explained that participation was on a voluntary basis, and verbal consent was obtained. Three hundred twenty-five (78.9%) took part in the study. A 31-item questionnaire, prepared on the basis of the relevant literature, was employed (5, 9, 16, 17, 19-22, 24, 25, 27, 29). This was tested on 15 physicians working in a community health center before the study began. The first part (7 item) contained questions regarding FPs' sociodemographic characteristics and working conditions. In the second part (13 item), the FPs were asked to respond to statements concerning CRC screening. The third part (11 item) involved FPs' recommendations concerning how CRC screening might be increased. "What is the frequency of colorectal cancer?", "What rank does colorectal cancer rank in terms of mortality?", "What is the rate of CRC screening in the at-risk group in the city where you work (Samsun)" and "Do you have any recommendation concerning increasing CRC screening?" were asked open-ended questions. Other questions were answered yes or no.

Table 1. Family Physicians' Demographic and Working Characteristics

	Number	Percentage
Gender		
Male	211	64.9
Female	114	35.1
Marital status		
Married	288	88.6
Single/widow/divorce	37	11.4
Workplace		
Urban	144	44.3
Outlying district	146	44.9
Rural	35	10.8
	Mean±SE	**Min-Max**
Age	44.6 ± 0.4	26.0 - 63.0
Profession time	19.7 ± 0.4	1.0 - 37.0
Patients per day	59.1 ± 0.1	8.0 - 110.0

The questionnaire data were transferred onto IBM SPSS Statistics version 22.0 software. These data were analyzed as number and percentage. The chi-square test was applied in the comparison of grouped data. p values <0.05 were regarded as statistically significant.

RESULTS

Demographic and Working Characteristics of FPs: Three hundred twenty-five (78.9%) FPs took part in the study. Men represented 64.0% of the participants, 88.6% were married, the participants' mean age was 44.6±0.4 years, and their mean length of time in the profession was 19.7±0.4 years (Table 1). FPs were 14.4% of 10 years or less in time in the profession, and 15.1% were 40 years or younger. The FPs were asked how many individuals they served a day, and the amount of time they devoted to each patient. Their answers revealed a mean number of patients seen per day 59.1±0.1 (min-max: 8-110), and a median time of 5 min per patient (min-max: 5-20).

Awareness of FPs about CRC: FPs were also asked about the prevalence of CRC and its place among the most common causes of cancer. The rate of FPs who answered correctly is 67.1% and 57.2% (the correct response was 3). The participants were asked "What is the rate of CRC screening in the at-risk group in the city where you work (Samsun)" The rate of those who

Table 2. Opinions and Practices of Family Physicians Regarding CRC Screening

	Yes Percentage
Can CRC be prevented by screening programs?	76.4
Do you recommend CRC screening to your patients?	98.7
Do you order FOBT for your patients?	99.7
What do you do when the FOBT is positive?	
I repeat the test	16.1
I refer the patient to the specialist	83.9
Do you trust FOBT you use?	75.0
Do you recommend colonoscopies to patients with positive FOBT results?	93.4
Do your patients with positive FOBT results undergo colonoscopies?	85.2
Do you ask your patients to bring you their colonoscopy reports?	81.6
Do your patients send you their colonoscopy reports?	71.1
Can you perform FOBT for your patients attending FHC free of charge?	100.0
Have you received training on CRC risk factors in the last five years?	63.8
Do you have a special reminder for CRC on your computer for patients attending examinations?	87.4
If so, is there a place for this person's risk factors?	51.7*
If so, is there any information about family history in this section?	51.7*
Can you provide educational information about CRC screening to your patients?	71.7
Do you need additional staff to train your patients about CRC screening?	66.1
Do you think there is a need to increase CRC screening?	92.8

*As a proportion of physicians with CRC reminder sections on their computers (87.4%-284 individuals)

Table 3. Family Physicians' Recommendations for Increasing CRC Screening

	Number*	Percentage**
A dedicated member of staff being appointed for cancer screening	24	18.6
Public education	15	11.6
Reducing numbers of patients registered with family physicians	14	10.8
Mandatory applications/sanctions on individuals failing to comply	12	9.3
Public service announcements	9	6.9
Use of social media	6	4.6
TV broadcasts	5	3.8
Increasing the number of units where screening is performed	5	3.8
Public training	4	3.1
Frequent supervision of family physicians, and warnings or sanctions against those who fail to comply	4	3.1
Screening being performed in community health centers	4	3.1
Leaflets/visual stimuli	2	1.5
Incentivization	2	1.5
Sending letters or SMS	2	1.5
Increasing the validity of screening tests	1	0.7
Setting aside a special day for cancer screening	1	0.7
Calling patients on the phone for screening. Issuing invitations	1	0.7
Routine screening in hospitals	1	0.7
Organizing campaigns	1	0.7
Mobile screening tools	1	0.7
Sending kits to homes	1	0.7
Changing the health system	1	0.7

*More than one response was given.**AS a proportion of individuals (n=129) making recommendations for increasing CRC screening

answered correctly is 13.2% (the correct response was 14.2%). There is no statistically significant difference between physicians who answered correctly and other physicians in terms of gender, age, time in the profession and the region of work (p<0.05).

Opinions of FPs on CRC screening: FPs' opinions and practices concerning CRC screening are shown in Table 2. Accordingly, 76.4% of FPs thought that CRC can be prevented through screening programs. More than half of FPs recommended CRC screening, fecal occult blood test (FOBT), and colonoscopy for suitable patients and though that CRC screening rates needed to be improved. However, 25% of FPs stated that they did not trust the FOBT they employed. Analysis showed that 81.6% of FPs wished to see the colonoscopy reports, but only 71.1% stated that patients actually brought those reports to them. A history of CRC among family or friends was present among 28.1% of FPs. No significant difference was determined between FPs with or without family histories of CRC in terms of thinking that CRC can be prevented through screening programs (p=0.556), recommending CRC screening (p=0.276), having FOBTs performed (p=0.551), confidence in the FOBT (p=0.591), or recommendation of colonoscopy (p=0.579). No significant difference was determined in terms of FPs gender, age, time in the profession and place of work CRCs can be prevented with a screening program (p=0.347; p=0.487; p=0.588; p=0.492), the status of recommending CRC screening (p=0.556; p=0.147; p=0.781; p=0.321), the status of performing GGT (p=0.187; p=0.544; p=0.922; p=0.224), the status of trusting the FGK test (p=0.811; p=0.098; p=0.122; p=0.080), and the cases of recommending colonoscopy (p=0.254; p=0.078; p=0.760; p=0.388). While 71.7% of FPs thought they could educate their patients about CRC screening, 66.1% reported needing additional personnel to provide that education. Finally, 87.4% of FPs reported having a special reminder section on their computers concerning CRC for patients attending their clinics.

Recommendations of FPs to increase CRC screening: The open-ended question "Do you have any recommendation concerning increasing CRC screening?" was asked, and 39.7% of FPs made at least one recommendation. The distribution of the recommendations received is shown in Table 3. The FPs most frequently recommended 'The employment of a dedicated member of staff for cancer screening

Table 4. Levels of Support among Family Physicians for Methods That May Be Effective in Increasing CRC Screening

	Percentage
Public education	96.0
Health information on social media and TV	95.3
Reminder messages being sent to patients	86.0
Health worker education	85.7
Billboard advertisements	85.4
Reminder phone calls being made to patients	84.1
Posters	83.4
Reminder letters to be sent to patients	83.4
Pamphlets	79.7
Reminder leaflets	77.7
Newspaper information notices	74.1

in family health centers", "public education" and "reducing the numbers of patients registered with FPs". FPs' levels of support for measures that might be effective in increasing CRC screening are shown in Table 4. FPs most frequently considered that "public education", "health education on social media and TV", and "reminder messages sent to patients" would be effective. The measures they thought would have the least impact on CRC screenings were "leaflets", "reminder letters", and "newspaper notices".

DISCUSSION

Awareness of FPs about CRC
The great majority of FPs correctly identified the rankings of CRC among all forms of cancer in terms of prevalence and mortality in Turkey. However, they were unaware of the correct CRC screening rate in the province where they lived and worked, citing a much higher figure than the reality. All countries have their own specific CRC screening programs. The rate of participation in national CRC screening programs in different countries ranges between 2% and 80%. The CRC screening participation rate in Turkey in 2016 was 20-30% (14). The FPs in the present study citing a CRC screening participation rate approximately twice as high as the true figure may derive from their receiving inadequate feedback from health managers, or to insufficient interest in the subject. Exchanges of information between health managers and FPS needs to be raised to a higher level in order to correct this.

Opinions of FPs on CRC screening: The great majority of FPs participating in this study thinks that

CRC can be prevented by means of screening programs. No significant difference was determined between FPs with relatives diagnosed with CRC and those without in terms of attitudes toward or application of CRC screening. There was no difference in the approach of FPs to CRC screening in terms of gender, age, time in the profession and place of work. This situation shows that the barriers to CRC screenings stem from the health organization or working conditions rather than FPs.

Recommendations of FPs to increase CRC screening: Approximately 60% of FPs made no recommendation regarding increasing CRC screening. FPs are aware of the scale of the threat to health posed by CRCs, and think that screening can contribute to solving the problem. However, they made no recommendations regarding that solution. This may be due to their not 'putting their minds' to increasing CRC screening, or to a lack of confidence that CRC screening can be increased.

Those FPs who did suggest recommendations for increasing CRC screening most frequently proposed "The employment of a dedicated member of staff for cancer screening in family health centers", "public education", and "reducing the numbers of patients registered with FPs". FPs were given a number of propositions for increasing participation in screening programs and were asked to indicate how effective they thought these would be. FPs most frequently considered that "public education", "health education on social media and TV", and "reminder messages sent to patients" would be effective in increasing participation.

Significant work has been done to identify and evaluate obstacles to CRC screenings, and numerous factors have been identified (18). A systematic review concerning participation in publicly available CRC screening programs summarized barriers to screening as 'fear of cancer', 'not knowing how to conduct the test', 'mental health' and 'lack of knowledge about the test.' Factors encouraging taking part in screening included 'being supported by general practitioners' and 'knowing someone who has participated in the CRC screening program' (18). In a study from the USA, individuals cited "not wanting to handle stool" and "not wanting to keep the cards with the stool sample in the hands" as pretexts for not participating in a screening program based on the FOBT (30). In another study from the USA, non-participation in screening was reported to derive from "lack of awareness" and "inadequate health provider counseling" (31). In a study from Denmark, the most important reasons for participating in CRC screening were described as "receipt of a personal letter containing an invitation to take part in CRC screening" and "payment not being requested" (32). A study involving general practitioners described "include patient discomfort with the screening method offered, cost, and perceived low importance of screening" as the most frequent barriers to participation in CR screening (33). According to a systematic review, the following are the main obstacles to screening for CRC in Turkey: As lack of knowledge about screening, lack of knowledge about cancer symptoms, low self-perception of risk, fear of the positive result, be ashamed to have screening, lack of time, financial impossibility, do not having a family history of cancer, painful and aching procedure, problem of accessing the screening, not having any complaints, not trusting the screening and do not recommend screening tests by healthcare professionals (34).

It may not be possible to target and change all the obstacles to participation in CRC screening. However, increasing public awareness and knowledge has been described as capable of ensuring higher participation (18). It has also been reported that logistical problems can be eliminated by providing technical guidance and materials together with logistical support from screening centers or general practitioners (18). FPs' recommendations for increasing participation in CRC screening programs are essentially an expression of what they regard as the reason for low uptake. We think that the sensitivity of FPs concerning public education in Turkey is associated with their seeing a lack of public knowledge on the subject and their belief that participation can be increased through public education.

Barriers to CRC screening: The average number of patients seen by the FPs in this study was 59 per day. In Ireland, GPs in solo practice is an average consultation rate of 32 daily. GPs in group practices are an average of 29 consultations per day with (35). In the US, the largest percentage of physicians saw between 11 and 20 patients per day. Only 1.3% of physicians saw between 51 and 60 patients per day (36). In Canada, family physicians see an average of 70-125 patients per week (37). Our results suggest that FPs in Turkey is under severe workload pressure. According to one study, primary care providers were estimated to need 26.7 h/day, including 14.1 h/day for preventive care, 7.2 h/day for

chronic care, 2.2 h/day for acute care, and 3.2 h/day for documentation and inbox management (38). Educating patients about CRC and screening was reported by 71.7% of FPs in this study. However, it is impossible to conclude that FPs can provide sufficient education with such a workload. In our country, as well as in the rest of the world, excessive workload is an obstacle to the full performance of primary health care workers.FPs recommending that a dedicated member of health staff be appointed for screening may be a reflection of this. The methods that FPs regarded as having the least effect on participation in CRC screening were "pamphlets", "reminder leaflets", and "informative texts in newspapers". The world is changing rapidly, newspaper consumption rates in Turkey are declining fast, and use of social media in increasing. From that perspective, FPs think that old-fashioned medical practices may not be effective.

CRC screening in Turkey is free of charge. A large number of FPs reported having sections for CRC scanning on their computers, referring appropriate patients for CRC scanning, and asking patients to bring their colonoscopy reports to them. However, CRC screening rates in the province where they work are very low. We think that this shows that the problem cannot be solved merely by FPs making suggestions to their patients, and that many social, cultural, and logistical difficulties must be overcome.

Strengths and Limitations
This is the first study on the subject to be conducted with all FPs in a province in Turkey. Approximately 80% of FPs took part. However, the fact that the study was performed in only one province may make it difficult to generalize the results. In addition, the use of a self-report questionnaire may have led to bias.

CONCLUSION
FPs were aware of the great threat to health posed by CRC and think that screening can contribute to solving the problem. However, only 39.7% of FPs made suggestions concerning how screening might be increased. FPs most frequently thin that "public education", "health education on the social media and TV" and "reminders issued to patients" may be effective in increasing CRC screening. The methods they regarded as having the least effect on CRC screening are "pamphlets", "reminder leaflets", and "informative texts in newspapers".The workload in family health centers is high. This affects participation in CRC screening programs. Cancer screenings

should be carried out based on a new understanding, not only by physicians and family health personnel, but also by a multidisciplinary team, including other health professionals such as health educators, within a team approach. For this reason, family health centers should be supported both by health personnel and technically. Improving patients' understanding of the importance of CRC screening, educational interventions using mass media, and culturally adapting education to populations where education is difficult to deliver may contribute to overcoming the problem. In addition, there is a need for arrangements with the health services organization.

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ONLINE LEARNING SELF-EFFICACY IN CARDIOPULMONARY PHYSIOTHERAPY: PERCEPTIONS OF NEW GRADUATES

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ABSTRACT

Purpose: Rapid transition to distance learning during COVID-19 pandemic induced educators of hands-on professions to explore effectiveness of online learning. We aimed to investigate online learning self-efficacy in cardiopulmonary physiotherapy.
Materials and Methods: Group 1 included graduates underwent only face-to-face learning while group 2 consisted of graduates underwent face-to-face and online learning. A questionnaire was developed by the authors including competencies in cardiopulmonary physiotherapy assessment and treatment skills to assess self-efficacy. The questionnaires were sent via e-mail.
Results: Fifty-four graduates in group 1 and 82 graduates in group 2 responded to the questionnaires (response rate: 27%). No significant difference was found between groups in terms of self-efficacy in cardiopulmonary physiotherapy assessment and treatment skills. Self-efficacy in practical domain of exercise tests was higher in group 1 (p=0.021). Practical courses related to cardiopulmonary physiotherapy and type of education had negative effects on career plans in cardiopulmonary physiotherapy in group 2 (p=0.032 and p=0.001, respectively). Duration of clinical practice was positively correlated with practical cardiopulmonary physiotherapy assessment (p=0.005) and treatment (p=0.047) in group 2.
Conclusion: Online learning seems to be a feasible option to develop adequate self-efficacy in cardiopulmonary physiotherapy. However, practical courses, type of education and duration of clinical internship are important for future career plans in cardiopulmonary physiotherapy.

Key words: Online learning, self-efficacy, cardiopulmonary physiotherapy

INTRODUCTION

Physiotherapy is a practical "hands-on" profession where physical touch is considered as its fundamental element (1,2). Thus, physiotherapy education is based on a performance-based learning approach which aims to increase students' knowledge and skills by utilizing role modelling, communication, and the development of practical skills to prepare those to meet the demands of clinical practice (2,3). Learning practical skills is the core component of the physiotherapy curriculum (4). Therefore, face-to-face learning is considered as the most appropriate teaching method for physiotherapy profession as it allows students to gain required skills and knowledge to work independently after graduation. From the graduating physiotherapy students' point of view, "connecting theory and practice" and "the role of clinical supervisors" are the

two main factors for professional development indicating the importance of practical classes and clinical placements in physiotherapy education (4).

Outcome measures focusing on student performance in clinical settings, one of which is task-specific confidence or self-efficacy, helps to determine professional development in health professional students. Self-efficacy is suggested to be the link between skills, knowledge and performance (5). Bandura defines self-efficacy as a person's belief about his/her capability to perform at a certain level depending on the capacity to use his/her skills and knowledge (6). Self-efficacy can be influenced by three main factors: 1) performance mastery being the strongest source of self-efficacy for an individual which is related to direct practice, 2) vicarious experiences which is related to observation and modelling of others, 3) verbal or social persuasion which is related to individual's beliefs regarding his/her ability to cope with challenging tasks or situations (7). All of these factors indicate the importance of face-to-face learning, mostly including clinical practice in health professional education. Given the significance of self-efficacy, its assessment in entry-level health professional education is worthy of further consideration, specifically after the mandatory transition to online learning.

The Coronavirus Disease 2019 (COVID-19) pandemic was a challenge for educational systems all over the world. In many countries, governments decided to stop face-to-face education as a part of lockdowns. Council of Higher Education in Turkey suspended education at all universities for a week with the decision taken by the government on March 12, 2020. During this period, the opportunities and capacities of universities for distance education were determined. All decisions taken about curriculum, infrastructure, human resources, content, and implementation were swiftly put into practice (8). Teaching was mandatorily delivered in an online-only mode for the remainder of spring semester. During the early period, classes were taught online via online platforms. Thereafter, our university started to use the institutional online platform *(online.deu.edu.tr)* for both synchronous and asynchronous teaching. For the following academic year, started in October 2020, a hybrid model of education (online and face-to-face learning) was implemented. The rapid switch to online learning method was an unexpected situation rather than a well-planned adaptation for both students and educators.

A number of studies have addressed self-efficacy specific to different domains in health care education regarding its effect on student motivation, clinical performance and career development (9-11). After the COVID-19 pandemic, researches have focused on the outcomes of online learning mostly in first level of university education (12,13). In addition to the relevant studies in the field of physiotherapy education before (14-16) and after the COVID-19 Pandemic (1,3,17), the aim of the current study was to gain insight into what had happened to cardiopulmonary physiotherapy education during the pandemic through investigating the effect of online learning on new graduate physiotherapists' self-efficacy specific for cardiopulmonary physiotherapy.

MATERIALS AND METHODS
Participants
The entire sample consisted of all graduate physiotherapists of Dokuz Eylul University, Faculty of Physical Therapy and Rehabilitation (formerly School of Physical Therapy and Rehabilitation) between 2018 and 2021 academic years (n=506). Group 1 consisted of the graduates of 2017-2018 and 2018-2019 academic years who underwent only face-to-face learning (n=117 and n=157, respectively). Group 2 consisted of the graduates of 2019-2020 and 2020-2021 academic years who underwent face-to-face learning and online learning (n=111 and n=121, respectively). The data were collected between January 2021 and June 2021.

The study was conducted in accordance with the ethical standards of Helsinki Declaration and was approved by the Institutional Non-invasive Research Ethics Board (Date: 23.11.2020, Decision No: 2020/28-32).

Data collection
A thorough search of the literature yielded no published instrument to measure self-efficacy related to cardiopulmonary physiotherapy in physiotherapy professionals and/or students. Therefore, a survey was designed to measure self-efficacy in cardiopulmonary physiotherapy by the authors including basic theoretical and practical competencies. The survey design was guided by Bandura's theory of self-efficacy scale construction guidelines and was divided into two components as self-efficacy measure and socio-demographic questions (18). Graduates were asked by e-mail

about their willingness to participate in the study before completing the online questionnaire. All the e-mail addresses were recorded from the students' office of the faculty.

Self-efficacy in cardiopulmonary physiotherapy
Self-efficacy is a task-specific confidence. Therefore, Bandura suggests measuring it specific to one area or domain (18). Specific self-efficacy scales are thought to be more predictive for the behavior under study compared to general ones. Therefore, in this current study, we have designed to measure the perceived level of confidence tailored to competencies in cardiopulmonary physiotherapy assessment and treatment skills. Each item was developed based upon the curriculum of undergraduate physiotherapy education at Dokuz Eylul University. All the items were prepared in accordance with the learning objectives and learning outcomes of theoretical and practical courses and clinical practices related to cardiopulmonary physiotherapy. As a result, we have determined 32 items under two main sub-dimensions as "physiotherapy assessment methods" (15 items) and "physiotherapy treatment methods" (17 items) in order to measure self-efficacy in theoretical and practical competencies in cardiopulmonary physiotherapy (Appendix 1). In the self-efficacy questionnaire consisting of 32 items, 5-point Likert type scoring (ranging from 1= very little confidence to 5= a lot of confidence) was used for each item. As a result, five different scores were calculated including assessment methods-theoretical, assessment methods-practical, treatment methods-theoretical, treatment methods-practical and total score. The scores ranged between 17-85 for physiotherapy assessment methods and 15-75 for physiotherapy treatment methods. The total score ranged from 64 to 320, higher scores indicating greater self-efficacy. To pilot the survey, it was sent to five physiotherapy new graduates who were asked to comment on comprehensibleness, applicability and feasibility. They have reported that the survey was simple to complete for each item. These respondents were not included in the analysis, only their feedback was used for minor adjustments.

Socio-demographic questions
Socio-demographic data including age, gender, graduation year, type of education for theoretical and practical cardiopulmonary physiotherapy courses (obligatory and elective), experiences of clinical practical courses, experiences of clinical practice related to cardiopulmonary physiotherapy, career plans and related factors in cardiopulmonary physiotherapy were collected.

Statistical analysis
Statistical analyses were performed using SPSS Version 24 (Chicago, IL, USA). Continuous variables were expressed as mean and standard deviations while categorical variables were expressed as numbers (n) and percentages (%). Differences between the groups were analyzed with Mann-Whitney U test for age, duration of clinical practice and self-efficacy including four subgroups and total scores. The association between duration of clinical practice and self-efficacy was determined by Spearman correlation coefficient. The strength of correlations was classified as very weak ($r=0–0.19$), weak ($r=0.2–0.39$), moderate ($r=0.40–0.59$), strong ($r=0.6–0.79$), and very strong ($r=0.8–1$). Factors affecting career plans in cardiopulmonary physiotherapy were compared using Chi-Square test. Statistical significance level was set at $p<0.05$.

RESULTS
Fifty-four physiotherapists (20 male, 34 female; 25±1.06 years of age) graduated in 2018 and 2019 who underwent only face-to-face learning (Group 1) and 82 physiotherapists (22 male, 60 female; 23.5±1.07 years of age) graduated in 2020 and 2021 who underwent face-to-face learning and online learning (Group 2) responded to the online survey. The total response rate was 27%. According to post-hoc power analyses the power of the study was 9.036%.

Socio-demographic data collection provided the information of age, gender, clinical placements related to cardiopulmonary physiotherapy, theoretical obligatory and elective courses in cardiopulmonary physiotherapy during the 4-year physiotherapy education. Age was significantly higher in group 1 compared to group 2 ($p<0.01$). Under normal circumstances, four-year physiotherapy education in our faculty includes a 4-week clinical practice in summer after the completion of each second and third years. In the 4th year, the internship includes a 15-week clinical placement in each semester. Group 1 completed all these clinical practice courses, while group 2 completed only 2nd year clinical practice during only face-to-face learning. Fifty-six graduates

Table 1. Socio-demographic data of the groups

	Group 1 *(n=54)*	Group 2 *(n=82)*
Age, *years*	25.0 ± 1.06*	23.5 ± 1.07
Gender, *n (%)*		
Female	34 (63.0)	60 (73.2)
Male	20 (37.0)	22 (26.8)
Duration of face-to-face clinical placements, *months*	32.7 ± 14.3*	24.5 ± 13.5
Clinical placements	n (%)	n (%)
Cardiology		
Yes	38 (70.4)	43 (52.4)
No	16 (29.6)	39 (47.6)
Cardiovascular surgery		
Yes	39 (72.2)	46 (56.1)
No	15 (27.8)	36 (43.9)
Chest diseases		
Yes	47 (87.0)	34 (41.5)
No	7 (13.0)	48 (58.5)
Thoracic surgery		
Yes	25 (46.3)	35 (42.7)
No	29 (53.7)	47 (57.3)
Internal medicine		
Yes	41 (76.0)	55 (67.1)
No	13 (24.0)	27 (32.9)
General surgery		
Yes	28 (51.9)	40 (48.8)
No	26 (48.1)	42 (51.2)
Pediatrics		
Yes	47 (87.0)	64 (78.0)
No	7 (13.0)	18 (22.0)
Oncology		
Yes	44 (81.5)	47 (57.3)
No	10 (18.5)	35 (42.7)
Anesthesiology intensive care unit		
Yes	24 (44.4)	28 (34.1)
No	30 (55.6)	54 (65.9)
Internal medicine intensive care unit		
Yes	25 (46.3)	33 (40.2)
No	29 (53.7)	49 (59.8)
Obligatory theoretical courses		
Internal medicine		
Face-to-face	54 (100)	82 (100)
Online	-	-
Surgical medicine		
Face-to-face	54 (100)	78 (95.1)
Online	-	4 (4.9)
Cardiac physiotherapy		
Face-to-face	54 (100)	67 (81.7)
Online	-	15 (18.3)
Pulmonary physiotherapy		
Face-to-face	54 (100)	75 (91.5)
Online	-	7 (8.5)
Pediatric cardiopulmonary physiotherapy		
Face-to-face	54 (100)	61 (74.4)
Online	-	21 (25.6)
Elective theoretical courses**		
Physiotherapy in lung diseases		
Face-to-face	39 (100)	31 (49.2)
Online	-	32 (50.8)
Physiotherapy in palliative care		
Face-to-face	42 (100)	36 (80.0)
Online	-	9 (20.0)
Physiotherapy in organ transplantation		
Face-to-face	38 (100)	35 (83.3)
Online	-	7 (16.7)
Oncologic physiotherapy		
Face-to-face	42 (100)	39 (84.8)
Online	-	7 (15.2)
Home care and physiotherapy		
Face-to-face	37 (100)	40 (83.3)
Online	-	8 (16.7)

*Mann Whitney U test; p<0.01. ** For the elective courses, percentages were calculated according to the total number of students who has selected the related course.

Table 2. Comparison of the groups in terms of self-efficacy in cardiopulmonary physiotherapy

	Group 1 *(M ± SD)*	Group 2 *(M ± SD)*	*p*
Assessment-*Theoretical (Min:17-Max:85)*	69.2 ± 8.3	69.6 ± 10.3	0.659
Assessment-*Practical (Min:17-Max:85)*	68.5 ± 10.0	66.2 ± 11.6	0.428
Treatment-*Theoretical (Min:15-Max:75)*	65.8 ± 7.8	65.7 ± 7.3	0.955
Treatment-*Practical (Min:15-Max:75)*	63.8 ± 7.9	62.3 ± 9.1	0.462
Total score *(Min:64-Max:320)*	267.4 ± 30.1	263.9 ± 34.2	0.681

Min: Minimum, Max: Maximum, M: Mean, SD: Standard Deviation; Mann Whitney U test

Table 3. Comparison of the groups in terms of self-efficacy in cardiopulmonary physiotherapy-*Assessment*

Competencies		Group 1 (M ± SD)	Group 2 (M ± SD)	*p*
Chest circumference measurement	T	4.1 ± 0.8	4.1 ± 0.8	0.632
	P	4.0 ± 0.8	4.0 ± 0.9	0.698
Measuring respiratory rate	T	4.7 ± 0.4	4.7 ± 0.4	0.436
	P	4.6 ± 0.4	4.5 ± 0.6	0.356
Measuring heart rate	T	4.7 ± 0.4	4.7 ± 0.4	0.973
	P	4.6 ± 0.5	4.4 ± 0.7	0.312
Measuring blood pressure	T	4.3 ± 0.7	4.3 ± 0.7	0.867
	P	4.1 ± 0.9	4.1 ± 0.8	0.607
Palpation of peripheral pulses	T	4.2 ± 0.7	4.1 ± 0.8	0.787
	P	4.1 ± 0.7	3.8 ± 0.9	0.251
Monitorization	T	3.0 ± 1.0	3.3 ± 1.1	0.228
	P	3.1 ± 1.1	3.1 ± 1.1	0.954
Inspection	T	4.3 ± 0.6	4.4 ± 0.7	0.312
	P	4.1 ± 0.8	4.0 ± 0.9	0.688
Assessment of dyspnea	T	4.4 ± 0.6	4.3 ± 0.7	0.955
	P	4.2 ± 0.6	4.2 ± 0.8	0.835
Assessing symptoms of respiratory distress	T	4.4 ± 0.5	4.4 ± 0.6	0.511
	P	4.2 ± 0.6	4.1 ± 0.8	0.635
Assessment of accessory muscles for breathing	T	4.3 ± 0.6	4.2 ± 0.7	0.806
	P	4.2 ± 0.7	3.9 ± 0.9	0.128
Assessment related to mechanical ventilation	T	3.3 ± 1.08	3.4 ± 1.09	0.532
	P	3.2 ± 1.09	3.1 ± 1.08	0.462
Auscultation	T	3.2 ± 1.12	3.5 ± 1.06	0.221
	P	3.3 ± 1.2	3.1 ± 1.07	0.181
Chest wall palpation	T	4.1 ± 0.8	4.1 ± 0.7	0.998
	P	4.1 ± 0.8	4.0 ± 0.8	0.578
Assessment of chest pain	T	4.1 ± 0.8	4.1 ± 0.8	0.632
	P	4.0 ± 0.8	4.0 ± 0.9	0.698
Exercise testing	T	3.9 ± 0.9	3.8 ± 1.14	0.796
	P	3.8 ± 1.04	3.4 ± 1.07	**0.021***
Assessment of respiratory muscle strength	T	3.7 ± 1.06	3.6 ± 1.17	0.623
	P	3.6 ± 107	3.5 ± 1.1	0.355
Assessment of peripheral muscle strength	T	4.2 ± 0.8	4.3 ± 0.7	0.473
	P	4.1 ± 0.9	4.1 ± 0.8	0.897

T: Theoretical, P: Practical, M: Mean, SD: Standard Deviation; *p<0.05, Mann Whitney U test

in group 2 accomplished 3rd and first semester of 4th year clinical practice courses while 31 graduates completed second semester's clinical placement in the 4th year. During the online learning process, all these clinical practices were postponed and clinical scenarios, clinical problem solving, and case studies were implemented through synchronous and asynchronous methods. As a result, 26 graduates completed 3rd year's and 51 graduates completed 4th year's clinical practices through online learning in group 2. Duration of face-to-face clinical placements in group 1 was significantly higher than group 2 (p<0.01) (Table 1).

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Table 4. Comparison of the groups in terms of self-efficacy in cardiopulmonary physiotherapy-*treatment*

Competencies		Group 1 (M ± SD)	Group 2 (M ± SD)	p
Breathing control	T	4.5 ± 0.5	4.5 ± 0.5	0.779
	P	4.4 ± 0.5	4.4 ± 0.6	0.978
Active cycle of breathing technique	T	4.5 ± 0.5	4.5 ± 0.5	0.779
	P	4.4 ± 0.5	4.4 ± 0.6	0.978
Thoracic expansion exercises	T	4.5 ± 0.5	4.5 ± 0.5	0.926
	P	4.4 ± 0.6	4.3 ± 0.6	0.588
Diaphragmatic breathing exercise	T	4.5 ± 0.5	4.5 ± 0.5	0.971
	P	4.4 ± 0.6	4.3 ± 0.6	0.457
Forced expiration technique	T	4.4 ± 0.6	4.4 ± 0.5	0.821
	P	4.4 ± 0.6	4.2 ± 0.7	0.204
Coughing	T	4.4 ± 0.6	4.4 ± 0.5	0.821
	P	4.4 ± 0.6	4.2 ± 0.7	0.204
Incentive spirometry	T	3.9 ± 0.9	4.1 ± 0.8	0.236
	P	3.8 ± 0.9	3.9 ± 0.9	0.635
Postural drainage techniques	T	4.1 ± 0.9	4.1 ± 0.6	0.985
	P	4.1 ± 0.8	3.9 ± 0.8	0.197
Manual techniques (percussion, vibration, shaking)	T	4.4 ± 0.6	4.4 ± 0.6	0.935
	P	4.3 ± 0.6	4.2 ± 0.6	0.340
Mobilization	T	4.5 ± 0.6	4.5 ± 0.5	0.364
	P	4.5 ± 0.5	4.3 ± 0.6	0.251
Transfer activities	T	4.5 ± 0.6	4.4 ± 0.5	0.551
	P	4.4 ± 0.6	4.3 ± 0.6	0.297
Management of dyspnea	T	4.4 ± 0.6	4.4 ± 0.7	0.984
	P	4.2 ± 0.6	4.3 ± 0.7	0.495
Inspiratory muscle training	T	4.1 ± 0.7	4.1 ± 0.7	0.946
	P	3.9 ± 0.9	3.8 ± 0.9	0.972
Therapeutic exercises	T	4.3 ± 0.6	4.2 ± 0.7	0.747
	P	4.3 ± 0.6	4.1 ± 0.9	0.338
Aerobic exercise training	T	4.4 ± 0.6	4.3 ± 0.6	0.319
	P	3.3 ± 0.6	3.1 ± 0.8	0.121

T: Theoretical, P: Practical, M: Mean, SD: Standard Deviation; Mann Whitney U test

When the groups were compared in terms of self-efficacy in cardiopulmonary physiotherapy, no significant difference was found (Table 2). Table 3 shows the comparison of the groups in terms of each item within theoretical and practical domains for assessment skills in cardiopulmonary physiotherapy. Self-efficacy of the new graduates in group 1 was significantly higher than group 2 in terms of practical component of "exercise testing" (p=0.021). Table 4 presents the data regarding the comparison of the groups in terms of each item within theoretical and practical domains for treatment skills in cardiopulmonary physiotherapy. No significant difference was found in terms of any items between the groups. Duration of face-to-face clinical placement was positively correlated with self-efficacy in practical domains of both assessment (r=0.304, p=0.005) and treatment (r=0.220, p=0.047) parameters, and total self-efficacy (r=0.255, p=0.021) in group 2.

We also surveyed the factors, which have the possibility to have negative or positive effect on career plans of new graduate physiotherapists in cardiopulmonary physiotherapy. "Practical courses related to cardiopulmonary physiotherapy" and "type of education" were the two negative factors for group 2 compared to the graduates of group 1 (Table 5).

DISCUSSION

This study has provided insight into the effects of online learning during the COVID-19 pandemic on the self-efficacy of new graduate physiotherapists in cardiopulmonary physiotherapy. Our main findings indicated no significant difference in terms of self-efficacy in both theoretical and practical cardiopulmonary physiotherapy skills between new graduates undergone only face-to-face learning and new graduates undergone face-to-face and online learning. The only significant difference occurred in terms of the practice of the item including "exercise

testing" which requires mainly practical experience among theoretical and practical competencies of all items. Moreover, "practical courses related to cardiopulmonary physiotherapy" and "type of education" negatively affected future career plans of new graduated physiotherapists in cardiopulmonary physiotherapy who had undergone face-to-face and online learning.

The drastic transition to online learning during the COVID-19 pandemic was an unexpected obligation rather than a well-planned, informed choice. This global situation prompted the researchers to investigate the perceptions of students/educators, advantages or disadvantages of online learning, specifically for the higher-level education relying on hands-on practice, such as physiotherapy. Physiotherapy students preferred traditional classes compared to online sessions for achieving learning outcomes of practical skills and social competencies in Yan et al.'s study (17). Parallel to the findings, Ranji et al. also indicated a preference of physiotherapy students on behalf of traditional classroom teaching to develop better hands-on skills (19). Despite

students' point of view, physiotherapy educators found online learning partially effective, even though it was impossible to teach psychomotor and communication skills in an online-only platform (1). Similarly, in another study, physiotherapy educators from three different countries described teaching during the pandemic as one of the most challenging experiences of their professional careers due to difficulties in making authentic connections with students, adapting to technological interruptions, assessment of student understanding of content, and managing work-life balance (20).

In spite of abovementioned studies, online learning self-efficacy of physiotherapy students during the COVID-19 pandemic has rarely been investigated. There is limited data indicating controversial results. In Madi et al.'s study, online learning self-efficacy and academic self-efficacy were found to be significantly decreased, in which those were assessed at the initial stages of online learning and 12 months thereafter (21). However, Szekeres and MacDermid compared the results of in-person stake-holder-hosted, interactive, problem-based seminars versus online

Table 5. Factors affecting career plans in cardiopulmonary physiotherapy.

	Group 1 (n=54) n (%)	Group 2 (n=82) n (%)	p
Type of education (face-to-face or online learning)			
Negative	2 (3.7)	22 (26.8)	**0.001ᵞ**
Positive	52 (96.3)	60 (73.2)	
Practical courses related to cardiopulmonary physiotherapy			
Negative	3 (5.6)	15 (18.3)	**0.032***
Positive	51 (94.4)	67 (81.7)	
Theoretical courses related to cardiopulmonary physiotherapy			
Negative	3 (5.6)	7 (8.5)	0.515
Positive	51 (94.4)	75 (91.5)	
My practical knowledge in cardiopulmonary physiotherapy			
Negative	12 (22.2)	27 (32.9)	0.177
Positive	42 (77.8)	55 (67.1)	
My theoretical knowledge in cardiopulmonary physiotherapy			
Negative	5 (9.3)	16 (19.5)	0.105
Positive	49 (90.7)	66 (80.5)	
My professional competency in cardiopulmonary physiotherapy			
Negative	17 (31.5)	35 (42.7)	0.188
Positive	37 (68.5)	47 (57.3)	
Role model characteristics of lecturers of the department of cardiopulmonary physiotherapy			
Negative	3 (5.6)	8 (9.8)	0.379
Positive	51 (94.4)	74 (90.2)	
Job opportunities in cardiopulmonary physiotherapy			
Negative	9 (16.7)	11 (13.4)	0.601
Positive	45 (83.3)	71 (86.6)	

*p<0.05, ᵞp<0.01; Chi-Square test

problem-based tutorials on self-efficacy to implement outcome measures in practice among physical and occupational therapists and found no significant difference between the two methods six months following the interventions suggesting online learning was as good as face-to-face learning for improving and retaining self-efficacy (22). Similarly, Scott et al. indicated no significant difference between pediatric physical therapy curriculum delivered via classroom-based, online, or hybrid instruction in promoting pediatric-specific growth in student self-efficacy (23). Our findings are parallel to the results of the last two studies indicating similar effects of online learning and face-to-face learning on physiotherapy students' self-efficacy. However, in contrast to similar studies, we have investigated domain-specific self-efficacy rather than general self-efficacy, in line with Bandura's self-efficacy theory suggesting measuring it specific to one area or domain. As a result, we have detected similar levels of self-efficacy within both groups received only face-to-face learning and face-to-face and online learning specific to cardiopulmonary physiotherapy. The perceptions of the new graduates were congruent on behalf of their theoretical and practical competencies in the field. We have constructed the survey based on the learning outcomes of our 4-year undergraduate physiotherapy education of the faculty including basic assessment and treatment skills specific to cardiopulmonary physiotherapy. The only significantly different item between our groups was the practical part of "exercise testing". Self-efficacy of new graduates received only face-to-face learning in practicing exercise testing was significantly higher than the new graduates received face-to-face learning and online learning. This finding seems reasonable as exercise testing is a substantially practical competency requiring specific equipment and experience of practice. However, self-efficacy of all other cardiopulmonary physiotherapy assessment and treatment competencies were similar between the two groups.

Duration of face-to-face clinical practice was significantly lower in the group received face-to-face learning and online learning. It was significantly and positively correlated with self-efficacy in total and in practical domains of assessment and treatment competencies in the new graduates received face-to-face learning and online learning, but not in the group received only face-to-face learning. This finding indicates the importance of clinical practice to enhance a better-perceived self-efficacy in practical domains of physiotherapy. In parallel to this finding, the new graduates received face-to-face learning and online learning believed "type of education" and "practical courses related to cardiopulmonary physiotherapy" were the two negative factors affecting their future career plans in cardiopulmonary physiotherapy. These findings highlight the importance of lack of practical sessions in physiotherapy education in case of a distance learning.

The most important limitation of the study was the method for data collection. The data were collected using an online survey, which may not be suitable for students due to their negative attitudes towards online learning. Moreover, during the period numerous studies included students collected their data using online questionnaires in Türkiye like all other countries. As a result, our response rate cannot be considered acceptable. Therefore, the findings need to be interpreted with caution. However, there is no study investigating the effect of online learning on self-efficacy in cardiopulmonary physiotherapy. From this aspect, we have assessed domain-specific self-efficacy using a constructed questionnaire including theoretical and practical competencies based on the learning outcomes of cardiopulmonary physiotherapy lectures and clinical practices during the 4-year physiotherapy undergraduate education. We believe that, the questionnaire we have developed will guide to future validation and research studies in the field.

CONCLUSION

In conclusion, the result of the current study suggests favorable outcomes of a combination of face-to-face learning and online learning compared to only face-to-face learning in order to construct adequate self-efficacy in cardiopulmonary physiotherapy, even under the obligatory circumstances without any preliminary preparation. Therefore, we believe that online learning will give an opportunity for future higher-level of educational system supporting traditional face-to-face activities, specifically to resolve problems due to time and distance. An integrated approach of online theoretical and face-to-face practical sessions along with clinical practices will no doubtfully provide adequate self-efficacy in cardiopulmonary physiotherapy as a future educational option.

Appendix 1. Assessment of self-efficacy in cardiopulmonary physiotherapy
(1: very little confidence-- 5: a lot of confidence)

	Theoretical					Practical				
Competencies										
Physiotherapy Assessment Skills										
Chest circumference measurement	1	2	3	4	5	1	2	3	4	5
Measuring respiratory rate	1	2	3	4	5	1	2	3	4	5
Measuring heart rate	1	2	3	4	5	1	2	3	4	5
Measuring blood pressure	1	2	3	4	5	1	2	3	4	5
Palpation of peripheral pulses	1	2	3	4	5	1	2	3	4	5
Knowledge of monitorization	1	2	3	4	5	1	2	3	4	5
Inspection	1	2	3	4	5	1	2	3	4	5
Assessment of dyspnea	1	2	3	4	5	1	2	3	4	5
Assessing symptoms of respiratory distress	1	2	3	4	5	1	2	3	4	5
Assessment of accessory muscles for breathing	1	2	3	4	5	1	2	3	4	5
Assessment related to mechanical ventilation	1	2	3	4	5	1	2	3	4	5
Auscultation	1	2	3	4	5	1	2	3	4	5
Chest wall palpation	1	2	3	4	5	1	2	3	4	5
Assessment of chest pain	1	2	3	4	5	1	2	3	4	5
Exercise testing	1	2	3	4	5	1	2	3	4	5
Assessment of respiratory muscle strength	1	2	3	4	5	1	2	3	4	5
Assessment of peripheral muscle strength	1	2	3	4	5	1	2	3	4	5
Physiotherapy Treatment Skills										
Breathing control	1	2	3	4	5	1	2	3	4	5
Active cycle of breathing technique	1	2	3	4	5	1	2	3	4	5
Thoracic expansion exercises	1	2	3	4	5	1	2	3	4	5
Diaphragmatic breathing exercise	1	2	3	4	5	1	2	3	4	5
Forced expiration technique	1	2	3	4	5	1	2	3	4	5
Coughing	1	2	3	4	5	1	2	3	4	5
Incentive spirometry	1	2	3	4	5	1	2	3	4	5
Postural drainage techniques	1	2	3	4	5	1	2	3	4	5
Manual techniques (percussion, vibration, shaking)	1	2	3	4	5	1	2	3	4	5
Mobilization	1	2	3	4	5	1	2	3	4	5
Transfer activities	1	2	3	4	5	1	2	3	4	5
Management of dyspnea	1	2	3	4	5	1	2	3	4	5
Inspiratory muscle training	1	2	3	4	5	1	2	3	4	5
Therapeutic exercises	1	2	3	4	5	1	2	3	4	5
Aerobic exercise training	1	2	3	4	5	1	2	3	4	5

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EVALUATION OF PROFESSIONAL SELF-EFFICACY PERCEPTIONS OF MEDICAL SCHOOL INTERN STUDENTS

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ABSTRACT

Purpose: The aim of this study was to assess interns' perceptions of professional self-efficacy and to identify the factors associated with it.

Material and Methods: This is a cross-sectional study. The data of the study, which was approved by the ethics committee, were collected from 204 trainees between September and October 2022 using the face-to-face interview method. Data analysis was performed using the SPSS 27.0 package. The type 1 error level was accepted as 5% for statistical significance.

Results: 62.3% of the study group were female and the median age of the group was 24.00 years. The participants' median score on the self-efficacy sub-dimension of the scale was 60.00. The median self-efficacy score was significant and higher than those who felt inadequate to work in the periphery and those who felt that patients could actively participate in the history, physical and treatment processes during the internship (p<0.001).

Conclusion: Professional self-efficacy perceptions of intern doctors; it was found to be higher in those who felt sufficient to work in the periphery and those who felt that patients could actively participate in the history, physical examination and treatment processes during the training period.

Keywords: Professional competence, medical faculty, medical student, medical education

INTRODUCTION

Self-efficacy means that in order for people to use their skills effectively, they must first have confidence in the subject they are interested in (1). In other words, self-efficacy is not about individuals having sufficient talent; it is the belief that one has the necessary ability to do a particular job. Professional self-efficacy is a special type of self-efficacy defined as the competence that the individual feels about being able to successfully perform tasks and responsibilities related to his profession (2).

Professional self-efficacy also expresses an individual's belief and self-confidence in their ability to perform the tasks associated with the profession and to cope with difficulties. Individuals with high professional self-efficacy have more motivation to deal with challenges related to their profession (3). Perceptions of self-efficacy influence cognitive, motivational, emotional and decision-making processes and occupy an important place in the lives of individuals. When these processes are taken into account, it is found that individuals with high self-

efficacy perceptions set higher goals and strive to achieve these goals by making consistent choices (4). Several studies have shown that perceptions of self-efficacy influence individual behaviour. For this reason, questioning and examining self-efficacy can help individuals predict their future behaviour and understand the reasons for that behaviour (4,5,6).

In medicine, a profession that deals with human health, self-efficacy is an important issue. Before starting their professional lives, doctors are required to complete their medical education, which may vary according to society, place and time, but the basic content is globally specific and continues throughout life (7). "Pregraduate Medical Education, National Core Education Programme (UCEP-2020) was established in the early 2000s to train doctors with standardised basic knowledge and skills. The UCEP-2020 defines the basic standards of undergraduate medical education, which includes the knowledge, skills and attitudes that all students in different faculties in our country should acquire during their education. In our country, every faculty provides medical education according to this programme (8, 9, 10). There are two semesters of medical training, a preclinical and clinical period. The first few years are spent on theory and basic skills training, the pre-clinical preparation period (11, 12).

The perception of self-efficacy in the professional and academic success of medical students undergoing such an intensive educational process is an important issue. In the educational process, many factors influence students' perceptions of self-efficacy and these situations should be evaluated according to the students (13). Information about the factors that influence the professional self-efficacy of medical students can be used to investigate the reasons for their lack of self-efficacy and to eliminate these deficiencies and to train medical students with high professional self-efficacy. The aim of this study is to assess intern doctors' perceptions of professional self-efficacy and to identify factors that may be associated with this.

MATERIALS AND METHODS

This is a cross-sectional epidemiological study. Approval was obtained from the Necmettin Erbakan University Meram Faculty of Medicine Ethics Committee for Drugs and Non-Medical Devices (Date: 09.09.2022, Decision No: 2022/3954) and the Meram Faculty of Medicine Dean's Office. In addition, prior to data collection, intern doctors were given detailed information about the study and verbal consent was obtained. The population of the study consists of 238 intern doctors who are in their sixth year of training at Necmettin Erbakan University Meram Faculty of Medicine in the 2022-2023 academic year. The study was conducted with 204 (86%) intern doctors who were trained between 15/09/2022 and 15/10/2022 and who gave verbal consent to participate. Interns who did not agree to participate in the study and who had a missing data collection form were excluded from the study.

Following the literature review for the research, a data collection form was prepared (6-9,11). This form is made up of 33 questions and three sections. The first part of the form, consisting of five questions, covers the socio-demographic characteristics of individuals, and the second part, consisting of 11 questions, includes questions about medical school and specialty preferences. The last section consists of the Scale of Doctor Candidates' Perceptions of Importance and Self-Efficacy Regarding Professional General Competencies, developed by Başusta and Elçin in 2014. The scale is a two-way scale consisting of 17 statements, with each item having a score from one to five. Thus, interns rated each statement by marking the appropriate number in the "IMPORTANCE" column and their belief in their own competence in the "SELF-EQUALITY" column. On the one hand, the students' level of self-efficacy is determined in relation to 17 situations defined by the scale using the same items. On the other hand, it aims to reveal the students' perception of the importance of these 17 situations. A 5-point Likert structure was preferred for the responses to the scale items (5 points: highest level category, 1 point: lowest level category). High scores on both sides of the scale reflect high self-efficacy and high importance. During the development of the scale used, Cronbach alpha reliability coefficients were found to be 0.930 for self-efficacy and 0.910 for importance (14). The Cronbach alpha coefficient calculated for this sample in which the study was conducted was 0.940 for self-efficacy and 0.968 for significance. Data collection forms were administered to volunteer participants under observation.

Statistical analysis of data was performed using IBM SPSS Statistics, version 27.0 (IBM Corp, Armonk, N.Y., USA). When summarising numerical data, medians, Q1 and Q3 values, numbers and percentages were used to summarise categorical data. The suitability of the data for normal distribution

was checked using visual and analytical methods. Mann-Whitney U test and Kruskal-Wallis H test were used to compare categorical data with numerical data that did not fit the normal distribution. Binary comparisons were made using the Mann-Whitney U test in groups with significant Kruskal-Wallis H test results, with Bonferroni correction. Statistically, cases were considered significant if the p-value was less than 0.05.

RESULTS

The median age of the 204 intern doctors included in the study was 24.00 (23.00-24.00) years. 62.3% (n=127) of participants were women and 52.5% (n=107) had income equal to expenditure. The socio-demographic characteristics of the participants are shown in Table 1.

It was determined that 18.1% (n=37) of the participants had a loss of semester and/or internship while studying at the medical school. 67.6% (n=138) of the intern doctors stated that the medical school did not meet their expectations in terms of profession, 45.1% (n=92) were not satisfied with studying in the medical school, and 23.5% (n=48) did not want to re-choose the medical school. 55.9% (n=114) of the participants stated that they preferred medical school because they wanted to, 55.4% (n=113) because they wanted to be useful to people, and 54.9% (n=112) because they had a job guarantee (Table 2). 67.2% (n=137) of participants reported that they felt the training they received at medical school was inadequate for working as a general practitioner, and 82.8% (n=169) reported that they felt inadequate for working in peripheral areas after graduation. 46.1%

Table 1. Socio-demographic characteristics of the participants

Characteristics		n (%)
Gender	Female	127 (62,3)
	Male	77 (37,7)
Income status	Income less than expenses	62 (30,4)
	Income equal to expenses	107 (52,5)
	Income more than expenses	35 (17,1)
Ehere they live now	Stay with their family	87 (42,6)
	At home with friends	66 (32,4)
	Home alone	37 (18,1)
	In the student dormitory	14 (6,9)
Presence of doctors among first-degree relatives	Yes	43 (21,1)
	No	161 (78,9)

Table 2. Characteristics of doctors in training with regard to medical education

Characteristics	n (%)
Loss of semesters and/or internships in medical school	
Yes	37 (18,1)
No	167 (81,9)
The state of medical education meeting professional expectations	
Yes	66 (32,4)
No	138 (67,6)
Satisfaction with medical school	
Yes	112 (54,9)
No	92 (45,1)
Want to choose medical school again if they had the right to choose	
Yes	82 (40,2)
Don't know	74 (36,3)
No	48 (23,5)
Reasons for choosing medical school*	
For their own sake	114 (55,9)
Helping people	113 (55,4)
Because it is a job guarantee	112 (54,9)
The dignity that medicine brings	98 (48,0)
High income	78 (38,2)
Family request	58 (28,4)

* Participants stated more than one reason for preference.

Table 3. Intern doctors' opinions on medical faculty education and specialty preferences

Characteristics	n (%)
Whether the medical school education is sufficient to work as a general practitioner	
Enough	24 (11,8)
Don't know	43 (21,0)
Not enough	137 (67,2)
Feel sufficient to work in the field	
Yes	35 (17,2)
No	169 (82,8)
Ability of patients to actively participate in the history, physical examination and treatment processes during the internship.	
Yes	110 (53,9)
No	94 (46,1)
Departments in which you would like to receive specialised training	
Basic Sciences Departments	20 (9,8)
İnternal Medicine	110 (53,9)
Surgical Departments	74 (36,3)
Important factors influencing branch preference*	
Loving the department they prefer	161 (78,9)
Suitable for personal ability and interest	148 (72,5)
To have time for myself and my family	127 (62,3)
Possibility of professional satisfaction	122 (59,8)
Working hours, number of attacks	119 (58,3)
Salary amount	106 (52,0)
Risk level and level of responsibility of the department	98 (48,0)
Medical Specialist Examination score	81 (39,7)
Possible exposure to violence	78 (38,2)

* Participants stated more than one reason for preference.

(n=94) of intern doctors in training reported that they were unable to actively participate in the examination and treatment of patients during their training. It was found that all participants (100%) wished to undertake specialist training at some point in their career. It was found that 53.9% (n=110) of registrars wanted to specialise in internal medicine, 36.3% (n=74) in surgery and 9.8% (n=20) in basic sciences (Table 3). The median score of the participants in the "Importance and Self-Efficacy Perceptions of Physician Candidates Scale" from the importance part is 81.00 (70.00-85.00), and the median score from the self-efficacy part is 60.00 (52.00-69). There was a significant difference between the genders of participants in terms of the median total score

obtained from the Importance section (p<0.05). The difference was due to the fact that the median total score of women was higher than that of men. According to the socio-demographic characteristics of the individuals, the self-efficacy scores were found to be similar (p>0.05) (Table 4).

The importance and self-efficacy scores were significantly higher among those who reported that studying at the Faculty of Medicine met their professional expectations. The importance and self-efficacy scores of those who were satisfied with studying at the Faculty of Medicine were also significantly higher than those who were not satisfied (p<0.05) (Table 5).

Self-efficacy scores were higher among those who felt their training was insufficient to work as a general practitioner than among those who felt it was sufficient and were undecided (p<0.001). The self-efficacy scores of those who felt competent to work in the periphery were higher than those who did not feel competent (p<0.001). The self-efficacy scores of those who reported that they could actively participate in the history, physical examination and treatment processes during the internship were significantly higher than those who reported that they could not participate (p<0.001). It was found that the self-efficacy scores of those who said they wanted to study basic sciences in specialty training were significantly lower than those who said they wanted to study internal medicine and surgery (p=0.016) (Table 6). to study internal medicine and surgery (p=0.016) (Table 6).

Table 4. Comparison of scale sub-dimension scores and socio-demographic characteristics

Characteristics	Importance sub-dimension		Self-efficacy sub-dimension	
	Median (Quarterly 1-3)	p	Median (Quarterly 1-3)	p
Gender				
Female	82,00 (74,00-85,00)	**0,002**	59,00 (52,00-67,00)	0,607
Male	77,00 (66,00-84,00)		61,00 (50,50-70,50)	
Income status				
Income less than expenses	81,00 (68,75-84,00)		58,00 (50,75-69,50)	
Income equal to expenses	81,00 (71,00-85,00)	0,855	61,00 (52,00-69,00)	0,989
Income more than expenses	80,00 (70,00-85,00)		64,00 (50,00-69,00)	
Where they live now				
Stay with their family	80,00 (69,00-85,00)		57,00 (51,00-67,00)	
At home with friends	82,00 (72,00-85,00)		62,00 (54,75-69,00)	
Home alone	81,00 (71,50-84,50)	0,204	59,00 (50,50-73,00)	0,626
In the student dormitory	75,50 (54,25-81,75)		58,00 (50,00-70,75)	
Presence of doctors among first-degree relatives				
Yes	81,00 (69,00-85,00)	0,998	59,00 (53,00-67,00)	0,656
No	81,00 (70,00-85,00)		60,00 (51,00-69,50)	

Table 5. Comparison of scale sub-dimension scores with characteristics related to medical education

Characteristics	Importance sub-dimension		Self-efficacy sub-dimension	
	Median (Q1-3)	p	Median (Q1-3)	p
Loss of semesters and/or internships in medical school				
Yes	78,00 (64,50-84,00)	0,121	59,00 (50,00-71,00)	0,919
No	81,00 (72,00-85,00)		60,00 (52,00-69,00)	
The state of medical education meeting professional expectations				
Yes	83,00 (72,75-85,00)	**0,047**	64,00 (53,00-71,00)	**0,019**
No	80,50 (69,75-84,00)		59,00 (50,75-67,00)	
Satisfaction with medical school				
Yes	83,00 (73,25-85,00)	**0,019**	63,00 (53,00-71,00)	**0,004**
No	79,00 (68,25-84,00)		56,50 (50,00-65,00)	
Want to choose medical school again if they had the right to choose				
Yes	82,00 (73,50-85,00)		62,00 (53,00-71,00)	
Don't know	81,00 (65,75-85,00)	0,608	57,50 (51,00-67,00)	0,147
No	79,00 (70,00-85,00)		60,00 (50,00-68,50)	

Table 6. Comparison of Scale Sub-Dimension Scores with Intern Doctors' Medical Faculty Education and Specialty Preferences

Characteristics	Importance sub-dimension		Self-efficacy sub-dimension	
	Median (Q1-3)	p	Median (Q1-3)	p
Whether the medical school education is sufficient to work as a general practitioner				
Enough	79,50 (67,00-85,00)		65,50 (56,00-71,00)	
Don't know	82,00 (73,00-84,00)	0,983	67,00 (55,00-74,00)	**<0,001**
Not enough	81,00 (70,00-85,00)		57,00 (50,00-65,50)	
Feel sufficient to work in the field				
Yes	80,00 (66,00-85,00)	0,973	70,00 (61,00-76,00)	**<0,001**
No	81,00 (70,50-85,00)		57,00 (51,00-67,00)	
Ability of patients to actively participate in the history, physical examination and treatment processes during the internship.				
Yes	81,00 (72,75-85,00)	0,141	63,00 (55,00-71,25)	**<0,001**
No	79,00 (63,75-85,00)		56,00 (49,75-65,00)	
Departments in which you would like to receive specialised training				
Basic Sciences Departments	79,50 (57,75-84,00)		53,00 (47,25-58,50)	
İnternal Medicine	81,50 (70,75-85,00)	0,548	60,00 (52,00-68,25)	**0,016**
Surgical Departments	80,50 (71,75-85,00)		61,00 (52,00-71,25)	

DISCUSSION

In this study, which was conducted to assess the professional self-efficacy perceptions of intern doctors and to identify the factors that might be associated with it, it was found that about two thirds of intern doctors did not meet the professional expectations of the Faculty of Medicine and about half of them were not satisfied with their studies at the Faculty of Medicine. In the studies conducted, it was found that the rate of those who were satisfied with their studies at the Faculty of Medicine was at least 70.0% (15). In this study, about a quarter of the intern doctors said that they would not choose to study medicine again if they had the choice. In Aker et al.'s study of newly graduated intern doctors in 2020, the rate of doctors who would not choose medical school again was found to be 33.3%, and in Atılgan et al.'s study of intern doctors in 2020, this rate was found to be 42.7% (9,16). Differences in these rates may be a consequence of the inability to choose a profession according to personal characteristics and the intensive training process.

In this study, the three most common reasons why intern doctors prefer to go to medical school are their own desire, to be useful to people and to secure a job. Similar studies among medical students have found

that the most common reason for preferring to study medicine was the answer 'own desire' (9,17). Other similar studies have found that the desire to help people is the main reason for preference (8,16). In order to cope with all these difficulties, the fact that they will be doing their own work and the desire to help people play an important role.

In this study, more than half of the intern doctors said that they felt that the training they had received at medical school was not sufficient for them to work as general practitioners, and 82.8% said that they felt inadequate to work in peripheral areas after graduation. The fact that medical training is mainly provided in tertiary care settings and that intern doctors continue to work in non-tertiary care settings after graduation can be seen as a reason for this concern. This finding highlights the need to tailor training content to the settings in which graduates are likely to work and the patients and diseases they are likely to encounter. The study found that all intern doctors wanted to specialise, mostly in internal medicine and then in surgery. In the literature, it was found that similar results were obtained in studies conducted with internists, the desire to specialise was high and the most preferred departments were in the field of internal medicine (17, 18, 19). The importance

of primary health care for sustainable health care is undisputed. For this reason, it is considered necessary to examine the factors that may lead to the tendency of medical students to specialise and to emphasise the importance of primary health care services in medical education.

The most important factors that may influence the specialty preference of intern doctors in this survey who say they want to specialise are that they like the specialty they prefer and that it matches their personal skills and interests. It is also noteworthy that the risk level of the department, the TUS score and the likelihood of being exposed to violence are the last factors. Similarly, the studies conducted found that the professional satisfaction of the chosen department is the most important factor (7, 20). These findings highlight the importance of professional satisfaction and personal attention in the choice of specialty, despite the challenging training process and working conditions. It is also worth noting that the recent increase in violence in the health sector affects the choice of specialty, but does not prevent professional satisfaction.

This study found that the self-efficacy sub-dimension scores were significantly higher for those who reported that their medical training met their professional expectations and for those who were satisfied with their medical training. Vocational self-efficacy is an individual's assessment of the skills needed to perform a job (21). Although this situation may be related to career choice without taking into account individual characteristics, it remains a prediction as full causality was not questioned in our study.

In this study, the median self-efficacy sub-dimension scores of intern doctors who felt their medical school training was inadequate for working as a general practitioner were significantly lower than those of those who felt it was adequate and those who were undecided. It was also found that the median self-efficacy score was significantly higher than that of those who felt it was insufficient to work in the periphery and those who felt they could actively participate in the history, physical examination and treatment of patients during the training period. It was found that the mean self-efficacy score of those who said they wanted to train in basic sciences in specialty training was significantly lower than that of those who said they wanted to train in medical and surgical sciences. Some studies have found a negative relationship between individuals' perceptions of

professional self-efficacy and burnout (22, 23, 24). A meta-analysis of 114 studies by Stajkovic et al. reported a strong correlation between individuals' perceptions of professional self-efficacy and their performance (25). Similar studies with intern doctors have found that doctors' self-efficacy beliefs about some basic professional skills are low (8,9). Our findings and studies suggest that perceptions of professional self-efficacy are an important issue to consider. It can be seen that intern doctors with low perceptions of professional self-efficacy do not feel confident enough to practice in the field, and tend to prefer basic science and move away from clinics during specialisation. This may be due to the anxiety caused by the uncertainty of the problems that intern doctor may face after graduation.

CONCLUSION

Interns' perceptions of professional self-efficacy; it was found to be higher among those who said that the medical faculty education met their professional expectations, those who were satisfied with the medical faculty education, those who felt competent to work in the periphery, and those who said that they could actively participate in patient-related processes during the internship period. In addition, perceptions of professional self-efficacy were lower among those who felt that the medical faculty education was insufficient to work as a general practitioner and among those who stated that they wanted to receive basic science education in specialty training. In line with these findings, it can be concluded that increasing the professional self-efficacy perceptions of intern doctors, and therefore medical students, may be effective both in terms of working life and specialty preferences. To this end, the first step should be to strengthen the content of training to give them the skills to deal with the problems they are likely to encounter in the environments in which they are likely to work in the future. Medical education should be prepared to give priority to the health needs of society and students should be trained in subjects directly related to these problems. In addition, areas of application in medical education should be prepared based on society, and learning activities should be organised within society. Early exposure to the problems they are likely to encounter in the environments in which they will work in the future can help students to cope with these problems more easily. For all these reasons, the emphasis should be on student-centred, problem-solving education with

active participation. Their knowledge should be reinforced by practical training using animations based on real examples in simulation laboratories. All theoretical and practical knowledge and experience required for basic medicine should be taught. Postgraduate medical education and continuing medical education should be emphasised as well as pregraduate education. With such changes and updates in the education system, it is possible to gain competence in the practice of medicine on one's own.

Limitations
Our study had several limitations. Due to the cross-sectional design of the study, it was not possible to assess the long-term causal relationships between different factors related to professional importance and self-efficacy. In addition, only residents trained at a medical faculty were included in the study. It is an important limitation that doctors and residents working in different institutions and in different specialties were not included in the study. Despite the above limitations, this study provides important findings in identifying the factors associated with interns' professional meaning and self-efficacy. It also highlights the need to review medical education and contributes to the literature on the importance of this issue.

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THE PSYCHOMETRIC PROPERTIES OF THE HEALTH BELIEF MODEL SCALE FOR EXERCISE IN THE TURKISH POPULATION

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ABSTRACT
Purpose: Personal health and exercise belief is an essential component of creating physical activity and exercise programs. The Health Belief Model Scale for Exercise (HBSE) is an instrument that evaluates this component. Our study aims to translate the HBSE into Turkish and to investigate its psychometric properties in the adult population.
Materials and Methods: After the translation process, we included 180 participants (median age: 28 years, female/male: 115/65) in our study. Explanatory factor analysis was performed. Internal consistency was measured by Cronbach alpha and test-retest reliability was assessed using the intra-class correlation coefficient (ICC). Convergent, divergent, and known-groups validity (gender, educational level, marital status, and regular exercise habit) were used for construct validity.
Results: Factor analysis indicated six factors (factor-loadings=0.664 to 0.900). Cronbach α coefficients ranged from 0.706 to 0.842 and ICC ranged from 0.710 to 0.956. It was seen that the HBSE subscores with the scales that were used for convergent validity had a moderate-strong correlation (Rho=0.614 to 0.752 and <0.001). Age and BMI were not related to the HBSE scores (p>0.05). The HBSE total scores were higher in females and persons with regular exercise habits (p<0.05).
Conclusion: The results highlighted that the Turkish version of the HBSE is a reliable and valid instrument to assess exercise belief.

Keywords: Health belief model, physical activity, exercise, psychometrics.

INTRODUCTION

The knowledge gained over the years has proven the harmful effects of a sedentary lifestyle on health. Regular physical activity (PA) and exercise have been shown to reduce the development and progression of chronic diseases and disabilities, and decrease the risk of premature death, enhance life expectancy and produce many other health-related benefits (1–3). Therefore, promoting PA participation is among the fundamental necessities for improving health (2).

To develop an intervention for improving PA, descriptive information about the determinants of this behavior is needed. It is known that there are several factors about PA, and the internal and external processes associated with these factors contribute to the development of this behavior. Physical activity determinants are categorized into two main headings to explain these processes: a) individual properties such as self-efficacy, motivational status, history of PA and exercise habits, and other healthy lifestyle behavior, etc., and b) environmental properties

including sociocultural status, time, financial situation, access, etc (4).

There are behavioral change models developed to improve health behaviors including PA. These models play a key role in explaining, developing, and encouraging healthy behavior. The Health Belief Model (HBM) is one of the most common models used to identify the processes of health behaviors and health belief variables, maintain these habits, and provide a basis for health research about behavior change (5). There are six components associated with the exercise behavior change process in the current version of the model such as perceived benefits, perceived barriers, perceived severity, perceived susceptibility, cues to action, and self-efficacy (6). Based on these findings, it can be said that HBM is an important predictor and an effective model of exercise behavior (7).

The known contributions of HBM to improve PA and exercise behavior have brought along the necessity for some tools to evaluate this process. Consequently, several scales have been developed based on this model. One of them is the Health Belief Model Scale for Exercise (HBSE) which was developed by Wu et al. (2020), and evaluates exercise habits based on health beliefs. When examining Turkish scales related to exercise beliefs, it is observed that both the developed and translated scales are limited (9,10) Therefore, the study aims to perform a Turkish translation of HBSE and assess whether it is a valid and reliable tool for examining the HBSE in adults.

MATERIALS AND METHOD
Permission and Ethics
Before starting our study, permission was obtained from the author who developed the scale to translate it into Turkish and investigate its psychometric properties. The ethical approval of the study was obtained from XXX University Ethical Committee (Approval Number: 145) and conducted in accordance with the provisions of the Helsinki Declaration. An informed consent form was obtained from all participants. The methodological quality was examined using the COSMIN criteria (11).

Participants
This study was conducted as a cross-sectional design and was carried out between January and April 2021. Participants were reached through snowball sampling by Google Forms (https://docs.google.com/forms/d/1emb7q5fa8ViVMs50LPGjWc63UulOdY_YVXilDQifpbE/edit?usp=forms_home&ths=true). The inclusion criteria for participants were (1) being aged 18-65 years, (2) being a native Turkish speaker, and (3) completing all surveys. Individuals with physical disabilities or reported diagnosed psychological or cognitive problems were excluded from the study.
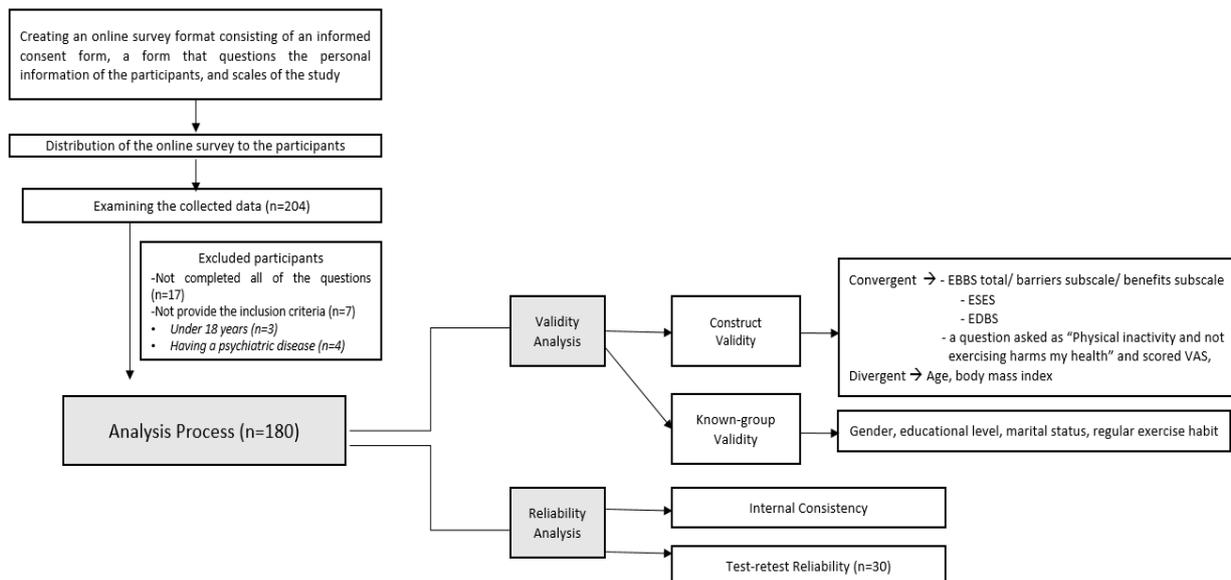

Figure 1. Flowchart of the study

Study Procedure

The study consisted of two stages. First, the HBSE was translated from English into Turkish. Then, the psychometric properties of the Turkish version of the HBSE were examined. The flowchart of the study design is shown in Figure 1.

Translation of the Scale: The translation process of the scale was conducted in accordance with the guidelines and showed all of the process in Figure 2 (12). We established a committee of four specialists, consisting of two physiotherapists with PhD degrees and master's degrees, a software engineer, and a physician with English as her first language who is fluent in both Turkish and English. First, the scale was translated from English to Turkish by two Turkish speakers who were also proficient in English. From these translations, a single form was created that reached a consensus for Turkish. The Turkish form was then translated back into English by two translators, one of whom had no background in medicine. The expert committee then assembled, compared, and debated the vocabulary used in the translation with reference to its compatibility with both languages and the target group. All versions of the scale were then compared for validity. There were no

items added or removed. Only the 7th item was revised for better understanding and the "for me" part was added to the item "I have not found proper exercise". After the translation process, a pilot study was carried out to assess the items' clarity and contribute to a better comprehension of the questions. Participants' feedbacks were also gathered about the understandability of items. In this context, we included 10 participants to develop the last version of the scale and we did not use the results of the pilot study for the main analysis. Eventually, the final form was constituted.

Psychometric Properties: The participants completed a questionnaire about the sociodemographic characteristics, physical properties, and regular physical activity. They were asked a question described as follows "How often do you perform exercises lasting at least 20 min that make you sweat more or breathe more quickly than normal?". The participants who responded to the question as "a few times a week" or "every day" were considered as having an exercise habit (13). For validity analysis, different scales were used for each subscale, as no other Turkish scales measured the parameters of HBSE. The participants filled out the

Stages	
Stage 1: Translation	- Translation from English to Turkish by two translators
Stage 2: Synthesis	- Reuniting the two translations and generating a single form that arrived at a consensus for Turkish
Stage 3: Back translation	- Back translation from Turkish to English by two back translators
Stage 4: Translation committee	- Reviewing the all of the versions of the scale and reaching a consensus on discrepencies
Stage 5: Pilot testing	- Testing the pre-final version of the scale on a pilot group (n=10)
Stage 7: Final version of the scale	- As considered all stages, deciding the final version of the scale

Figure 2. Translation process of the scale

following scales: the benefits subscale of the Exercise Benefits/Barriers Scale(EBBS) for perceived benefits of HBSE, the barriers subscale of EBBS for perceived objective and subjective barriers of HBSE, Visual Analog Scale (VAS) for perceived severity of physical inactivity of HBSE, Exercise Self-Efficacy Scale (ESES) for self-efficacy of HBSE, and Exercise Processes of Change Scale (EPCS) for cues to action of HBSE. For the test-retest reliability, 14 days after the initial assessment, a randomly selected 30 participants were asked to complete the HBSE again.

Instruments
Health Belief Model Scale for Exercise
The scale was developed by Wu et al. and examines the personal exercise and health beliefs (8). The 18-item scale includes 6 subscales perceived benefits (3-items), perceived objective barriers (4-items), perceived subjective barriers (3 items), perceived severity of physical inactivity (2-items), self-efficacy (3-items), and cues to action (3-items). The items were answered on a 5-point Likert system (1-totally disagree to 5-totally agree).

Exercise Benefits/Barriers Scale (EBBS)
The Turkish validity and reliability of the scale originally developed by Sechrist et al. have already been done by Ortabag et al. This scale evaluates the personal perception of benefits and barriers regarding exercise (10, 14). It consists of a total of 43 questions,

14 of which are barriers and 29 of which are benefits. Participants answer the questions as "strongly agree-1, agree-2, disagree-3, strongly disagree-4". Exercise benefits and exercise barriers are calculated as two subscales and total scores after completing the scale.

Exercise Self-Efficacy Scale (ESES)
It was developed by Bandura (1997), who introduced the concept of self-efficacy (15). The scale consists of 18 items graded from 0% to 100%. According to their self-efficacy beliefs, participants record their answers ranging from 0 (not able to do), 50 (able to moderate) to 100 (definitely able) with 10-unit intervals on a 100-point scale.

Exercise Processes of Change Scale (EPCS)
It was developed by Marcus et al. (16) and translated into Turkish by Gümüş and Yitiş (17). The scale is consisting of 40 items answered on a five-point Likert-type scale. A minimum of 40 and a maximum of 200 points are obtained from the scale. High scores indicate that the probability of deciding on change is high.
The Visual Analog Scale (VAS) is a self-reported scale consisting of a horizontal line with anchor points of "no pain" (on one end "0") and "worst- unbearable pain" (on one end "10"). The participants were instructed to place a mark where they felt the severity of pain on this 10 cm-long horizontal line (described as no pain- 0 and most severe-10) (18).

Table 1. Characteristics of Participants'

Variables (n=180)	Statistics
Age, years	28 (25/36)
Gender, n (%)	
Female	115 (64.1)
Male	65 (35.9)
Height, cm	169 (162/176)
Weight, kg	65 (57/78)
Body Mass Index, kg/m^2	23.14 (20.92/25.78)
Educational level, n (%)	
Primary school	4 (2.3)
High school	24 (13.3)
University	116 (64.6)
Postgraduate	36 (19.9)
Marital Status, n (%)	
Single	99 (55.2)
Married	7 (3.9)
Divorced	74 (40.9)
Regular Exercise Habit, n (%)	
Yes	53 (29.44)
No	127 (71.56)

Categorical variables presented as n (%) and continuous but not normally distributed variables presented as median (1.-3. Quartiles).

Statistical analysis

Statistical analysis was performed using SPSS Version 20. The Kolmogorov-Smirnov test and histogram graphs were used to determine whether the distribution of the data was normal. Continuous variables were expressed as the median (interquartile range) due to the non-normal distribution of the data, while categorical variables were expressed as numbers with percentages (%). All of the results were interpreted at a significance level of $p < 0.05$. To examine the factor structure of HBSE, principal components explanatory factor analysis was applied whose explanatory rate was accepted as minimum 60% (19). Cronbach's alpha coefficient was used to

Table 2. Outcomes of measurements

Variables	Median (IQR)
Health Belief Model Scale for Exercise	
Perceived benefits	14 (3)
Perceived objective barriers	11 (4)
Perceived subjective barriers	7 (3)
Self-efficacy	10 (3)
Perceived severity of physical inactivity	8 (3)
Cues to action	6 (4)
Total score	56 (7)
Exercise Benefits/Barriers Scale	
Benefits Score	92 (16)
Barriers Score	29 (8)
Total Score	121 (19)
Exercise Self-Efficacy Scale	100 (39)
Exercise Decisional Balance Scale	130 (36)
Physical inactivity and not exercising harms my health (VAS, mm)	9 (3)

IQR= Interquartile range, VAS= Visual analog scale

Table 3. Intra-rater reliability, Cronbach α values if item deleted and factor loadings for the each items of Health Belief Model Scale for Exercise

HBSE Sub-scores	Items	Intra-rater reliability [ICC(95%CI)]	Cronbach α	Cronbach α if item deleted	Factor loadings
Perceived benefits	**Item 1**	0.816 (0.612-0.913)		0.731	0.828
	Item 2	0.905 (0.800-0.955)	0.796	0.669	0.859
	Item 3	0.867 (0.723-0.936)		0.754	0.795
Perceived objective barriers	**Item 4**	0.801 (0.581-0.905)		0.662	0.717
	Item 5	0.712 (0.602-0.863)	0.706	0.645	0.732
	Item 6	0.932 (0.857-0.697)		0.587	0.786
	Item 7	0.862 (0.712-0.934)		0.674	0.664
Perceived subjective barriers	**Item 8**	0.806 (0.690-0.908)		0.782	0.728
	Item 9	0.710 (0.601-0.861)	0.784	0.611	0.893
	Item 10	0.749 (0.568-0.881)		0.721	0.811
Self-efficacy	**Item 11**	0.718 (0.501-0.866)		0.799	0.837
	Item 12	0.813 (0.612-0.911)	0.842	0.705	0.900
	Item 13	0.833 (0.654-0.920)		0.824	0.824
Perceived severity of physical inactivity	**Item 14**	0.839 (0.665-0.923)		0.621	0.851
	Item 15	0.711 (0.592-0.862)	0.766	0.621	0.882
Cues to action	**Item 16**	0.814 (0.609-0.912)		0.668	0.841
	Item 17	0.956 (0.907-0.979)	0.758	0.616	0.847
	Item 18	0.798 (0.580-0.904)		0.743	0.793

HBSE: Health Belief Model Scale for Exercise, ICC: Intra-class correlation coefficent; CI: confidence interval

measure internal consistency; a value of at least 0.70 indicated adequate internal consistency (20). The interclass correlation coefficient (ICC) model (the two-way random effects and absolute agreement methods) at 95% confidence interval was used for test-retest reliability. Reliability was considered acceptable if the ICC was between 0.50 and 0.75,

considered good if values were 0.75-0.90, and excellent if it was above 0.90 (21). The HBSE and other variables' Spearman's correlation coefficients were used to examine the concurrent validity, which was provided within a 95% confidence interval. The coefficients were reported as follows: │0.00/0.10│= negligible correlation; │0.10/0.39│ = weak

Table 4. Construct validity of the Health Belief Model Scale for Exercise

	Rho (95%CI)	*p[a]*
Convergent Validity		
Perceived Benefits Subscale of HBSE-*Exercise Benefits Subscale of EBBS*	0.752 (0.681-0.806)	<0.001
Perceived Objective Barriers Subscale of HBSE-*Exercise Barriers Subscale of EBBS*	0.660 (0.548-0.753)	<0.001
Perceived Subjective Barriers Subscale of HBSE-*Exercise Barriers Subscale of EBBS*	0.614 (0.500-0.709)	<0.001
Self-Efficacy Subscale of HBSE- ESES	0.741 (0.665-0.802)	<0.001
Perceived Severity of Physical Inactivity Subscale of HBSE – *Physical inactivity and not exercising harms my health (VAS)*	0.689 (0.588-0.770)	<0.001
Cues to Action Subscale of HBSE - *EDBS*	0.672 (0.563-0.769)	<0.001
Total Score HBSE– *Total Score of EBBS*	0.607 (0.491-0.707)	<0.001
Divergent Validity		
Age	0.019	0.779
BMI	0.170	0.022

HBSE= Health Belief Model Scale for Exercise, EBBS= Exercise Benefits/Barriers Scale, ESES= Exercise Self-Efficacy Scale, VAS= Visual analog scale, EDBS=Exercise Decisional Balance Scale

Table 5. Comparison of groups for known group validity

Known Groups	Health Belief Model Scale for Exercise Total Score	
	Median (IQR)	***p***
Gender		
Female	57(7)	0.048[a]
Male	55(7)	
Educational level		
Primary school	60(10)	
High school	54(10)	0.447[a]
University	56(7)	
Postgraduate	56(4)	
Marital Status		
Single	55(6)	
Married	57(8)	0.527[b]
Divorced	57(5)	
Regular Exercise Habit		
Yes	57(7)	0.003[a]
No	54(7)	

a= Mann Whitney U, b= Kruskal Wallis

correlation; │0.40/0.69│= moderate correlation; │0.70/0.89│= strong correlation; and │0.90/1.00│= very strong correlation (22). For validity analysis, it was considered acceptable if the coefficients were more than 0.3 (23). We hypothesized that HBSE subscales scores would have moderate to strong correlations between the other scales for convergent validity and poor correlations with age and body mass index (BMI) for divergent validity based on our clinical opinion. Known-group validity was analyzed according to gender, educational level, marital status, and regular exercise habits using the Kruskal Wallis or Independent Samples T test.

For sample size calculation, we considered the recommendations in the literature. The study participants should be range from 2 to 20 subjects per item, with an absolute minimum of 100 to 250 subjects according to Anthoine and colleagues (24). For validity, a minimum 61 participants were required to detect a correlation coefficient of 0.40 with alpha <0.05 and 90% power (25), and for reliability, a minimum sample size of 30 calculated the ICC at a 95% confidence interval (CI) with 90% power was sufficient to detect the value of at least 0.50 (26). In accordance with these recommendations, the study was included a total of 180 participants, and we sent the form to 30 of the participants for the retest.

RESULTS

The sample of the study consisted of 180 participants (female=115, male=65) with median age of 28 (25/36) years (min: 19, max: 61 years). The participants' characteristics and variables are presented in Table 1.

According to the Principal Component Analysis, it was observed that the scale had a 6-factor structure (Items 1, 2, 3: Factor 1; Items 4, 5, 6, 7: Factor 2; Items 8, 9, 10: Factor 3; Items 11, 12, 13: Factor 4, Items 14, 15: Factor 5, Items 16, 17, 18: Factor 6). The factors' explanation ratio was over 60% and the factor loadings ranged from 0.664 to 0.900 (Table 2). The subscales had good internal consistency (Cronbach α coefficients ranged from: 0.706 to 0.842). Cronbach's if item deleted coefficients vary between 0.611 and 0.824. For the total score of the scale, it had excellent intra-rater reliability (ICC: 0.914) and for the subscales, ICC values ranged from 0.710 to 0.956 at a 95% CI (Table 3).

It was observed a strong correlation between the perceived benefits subscale of HBSE with the exercise benefits subscale of EBBS (r=0.752,

p<0.001), and between the self-efficacy subscale of HBSE with ESES score (r=0.741, p<0.001). Furthermore, it was found a moderate correlation between the perceived objective and subjective barriers subscales of HBSE with the exercise barriers subscale of EBBS (r=0.660, r=0.614, p<0.001, respectively), between the perceived severity of physical inactivity subscale of HBSE with the question was scored VAS (r=0.689, p<0.001), and between cues to action subscale of HBSE and EPCS scores (r=0.672, p<0.001). All subscales of HBSE scores with age and BMI did not correlate (p>0.05, Table 4). The participants who had regular exercise had higher health beliefs about exercise and males had lower values compared to females (p=0.003, p=0.048, respectively). The HBSE scores were not different among different educational levels and marital status of the participants (p>0.05, Table 5).

DISCUSSION

The Turkish version of the HBSE was demonstrated to be valid and reliable in examining personal health beliefs regarding exercise in our study, which also looked at the scale's internal consistency, test-retest reliability, and construct validity. The HBSE scale is one of the limited tools that comprehensively evaluate exercise-related beliefs. Notably, our study is the first to translate this scale into another language and examine its psychometric properties.

The HBM is one of the frameworks that can be used to predict and explain physical activity and exercise behavior (6). The current model of HBM encompasses six domains: perceived benefits, perceived susceptibility, perceived severity, perceived barriers, self-efficacy, and cues to action (6). All these domains of HBM will influence adaptation for physical activity (PA) and exercise behavior. While more perceived benefits will arouse more willingness to do, adapt, and sustain an exercise or PA program, perceived barriers will influence exercise behavior conversely (27). Self-efficacy is one of the most important parts of HBM. It is suggested that a patient's self-efficacy to exercise is among the crucial factors influencing exercise adherence (28). Taking action is an important step in the model of behavior change developed by Prochaska and Diclemente, and it plays a key role in transforming exercise into a wellness behavior (29). Therefore, it is important to evaluate the cues to action. If a person does not understand the potential threat of physical inactivity, she/he won't act for

exercise/find the motivation for exercise, and/or sustain the exercise behavior (30). For this reason, all domains of the HBM are considered necessary for exercise behavior.

In our study, it was observed that the Cronbach alpha ranged from 0.706 to 0.843 for all of the subscales of the Turkish version of the HBSE. Notably, when comparing the Cronbach's alpha of the original and the Turkish version of the HBSE, it was found that the Cronbach alpha of the Turkish version was higher (ranging from 0.63 to 0.84 in the original version of HBSE) (8). In addition, the moderate to strong ICC values revealed that assessment repeated 14-day intervals had a high level of test-retest reliability of the Turkish version of the HBSE. In the original study of this scale, test-retest reliability was not examined (8). In this respect, although we cannot compare it with the original scale, it may be said that the HBSE is a reliable tool to examine exercise beliefs.

It was found in the explanatory factor analysis of the HBSE that the six-factor model was applicable. The original version of the scale consisted of six factors (8) and all of the factors involves the same items in both versions. While factor loads of 18 items in the original version vary between 0.57 and 0.88, factor loads in the Turkish version show a slightly better factor load. (0.664 to 0.900).

In the original study of the scale, validity was not examined (8). However, the construct validity of the Turkish version of the scale was also examined in our study. Each subscale of the HBSE was assessed for convergent validity using valid and reliable scales that were relevant to the domain measured for each part of the HBSE (10,15,17).

Additionally, when comparing the study of the Turkish version with the original study, it could be noted that the Turkish version had a higher percentage of female and younger participants. Although age was not found to be associated with scores in our study, more studies are needed to further explore this issue. Health behaviors and beliefs are triggered by social, demographic, and environmental contexts.

Furthermore, these properties may impact males' and females' health behavior in similar or different ways. For instance, marital status may change behaviors, and marriage can support a healthier life for both females and males. The benefits for males are due to increased social control promoted by marriage (31). Thus, the benefits of marriage for males' health are more significant, whereas those of marriage for females' health tend to develop more gradually (32).

It was thought that these differences are similar for PA and exercise. Existing literature highlights that positive influential factors for PA consist of several variables such as male gender, young age, high education level, and being married (33). Our study showed that health beliefs about exercise differ based on gender and regular exercise habits but not educational level and marital status. The literature about exercise behavior has varied results regarding gender differences. It was known that males frequently tend to more in exercise participation than females (34). It is said that gender roles may affect exercise behavior and beliefs in traditional cultures (35,36). Moreover, the gender difference in motivation for PA and exercise is an important predictor of this issue. Males' motivators consist of intrinsic triggers such as competition, individual interest, or gaining strength, while females' motivators include extrinsic triggers such as having a good appearance, losing weight, or attracting attention (37,38). Our results encourage that exercise belief in females was higher than in males. However, this issue may vary based on different health status and further research is needed for a more comprehensive understanding. Another variable found to affect exercise belief in our study is regular exercise habits. It has been observed that people with regular exercise habits tend to have higher exercise beliefs. This relationship can be viewed from both perspectives. The benefits that people gain from regular exercise habits may reinforce their exercise beliefs. Conversely, having a high exercise belief may be struct the groundwork for acquiring a regular exercise habit.

We had some limitations. We investigated the psychometric properties of the scale on young and educated population and our participants had narrow range of age. Additionally, we reached predominantly females more than males. In future studies, it may be considered these limitations and include mixed participants reflecting the general population.

CONCLUSION

To the best of our knowledge, the present study is the first study to examine the psychometric properties of another language version of the HBSE. There is a need for more studies to explore and determine differences among different nations, cultures, and populations. In this study, some basic determinants for exercise belief were considered. More research is needed, taking into account additional variables

related to exercise behavior and adherence. Especially, environmental variables should be assessed for health beliefs about exercise in future studies.

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THE MEDIATOR ROLE OF SOCIAL PHYSIQUE ANXIETY ON BODY IMAGE AND ORTHOREXIA AMONG ADULT WOMEN IN A PROVINCE IN THE MEDITERRANEAN REGION OF TURKEY

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ABSTRACT

Purpose: Orthorexia nervosa (ON) has garnered increasing attention in the literature as a relatively new eating disorder characterized by an excessive preoccupation with healthy eating, which can result in malnutrition and other health problems. While studies have established a link between body image and ON, the role of social physique anxiety (SPA) as a mediator in this relationship remains unclear. The present study aimed to address this gap by examining the mediating role of SPA in the relationship between body image and ON in women.
Material and Methods: A total of 647 women aged 18 to 65 years were recruited from a Province in the Mediterranean Region of Turkey. The causal steps approach (Baron and Kenny method) was used in the statistical evaluation of the mediation model and the realization of the steps testing the mediation model was evaluated. The hypothesized mediation model was tested with the PROCESS macro for SPSS models in Model 4 using a bootstrapping approach to assess the significance of indirect effects.
Results: After controlling for the effects of age, education, marital status, employment status, body mass index (BMI), and weight perception for consistency with BMI, the results of regression analyses supported the mediating effect of SPA on the relationship between body image and ON.
Conclusion: It follows from these findings that the inclusion of strategies aimed at reducing negative body image perception and SPA may contribute to improved prevention efforts aimed at reducing ON among Turkish women.

Keywords: Body image, eating disorders, social interaction, women's health, mediator variable.

INTRODUCTION

Healthy eating awareness has become a primary focus for individuals in developed societies. However, developing an obsession with this issue can often lead to disruption of eating patterns and, in the long run, eating disorders. Due to their increasing prevalence and associated socioeconomic burdens,

eating disorders are recognized as a global public health issue (1).

Orthorexia Nervosa (ON) is a condition where individuals become excessively fixated on consuming pure and healthy foods to improve their health. It is not yet officially recognized as a separate diagnosis in the DSM-5-TR (2). Some researchers argue whether ON should be classified as a subtype of Anorexia Nervosa or Obsessive-Compulsive Disorder (OCD), or as a distinct disorder (3, 4). ON begins with a healthy preference for a balanced diet that gradually becomes an unhealthy obsession, characterized by obsessive thoughts, compulsive behaviors, and self-punishment (5-7). ON shares many similarities with other eating disorders, involving significant weight loss, anxiety, perfectionism, and the desire to maintain control (7). The prevalence of ON varies widely, ranging from 7% to 82%, with an increase in frequency observed in recent years (6). Women who are more interested in dieting, such as dancers, gymnasts, and models who need to maintain a certain weight, are at higher risk for ON (8).

Body image is the mental representation of one's own body and influences relationships with the outside world (9). Throughout history, individuals have wanted to conform to cultural body standards to be accepted (10) which has shaped the view of the human body (11). Women tend to view themselves from an outsider's perspective, leading to self-objectification (12, 13). Cognitive-behavioral models suggest that negative body image can lead to eating disorders, especially in women (14). This can lead to ON tendencies and eating disorders like bulimia and anorexia (13, 15). Studies have supported these findings (16, 17). Based on this, the current study proposed hypothesis 1: body image could positively predict women's ON significantly.

Individuals are concerned with how they are perceived by others in terms of their physical appearance and often aim to make a positive impression (18, 19). However, failing to achieve this goal can lead to distressing emotions, known as "social physical anxiety" (20). This type of anxiety has been linked to eating disorders and is becoming increasingly prevalent as people prioritize being liked and approved of. Additionally, conflicting information about healthy eating habits in the media can contribute to this anxiety, particularly in women. All these factors may contribute to the rise of ON in women in the future, highlighting the importance of examining the relationship between body image and ON.

According to studies on the association between SPA and ON, persons with higher SPA have a higher ON inclination, and especially women, make an effort to be thinner, resulting in eating disorders (21, 22). It has been observed that social physical anxiety has different mechanisms of action in studies investigating the variables associated with eating attitude. The evidence obtained is that SPA has a mediating effect. However, it is also stated that the mediating effect of SPA in the relationship between body image and eating disorders may be valid for populations particularly susceptible to experiencing both body-related concerns and eating disorders and cannot be generalized (23). There is not enough research in the literature investigating the link between SPA and ON. More investigation needs to be made in vulnerable groups to obtain clearer evidence of the mediating effect of SPA.

As a result, based on previous research and theories, we presented Hypothesis 2: SPA would mediate the relationship between body image and ON. To summarize, we constructed a mediation model to study the association between women's body image and ON, as well as the mediating influence of SPA. Figure 1 depicts the theoretical model.

MATERIALS AND METHODS
Participants
This cross-sectional analytical observational study targeted women aged 18-65 living in a province in the Mediterranean Region of Turkey as of March 2022, with a total population of 135819. A sample size of 768 was determined using Open-Epi software, with a 50% prevalence, 95% confidence interval, 5% variation, and design effect of 2. The sample size obtained was sufficient for mediation analysis in the developed model according to the literature. Because it was reported in a cross-sectional study that 422 participants were required and adequate to evaluate a moderate mediation effect size using the bootstrap method to achieve 80% power (24). Using convenience sampling methods, 647 adult women were reached by face-to-face interviews with individuals who agreed to participate in the study at a total of eight booths set up in 3 main streets and the university campus in the settlement where the study was conducted, with a reach level of 84.3%.

Measures

The Body Image Scale, developed by Secord and Jourard and translated into Turkish by Hovardaoglu, is a 40-item questionnaire that measures satisfaction with various bodily parts and functions (25, 26). Responses are rated on a 5-point Likert scale ranging from 1 ("I don't like it at all") to 5 ("I like it very much"). Scores range from 40 to 200, with higher scores indicating greater satisfaction with one's body. The scale is one-dimensional and consists entirely of positive statements. There is no cut-off score, and body image is evaluated based on the mean score. The adapted scale demonstrated high internal consistency with a Cronbach Alpha coefficient of 0.93.

The Social Physique Anxiety Scale (SPA) is a 12-item inventory developed by Hart et al. to assess anxiety related to one's physique when judged by others (20). Balli and Asci validated its use for the Turkish population (27). The inventory uses a five-point Likert scale, with some items reverse-scored. The Turkish adaptation of the scale uses a 7-item version with a reliability of 0.83. There are no sub-dimensions or cut-off points, and scores range from 7 to 35, with higher scores indicating greater concern about one's appearance.

Donini et al. developed the Healthy Eating Obsession Scale (ORTO-15) to assess individuals' obsession with healthy eating (28). The self-assessment test consists of 15 questions and its Turkish validity and reliability study was conducted by Arusoglu (29). Four items were deleted from the scale adapted to Turkish (ORTO-11). A single item of the scale is scored in the opposite direction. Orthorexic tendencies are scored 1 point and regular eating behaviors are scored 4 points in the scale. The total score of the scale is the sum of all items, and low scores indicate a predisposition to ON. The cut-off point of the scale corresponds to the 25% cut-off value to determine the prevalence of orthorexia. In our study, those with an ORTO-11 score below 23 were considered orthorexic. The Cronbach's alpha coefficient of the scale was reported as 0.62.

Personal Information Form contains seven questions that inquire about the individual's age, educational status, marital status, height and weight, employment status, and thoughts about her own weight. Body mass index (BMI) was calculated by dividing weight in kg by height in m squared. Those with a BMI of <18.5 were classified as underweight, those with a BMI of 18.5-24.9 as normal, those with a BMI of 25-29.9 as overweight, and those with a BMI of 30 or higher as obese (30). When women's BMIs were compared to their perceptions about their own weight, overweight and obese by BMI were combined and presented as overweight/obese in a single group.

Procedure

Participants were interviewed by a member of the research team. After briefing about the content of the study (body/eating attitudes) and the anonymous nature of their participation, the women who gave written informed consent completed a paper-and-pencil questionnaire. No economic or academic incentives were offered to participants in exchange for participation. The data were collected in two months in March and April 2022. and its later amendments or comparable ethical standards. Ethical approval was granted by the Suleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee (Date: January 26, 2022; No: 28).

Data analyses

The independent variables were age, educational status, marital status, height and weight, body mass index (BMI), employment status, and thoughts about her own weight in this study. The dependent variable was orthorexia nervosa status. Additionally, the mediating effect of SPA on the relationship between body image and ON in women has been investigated in this study. SPA is the mediating variable. As covariates, age, education level, marital status, employment status, consistency of BMI, and weight perception were introduced.

The hypothesized mediation model was tested with the PROCESS macro for SPSS models in Model 4 (to examine the Body Image → SPA → ON agent sequence) (Figure 1) using a bootstrapping approach to assess the significance of indirect effects (31). To obtain the robust standard error and Bootstrap confidence interval of parameter estimation, 5000 Bootstrap samples (each with a sample size of 647 people) were selected. The causal steps approach (Baron and Kenny method) was used in the statistical evaluation of the mediation model and the realization of the steps testing the mediation model was evaluated (32). The associations under investigation are considered statistically significant when the 95% confidence interval (CI) obtained using a bias-corrected and accelerated bootstrapping technique does not contain zero. All continuous variables were

standardized prior to performing the described regression analyses. As a result, regression coefficients (B) are displayed in their standardized form.

RESULTS

Table 1 presents the demographic characteristics of the participants; whose average age was 30.4 (SD = 11.2). A significant majority of the group was comprised of those with university or higher education (n= 519, 80.2%), single (n= 446, 68.9%), and working or studying (n= 568, 87.8%). Participants' BMI and weight perception were compared, and they were classified as compatible or non-compliant. The majority of women (n= 511, 79.0%) perceived their weight consistently with their BMI.

Orthorexia was discovered in 20.2% of the participants (n = 131). The mean body image score of the participants was 145.3 (SD= 22.3), the SPA score was 19.3 (SD= 5.1), and the ON was 26.1 (SD= 4.3). Body image was shown to be positively related to ON (r= 0.08, p<0.05) and negatively related to SPA (r=-0.39, p<0.001). SPA and ON trends are declining as body image satisfaction rises. ON was adversely associated with SPA (r=-0.25, p<0.001). The ON trend increases as the SPA increases. Age has no correlation with any of the key variables.

The summary of direct and indirect effects of body image on orthorexia nervosa are shown in Figure 1 and Table 2. The effects of body image and education status on the mediating variable SPA were negative and significant, according to path a. Body image satisfaction was lower (B = -0.09, SE =0.01, t = -10.78, p< 0.001), and not having a university or higher education (B=-2.15, SE = 0.58, t = -3.72, p<0.001) increased SPA. In path c′ and b, SPA was found to significantly reduce the score of ORTO 11 and thus increase the trend of ON (B= -0.22, SE = 0.04, t = -6.37, p<0.001, respectively). In path c, in which the overall effect is assessed, the body image increased significantly the score of ORTO 11 (without a mediated effect of the SPA), i.e., it was shown that it reduced the trend of ON (B= 0.02, SE = 0.01, t = 2.25, p<0.05). In path c′, the significance of the body image with ORTO 11 was completely eliminated when the analysis included SPA (B= -0.01, SE =0.01, t = -0.37, p>0.05). The mediation effect of SPA was statistically significant (γ=0.02, SE=0.01, 95% CI [LLCI= 0.01, ULCI= 0.03]). In this context, SPA had an enhancing role as a mediator in the effect of body image on ON.

In this case, SPA was found to be a full mediator. In other words, the effect of body image on ON was determined to be realized through SPA. While body image dissatisfaction has no direct effect on ON, it does increase the ON trend by increasing SPA.

DISCUSSION

The mediating effect of SPA on the relationship between body image and ON in women has been investigated in this study. The mediator variable, which can also be defined as the intervening variable, is known as the variable that transmits the effect of the independent variable (prediction variable) to the dependent variable (result variable). The mediator variable (M), which functions as a link between the independent variable (X) and the dependent variable (Y), aids in explaining the effect of the independent variable on the dependent variable. In other words, the mediator variable is one that explains how and why a relationship between two variables exists (32). In this study, the SPA variable (M) provides the link between the independent variable body image (X) and the dependent variable ON status (Y). SPA is the mediator variable that helps us to understand the relationship between body image and ON. According to Baron and Kenny, a variable that is claimed to be a mediator variable (M) is defined as a mediating variable if it satisfies the necessary conditions one after the other (32). According to this approach, also known as the traditional method, the mediation effect in the mediating effect model shown in Figure 1 can be statistically tested as follows:

- As the first condition; X must significantly affect Y (path c). In our study, body image (X) significantly affected ON status (Y) (B=0.02, p<0.05).
- As the second condition, X must significantly affect M (path a). In our study, body image (X) significantly affected SPA (M) (B=-0.09, p<0.001).
- As the third condition; M should significantly affect Y when X and M are included in the regression analysis together (path b). In our study, when body image (X) and SPA (M) were included in the regression analysis, SPA (M) significantly affected ON status (Y). (B=-0.22, p<0.001).

If there is a non-significant relationship between X and Y, it is said to be a full mediation effect, and if there is a decrease in the relationship between X and Y, it is said to be a partial mediation effect (path c'). In our study, when body image (X) and SPA (M) were included in the regression analysis, a non-significant relationship was found between body image and ON

Table 1. Participants' demographic characteristics

Variables	n	%
Total	647	100.0
Gender		
Female	647	100.0
Education status		
University and above	519	80.2
Other	128	19.8
Marital status		
Single	446	68.9
Married	201	31.1
Working status		
Working or student	568	87.8
Not working or retired	79	12.2
Body mass index		
Underweight	60	9.3
Normal	433	66.9
Overweight	111	17.2
Obese	43	6.6
Consistency of weight perception		
Consistent	511	79.0
Inconsistent	136	21.0
Orthorexia nervosa status		
Normal	516	79.8
Orthorexic	131	20.2
	Mean	Standard deviation
Age	30.41	11.21

Table 2. Summary of direct and indirect effects of body image on orthorexia nervosa

Outcome variable	Predictors	Fitting index		Regression coefficients				
		R^2	F	B		SEB	LLCI	ULCI
Social Physique Anxiety		0.18	22.66**					
(Path a)	Age (ref: ≤30)			0.72		0.69	-0.64	2.08
	Education status (ref: university and above)			-2.15	**	0.58	-0.11	-0.07
	Marital status (ref: single)			-0.14		0.68	-3.29	1.02
	Working status (ref: working/student)			0.32		0.70	-1.05	1.69
	Consistency of weight perception (ref: inconsistent)			0.56		0.46	-0.34	1.46
	Body image			-0.09	**	0.01	-0.11	-0.07
Orthorexia Nervosa		0.07	7.32**					
(Path c′	Age (ref: ≤30)			-0.22		0.62	-1.43	0.99
and Path b)	Education status (ref: university and above)			-0.95		0.52	-1.97	0.07
	Marital status (ref: single)			0.79		0.61	-0.40	1.98
	Working status (ref: working/student)			-0.58		0.62	-1.79	0.65
	Consistency of weight perception (ref: inconsistent)			-0.32		0.41	-1.12	0.48
	Body image (direct effect on orthorexia)			-0.01		0.01	-0.02	0.01
	Social Physique Anxiety			-0.22	**	0.04	-0.29	-0.16
Orthorexia Nervosa		0.02	1.68					
(Path c)	Age (ref: ≤30)			-0.38		0.64	-1.63	0.86
	Education status (ref: university and above			-0.47		0.53	-1.51	0.58
	Marital status (ref: single)			0.82		0.62	-0.41	2.04
	Working status (ref: working/student)			-0.65		0.64	-1.90	0.61
	Consistency of weight perception (ref: inconsistent)			-0.45		0.42	-1.27	0.38
	Body image (indirect effect on orthorexia)			0.02	*	0.01	0.01	0.03

LLCI: Lower Level of the 95% Confidence Interval. ULCI: Upper Level of the 95% Confidence Interval. *p<0.05, and **p<0.001

(path c′, B=-0.01, p>0.05). Therefore, it was determined that SPA had a full mediating effect in this relationship. Each proposed condition must be provided step by step in this evaluation method. In our study, all of these steps were provided step by step. We found that SPA played a mediating role in the link of body image to ON, which also verified our

hypothesis 2. For some time, researchers have recognized that there is a link between body image and eating behaviours (14,16,17). According to Barnes and Caltabiano, high body image scale scores influence ON status (16). ON-prone individuals, according to Barthels et al., have very inflexible notions about a healthy body image (17).

We discovered a substantial association between body image and ON in the c path of the interactions evaluated in our research. The ON tendency diminished as the individuals' body image improved. Women's body image was found to have a significant effect on SPA. The SPA has been found to be higher in women who are dissatisfied with their bodies. According to the literature, women are less content with their bodies than males. Furthermore, studies have reported that as women's dissatisfaction with their bodies increases, so does SPA (33, 34). It is understandable for the individual to experience such anxiety about her body in social life. In fact, it is well known in the literature that people who are stigmatized about their bodies face devaluation and humiliation in their social environment (35). Overweight people face more discrimination in hiring, college admission, employment and income, dating, medical care, the media, and advertising. They have fewer opportunities for themselves (36). It is expected that the anxiety of being subjected to such treatment in social situations to increase the individual's level of anxiety.

The results of our study revealed a significant positive association between SPA and ON tendency in Turkish women, indicating that women with higher SPA scores have a greater susceptibility to ON. These findings align with previous research demonstrating that individuals with higher SPA scores tend to have a desire to achieve a thinner physique, which can potentially lead to disordered eating behaviours (21, 22). However, it is important to note that comparing SPA and ON alone may not provide a comprehensive understanding of the complex interplay between body image, SPA, and ON. Given the limited literature on this topic, further investigation is warranted.

Furthermore, our study revealed that when examining the joint effect of body image and SPA on ON tendency, SPA emerged as a significant mediator, while the effect of body image on ON tendency disappeared. These novel findings suggest that SPA may fully mediate the relationship between body image and ON tendency in Turkish women. To the best of our knowledge, no prior research has investigated the interplay between these variables in the context of ON. As such, our study highlights the need for additional research to further explore and compare the complex associations between body image, SPA, and ON.

Limitations

The limitations of this study are that the study group consists entirely of women, is highly educated, has a high employment rate and is relatively young. This may have led to higher orthorexia scores compared to the general population. In addition, such a group may have higher body perception concerns and social physical anxiety. Therefore, the findings obtained may have been more pronounced than they actually were, unlike the population. Most probably, the reason for this situation is that no probability sample selection was made and data was collected by convenience sampling.

In our country, studies conducted in women on this subject were generally conducted in adolescent and young adult groups. In our study, although the majority of the participants were young, it is an advantage that middle-aged and older women were also included. In addition, considering the studies
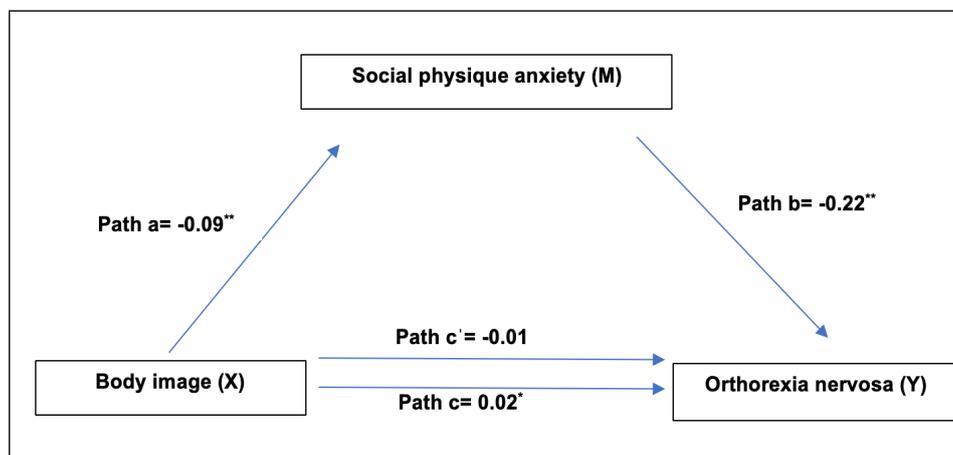

Figure 1. Mediation model of social physique anxiety on the relationship between body image and orthorexia nervosa ($^*p<0.05$, and $^{**}p<0.001$)

examining SPA and body image together in the literature, the fact that the mediating role of SPA on ON was revealed is an additional contribution.

Future studies that use age classification to represent older individuals, especially for adults, may provide more reliable results about the population for the level of ON in women. On the other hand, the ON status of male individuals needs to be determined.

CONCLUSION

In light of our findings, it can be concluded that body image and SPA are significant determinants of ON among Turkish women. The increase in body dissatisfaction and physique anxiety play a crucial role in the development of ON. Our study shows that SPA acts as a full mediator in the relationship between body image and ON, whereby an increase in body dissatisfaction leads to increased SPA, which, in turn, increases the likelihood of ON. Interventions aimed at reducing SPA among individuals may be an effective strategy for reducing ON and other eating disorders associated with body image issues. Given the limited research on SPA and body image together, this study's identification of the mediating role of SPA on ON can pave the way for future research in this area. Further research is needed to explore the complex interplay between body image, SPA, and ON, and to develop effective interventions for preventing and treating these disorders among vulnerable populations.

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A BEHAVIORAL APPROACH TO THE EFFECTS OF THE GENDER OF VOICE ON THE DICHOTIC LISTENING TEST PERFORMANCE

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ABSTRACT

Purpose: In the dichotic listening test, not only the asymmetry of the auditory system is evaluated but also the associated cognitive processes. The aim of this study was to examine the effect of male and female voices on dichotic listening.

Methods: Participants consisted of 10 men and 14 women, aged 18–45 (28.54±6.23) without neurological or auditory disorders. The dichotic listening test was applied to four different sessions. These sessions: female voices in both ears, male voices in both ears, male and female voices in both ears (mono session), male voices in the right ear, female voices in the left ear, and female voices in the right ear, and male voices in the left ear (stereo).

Results: It was determined that brain lateralization was significantly reduced in the female session compared with the stereo session; in other words, right ear dominance decreased (p=0.026, d=-0.293). It was determined that there was a significant difference between the number of errors in male and stereo sessions.

Conclusion: Participants preferred the syllables voiced with male voice more in mono and stereo sessions. It is observed that female participants mostly prefer syllables voiced with a male voice, and male participants prefer syllables voiced with a female voice.

Keywords: dichotic listening test, gender of voice effect, ear dominance

INTRODUCTION

The sound perception is a process that requires physical, auditory, and cortical co-adaptation. During this perceptional process, bottom-up information processing requires combining different modalities of information from the environment and reflects the physical-sensory processing part of sound perception. Also, Top-down information processing is involved to the process of originating information flow from upper perceptual systems. Because of human physiology, left-hemisphere dominance is characterized as a right ear advantage during the auditory perception. For this reason, sounds coming from the right ear are expected to be perceived as dominant. The asymmetry of auditory perception can be evaluated by the dichotic listening test which is a

non-invasive, low-cost, and simple test (1). In the dichotic listening (DL) test, not only the asymmetry of the auditory system, but also the associated cognitive processes are evaluated. The most common dichotic listening test is a test in which speech processing can be evaluated in terms of hemispheric asymmetry by simultaneously listening to different (heteronymous) or the same (homonymous) syllables consisting of a consonant and a vowel, respectively (2). Consonant–vowel (CV) syllables with stop consonants (/b/, /d/, /g/, /p/, /k/, /t/) and /a/ are the most common DL stimulus (3). One of the well-known results of the classical dichotic listening test is that right-handed participants prefer syllables presented to their right ears over those presented to their left ears when they are not asked to direct their attention to either ear (4-7). Kimura explained this situation with anatomical advantages such as the processing of speech signals in the left hemisphere, the functional differences of crossed and uncrossed nerve fibers in the afferent pathway extending from the cochlea to the cerebral cortex, and the occlusion of uncrossed fibers from the left ear because of their struggle with the signals coming from the right ear while reaching the left hemisphere (8). This is also called as the right ear advantage by Kimura (8). The main alternative to the structural model is the "attention model" proposed by Kinsbourne (9). In this model, when the participant is given a task or expects a task, the region responsible for that task is activated more in the left hemisphere compared to the right hemisphere. The accuracy of

the answers given by the participants in the Dichotic Listening test is highly dependent on their attention (10,11).

One of the possible mediators of the DL test results could be the gender of the voice. Although there are studies examining the effects of the participant's gender on the dichotic listening test, the research on the effect of the gender of the sounds present in the dichotic listening test is very limited. In this study, it was aimed to evaluate the effects of male and female voices on auditory asymmetry during the DL test (cv-syllables) by removing the ear dominances. To achieve this, we re-designed the classical dichotic listening test sessions called as mono and stereo. In mono session we aimed to get the gender preference independent from the ear and syllables, while in stereo session we aimed to get the gender preference dependent to the ear and syllables.

MATERIALS AND METHODS

The participants consisted of 10 men and 14 women, aged 18–45 years (28.54±6,23), without neurological or auditory impairments. The participants were selected as a result of the hand dominance test, and all were right-handed. The participants who had an average hearing loss of 30 dB HL (dB hearing level) or more in one ear according to the audiometry test or who had an average difference of more than 15 dB HL between their left and right ears were excluded from the study. Participants whose number of
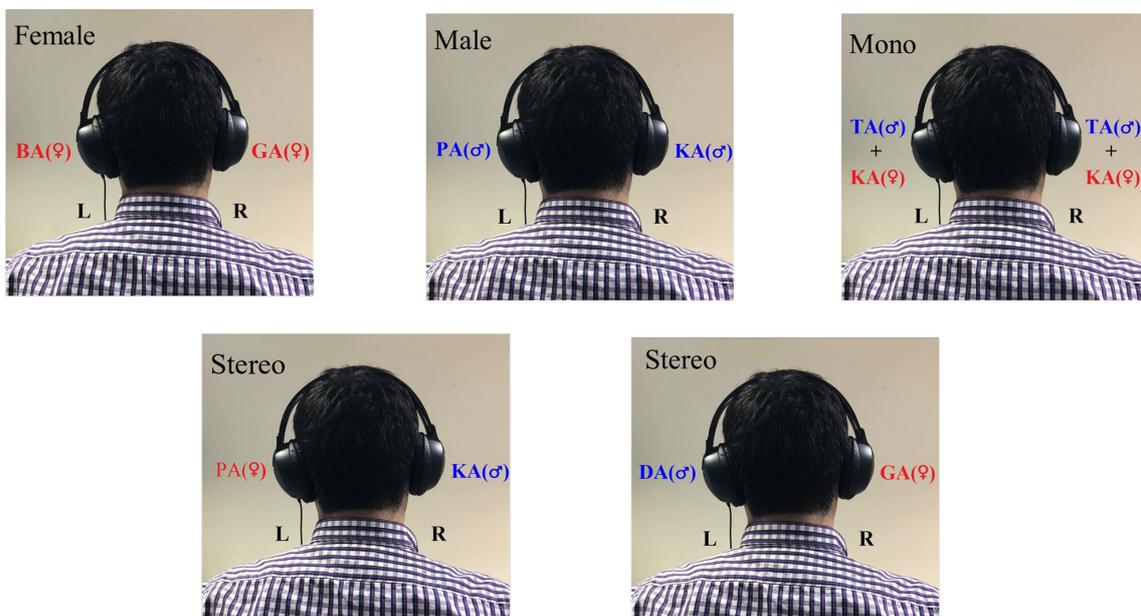
Figure 1. Presentation of female, male, mono and stereo sessions in one sample

erroneous responses exceeded 10 percent of the number of stimuli were excluded from the study.

Six consonant-vowel syllables (ba, da, ga, pa, ka, and ta) were delivered via headphones to the participants sitting in a sound-isolated room. Participants were asked to mark the first or best syllable they heard on the six-key response keyboard using their right hand (12). Before the application of dichotic listening test, a two-minute pre-test was conducted to help the participants to familiarize.

In the dichotic listening test, four sessions involving male and/or female voices were applied in balanced order to eliminate the order effect. These sessions are (i) female voices in both ears, (ii) male voices in both ears, (iii) male and female voices in both ears simultaneously (mono session) and (iv) male and female voices in both ears separately (stereo) (Figure 1).

Ethics committee approval was obtained from Dokuz Eylul University Non-Interventional Research Ethics Committee (Date: 13.05.2019, Decision no: 2019/4776). This prospective study was conducted between September 2019 to Nov 2022 at the Dokuz Eylül University, Izmir, Turkey.

Statistical Analyses

The data were analyzed using JASP *(Version 0.17.1)*. The Shapiro-Wilk test was used for controlling the normality of the data in within-group comparisons, Pearson (parametric) or Spearman (non-parametric) tests were used to compare the correlation between voice types. Stereo session and mono session were compared with repetitive measures of variance analysis (rm-ANOVA). The Friedman test was used for statistical analysis of the difference between the three sessions, as it was shown that the data did not have a normal distribution when the number of incorrect answers in the female, male, and stereo sessions were evaluated using the normality test. The Conover test was applied for post-hoc analyses.

RESULTS

In the evaluations made in four separate sessions for each participant, no significant gender effect was found on the behavioral responses of the participants ($p>0.05$). For the comparisons of gender voice, an analysis of variance in repeated measures (rm-ANOVA) were employed. When the stereo session and mono sessions were compared, the session main effect [$F_{(1,20)}=13.362$; $p=0.002$; $\eta^2= 0.001$] and the main effect of voice gender [$F_{(1,20)}=35.132$,

$p<0.001$, $\eta^2 =0.582$] were found to be significant. There was no significant difference between session and voice gender interactions ($p>0.05$) (Figure 2). Additionally, there was no significant difference between the age of male and female participants ($p>0.05$)

There is no significant difference between the number of syllables in which male and female participants prefer female and male voices in mono and stereo sessions. However, it can be seen from the way that female participants prefer more male voices and male participants mostly prefer female voices (Figure 3).

When the erroneous numbers in the mono and stereo sessions were evaluated using the paired sample t test, it was found that the errors made in the mono session were significantly higher than in the stereo session ($p<0.001$, $d= 0.805$).

According to the Friedmann test, it was determined that the number of erroneous responses changed significantly between sessions ($p=0.008$), and the Conover test was applied for post-hoc analyses. Accordingly, it was determined that there was only a significant difference between the number of errors in the male and stereo sessions ($t=3.055$; $p=0.012$).

DISCUSSIONS

When all participants in our study were evaluated as a group regardless of their gender, in mono and stereo sessions, they preferred the syllables voiced with a male voice more. When grouping according to participant genders for mono and stereo sessions, there is no significant difference between the number of syllables in which male and female participants prefer female or male voices. However, it is observed that female participants mostly prefer syllables with a male voice, and male participants prefer syllables with a female voice. By increasing the number of participants, it will be important to evaluate whether this trend continues and whether this difference is statistically significant. In the literature in which different results are obtained when the participants are compared with the voices of the opposite sex compared to the voices of the same sex. In a dichotic listening study using a female voice or a male voice in one ear and white noise in the opposite ear and participants' reaction times to these sounds according to the gender of the voice, female participants were shown to be faster at categorizing male voices more accurately than female voices. This situation supports the tendency toward opposite gender during voice categorization (13). Studies examining the possible
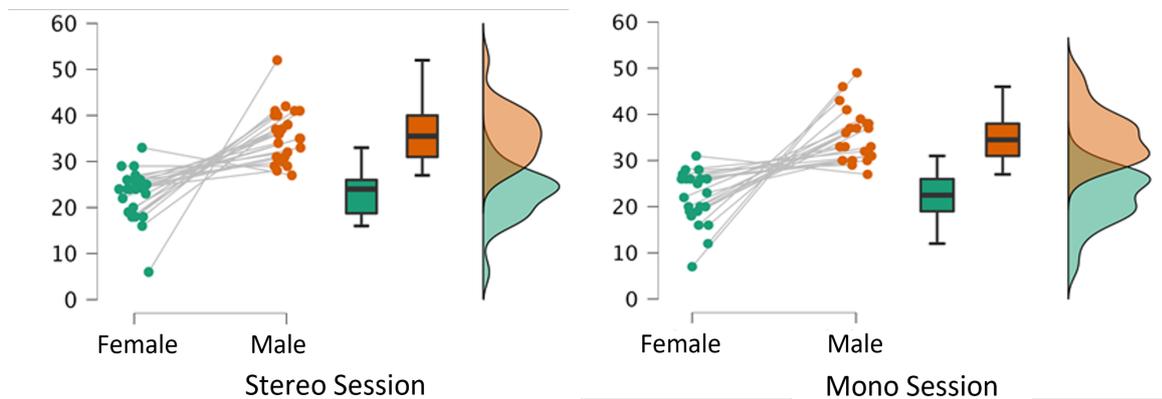
Figure 2. Number of female and male voice preferences of the participants in the stereo and mono sessions
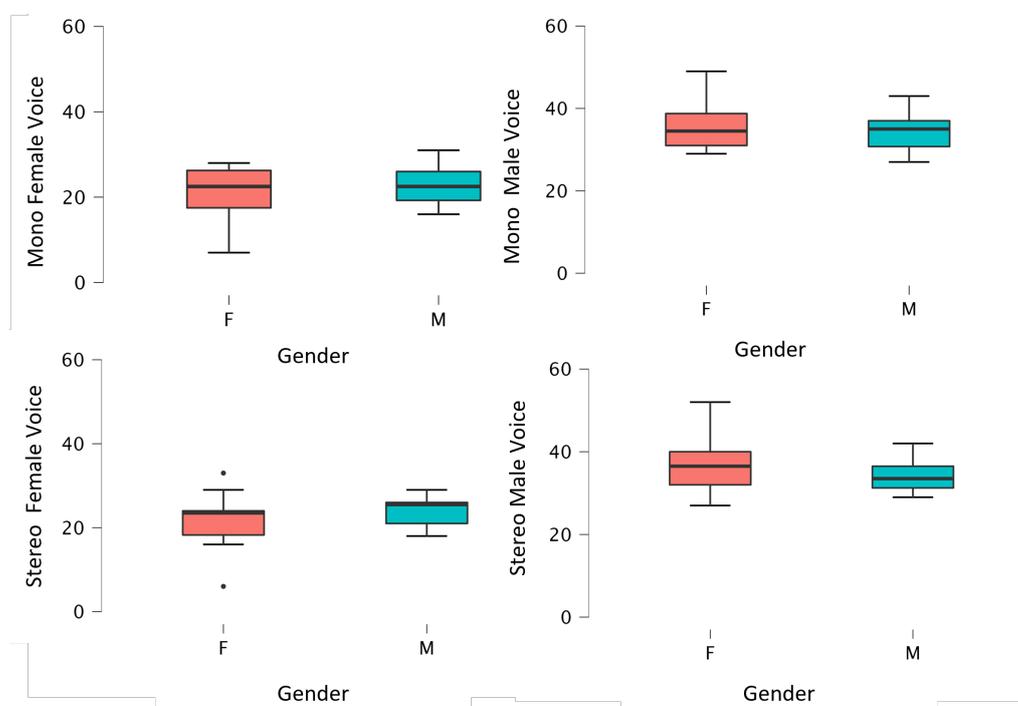

Figure 3. Average of female and male participants choosing syllables with male and female voice gender in Mono and Stereo sessions

differences in hearing and cortical structures between men and women generally did not find significant effects of the gender of the participants on the structural differences in the brain. It has been reported that auditory asymmetry is similar in both genders, and although structurally hemispheric differences are slightly more pronounced in males than females, they are not statistically significant (14). The role of the left and right hemispheres in processing the gender of sounds is controversial. Although some studies suggest that both hemispheres play an active role, others suggest the superiority of the right hemisphere (15). In a study

conducted on healthy participants, it was shown that the categorization of the gender of the voice was faster when the stimuli were presented to the left ear. Additionally, healthy participants categorized female voices more accurately than male voices in the noise comprehension test. (13). In the fMRI study conducted regardless of the gender of the listeners, it was determined that female voices showed stronger activity in the temporal cortex than male voices (16). It is argued that this is due to the processing of timbre dimensions in the non-primary auditory cortex and creates a greater activation because female voices have a more complex timbre. Prete et al., while

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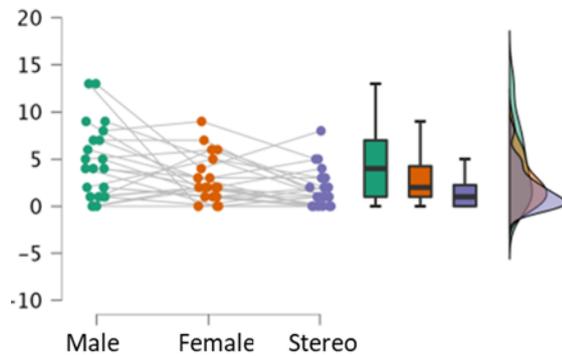
Figure 4: Distribution of number of incorrect answers in male, female and stereo sessions

dichotic syllables were used in their study, Weston et al. used words, and this affects the results. It is thought that as the complexity of the sound sent as a stimulus increase, the activation in the female voice increases. It can be thought that syllabic stimuli consisting of consonant and vowel syllables, and which can be evaluated as less complex, are evaluated over the fundamental frequencies of the sound in the primary auditory cortex. In the postmortem MRI study, there was no difference in temporal region structurality between males and females. (17). On the other hand, when the results of the tests in which hemispheric asymmetry was evaluated behaviorally, no difference was found between the genders. In a meta-analysis study compiled from studies aiming to reveal gender differences in language lateralization with the dichotic listening test, it has been observed that women have a more right ear dominance than men (17). In another study series, no significant effect was found on the gender of the participant in the dichotic listening tests performed with different types of syllables and word lists (18,19). There is a slight but consistent female advantage in early language development. This, however, appears to disappear during childhood. In adults, it is difficult to identify sex differences in verbal abilities and brain structure and function related to language processing (20,21).

When the erroneous responses in all sessions are examined, it is seen that the most errors were made in the session in which syllables pronounced with a male voice were given. Another session with a very close number of errors made in the men's session was the mono session. The session with the least error was the stereo session. So, few errors were made in the stereo session. This can be explained by

the fact that the participants focused on the female or male voice, suppressing the voice of the other gender coming from the opposite ear and reducing the confounding effect. Since the fundamental frequencies of the syllables are the most different from each other in the male and female sessions, the probability of them masking each other may decrease. Thus, with the arrival of syllables of different genders from both ears in the stereo session, the dominance of syllables over each other may be lost. For this reason, more errors may have been observed in the male and female sessions than in the stereo session. When the number of errors made in mono and stereo sessions is examined, it is seen that significantly more mistakes are made in the mono session than in the stereo session. This situation may have arisen from the difficulty of the process that occurs when syllables of different genders are sent to both ears at the same time in a mono session. In this session, the syllables coming from the right or left ear for the male voice and the syllables coming from the right or left ear for the female voice are the same. In this respect, it is unclear from which ear the participant heard the answer, and the gender of the syllable chosen by the participant can be evaluated. Since the participants in the mono session heard two different syllables from two different genders in both ears simultaneously, the syllables affected each other's intelligibility, and a syllable that was not actually sent might have emerged as an erroneous response. At this point, it may be important in terms of phonetics to examine erroneous responses and determine which two syllables are most often incorrectly selected.

CONCLUSION
In this study, for the first time in the literature, a dichotic listening test paradigm and a modified dichotic listening paradigm (mono and stereo sessions) were created in the Turkish mother tongue with male and female voices. With the modified dichotic listening test, the right ear dominance, which is the most known result of the dichotic listening test, was eliminated as much as possible, and the hemispheric dominance of the sound, which was caused only by the stimulus difference, was examined. There was no statistically significant effect on the behavioral responses of the participants, male or female. It was observed that the participants preferred the male voice more, regardless of their gender.

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EVALUATION OF SERUM DRUG CONCENTRATIONS IN A TERTIARY CARE HOSPITAL: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Serum drug concentration (SDC) is an important parameter used in drug efficacy and treatment follow-up.
Aim: This study aimed to evaluate subtherapeutic, therapeutic and toxic SDCs, SDC measurement requests and demographic specialities (age and sex) for carbamazepine, phenytoin, phenobarbital, lithium and digoxin.
Materials and Methods: This is a cross-sectional study, evaluating the outpatients' and inpatients' SDC data treated at Research and Application Hospital of Afyonkarahisar Health Sciences University between January 1, 2012 and February 28, 2019, and having SDC data. The relations between dependent and independent variables was evaluated with chi-square analysis and Students' T-test. P<0.05 was considered statistically significant.
Results: A total of 3735 patients, 8946 admissions (mean: 41.1±26.6 years, 51.3% females) and 10158 SDCs were reviewed. Digoxin SDC was the most common measurement, at a rate of 33.7%. The highest number of SDC measurement was made in 2016 (n=1627). Subtherapeutic SDC rates were high for phenytoin, lithium, and digoxin (69.8%, 39.7%, 35.8%, respectively). Digoxin (16.2%) and phenobarbital (9.8%) were the drugs with the highest rate of toxic SDC. SDC increased for all drugs with increasing age, this was statistically significant for carbamazepine, lithium and digoxin (P<0.05). SDC for digoxin was found to be significantly higher in female sex (P<0.001).
Conclusion: In this study, subtherapeutic and toxic SDC levels were examined. This study revealed the need for prospective studies evaluating Therapeutic Drug Monitoring (TDM) together with patient- and drug-related factors.

Keywords: therapeutic drug monitoring, serum drug concentration, digoxin, phenobarbital, phenytoin

INTRODUCTION

Measuring drug concentration in blood is a method applied for many years, providing better information than drug dosage in terms of drug efficiency and safety. In this method, which is based on biochemical analysis alone, drug concentrations are interpreted within the specified therapeutic range, regardless of patient related factors. The therapeutic index of a drug is the concentration range between the minimum effective concentration and the minimum toxic concentration of the drug (1). Interpretation involves only subtherapeutic, therapeutic and toxic levels. This information is necessary for the clinician to set the dose of the drug.

Serum drug concentration (SDC) is not measured for each and every drug. Thus, certain drug-related criteria were determined in order to perform a SDC measurement: if the therapeutic range is narrow, if it is ineffective or toxic, when the dosage is changed, if there is a drug-drug interaction, and if it is clinically difficult to observe the effect of the drug (2, 3). SDC has been measured for years for antiepileptic (e.g. phenytoin), antiarrhythmic (e.g. digoxin), antidepressant (e.g. lithium), antibiotic (e.g. vancomycin), antineoplastic (e.g. methotrexate) and immunosuppressive (e.g. cyclosporine) drugs (4,5).

In our country however, SDC measurement started in the 1980s. Studies based on SDC measurements are limited and conducted in tertiary healthcare institutions (6-8). Evaluating merely drug levels was the major limitation of these retrospective studies, where demographic data and SDC measurement requests affecting the drug level were not taken into account.

Our study, carried out between 2012 and 2019 in a tertiary healthcare institution, aimed to evaluate a) the number of SDC measurement requests by different drugs; b) SDC rate at subtherapeutic, therapeutic and toxic levels; and c) the demographic specialities (age and sex) affecting SDC.

MATERIALS AND METHODS

This is a descriptive and cross-sectional study. The study was initiated after the approval Afyonkarahisar Health Sciences University- Non-Interventional Research Ethics Committee (Date: 13.05.2022, Decision No: 2022/309) and was carried out in line with the principles of the Declaration of Helsinki.

The patients with SDC data who applied to AFSU Health Application and Research Center between January 1, 2012 and February 28, 2019 constituted the sample. The date of data collection: February-July 2022. The sample size was calculated as minimum 310 individuals by the Open Epi program, with a deviation of 5% and a confidence level of 95%, in line with the information obtained from previous studies, and accepting the average therapeutic limit as 72% for the antiepileptic serum drug level (6-8). However, the patients sample was not selected by any limitation rule, but all the patients who met the inclusion criteria within the specified date range were included in the study. All the patients of all age ranges, who received outpatient or inpatient treatment at AFSU Application and Research Center, and whose SDC was measured, were included in the study. The SDC ratio (number of tests/number of patients) was calculated. An attempt was made to standardize this ratio by calculating the average number of SDC measurements per patient.

SDCs were measured spectrophotometrically by Cobas 8000 analyzer (Roche) in AFSU Medical Biochemistry Laboratory. Standard calibrations, internal and external quality control tests were regularly performed. Therapeutic ranges were defined as 4-12 µg/ml for carbamazepine, 10-20 µg/ml for phenytoin, 10-30 µg/ml for phenobarbital;

Table 1. Drugs with SDC measurements and demographic characteristics of the patients

Drug	Number of Patients n	Number of Applications n	Number of Tests n	Mean Age (S) Years	Gender Female (%)	Male (%)
Carbamazepine	662	2015	2078	20.3 (16.0)	917 (44.1)	1161 (55.9)
Phenytoin	200	289	321	35.4 (21.5)	128 (39.9)	193 (60.1)
Phenobarbital	339	1036	1112	3.8 (2.5)	498 (44.8)	614 (55.2)
Lithium	585	2759	3220	39.4 (13.7)	1637 (50.8)	1583 (49.2)
Digoxin	1949	2847	3427	67.2 (16.6)	2031 (59.3)	1396 (40.7)
Total	3735	8946	10158	41.1 (26.6)	5211 (51.3)	4947 (48.7)

S: Standart deviation

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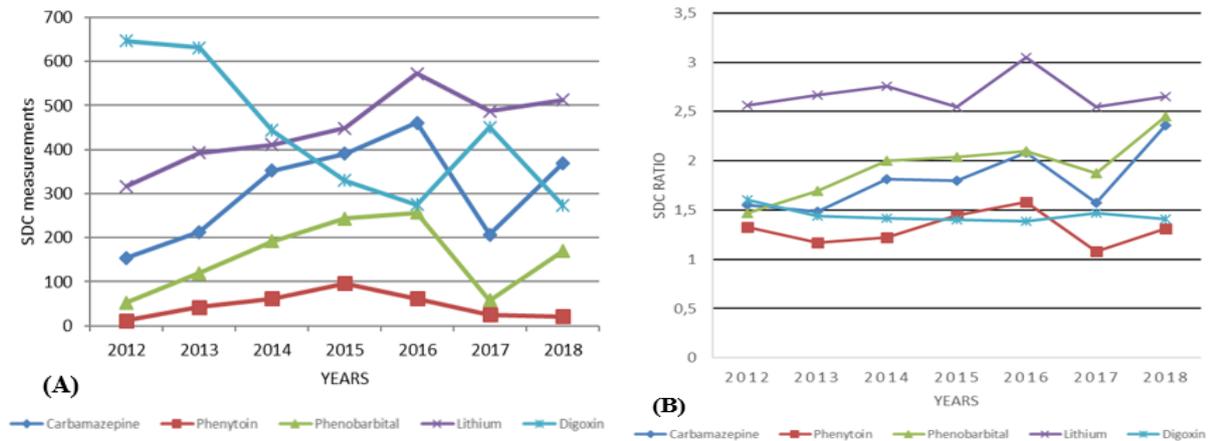
Figure 1. The trend of change serum drug concentration (SDC) measurement numbers and SDC ratio by years. A) SDC measurement numbers. B) SDC ratio: Number of Tests / Number of Patients

0.6-1.2 mmol/l for lithium and 0.6-1.2 ng/ml for digoxin. In line with the literature, 2.0 ng/ml and above was accepted as toxic level for digoxin (9).

Statistical analysis

Descriptive statistical analysis was implemented for the demographic data and laboratory findings of each hospitalization of the patients. Results were presented as number (n), percent (%), mean ± standard deviation (S). In the descriptive statistics by years, there was only 2 months of data for 2019. For this reason, data for 2019 was not presented in the chart.

The relationship between dependent and independent variables was evaluated by chi-square analysis for categorical variables and by Students's t test for the variables indicated by measurement. The median values of the age factor, as an independent variable, were calculated for each drug. Based on these median values, analyses were performed by seperating into two groups. Data were analyzed with the statistical program SPSS-24 (SPSS INC., Chicago, IL, USA). $P<0.05$ was considered statistically significant.

RESULTS

A total of 10158 SDCs were measured in 3735 patients. The most SDC was measured for digoxin, while the least for phenytoin (Table 1). Mean age of the patients was 41.1±26.6 years and 51.3% were female. The rate of patients under 18 years of age was 24.1%, while the rate of patients aged 65 and over was 25.6%. Mean age of the patients with SDC

measured was highest for digoxin (67.2±16.6 years) and lowest for phenobarbital (3.8±2.5 years) (Table 1).

The least number of SDC measurements was performed for phenytoin (3.2%) over eight years and the most for digoxin (33.7%) (Table 1). The second most frequent SDC measurement was for lithium (31.7%). As for the SDC measurements by years, the highest number was in 2016 (n=1627), while the lowest in 2017 (n=1229). The number of SDC measurements for digoxin decreased over the years, and displayed fluctuations after 2016. The number of SDC measurements for phenobarbital and lithium showed an increasing trend over the years, but a substantial drop was determined in 2017. The change in the number of SDC measurements of drugs by years is presented in Figure 1 (A). The SDC ratios showed a similar trend to the SDC measurement numbers. In patients taking lithium, the SDC ratio ranged from 2.55 to 3.05, and it was the drug most frequently requested per patient (Figure 1 (B)). Although digoxin was the drug with the most requests, its SDC ratio was the lowest and the least requested drug per patient.

About three-quarters of the measured SDCs for carbamazepine and phenytoin were detected at the therapeutic level. While 23.7% of the SDC measured for phenytoin was within the therapeutic range, 69.8% was below subtherapeutic level. It was determined that 29.5% of the SDC measured for digoxin was above 1.2 ng/ml, while 16.2% was at the toxic level (>2 ng/ml). Among the drugs with SDC data, the highest toxic level was found for digoxin, followed by

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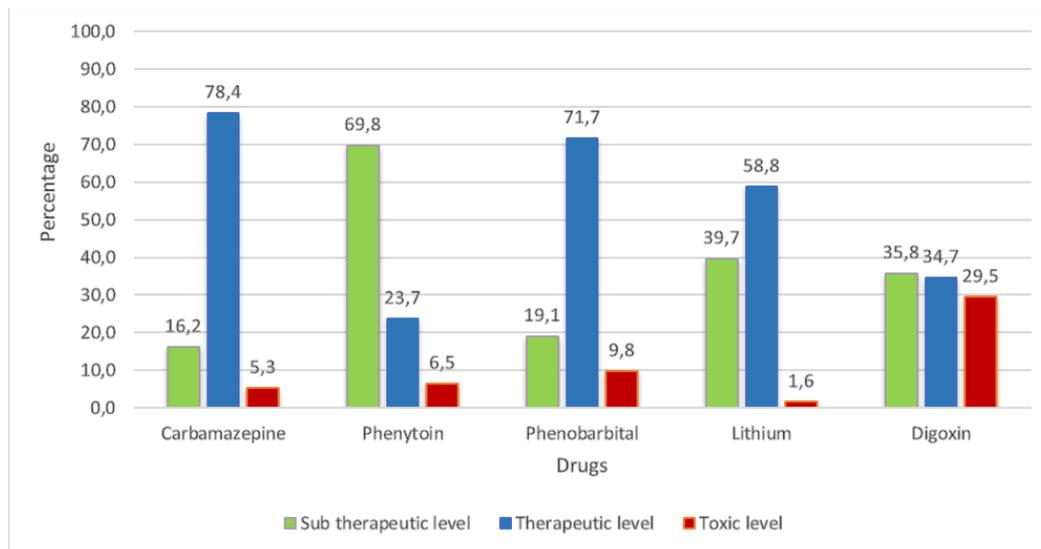
Figure 2. Serum drug concentration (SDC) percentage of subtherapeutic, therapeutic and toxic levels

phenobarbital with a rate of 9.8% (Figure 2). Looking at the rates of toxic levels of digoxin and phenobarbital over the years, we find that they were highest in 2019 (Figure 3).

As for the factors affecting SDC, the concentration was found to increase for all drugs with increasing age, and this was statistically significant for carbamazepine, lithium, and digoxin (Table 2). With respect to sex factor however, SDC was found to be higher in female sex for all drugs except phenobarbital, but there was statistical significance only for digoxin (Table 3).

DISCUSSION

In this study, SDC measurement results of/in a tertiary university hospital, with a capaciy of 655 beds and approximately 450 thousand outpatients per year, are presented retrospectively. The most frequent SDC measurement was for digoxin. The sample size was higher with respect to the similarly designed studies in Turkey, where data were analyzed retrospectively (7, 8). When compared with two different studies evaluating only digoxin SDC, the number of digoxin SDC measurements (n=3427) was higher with respect to the study of Özyiğit et al., and similar to the study of Yılmaz et al. (10, 11). The number of SDC measurements for antiepileptics was less that that of the study by Karaalp et al (12). In our study, the results of all drugs whose SDC was measured were evaluated, were not specific to only one drug group.

The mean age of the patients with SDC measurement was highest for digoxin and lowest for phenobarbital.

Digoxin is a drug used in the treatment of heart failure and atrial fibrillation. Determining a high value for the mean age due to the the indication of use, gave out similar results with respect to the other studies in the literature (13, 14). Phenobarbital is an antiepileptic agent that is frequently used in the neonatal and childhood age group (15) . For this reason, in our study, the mean age of the patients with phenobarbital SDC was found to be low, in accordance with the literature (16).

A complex trend was observed in the SDC measurements of these drugs over the years. SDC measurement was more balanced for phenytoin, while it tended to decrease for digoxin and to increase for other drugs. However, in 2016-2017, SDC measurement reversed its trend for the other drugs except phenytoin. The number of SDC measurements was very low, especially in 2017. Just the contrary was observed for digoxin SDC measurement. This may be attributed to the doctor requesting the test. There is no TDM Service in our hospital. Considering the variation in the study results by the physicians requesting SDC measurements, it is apparent that there is a need for more information on TDM and a standardization of the requests of drugs in the clinical unit.

In addition to regular monitoring of serum lithium concentrations because of its very narrow therapeutic range, it is said that more extensive monitoring is needed even when SDC is in the "normal" range. Age, polypharmacy, and morbidities are important factors that accelerate lithium toxicity (17). These differences between the SDC ratios of the drugs

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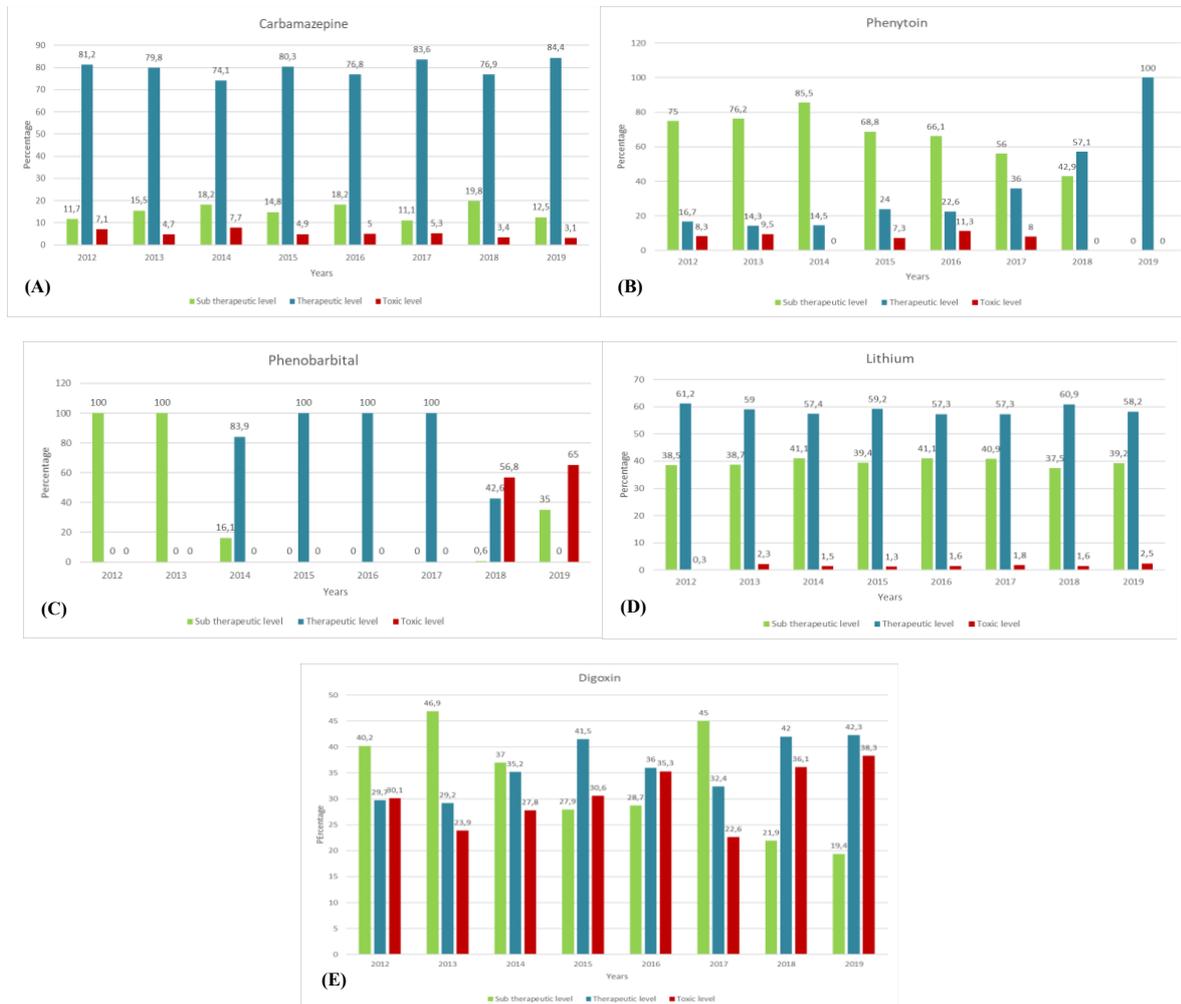
Figure 3. Serum drug concentration percentage of subtherapeutic, therapeutic and toxic levels by years. A) Carbamazepine, B) Phenytoin, C) Phenobarbital, D) Lithium, E) Digoxin.

indicate that the requested department and physicians ordered the test without paying attention to the SDC order indications.

Phenytoin, lithium and digoxin were the drugs with the highest SDC at subtherapeutic level. This rate was about 70% for phenytoin, which was very high. But in a study on TDM of antiepileptic drugs in Turkey (12), this rate was 61%, which was close to the rate we found in our study. However, this rate varied between 35-37% in the studies conducted in several other countries, which was much lower with respect to our study results (18, 19). The accepted therapeutic range for phenytoin SDC may not be valid for all patients. SDC is related to the type and severity of the seizure, and it is not recommended to increase the dose of phenytoin in patients having seizures controlled at a subtherapeutic level (20). However, there is a study reporting subtherapeutic levels of

phenytoin in most of the patients with seizures (21). Besides individualization of the dose and SDC, it is also extremely important to assure therapeutic range as much as possible and to consider patients' data when interpreting SDCs (22).

In the study, the SDC for lithium was found at a subtherapeutic level of 40%. Nepal et al. found the SDC rate for lithium as 14% in their study conducted in a tertiary healthcare institution (23). In two other studies with similar research samples, the SDC rate for lithium was found to be 30% and 32%, which were closer to our study results (24,25). Lithium has been used in the treatment of bipolar disorder for many years. In addition to the studies reporting that low-dose lithium treatment can increase constructive behavior while decreasing destructive behavior, providing neuroprotective benefits and causing less suicide and psychosis (26,27), there are also some

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Table 2. Comparison of SDC levels between age groups

	Age (n)	Mean (S)	P
Carbamazepine	**15 ≥** (1078)	6.3 (3.1)	*< 0.001*
	15 < (1000)	7.3 (3.2)	
Phenytoin	**36 ≥** (162)	7.5 (6.8)	0.359
	36 < (159)	8.2 (7.0)	
Phenobarbital	**1 ≥** (655)	17.4 (9.6)	0.194
	1 < (457)	18.3 (11.8)	
Lithium	**37 ≥** (1686)	0.59 (0.25)	*<0 .001*
	37 < (1534)	0.64 (0.33)	
Digoxin	**70 ≥** (1723)	0.90 (0.89)	*<0 .001*
	70 < (1704)	1.22 (1.0)	

Age was analyzed by dividing the patients into two groups based on the median value for each drug. Student's t-test was performed. S: Standart deviation

Table 3. Comparison of SDC levels between gender

	Gender (n)	Mean (S)	P
Carbamazepine	**Female** (917)	6.9 (3.3)	0.309
	Male (1161)	6.7 (3.1)	
Phenytoin	**Female** (128)	8.2 (7.6)	0.512
	Male (193)	7.7 (6.5)	
Phenobarbital	**Female** (498)	17.6 (10.6)	0.606
	Male (614)	17.9 (10.5)	
Lithium	**Female** (1637)	0.62 (0.32)	0.744
	Male (1583)	0.61 (0.26)	
Digoxin	**Female** (2031)	1.21 (1.10)	*< 0.001*
	Male (1396)	0.87 (0.90)	

Student's t-test was performed

other studies indicating less adverse effects at low concentrations despite more relapses (28,29). It was also reported that low and high serum lithium concentrations displayed no difference (30). In the light of these information, it was recommended to target SDC for lithium treatment as 0.6-0.75 mmol/l, and as 0.8-1.0 mEq/L for newly diagnosed patients if they can tolerate it (29-31).

Approximately two-thirds of digoxin SDC was detected outside the therapeutic range. The reference range for digoxin was recognised as 0.8-2 ng/ml by the laboratories, for a long time. However, the target SDC in heart failure was suggested as 0.5-0.9 ng/ml for digoxin in advanced analysis of the Digitalis Investigation Group (DIG) study, revealing that mortality was reduced at low SDC (13). Therefore, considering its use for atrial fibrillation too, the lower limit of SDC for digoxin was updated as 0.6-0.7 ng/ml (32). The reason for the high rate of

subtherapeutic SDC for digoxin in our study was that low SDC was targeted by considering the guidelines and clinical studies. (32). However, subtherapeutic concentrations below 0.5 ng/ml for digoxin were accepted as '*undetectable SDC*' in the literature, which was determined as 7%, lower than our study results (33). There is no information on the efficacy of digoxin at very low concentrations. For this reason, it should be taken into consideration that subtherapeutic SDC may cause failure in treatment. Among the medicines, digoxin displayed the highest toxic CDC levels, with the rates of 30% (>1.2 ng/ml) and 16% (>2 ng/ml). This was followed by phenobarbital at a rate of 10%. In the studies examining the relationship between Digoxin SDC and mortality, SDC was determined above 1.2 ng/ml at a rate of 23.7%-36.7%, consistent with our results (33-35). Considering the toxic level >2 ng/ml, similar results were determined with the literature, at a rate

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of 8-17% (36-38). Although alternative drugs have been developed, the toxicity of digoxin remains high, especially in 2019.

Phenobarbital SDC was toxic at a rate of 10%. This rate was found to be 11.5%, in a study conducted in Turkey (12). Phenobarbital has been used as a first-line treatment for epilepsy in neonates, despite limited efficacy and safety data (39). Phenobarbital is metabolized in the liver by cytochrome P450 (CYP) enzymes, and genetic polymorphisms in these enzymes may affect metabolism as well as elimination of phenobarbital (40). Therefore, both potential drug-drug interactions and interindividual differences are the factors affecting phenobarbital SDC (41). It requires attention in terms of high SDC, because it is an antiepileptic used especially in the newborn and pediatric age group. The fact that very high toxic concentrations of phenobarbital were found in the last two years in which the study data were collected indicates that attention should be paid to the safe use of this drug.

Patient demographics, such as age and sex, may affect SDC. In our study, SDCs were found to be higher for all drugs with increasing age. Similarly, Grzesk et al. determined significantly increased SDCs for digoxin by increasing age (42). In addition to the studies indicating higher rates of lithium SDC by increasing age, there are also studies reporting no significant difference (43). The finding of a significant increase in digoxin SDC with age and female sex was consistent with the literature (36). Women, compared to men, have a higher percent body fat weight, which may lead to differences in the distribution of drugs (44). Decreased muscle mass, water ratio and kidney functions in elderly individuals may cause changes in the distribution and especially excretion of drugs (45). The higher rates of SDCs detected by increasing age and female sex may be due to changes in the pharmacokinetics of the drug. However, the other patient-related factors that may affect the pharmacokinetics of the drug should also be considered.

The limitation of this study is the lack of patients' data including height, weight, other drugs used, comorbidities, serum albumin and electrolyte levels, kidney and liver function tests that may affect the pharmacokinetics of the drugs, and baseline demographic characteristics, prognostic factors such as mortality and hospitalization, or health care expenditures. Because they were not included in the electronic database between 2012 and 2019. Another

limitation is that the study was carried out in a single center. The number of similar studies evaluating the SDC of all drugs is rather low and this study can be considered favourable due to the large number of data used in the analyses.

CONCLUSION
This study evaluated drug levels of both inpatients and outpatients admitted to a tertiary university hospital in a period of 8 years. SDC was determined high at subtherapeutic levels for phenytoin, lithium and digoxin; and at toxic levels for phenobarbital and digoxin. Although we cannot provide clinical outcomes, keep in mind that subtherapeutic levels may lead to treatment failure and poor prognosis, while toxic levels may lead to longer length of stay and higher mortality, development of additional comorbidities, and unnecessary health care expenditures.

It was observed that patient-related factors such as age and sex could affect SDC by changing the concentrations of the drug. This study evaluated only drug levels, TDM was not performed. Studies evaluating TDM specifically for the indications and the drugs will shed light on the subject.

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A PERSPECTIVE FROM AN OCCUPATIONAL MEDICINE CLINIC IN TURKEY: WHICH WORK-RELATED DISEASES DO OLDER WORKERS MOST FREQUENTLY SUFFER FROM?

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ABSTRACT

Purpose: This study aims to investigate the overall health status and work-related diseases of older workers, utilizing data collected from an occupational medicine outpatient clinic in a university hospital in Turkey.

Material and Methods: In this descriptive study, data from 526 workers, aged 45-64, who visited the occupational medicine clinic between 2015-2020 were analysed.

Results: The median age of the workers was 48 (45-64). Among the patients, 48.1% were smokers, and 73.4% had a BMI of 25 or higher. A significant majority of the workers (79.3%) were employed within the industry sector, with none working in agriculture. Out of the total patients, 291 individuals (55.3%) were found to have at least one chronic disease. A total of 328 (62.4%) of the workers were diagnosed with at least one work-related disease.

Conclusion: The high rates of smoking and obesity identified in this study highlight the need for health promotion initiatives in the workplace. Integrating regular chronic disease follow-ups into workplace health surveillance is crucial for the early detection and effective management of medical conditions. The absence of referrals from the agricultural sector underscores the need to enhance access to occupational health services for older workers in this sector. A comprehensive review of workplace measures related to work-related diseases is essential to protect the health of older workers.

Keywords: Older worker, occupational disease, work-related disease, aging workforce, workplace health promotion

INTRODUCTION

The aging of the population stands as one of the most significant demographic trends on a global scale. In 2021, the rate of the older population was 17.3% in the USA, 28.8% in Japan, 13.1% in China, 6.9% in India, and 9.7% in Turkey. The proportion of the older population is expected to be 16.3% in Turkey in 2040 (1).

The increasing share of older individuals in society means a corresponding rise in older workers in working life. There is no consensus on the definition of an "older worker." Various agencies and organizations employ a wide range of age brackets, ranging from 40 to 65 years, to define the "older workers" category (2). The ILO stated that Recommendation 162 for Older Workers applies to

"all workers who are liable to encounter difficulties in employment and occupation because of advancement in age" (3).

The process of aging presents a combination of advantages and disadvantages in working life. While older workers may experience declines in physical capacity, perception speed, and reflexes, they also exhibit heightened levels of experience, independent working skills, and a strong sense of responsibility (4). Staying in working life has various health and social advantages for older workers. Runge et al. found that older workers (50-64 years) who experienced a transition from employment to unemployment had a higher incidence of metabolic syndrome compared to the control group of individuals who remained employed (5). Early retirement was found to have a negative impact on the cognitive ability of workers in their early 60s (6).

The notion of "active aging", developed by the WHO, refers to the process of optimizing opportunities for health, participation, and security to enhance the quality of life as individuals age (7). Active aging emphasizes the importance of remaining engaged, productive, and socially connected throughout the aging process. This perspective recognizes that continued participation in the workforce contributes to the principles of active aging. In 2020, Turkey registered a labor force participation rate of 49.3% among individuals aged 15-64. However, the labor force participation rate for the older population (65+) stood at 10.0% (16.8% for older males and 4.6% for older females) (8).

Despite the existence of numerous scientific studies examining the health status of the older population in Turkey, research focusing specifically on older workers remains scarce. Therefore, our study, which aims to provide insights into the overall health status and work-related diseases among older workers through data obtained from an occupational medicine outpatient clinic in a university hospital, is anticipated to make a significant contribution to the existing literature in this field.

MATERIALS AND METHODS

This descriptive study was conducted at an occupational medicine outpatient clinic of a university hospital in Izmir, Turkey. The study included individuals aged 45-64 who were referred to the clinic between 2015-2020. The data were obtained from the medical records. No sample size was calculated,

rather all eligible cases were included in the study.

All the workers included in the study were referred to the clinic for further assessment either by their workplaces or the Social Security Institute due to suspected work-related medical conditions. Following workers' visits to the occupational health clinic, all disease diagnoses were either established or confirmed by the relevant specialist physicians at the university hospital. Then, the causal relationship between the confirmed diagnoses and workplace conditions was evaluated by occupational medicine specialists (MD) in the Occupational Medicine Department Council. Two distinct definitions were employed to characterize the relationship between diseases and work: "occupational disease" and "work-aggravated disease".

Occupational disease: Temporary or permanent illness, physical or mental disability experienced by insured individuals due to the repetitive nature of their work or the specific working conditions (9).

Work-aggravated disease: This term represents the situation in which the prognosis of the pre-existing disease is adversely affected by working conditions.

Work-related disease: In the study, this term refers to a comprehensive concept that covers both occupational diseases and work-aggravated diseases.

The data were analyzed using the SPSS statistics program. In descriptive analyses, frequency data were presented as numbers (n) and percentages (%), and non-normally distributed numerical data were reported using the median (minimum-maximum) values. The Kolmogorov-Smirnov test was used to determine whether the variables were normally distributed. For normally distributed numerical data, independent groups t-test was employed, while the Mann-Whitney U test was used for non-normally distributed numerical data. Fisher's Exact test and chi-square test were applied for the analysis of categorical variables.

This study was approved by the Ethics Committee of Dokuz Eylül University (Date: 18.01.2021, Decision No.2021/02-36).

RESULTS

Between the years 2015 and 2020, 526 workers aged 45-64 were referred to the university's occupational medicine outpatient clinic. Evaluated on an annual basis, the proportions of patients in the 45-64 age group among all patients assessed at the clinic

Table 1. Older workers' sociodemographic characteristics and overall health status

		Total	Female	Male	p
Gender (n=526)	Female	58 (11.0%)			
	Male	468 (89.0%)			
Age Group (n=526)	45-49	320 (60.8%)			
	49-54	138 (26.2%)			
	55-59	46 (8.7%)			
	60-64	22 (4.2%)			
Education (n=464)	Illiterate	6 (1.3%)	2 (4.0%)	4 (1.0%)	
	Literate	5 (1.1%)	0 (0.0%)	5 (1.2%)	
	Primary school graduate	272 (58.6%)	34 (68.0%)	238 (57.5%)	
	Secondary school graduate	59 (12.7%)	2 (4.0%)	57 (13.8%)	
	High school graduate	92 (19.8%)	5 (10.0%)	87 (21.0%)	
	Higher education	30 (6.5%)	7 (14.0%)	23 (5.6%)	
Smoking (n=526) (n, %)	Non-smoker	114 (21.7%)	35 (60.3%)	79 (16.9%)	<0.001
	Smoker	253 (48.1%)	17 (29.3%)	236 (50.4%)	
	Ex-smoker	159 (30.2%)	6 (10.3%)	153 (32.7%)	
Body Mass Index (n=435)	<18.5, underweight	2 (0.5%)	2 (4.2%)	0 (0.0%)	
	18.5-24.9, normal	114 (26.2%)	13 (27.1%)	101 (26.1%)	
	25-29.9, pre-obesity	199 (45.7%)	18 (37.5%)	181 (46.8%)	
	30-34.9, obesity class 1	99 (22.8%)	12 (25.0%)	87 (22.5%)	
	35-39.9, obesity class 2	19 (4.4%)	3 (6.3%)	16 (4.1%)	
	40 and above, obesity class 3	2 (0.5%)	0 (0.0%)	2 (0.5%)	
Body Mass Index (mean± SD)		27.7±4.1	27.4±4.9	27.7±4.0	>0.05
Chronic Diseases (n=526)	None	235 (44.7%)	9 (15.5%)	226 (48.3%)	
	1 chronic disease	144 (27.4%)	16 (27.6%)	128 (27.4%)	
	2 chronic diseases	96 (18.3%)	17 (29.3%)	79 (16.9%)	
	3 or more chronic diseases	51 (9.7%)	16 (27.6%)	35 (7.5%)	
Most Common Chronic Diseases	Hypertension	80 (15.2%)	14 (24.1%)	66 (14.1%)	
	Diabetes Mellitus	45 (8.6%)	6 (10.3%)	39 (8.3%)	
	Lumbar Disc Herniation	45 (8.6%)	8 (13.8%)	37 (7.9%)	
	Asthma	35 (6.7%)	11 (19.0%)	24 (5.1%)	
	Cervical Disc Herniation	31 (5.9%)	10 (17.2%)	21 (4.5%)	
	Peptic Ulcus	26 (4.9%)	5 (8.6%)	21 (4.5%)	
	COPD	23 (4.4%)	2 (3.4%)	21 (4.5%)	
	Meniscopathy	18 (3.4%)	4 (6.9%)	14 (3.0%)	
	Psychiatric Diseases	18 (3.4%)	8 (13.8%)	10 (2.1%)	
	Coronary Artery Disease	18 (3.4%)	3 (5.2%)	18 (3.4%)	
Chronic Diseases (median, min-max)		1 (0-6)	2 (0-4)	1 (0-7)	<0.001
Regular Drug Use (n=526)	None	307 (58.4%)	15 (25.9%)	292 (62.4%)	
	1 drug	79 (15.0%)	9 (15.5%)	70 (15.0%)	
	2 drugs	55 (10.5%)	11 (19.0%)	44 (9.4%)	
	3 or more drugs	85 (16.2%)	23 (39.7%)	62 (13.2%)	
Drugs Used Regularly (median, min-max)		0 (0-9)	2 (0-9)	0 (0-9)	<0.001

Table 2. Comparison of the sectors in which female and male older workers work

		Total	Male	Female	p
Sector	Ceramic manufacture	97 (18.4%)	97 (20.7%)	0 (0.0%)	<0.001
	Mining	83 (15.8%)	83 (17.7%)	0 (0.0%)	<0.001
	Metal manufacture	62 (11.8%)	61 (13.0%)	1 (1.7%)	0.008
	Concrete-cement-brick manufacture	52 (9.9%)	51 (10.9%)	1 (1.7%)	0.020
	Dental prosthesis laboratory	34 (6.5%)	31 (6.6%)	3 (5.2%)	>0.05
	Food production	29 (5.5%)	18 (3.8%)	11 (19.0%)	<0.001
	Textile	22 (4.2%)	13 (2.8%)	9 (15.5%)	<0.001
	Plastic manufacture	16 (3.0%)	10 (2.1%)	6 (10.3%)	0.005
	Construction	14 (2.7%)	14 (3.0%)	0 (0.0%)	>0.05
	Health services	13 (2.5%)	5 (1.1%)	8 (13.8%)	<0.001
	Electronic manufacture-automotive	11 (2.1%)	10 (2.1%)	1 (1.7%)	>0.05
	Chemistry	10 (1.9%)	9 (1.9%)	1 (1.7%)	>0.05
	Shipyard	10 (1.9%)	10 (2.1%)	0 (0.0%)	>0.05
	Transportation	9 (1.7%)	9 (1.9%)	0 (0.0%)	>0.05
	Wood manufacture	8 (1.5%)	8 (1.7%)	0 (0.0%)	>0.05
	Others	56 (10.6%)	39 (8.3%)	17 (29.3%)	

Table 3. Older workers' occupational diseases and work-aggravated diseases

Occupational Diseases (n= 372)*	**Total** (n=526)	**Male** (n=468)	**Female** (n=58)	p
Pneumoconiosis	131 (24.9%)	131 (28.0%)	0 (0.0%)	<0.001
Hearing loss	114 (21.7%)	113 (24.1%)	1 (1.7%)	<0.001
Upper extremity entrapment neuropathies	19 (3.6%)	12 (2.6%)	7 (12.1%)	0.002
Lumbar disc herniation	17 (3.2%)	16 (3.4%)	1 (1.7%)	>0.05
Upper extremity tendinitis	17 (3.2%)	12 (2.6%)	5 (8.6%)	0.030
Airway diseases (asthma, COPD)	17 (3.2%)	11 (2.4%)	6 (10.3%)	0.007
Cervical disc herniation	16 (3.0%)	10 (2.1%)	6 (10.3%)	0.005
Dermatitis	12 (2.3%)	8 (1.7%)	4 (6.9%)	0.034
Heavy metal intoxication	10 (1.9%)	10 (2.1%)	0 (0.0%)	>0.05
Other	19 (3.6%)	15 (3.2%)	4 (6.9%)	
Work-Aggravated Diseases (n=90)*	**Total**	**Male** (n=468)	**Female** (n=58)	p
Lumbar disc herniation	30 (5.7%)	22 (4.7%)	8 (13.8%)	0.011
Cervical disc herniation	15 (2.9%)	6 (1.3%)	9 (15.5%)	<0.001
Airway diseases (asthma, COPD)	14 (2.7%)	8 (1.7%)	6 (10.3%)	0.002
Allergic rhinitis	5 (1.0%)	1 (0.2%)	4 (6.9%)	0.001
Meniscopathy	5 (1.0%)	5 (1.1%)	0 (%0.0)	>0.05
Other	21 (4.0%)	13 (2.8%)	8 (13.8%)	

Some of the patients were diagnosed with more than one work-related disease.

in 2016, 21.8% in 2017, 24.8% in 2018, 17.3% in 2019, and 33.5% in 2020. The sociodemographic characteristics and overall health status data of the older workers are presented in Table 1. A total of 89.0% (468) of the patients were male. The median age of the patients was 48 years.

Among the 526 patients, 48.1% were identified as smokers, and 30.2% as ex-smokers. The prevalence

Table 4. Characteristics of the older workers diagnosed with certain work-related diseases

Work-Related Diseases	Sectors (n, %)	Age Group (n, %)	BMI (median, min-max)	Smoking Status (n, %)
Pneumoconiosis (131)	Mining (33, 25.2%), Ceramic manufacture (24, 18.3%), Metal manufacture (24, 18.3%), Dental prosthesis laboratory (15, 11.5%), Concrete-cement-brick manufacture (15, 11.5%)	45-49: 84 (64.1%) 50-54: 36 (27.5%) 55-59: 5 (3.8%) 55-64: 6 (4.6%)	26.8 (19.1-41.2)	Non-smoker: 14 (10.7%) Smoker: 72 (55.0%) Ex-smoker: 45 (34.4%)
Hearing loss (115)	Ceramic manufacture (40, 34.8%), Mining (20, 17.4%), Metal manufacture (19, 16.5%), Concrete-cement-brick manufacture (11, 9.6%), Shipyard (4, 3.5%), Dental prosthesis laboratory (3, 2.6%), Construction (3, 2.6%)	45-49: 72 (62.6%) 50-54: 33 (28.7%) 55-59: 8 (7.0%) 55-64: 2 (1.7%)	27.7 (19.8-39.5)	Non-smoker: 22 (19.1%) Smoker: 60 (52.2%) Ex-smoker: 33 (28.7%)
Lumbar disc herniation (47)	Food production (9, 19.1%), Ceramic manufacture (7, 6.1%), Health services (5, 10.6%), Metal manufacture (5, 10.6%), Construction (4, 8.5%), Textile (3, 6.4%), Concrete-cement-brick manufacture (3, 6.4%)	45-49: 35 (74.5%) 50-54: 10 (21.3%) 55-59: 1 (2.1%) 55-64: 1 (2.1%)	27.6 (21.2-37.4)	Non-smoker: 14 (29.8%) Smoker: 21 (44.7%) Ex-smoker: 12 (25.5%)
Cervical disc herniation (31)	Food production (5, 16.1%), Health services (3, 9.7%), Ceramic manufacture (3, 9.7%), Metal manufacture (3, Non-smoker: Smoker: Ex-smoker: 9.7%), Concrete-cement-brick manufacture (2, 6.5%)	45-49: 23 (74.2%) 50-54: 7 (22.6%) 55-59: 1 (3.2%) 55-64: 0 (0.0%)	25.5 (18.4-39.8)	Non-smoker: 9 (29.0%) Smoker: 18 (58.1%) Ex-smoker: 4 (12.9%)
Airway diseases (asthma, COPD) (31)	Textile (6, 19.4%), Food production (6, 19.4%), Metal manuacture (4, 12.9%), Plastic manufacture (4, 12.9%), Wood manufacture (3, 9.7%)	45-49: 22 (71.0%) 50-54: 5 (16.1%) 55-59: 2 (6.5%) 55-64: 2 (6.5%)	27.7 (18.4-37.0)	Non-smoker: 17 (54.8%) Smoker: 7 (22.6%) Ex-smoker: 7 (22.6%)
Upper extremity entrapment neuropathies (22)	Metal manufacture (4, 18.2%), Food production (3, 13.6%), Health services (2, 9.1%), Electronic manufacture - automotive (2, 9.1%)	45-49: 10 (45.5%) 50-54: 10 (45.5%) 55-59: 1 (4.5%) 55-64: 1 (4.5%)	27.1 (19.5-39.8)	Non-smoker: 4 (18.2%) Smoker: 13 (59.1%) Ex-smoker: 5 (22.7%)
Upper extremity tendinitis (19)	Health services (4, 21.1%), Textile (3, 15.8%), Ceramic manufacture (3, 15.8%), Metal manufacture (2, 10.5%)	45-49: 15 (78.9%) 50-54: 3 (15.8%) 55-59: 1 (5.3%) 55-64: 0 (0.0%)	27.4 (23.6-33.1)	Non-smoker: 6 (31.6%) Smoker: 8 (42.1%) Ex-smoker: 5 (26.3%)
Dermatitis (13)	Mining (2, 15.4%), Transportation (2, 15.4%)	45-49: 11 (84.6%) 50-54: 2 (15.4%) 55-59: 0 (0.0%) 55-64: 0 (0.0%)	25.5 (21.4-31.6)	Non-smoker: 2 (15.4%) Smoker: 8 (61.5%) Ex-smoker: 3 (23.1%)
Heavy metal intoxication (10)	Metal manufacture (5, 50.0%), Electronic manufacture-automotive (3, 30.0%)	45-49: 7 (70.0%) 50-54: 3 (30.0%) 55-59: 0 (0.0%) 55-64: 0 (0.0%)	26.8 (24.2-39.5)	Non-smoker: 1 (10.0%) Smoker: 8 (80.0%) Ex-smoker: 1 (10.0%)

of never-smokers was significantly higher among women compared to men (p<0.001). Out of the 435 individuals with available height and weight data, 73.4% had a body mass index (BMI) equal to or exceeding 25. No statistically significant difference was observed in the BMIs between female and male older workers (p>0.05) (Table 1).

Based on the self-reported medical histories, 55.3% of older workers reported having at least one chronic disease. Among those with chronic diseases, the median number of diseases was 2 (range: 1-7). Furthermore, 41.8% of the older workers regularly took at least one medication, with a median number of 2 drugs (range: 1-9). Female older workers exhibited a significantly higher number of chronic diseases and regularly used medications compared to their male counterparts (p<0.001 for both). The prevalent chronic diseases reported by the participants included hypertension (15.2%), diabetes mellitus (8.6%), lumbar disc herniation (8.6%), asthma (6.7%), and cervical disc herniation (5.9%) (Table 1).

When evaluated based on their present or most recent job, 79.3% of the workers were involved in the industrial sector, and 20.7% worked in the service sector. In the case of patients referred from the industrial sector, the majority (92.6%) were male workers, whereas in applications from the service

sector, the male proportion was 75.2%. The most common sectors of employment were ceramic manufacture (18.4%), mining (15.8%), and metal manufacture (11.8%). Moreover, a significant gender disparity was observed, with male older workers showing a higher frequency of employment in the ceramic manufacture, mining, metal manufacture, and cement-brick manufacture sectors, while female older workers had a higher frequency in the food production, textile, plastic, and healthcare sectors (Table 2).

In the occupational medicine clinic, 328 (62.4%) out of 526 older workers were diagnosed with work-related diseases through council evaluations. A total of 372 occupational diseases (90.9% male, 9.1% female) and 90 work-aggravated diseases (61.1% male, 38.9% female) were diagnosed among these 328 workers. A certain number of the patients were diagnosed with more than one work-related disease. Pneumoconiosis (131, 24.9%), hearing loss (114, 21.7%), and upper-extremity entrapment neuropathies (19, 3.6%) were the most prevalent occupational diseases. Additionally, lumbar disc herniation (30, 5.7%), cervical disc herniation (15, 2.9%), and airway diseases (13 asthma, 1 COPD, 2.7%) were the most common work-aggravated diseases (Table 3).

Among occupational diseases, the diagnoses of pneumoconiosis and hearing loss were found to be significantly more common in male older workers ($p < 0.001$), while upper extremity entrapment neuropathies, upper extremity tendinitis, CDH and dermatitis were diagnosed more frequently in female older workers ($p < 0.05$). In terms of work-aggravated diseases, cervical disc herniation ($p < 0.001$), lumbar disc herniation, airway diseases, and rhinitis ($p < 0.05$) were found to be significantly more common among women (Table 3).

Table 4 presents the sectors in which work-related diseases were most prevalent among older workers. In our study, it was determined that the sectors with the highest prevalence of pneumoconiosis and occupational hearing loss diagnoses were mining and ceramic manufacture. Additionally, metal manufacture and food production were the sectors where occupational upper-extremity entrapment neuropathies were most frequently diagnosed.

DISCUSSION

The majority of the older workers in the study worked in the industrial sector (79.3%). In Turkey, 64.2% of the employed population over the age of 65 years worked in agriculture, 27.7% in services, 6.1% in industry, and 2.0% in construction in 2020 (8). Although older workers work intensively in the agricultural sector in Turkey, there were no applications from the agricultural sector to the occupational medicine clinic. This situation may be explained by the fact that agricultural activities in Turkey are predominantly carried out in the form of family businesses, and self-employed workers are outside the scope of Occupational Health and Safety Law No. 6331, one of the main regulations in the field of occupational health and safety (10).

Tobacco smoking and obesity are among the major modifiable risk factors for chronic diseases, and are responsible for nearly one in five and one in ten deaths in US adults, respectively (11). High rates of obesity and smoking observed among the participants of the study indicate the necessity for the implementation of health-promoting policies for older workers, both on a national and workplace scale. Furthermore, the significance of fostering healthy lifestyle practices within the workplace has been increasingly recognized, not only for protecting the well-being of older workers but also for enhancing overall productivity by reducing absenteeism and presenteeism (2). Although studies addressing workplace health promotion actions for older workers were found to be few and generally of poor quality (12), there are also effective interventions that have been shown to improve the efficiency of older workers (13, 14).

More than half of the older workers in our study have at least one chronic disease. The most common chronic diseases were hypertension, diabetes mellitus, and lumbar disc herniation. Our results regarding chronic diseases are compatible with the overall health status of the older population in our country. In a study conducted in Turkey, the rate of having any chronic disease lasting more than six months was 38.4% in the 45-64 age group. The most common chronic diseases in the 45-64 age group were lumbar musculoskeletal disorders (16.6%), hypertension (16.3%), gastric ulcer (12.2%), rheumatic joint diseases (10.2%), osteoarthritis (10.1%), diabetes (8.2%) and cervical musculoskeletal disorders (7.1%) (15). According to the 2012 US National Institute of Occupational Health and Safety data, the most common chronic diseases in older workers were hypertension (58%), hyperlipidemia (45%), heart diseases (31%), arthritis

(29%) and diabetes (28%) (16). Chronic health conditions are a major economic burden for society owing to increased healthcare costs, decreased productivity, and absenteeism. Consequently, the significance of prevention, early detection, and ongoing monitoring of chronic diseases within the workplace has intensified, particularly as the population of older workers continues to grow.

In our study, respiratory system diseases, musculoskeletal diseases, and hearing loss were found to be the most common work-related diseases among older workers, and the distribution pattern was similar to that of general occupational diseases in Turkey (17). Occupational diseases, which are common in each sector, should be a guide in terms of the precautions to be taken in these areas. Due to the lack of referrals from the agricultural sector, data on the occupational diseases of older workers employed in this sector could not be obtained. Some of the most frequent hazards in agriculture are hazardous chemicals such as pesticides, carcinogenic agents such as UV radiation, zoonotic diseases, confined spaces such as silos, ergonomic hazards and extreme temperatures due to weather conditions (18). The inability of agricultural workers to access occupational health services may fail to identify health problems stemming from these risk factors and the inability to take preventive measures for these risk factors. This lack of access among agricultural workers may also create a void in data impeding the development of evidence-based occupational health policies.

Concerning the diagnosis of occupational diseases, stakeholders have various responsibilities concerning prevention, early detection, and post-diagnosis regulation. These responsibilities encompass identifying risk factors and implementing necessary preventive measures through workplace risk assessments, facilitating timely diagnoses through periodic health examinations and referrals to occupational medicine specialists, and effective management of workers diagnosed with occupational diseases within the workplace.   Aging is often accompanied by a decline in physical and mental functions, as well as reduced adaptability to challenging external conditions. Consequently, these physiological effects of aging on individuals should be taken into account during workplace risk assessments. It is crucial to accommodate older workers in the workplace to retain their participation in the workforce. Older workers also provide financial

benefits to the workplace in terms of lower staff turnover rates, lower recruitment costs, and greater benefits from training interventions (19). There are examples of successful interventions to support older workers in the workplace on health checks and counseling for workers at the individual level, interventions grounded on screening results, and enhancements to the work environment or organizational structure (20). Qualitative research from the Netherlands reveals barriers to supporting workers with chronic conditions to stay at work. Some of the identified barriers are negative organizational attitudes towards employees with chronic conditions, employees' hesitancy in engaging with employers to deal with work-related problems, lack of skills and knowledge of how to support employees with chronic conditions, and occupational physicians' lack of time and capacity for prevention (21).

Nine out of every ten older workers who applied to the occupational medicine clinic were male. The labor participation rate for women aged 15 and over is considerably lower than that for men in Turkey (32.8% and 70.3%, respectively) (22), and many women work in the informal economy (23). In our study, 90.9% of occupational diseases and 61.1% of work-aggravated diseases were identified in male older workers. The distribution of occupational diseases by sex was in line with the sex distribution of the applicants. In 2020, the majority of reported occupational diseases in Turkey, accounting for 79.7% of the total 908 cases, were observed among male individuals (17). According to Netherlands 2017 statistics, occupational diseases were reported most frequently in the 41-60 age group. Of a total of 4619 reported occupational diseases, approximately 20% were detected in men aged 51-60 years and approximately 15% in women aged 51-60 years. In all age groups, the proportions of men and women in occupational disease diagnoses were similar (24). An evident disparity was observed in gender distribution in clinic applications, occupational disease diagnoses in our study, and nationwide data on occupational diseases in Turkey. The fact that women mostly work in family businesses, in the agricultural sector, and in the informal economy prevents them from benefiting from occupational health and safety services and also creates a barrier to being diagnosed with work-related diseases. The negative impact of this situation may be greater in the older female workers group, in which chronic health problems are more common.

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Luleci D et al. Work related diseases in older workers

The male older workers in our study were more likely to work in the ceramics, mining, metal, and cement-brick sectors, which are known to have high rates of occupational hazards such as exposure to dust, chemicals, and noise. This may explain why pneumoconiosis and hearing loss were more frequently diagnosed in male workers. Conversely, female workers were more likely to work in the food, textile, plastic, and healthcare sectors. These sectors have different types of hazards such as repetitive movements and exposure to chemicals which explains why upper neuropathy, upper tendinitis, CDH, and dermatitis were found to be more common among female workers.

The data of the study were collected from a single source, an occupational health outpatient clinic in Turkey, thus our results may not be generalizable to all older workers in Turkey. Another constraint in terms of generalization is linked to the study's exclusive examination of older workers who were referred to the clinic for further assessment either by their workplaces or the Social Security Institute due to suspected work-related medical conditions. Therefore, our findings may not be representative of the broader population of older workers. The median age is observed to be 48 in the study, which may mean a limited representation of older worker groups with a more diverse age distribution. One of the strengths of our study lies in the fact that the data were obtained from one of the most experienced and longest-serving occupational disease clinics in Turkey. Additionally, considering the limited number of studies on occupational diseases among elderly workers in Turkey, our results are anticipated to provide insights into work-related diseases observed in older workers in Turkey.

CONCLUSION

The high rates of smoking and obesity observed in this study highlight the need for health promotion activities in the workplace. The result that over half of the older workers had at least one chronic disease reveals the importance of regular chronic disease follow-ups in the workplace. The absence of referrals from the agricultural sector underscores the need to enhance access to occupational health services for older workers engaged in this sector. The most frequently diagnosed work-related diseases were pneumoconiosis and hearing loss in male older workers, while musculoskeletal disorders were diagnosed more frequently in female older workers.

Appropriate occupational health and safety measures should be taken in workplaces regarding common occupational diseases and associated risk factors in certain sectors.

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THE RELIABILITY AND VALIDITY OF THE TURKISH VERSION OF THE TAMPA SCALE FOR KINESIOPHOBIA FOR TEMPOROMANDIBULAR DISORDERS

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ABSTRACT

Purpose: The objective of this study to translate the Tampa Scale for Kinesiophobia for Temporomandibular Disorders (TSK- TMD) and to examine its reliability and validity.
Material and Methods: The TSK- TMD was translated into Turkish as per international standards. The study included 111 patients with Temporomandibular Joint Disorder and aged 18-61 years. The research questionnaire collected demographic information, the Turkish version of TSK- TMD and Pain Catastrophizing Scale (PCS). Using the intraclass correlation coefficient (ICC) and Cronbach's alpha coefficient, respectively, internal consistency and test- retest reliability were examined. Construct validity was assessed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).
Results: The total Cronbach's alpha coefficient was found to be 0.876. The item total correlation of was found to be between 0.410 and 0.706. The ICC coefficient was found to be 0.951. The correlation coefficient by PCS, measured in terms of parallel from reliability, was discovered to be 0.520. According to the findings of EFA and CFA, the 12-item scale had the same two-factor structure as the original.
Conclusions: These results demonstrate the Turkish version of the TSK- TMD item questionnaire to be a valid and reliable instrument. It can be applied to patients with TMJ problems to assess kinesiophobia.

Keywords: Temporomandibular Disorders, Kinesiophobia, The Tampa Scale, Reliability and Validity.

INTRODUCTION

Temporomandibular disorders (TMD) are a group of structural and functional diseases caused by the muscular and/or joint structure of the chewing system and causing dysfunction (1). Symptoms of TMD are expressed as pain in the temporomandibular joint or chewing muscles, joint or mouth opening and closing movements, click or crepitation sounds, restriction in mouth opening, locking, deviation, or limitation during mandibular movements (2). There are many physical pathologies that cause TMD, and it is also associated with psychological, behavioral, and social factors (3). Several studies have been published recently on the relationship between pain and fear. Chronic pain stimulates fear of re-injury and causes an increased perception of pain. This increased perception of pain

causes the fear of movement to occur and reveals the situation of avoiding acting in the long term, depression and defect (4). In their study Crombez et al. stated that fear associated with pain causes more disability than pain itself (5). As a result of fear and anxiety caused by painful injury and sensitivity to re-injury, avoiding moving the area has been defined as kinesiophobia. To assess kinesiophobia, one uses the 17-item "Tampa Scale for Kinesiophobia (TSK)" (6).

This scale is used more widely, especially in musculoskeletal diseases (7, 8). Musculoskeletal pain arising from the temporomandibular joint also has similar features to musculoskeletal pain. Turner et al. stated that catastrophic thoughts play an important role in jaw movements and pain in TMD (9). In another studies, it was emphasized that kinesiophobia may cause injury and craniofacial pain in patients with TMD, and therefore, kinesiophobia is clinically important in the evaluation and treatment of patients (10, 11). In 2010, Visscher et al. adapted and reshaped TSK according to patients with temporomandibular joint problems, suggesting that their patients with TMD could be distinguished from other musculoskeletal diseases by the 'Tampa Scale for Kinesiophobia for Temporomandibular Disorders (TSK- TMD)' they described. The scale consists of 18 questions. They also added the "symptom checklist" section to the scale to determine whether the complaints were caused by pain, joint sound, deadlock, slipping, or other causes. According to the statistical analysis results of the scale, they suggested the use of the short version with 12 items (12). The validity and reliability of the TSK- TMD

China, Brazilian Portuguese, Korean and Spanish, languages have been demonstrated (13-16).

It will be helpful to evaluate the presence and level of kinesiophobia in the patient population with TMD and then to plan appropriate treatment programs. The purpose of this study was to translate and cross-culturally adapt the TSK- TMD into the Turkish version and to assess the reliability and validity.

MATERIALS AND METHODS
Translation and cross-cultural adaptation

The TSK- TMD has been translated and cross-culturally adapted in accordance with accepted standards outlined by Guillemin et al. (17). Firstly, permission was obtained from Dr. Corine Visscher, who developed and published the original TSK- TMD scale, to translate it into Turkish on November 23, 2015. The scale was translated into Turkish by two physiotherapist and one dentist who had a very good level of English and were independent of each other. The three translations thus created were made into a single scale by correcting the conceptual errors and inconsistencies in the translations by the two physiotherapists. One person whose mother language is English and who has a decent command of Turkish translated the scale from Turkish back into English. This person did not see the original version of the survey beforehand. All translations were compared with two physiotherapists, one dentist and one foreign language lecturer group, and the Turkish version was obtained. The created Turkish scale was applied to 10 patients for pilot purposes. For each question, the "Clarity Assessment Form", consisting of 1-completely understood to 5-understanding

Tampa Scale for Kinesiophobia for Temporomandibular Disorders
Translate from English to Turkish
Version 1
Translation from Turkish to English
Committee Decision, Original and Comparison
Pilot Study
The Latest Version of TSK- TMD Turkish Version
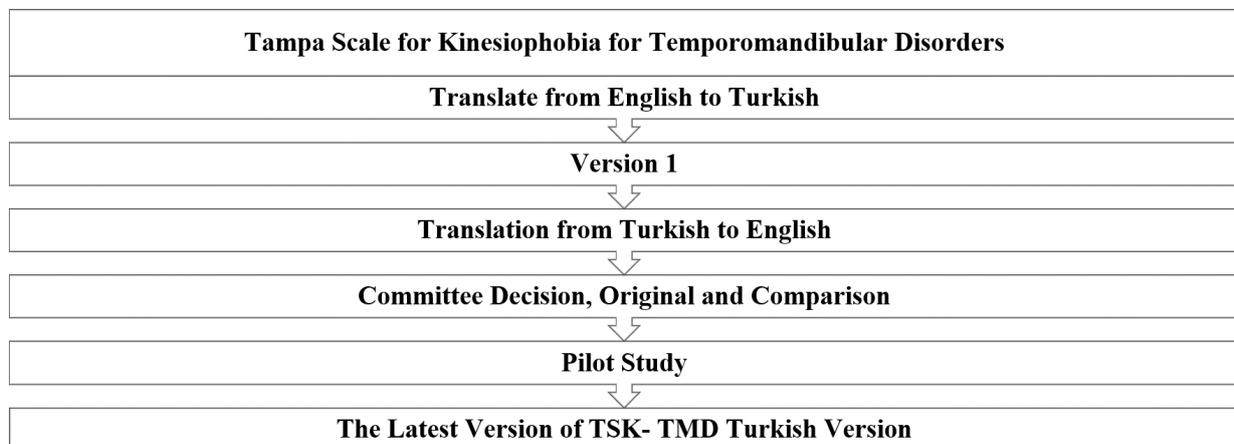
Figure 1. Flow chart of the translation the Tampa Scale for Kinesiophobia for Temporomandibular Disorders (TSK-TMD) from English to Turkish.

options, was used, and an item called "What would be your suggestion sentence?" was added for easier understanding. Finally, the Turkish version was accepted by deciding for the items that were not fully understood by the patients (Figure 1).

Sample size, participants, study design and ethics

While determining the sample size, both generally accepted statistical methodology recommendations and calculations were considered. Fayers et al. suggested that in studies of cultural adaptability, validity, and reliability, the sample size should be at least five times the number of items and at least 100 (18). The Turkish TSK- TMD consists of 12 items. In our study, we had to reach 60 (12x5) patients according to the number of items in the scale, but we reached 111 patients, above our target. The necessary sample size was computed using G-power 3.1 software with an effect size of 0.5, error probability of 0.05, and power 0.80 in order to examine the test-retest reliability of the Turkish TSK- TMD (19).

The study included patients diagnosed with TMD according to the Research Diagnostic Criteria/ Temporo- Mandibular Disorders (RDC/ TMD) (20) and was completed between January 2017 and September 2017 were included. The study was conducted with TMD patients who were followed up at Istanbul Aydın University, Faculty of Dentistry Polyclinic. 111 patients (75 female and 36 male) with an average age of 34±11 years participated in this study. The following requirements had to be met to be eligible for enrollment in the study: willingness to participate as a volunteer, age range of 18 to 65, presence of symptoms for at least six months, literacy, and the ability to comprehend and respond to questions. Participants with toothaches and cognitive impairment that would have made it difficult for them to comprehend and complete the survey questionnaire were not allowed to participate in the study.

An evaluation form was created using the RDC/ TMD form prepared in 1992 by Dworkin at al. to evaluate the personal and disease information of the cases (20). In the evaluation form created, the patient's sociodemographic information (age, gender, height, weight, marital status, occupation, educational status), presence of systemic disease, history of complaints, and parafunctional habits were questioned. For the patient's complaints of temporomandibular joint (TMJ), the presence of pain,

severity (with the Visual Analogue Scale- VAS), spread, sound from the joint, lock in the jaw movements, dislocation, slipping, and stiffness were performed. After this information was obtained, the patients had a TMJ examination. In the TMJ examination, the maximum mouth opening measurement was made using calipers, and whether there was any sound during TMJ movements and palpation of the TMJ and surrounding muscles was also assessed. Patients were asked to fill the Pain Catastrophizing Scale (PCS) in addition to TSK-TMD. To determine the reliability of Turkish TSK-TMD questionnaire, the scale was replied to by 40 patients after 3- 5 days for the 'test- retest' method.

According to the Helsinki Declaration's ethical precepts, this study was conducted. All participants received comprehensive study information, and their written informed permission was collected. The study was approved by the Okan University Institute of Health Sciences Ethics Committee (Date: 19.10.2016, Decision no: 7).

Tampa Scale for Kinesiophobia in Temporomandibular Disorders (TSK- TMD)

The original TSK- TMD is an English scale with 18-items that assesses patients with TMD's dread of movement. It uses a 4-point Likert scale (1 for strongly disagree, 2 for slightly disagree, 3 for partially agree, and 4 for strongly agree). Reversing the scores for items 4, 8, 12, and 16 yields the final score. According to the confirmatory component analysis of the scale, Visscher et al. shortened the scale to 12-items and recommended adopting a short form made up of two subfactors: activity avoidance and somatic focus. The first component, avoiding action, reflected the idea that activity might lead to re- injury or more pain (items 1, 2, 7, 9, 10, 11, and 12). The belief in significant underlying medical issues was represented in the second factor, somatic focus (3, 4, 5, 6, and 8 items). By accumulating all the points on this brief form, scores ranging from 12 to 48 are possible. The more kinesiophobia a person has, the higher their score suggests it is. As a result of the structural reliability assessment, they claimed that the 12-items version had good reliability and validity and was better appropriate for evaluation in TMD patients (12). In our study, a short form of 12-items was used.

Pain Catastrophizing Scale (PCS)

This scale was developed to identify patients' past usage of inadequate pain coping strategies as well as
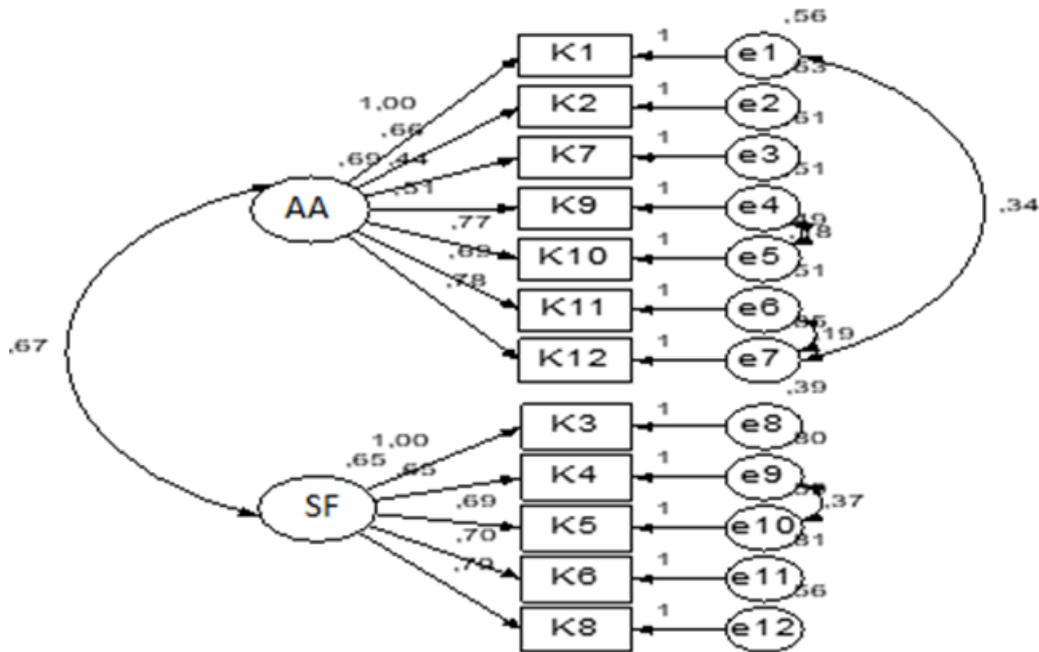
Figure 2. Diagram of the confirmatory factor analysis of the Tampa Scale for Kinesiophobia for Temporomandibular Disorders (AA: Activity Avoidance, SF:Somatic Focus)

catastrophic thoughts or feelings. It depicts the various feelings and emotions that people may have while enduring misery. Thirteen components make up the PCS, which also has three factors including expansion, self-reflection, and helplessness. Likert type scoring ranges from 0 to 4 points. From 0 to 52 is the possible total score. It demonstrates that people who perform well also have high disaster risk levels. (21). It was adapted into Turkish by Suren M. et al. (22).

Statistical Analysis

Using the SPSS 22 statistical analysis tool, the research's data were statistically evaluated. The scale model with 12 items was the subject of statistical analyses. Descriptive statistical techniques, such as number, percentage, minimum, maximum, average values, and standard deviation were computed in the examination of the data. 'Single Sample Kolmogorov- Smirnov Test' was used to test whether the research variables had a normal distribution.

The analysis of the hypothesis testing was done using parametric techniques. When comparing quantitative continuous data between two independent groups, the t-test was used, and when comparing quantitative continuous data between more than two independent groups, the One-Way ANOVA test was employed. The Scheffe test was employed as a supplemental post-hoc study after the ANOVA test to identify the differences. The study's continuous variables were analyzed using the Pearson's correlation method. The results were assessed using a 5% significance threshold and a 95% confidence range.

To ascertain the structural validity of the original scale form, a confirmatory factor analysis was conducted. The association between PCS and TSK- TMD scores was investigated using the equivalent (parallel) technique.

Internal consistency was assessed using the Cronbach alpha coefficient, item analysis, and the interclass correlation coefficient (ICC) value.

RESULTS

A total of 111 patients participated in our study. The average age ranges 34±11 (range 18–61). The t-test used to assess whether the averages of activity avoidance and somatic focus variables and total movement fear ratings varied by gender variable did not reveal any statistically significant differences between the groups (p> 0.05) (Table 1). The TSK-TMD's total score result, pain intensity, maximum

Table 1. Mean and standard deviation values of fear of motion and comparison results acoording to the gender

	Group	N	Mean	Sd	t	p
Avoiding Activity	Woman	75	19,120	4,638	-0,455	0,650
	Male	36	19,556	4,896		
Somatic Focus	Woman	75	12,733	3,681	0,278	0,782
	Male	36	12,528	3,582		
Fear of Movement	Woman	75	31,853	7,675	-0,146	0,884
	Male	36	32,083	7,937		

Table 2. Mean and standard deviation values of pain intensity, maximum mouth opening, PCS and TSK- TMD total scores

	N	Mean	Standard Deviation	Min.	Max.
VAS	111	4,460	2,392	0,000	9,000
Maximum Mouth Opening (mm)	111	36,937	5,847	25,000	50,000
PCS	111	27,982	9,897	6,00	52,00
TSK- TMD	111	31,801	7,870	12,00	48,00

VAS: Visual Analog Scale. PCS: Pain Catastrophizing Scale. TSK- TMD:The Tampa Scale for Kinesiophobia for Temporomandibular Disorders

Table 3. Normal and acceptable values of confirmatory factor analysis and index values of the scale

Index	Normal Value Acceptable Value	Normal Value Acceptable Value	TSK- TMD
x^2/sd	<2	<5	1,761
GFI	>0.95	>0.90	0,902
AGFI	>0.95	>0.90	0,900
CFI	>0.95	>0.90	0,931
RMSEA	<0.05	<0.08	0,078
RMR	<0.05	<0.08	0,061

x^2/sd: chi-square / degree of freedom. GFI: Goodness of-fit index. AGFI: Adjusted goodness of-fit index. CFI: Comparative fit index. RMSEA: Root means square error of approximation. RMR: Root means squares residual.

mouth opening amount, and PCS total score results are shown in table 2.

Validity
Confirmatory Factor Analysis (CFA)
Confirmatory factor analysis was performed to verify the factor structure of the original TSK- TMD for the construct validity of the scale. The reference values accepted for the fit indices used in this study and the index values after confirmatory factor analysis are shown in table 3.
Conformity statistics, calculated by confirmatory factor analysis, show that the model is at an acceptable level with the actual data collected from the participants (23). According to the results of the analysis, it indicates that the scale fits well according to the previously determined factor structure. This confirms the factors of activity avoidance and somatic focus, two sub-scales of the scale (Figure 2).

Parallel (Equivalent) Form Reliability
The positive relationship between the two equivalent forms indicates the sign of consistency. In the study, the PCS scale was used as a parallel form. The relationship coefficient (r) was evaluated between TSK- TMD and PCS. In TSK- TMD it was found to have a positive correlation with PCS as a parallel form (p 0.05) (Table 4).

Reliability
Cronbach's Alpha = 0.876 was discovered to be highly reliable in the reliability of the TSK- TMD (0.40 not reliable, 0.40 0.60 low reliable, 0.80 1.00 highly reliable) (24). This shows that the scale has internal

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consistency. Item total correlation values were found between 0.410 and 0.706.

Test- Retest Reliability

The test- retest reliability analysis of the scale was based on the total scores of 40 patients in the first evaluation and the second evaluation. For test- retest reliability, the ICC coefficient was calculated using a 95% confidence interval, and the reliability of the study was found to be high (ICC= 0.951). The ICC value was classified as 0.4 weak, 0.4- 0.75 medium, and > 0.75 excellent. An intra-class correlation coefficient for each item was also calculated (Table 5).

DISCUSSION

The 12-items "Tampa Scale for Kinesiophobia for Temporomandibular Disorders" (TSK- TMD), which evaluates and measures fear of movement in TMJ disorders, was translated into Turkish for this study. It was found that the TSK- TMD is a valid and dependable scale based on the study of important findings and pertinent criteria. The original TSK- TMD has been translated into various languages, such as Chinese, Brazilian Portuguese, Korean, and Spanish, for the evaluation of movement- related fear in TMD patients (13-16).

The transition from acute to chronic pain and its continuation are both impacted by fear that results from painful conditions. Prolonged pain is perceived as a catastrophe, fostering pain- related fear and

Table 4. Correlation between the Pain Catastrophizing Scale and Tampa Scale for Kinesiophobia for Temporomandibular Disorders

		TSK- TMD
PCS	r	**0,520****
	p	0,001

*<0,05; **<0,01

behavioral avoidance (25). Kinesiophobia is a pioneer in the disability of patients with various chronic pain conditions, including TMB. Fear of movement is more common, especially in patients with musculoskeletal disorders (26). Temporomandibular disorders are also a problem in the musculoskeletal structure, and as with other normal joint movements, avoiding moving and fearing the jaw joint should be evaluated (12).

A total of 111 patients with TMJ complaints for ≥6 months were included in the study. Female patients accounted for 67.6%, while male patients accounted for 32.4%. The average age of the patients was 34±11. In our study, the gender distribution of TMD patients showed a higher occurrence in women compared to men. Other research, however, have found that the prevalence of TMD is not greater in women than in males, contradicting our findings (27). No significant gender difference was found in kinesiophobia among TMD patients in this study, consistent with the original scale by Visscher et al. This aligns with our findings, indicating agreement

Table 5. Results of ICC analysis of the Tampa Scale for Kinesiophobia for Temporomandibular Disorders Item

	ICC	Interval
Item 1	0,905	0,820-0,950
Item 2	0,927	0,862-0,961
Item 3	0,849	0,715-0,920
Item 4	0,959	0,922-0,978
Item 5	0,967	0,937-0,982
Item 6	0,935	0,877-0,966
Item 7	0,847	0,710-0,919
Item 8	0,887	0,786-0,940
Item 9	0,866	0,747-0,929
Item 10	0,882	0,777-0,938
Item 11	0,816	0,651-0,902
Item 12	0,871	0,755-0,932
Total	0,951	0,907-0,974

(ICC: interclass correlation coefficient)

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with the original scale regarding the absence of a gender association with kinesiophobia.

TSK- TMD's internal consistency and homogeneity were assessed using Cronbach's alpha. For the Turkish translation, our investigation discovered a Cronbach's alpha coefficient of 0.87, showing strong internal consistency. The original scale's developers, Visscher et al., reported a Cronbach's alpha value of 0.83. If the Cronbach's alpha value is more than 0.80, the reliability is strong (12). The TSK- TMD scale exhibits good internal consistency, according to our findings. Item analysis evaluates the connection between the results of individual items and the scale's total score. If an item's overall correlation coefficient is less than 0.25, it is regarded as having insufficient dependability (24). Item- total correlations in this study varied from 0.410 to 0.706, demonstrating substantial connections between specific items and the Turkish TSK- TMD version's overall score. These correlations support the results of additional research and show consistently strong item- total correlation values.

Test- retest reliability analysis is another method used to determine the reliability of TSK- TMD. The correlation coefficient between the two measurements indicates the consistency of the measurement over time. In our study, 40 patients were retested within a 3-5-day interval. Each item's ICC value ranged from 0.816 to 0.967, and the overall score's ICC value was 0.951. Visscher et al. conducted a second evaluation for test- retest analysis with a 4-week interval involving 58 participants, resulting in an ICC value of 0.73 (12). In the Chinese version study by He et al., 30 patients completed the scale again after a 2-week interval, yielding an ICC value of 0.797 (13). Aguiar et al. conducted a Brazilian Portuguese study where 30 patients were retested after 1 week. Each item's ICC scores ranged from 0.75 to 0.92, and the overall score's ICC value was 0.95 (14). In the Korean version study by In Hee Park et al., all patients were retested within a 1-2-week period (15). The ICC value for the 18-item version was 0.764, and for the 12-item version, it was 0.752. In comparison to other studies, our study found higher ICC values, indicating a high level of consistency over time for our scale. We believe that this difference is due to the shorter retest interval used in our study compared to other studies. Factor analysis was used in this study to evaluate the construct validity of the TSK- TMD. The scale's items are classified and their relationship with one another

is examined by the structural validity (23). The scale has two factor structures, such as activity avoidance and somatic focus, according to the confirmatory factor analysis we carried out.

Visscher et al. conducted a factor analysis study on both the 18-items long model and the 12-items short model. They found that the statistical analysis results of the 12-items, two-factor short scale model provided stronger support for validity and reliability. They also conducted research on the 12- items short model for the Chinese version (12). Aguiar et al. examined the goodness of fit of three different models for the Brazilian Portuguese version (14).The first model was a two- factor model consisting of 18 questions, the second model was a 12-items, single-factor model obtained by excluding specific items from the 18-items scale, and the third model was a 12-items, two-factor model. The 12-items, two-factor model was shown to have the best fit by the statistical analysis results. In a study by In Hee Park et al. On the Korean version, both the original 18-items version and the 12-items version with two factors were analyzed. Based on the results, they suggested using the 12-items model with two factors (15). In the current study, we excluded four inverted questions and two questions that did not exhibit suitable factor loadings from the original scale. We utilized a two- factor, short 12-items model that was deemed appropriate based on previous research findings.

In this study, we examined the correlation between TSK- TMD and pain severity assessed by VAS and PCS. The total TSK- TMD score, and VAS had a Pearson's correlation coefficient of 0.466, showing that as patients' pain intensity increases, so does their anxiety of moving their jaw joint. The correlation coefficient between the total TSK- TMD score, and PCS total score was 0.520. Visscher et al. İnvestigated the convergent validity of the scale and found a Pearson's correlation coefficient of 0.23 for the total TSK- TMD score. Aguiar et al. explored the relationship between TSK- TMD-Br and the individual Pain Catastrophizing Scale, Patient Health Scale (0.38), and Mandibular Dysfunction Questionnaire (0.43) (14). The correlation coefficient between PCS and total TSK- TMD was found to be 0.48. In another study, researchers examined the correlation between the original scale and the global oral health questionnaire in the Chinese version, obtaining a Pearson's correlation coefficient of 0.563. Overall, our study demonstrated that the correlation between

TSK- TMD and PCS was highly significant and valid, supporting the scale's utility and reliability.

Patients who had TMD symptoms filled out a symptom checklist (pain, sound, locking, other) particular to their complaints to investigate the connection between kinesiophobia and those symptoms. According to Visscher et al., people suffered from chronic TMD who experienced more functional problems with the jaw joint showed higher degrees of dread of movement than pain perception. They showed a significant correlation between fear of motion and mechanical jaw issues such noises or locking (12). Patients, especially those making noise during jaw movements, attempted to avoid such noise by limiting their movements. Unlike musculoskeletal problems where avoidance behavior is typically driven by pain, this situation is slightly different. In a study by Gil-Martínez et al. on disability, pain intensity, and fear of movement in chronic temporomandibular disorders, no significant difference in kinesiophobia was found between patients with chronic joint disorders, myofascial pain, and mixed (jaw joint and myofascial pain) cases. This could be attributed to the fact that the patients in their study primarily presented with joint and muscle pain complaints rather than mechanical issues (10). Gil-Martínez et al. used TSK instead of TSK- TMD, which is specific to TMD. This may be due to patients' limited identification with their problems. Our study found that fear of movement is not strongly associated with voice or locking, but rather with temporamandibular joint pain. Pain appears to be the primary complaint among participants, expressed more frequently than voice or locking. The symptom checklist indicates that the scale can be used to assess kinesiophobia and understand general TMD symptoms.

The study revealed a negative correlation (-0.292) between active mouth opening capacity and kinesiophobia. This indicates that as the extent of mouth opening decreases or becomes restricted, patients tend to experience higher levels of fear associated with jaw movement.

Further research is needed to explore factors contributing to TMD and the impact of TMD types on kinesiophobia, including the disc, joint cartilage, chewing muscles, and other potential factors. Kinesiophobia plays a significant role in TMD, as fear-induced restrictions in jaw movements can lead to increased dysfunction, immobility, and long-term disability in the jaw joint. Evaluating kinesiophobia in

TMD is essential for understanding its impact on jaw mobility, facilitating effective treatment, and improving quality of life. Utilizing a scale to assess kinesiophobia can greatly assist physiotherapists working with TMD patients, enabling comprehensive evaluation, tailored exercise programs, and preservation/restoration of jaw joint functions. Patient awareness of kinesiophobia can enhance adherence to exercise programs and improve their effectiveness. Thus, the TSK- TMD scale holds significant value as an assessment tool in this context.

CONCLUSION

The original TSK- TMD was translated according to international recommendations. The scale was shown to have validity and reliability to evaluate kinesiophobia in patients with TMD. TSK- TMD can be used by dentists and physiotherapists to determine the level of kinesiophobia of patients with temporomandibular disorders, thereby creating an effective treatment program and increasing the success of the treatment.

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LEVELS OF AWARENESS, READINESS, AND ANXIETY OF PHYSIOTHERAPISTS RELATED TO ARTIFICIAL INTELLIGENCE

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ABSTRACT

Purpose: This study aimed to examine the level of awareness of physiotherapists about artificial intelligence (AI), readiness, anxiety level related to AI and barriers to AI use.
Material and Methods: 413 physiotherapists participated in an online and cross-sectional study. A custom-designed survey that focussed on the levels of knowledge, readiness, and anxiety of physiotherapists related to AI and factors limiting AI use
Results: 61% of physiotherapists had knowledge of AI in physiotherapy and rehabilitation. Mobile-based applications were reported as the most preferred approach among AI-based applications, while the cost of AI-based technological therapy applications was stated as the factor most limiting use of AI-based technological therapy applications in rehabilitation. Total score of Medical Artificial Intelligence Readiness Scale was calculated as 74.19±14.25, and total score of the Artificial Intelligence Anxiety Scale was 50.72 ±22.76. The level of readiness was lower among those with a bachelor's degree level of education compared to those with postgraduate degrees ($p<0.05$).
Conclusion: Physiotherapists have low levels of AI-related anxiety and a high degree of readiness. Physiotherapists were seen to have a positive attitude and willingness to use AI-based applications in practice. Nevertheless, the level of readiness could be increased by including AI-based applications in undergraduate curriculum.

Keywords: Physical therapist, artificial intelligence, perceptions, readiness

INTRODUCTION

Artificial intelligence (AI) technologies with subtypes, including machine learning, neural networks, and deep learning are increasingly playing a role in many health-related practices(1). Many healthcare professionals use these technologies in clinical decision-making, diagnosis, and patient management (2-5). The AI-based applications that are mainly used in physiotherapy and rehabilitation include video analysis, dexterous robotics, virtual assistant, prediction algorithms, and risk analysis (5). These approaches can potentially facilitate and improve data analysis and implementation, classification of function, and disability prediction(6).

Although AI usage in the field of healthcare has increased recently, examination of the attitude and knowledge levels of healthcare professionals towards AI shows that many professionals need more knowledge of the fundamental principles of AI systems. They are concerned about its implications in

clinical practice (7). Tajaldeen et al. stated that radiologists in residency programs and radiology departments were significantly lacking AI information because AI and its applications in radiology are increasing rapidly (8). As a result of a study by Baser et al. evaluating the concerns of family physicians about AI, it was determined that the anxiety levels of family physicians working in primary care were lower (9). Abuzaid et al. examined the perceptions and willingness of physiotherapists (PTs) to AI implementation, and they showed that although many participants appreciated AI applications, their knowledge of AI was inadequate (10). Another study investigating the knowledge and attitudes of PTs towards AI applications reported that their understanding of AI applications in rehabilitation was lower than their general knowledge about AI. In addition, it was stated that experience and educational qualifications were significant predictors of the level of knowledge (11).

The rising trend for the using of AI applications, AI applications socio-technical ignorance, and insufficient knowledge have triggered AI-related concerns (12). There are also concerns about the practical application of AI due to problems related to health data and liability, available enforcement tools, security, and ethics.

Even though studies in the literature have identified the knowledge and attitudes of PTs, there has been no evaluation of their readiness and anxiety levels using validated questionaire and the sample size of some of those studies was small. Therefore, the aim of this study was to comprehensively evaluate the AI knowledge level of PTs and their readiness and anxiety levels to the use of AI.

MATERIALS AND METHODS

This cross-sectional study was conducted using a web-based questionnaire created using Google Forms (Google, LLC), which was administered to PTs in Turkey during the period May 2022 to March 2023. This report has been prepared according to the Checklist for Reporting Results of Internet E-Surveys guidelines (CHERRIES) (13). The study was approved by Eskisehir Osmangazi University Non-Interventional Clinical Research Ethics Board. (Date: 22.02.2022, Decision Number: 24).

Subjects

The participants were invited via links from Google Forms on social media platforms (Whatsapp, Facebook and Instagram) and were informed about the aim of the survey in the preface to the questionnaire. The purpose of the study was explained, and consent to participate was given through statements at the beginning of the questionnaire. The subjects included were those who volunteered to participate, and had been working as a PTs for the last three months. The a priori sample size was calculated as 483 based on a cross-sectional studies formula for a sample size with a margin of error set at 5% and 95% confidence levels, so the questionnaire was sent online to 483 subjects.

Data Collection Instrument

The questionnaire was developed based on the purpose of the study and was created using Google Forms. The questionnaire included demographic characteristics and questions about AI knowledge, AI readiness level and anxiety regarding AI. Based on previous studies (7,8,10,11) in the literature,

Table 1. Knowledge of AI

Q1. Do you know about the applications of AI in physiotherapy and rehabilitation?
Q2. How did you obtain this information ?
Q3. Have you been informed about AI- based applications in your curriculum?
Q4.Would you like to be informed about AI-based applications in Physiotherapy and Rehabilitation curriculum?
Q5. Have you attended any training, congresses or symposia about AI outside of the traditional curriculum?
Q6. Have you taken part in research on AI?
Q7. Do you include AI-based applications in physiotherapy and rehabilitation practices?
Q8. Which of the AI-based technological therapy applications do you use?
Q9. Which of the following factors do you think limits the use of AI-based technological therapy applications in rehabilitation?
Q10. Are AI-based applications as effective as traditional physiotherapy and rehabilitation approaches?
Q11. Are you happy with the inclusion of AI in your life?
Q12. Are you worried about the inclusion of AI in your life?

AI: Artificial intelligence

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Table 2. Demographic characteristics of the participants

Variables	n=413
Age (years) median (IQR)	28.00 (5.00)
Duration of experience (years) median (IQR)	5.00 (5.00)
Gender	**n (%)**
Male	119 (28.8)
Female	294 (71.2)
Education degree	**n (%)**
Bachelors	208 (50.4)
Master	141 (34.1)
Doctorate	64 (15.5)
Employment sector	**n (%)**
Hospital	213 (51.6)
Rehabilitation centre	98 (23.7)
Academician	102 (24.7)
Speciality field	**n (%)**
General	125 (30.3)
Cardiopulmonary	34 (8.2)
Musculoskeletal	88 (21.3)
Neurological	166 (40.2)

IQR: Interquartile range

questions related to AI knowledge were created by adding our academic-professional field experience. In addition, the comprehensibility of the questions related to AI knowledge outside the questionnaires and whether they reflect their purpose was determined through a pilot study. This initial draft was sent to 35 PTs with clinical experience (mean years of experience: 8.6 years), and following feedback related to the wording and relevance of the questions, a final version was produced. This questionnaire consisted of questions in four sections of demographics and clinical characteristics, knowledge of AI, readiness and anxiety regarding AI.

Demographic and clinical characteristics
The gender, age, education level and years of practice experience were recorded. The duration of experience was categorised as '0-5 years', '5-10 years', '10-15'years and 'more than 15' years.

AI knowledge level
AI knowledge level was determined using questions about AI usage in research and practice, AI-based applications, and the factors affecting the inclusion of these applications in rehabilitation (Table 1).

AI Readiness Level
The AI readiness level was evaluated using the Medical Artificial Intelligence Readiness Scale (MAIRS). This questionnaire developed by Karaca

has 22 items in four subgroups: cognitive factors (items 1-8), skill factors (items 9-16), foresight factors (items 17-19) and ethics factors (items 20-22). Each item is scored on a 5-point Likert-type scale (1= strongly disagree to 5= strongly agree). The scale total score in the range of 22-110 points is obtained as the total of the subgroup scores, with a higher score representing good AI readiness (14).

Anxiety Regarding AI
The level of anxiety regarding AI was assessed with the Artificial Intelligence Anxiety Scale (AI-AS). The scale consists of 21 items in four sub-dimensions of learning (items 1-8 items), job replacement (items 9-14), sociotechnical blindness (items 15-18) and AI configuration (items 19-21). Each item is scored on a 7-point Likert type scale (1 = never through 7 = completely), providing a total score in the range of 35-175 points. Higher scores indicate an increased level of anxiety. This scale was translated into Turkish by Terzi et al.(15, 16).

Statistical analysis
Data were analyzed using SPSS software (version 25.0; IBM). The assumption of normality was examined using Skewness- kurtosis values. Distribution was accepted as normal when the skewness-kurtosis values were -2 to +2. Normally distributed continuous data were expressed as mean ± standard deviation values and categorical data as frequency and percentage. Chi-square tests were used to investigate the level of AI knowledge in physiotherapy and rehabilitation and the demographic characteristics of the study participants. The Independent Samples t-test was used to compare two groups of data, and One- way ANOVA was applied to three groups. Bonferonni adjustment was performed for the post hoc test. When the power of the study is calculated according to the readiness level of the study, the effect size was large (Cohen d= 1.159, 0.05, Power 0.99).

RESULTS
A total of 413 PTs (413/483, response rate: 85 %) participated in the study, comprising 29 % males and 71 % females with a mean age of 29 ± 5 years. The majority of PTs had bachelor's degrees and were working in hospitals. Most of the participants worked in neurological rehabilitation. The duration of experience was mean 6 ± 5 years, with 57% of the respondents reporting experience of <5 years, 30%
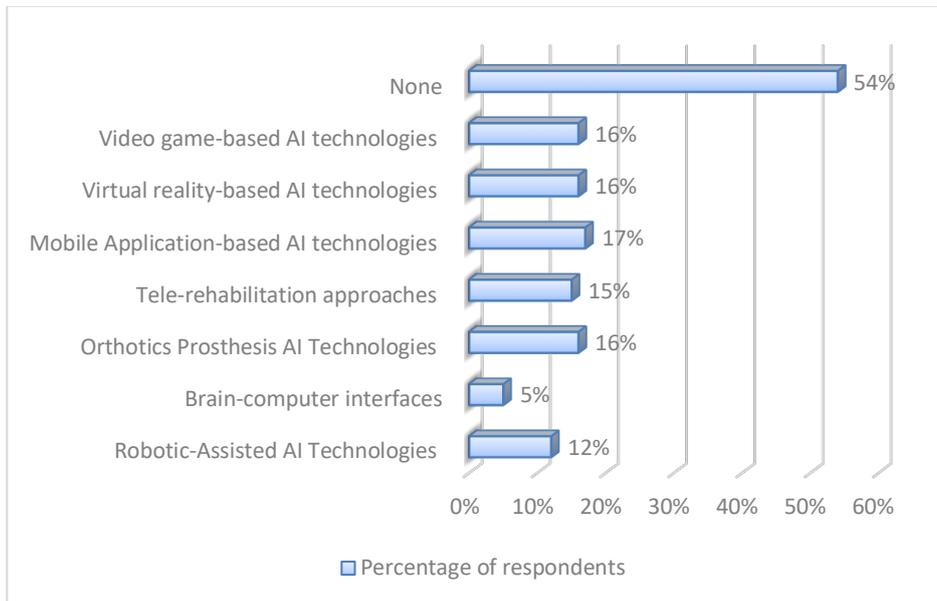
Figure 1. AI-based technological therapy applications used by physiotherapists

had <5-10 years, 9% had 10-15 years, and 4% had 15-20 years. The demographic and characteristic variables of the study participants are shown in Table 2.

Of the total study participants, 61% had knowledge about AI in physiotherapy and rehabilitation. The ratio of PTs knowing about AI in physiotherapy and rehabilitation was higher in the group with doctorate level qualifications (p<0.001) and in the academicians group (p<0.001). There was determined to be no difference in knowledge about AI in physiotherapy and rehabilitation according to the duration of experience (p=0.568), gender (p=0.246), or speciality field (p=0.113). This information had been obtained by 51% of the respondents from publications, by 43

% from attendance at a scientific meeting, by 35 % from social media, and by 31% during education. It was stated by 33% of PTs that training on AI was included in their physiotherapy and rehabilitation curriculum. All participants thought that information about AI applications was given in the physiotherapy and rehabilitation curriculum. Training sessions, congresses or symposia about AI outside the traditional curriculum had been attended by 19% of the respondents. Only 15 PTs had participated in research related to AI in physiotherapy and rehabilitation. AI- applications were included in their rehabilitation applications by 36% of the respondents. Mobile-based applications were reported to be the most preferred approach among AI-based
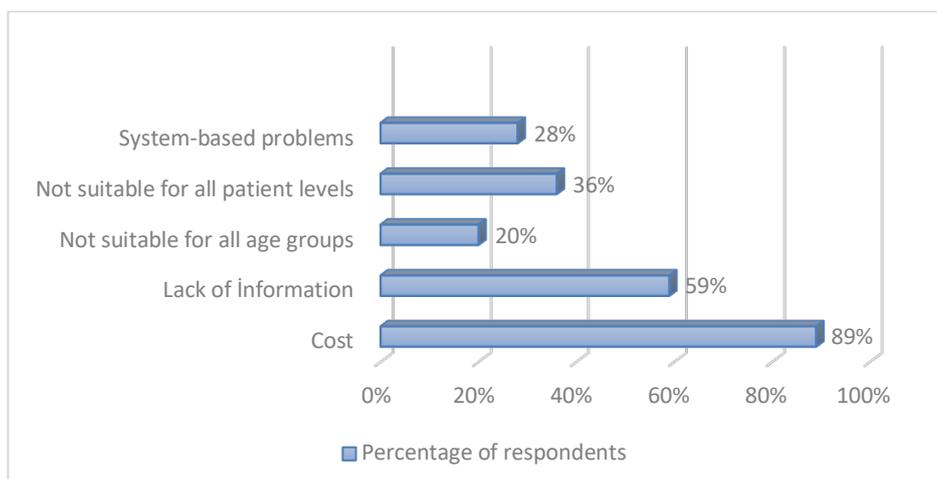

Figure 2. Factors limiting the use of AI-based technological therapy applications in physiotherapy and rehabilitation

Table 3. AI readiness and anxiety level of the physiotherapists

AI Readiness	Mean±SD	IQR (Min-Max)
Cognitive factor (8-40 points)	23.71±6.30	32 (8-40)
Ability factor (8-40 points)	29.42 ± 5.74	32 (8-40)
Vision factor (3-15 points)	9.93 ±2.49	12 (3-15)
Ethics factor (3-15 points)	11.12 ±2.06	12 (3-15)
Total MAIRS (22-110 points)	**74.19±14.25**	**88 (22-110)**
Anxiety Level		
Learning (9-63 points)	14.43 ±7.13	44 (8-52)
Job replacement (4-28 points)	16.13 ±8.98	36 (6-42)
Sociotechnical Blindness (4-28 points)	12.60 ±6.12	24 (4-28)
AI configuration (3-21 points)	7.55 ±5.23	18 (3-21)
Total score (35-175 points)	**50.72 ±22.76**	**120 (21-141)**

AI: Artificial Intelligence, AI-AS: Artificial Intelligence Anxiety Scale, *MAIRS: Medical Artificial Intelligence Readiness Scale, IQR: Interquartile Range, SD: Standart deviation*

applications. The AI-based technological therapy applications used by the PTs are shown in Figure 1. The cost of AI-based technological therapy applications was stated to be the factor most limiting the use of AI-based technological therapy applications in rehabilitation, followed by a lack of information on using AI-based technological therapy applications in rehabilitation (Figure 2). AI-based applications were thought to be as effective as traditional physiotherapy and rehabilitation approaches by 49% of the PTs, while 39 % had no idea. It was stated by 388 respondents that they were happy to include AI in their lives, and 26% were worried about the inclusion of AI in their lives.

The Level of Readiness and The Level of Anxiety Regarding AI

When the readiness level was examined, scores of MAIRS are shown in Table 3. The total score and subdimension scores of MAIRS were higher than the maximum average score obtained from the scale.
The findings of AI-AS are given in Table 3. The job replacement points of the AI-AS were higher than the maximum average score of the subdimensions point, while the total AI-AS score and other subgroup scores were lower than the highest average score. The comparisons of AI readiness and anxiety level according to demographic characteristics and AI knowledge are shown in Table 4 and Table 5.

DISCUSSION

This study investigated the level of AI knowledge and readiness, and the AI-induced anxiety level of PTs working in rehabilitation field. Although one-third of the participants included AI-based applications in their rehabilitation programs, more than half had knowledge about AI. Furthermore, mobile applications-based AI Technologies were the most preferred applications, and the cost of AI-based technological therapy applications was found to be the factor most limiting the use of AI in rehabilitation. While the readiness level for AI was high among PTs, they were particularly worried about AI replacing their jobs.

The results of this study were consistent with those of previous studies that have examined the AI knowledge of PTs, and showed that the majority used their knowledge of AI in the physiotherapy and rehabilitation field (10, 11). Alsobhi et al. assessed the relationships between AI knowledge and multiple factors, including sex, experience, employment sector, and educational qualifications. It was found that PT knowledge of AI differs according to sex, and that experience, time and educational qualifications are predictive factors of their knowledge (11). When the AI knowledge of the PTs in this study was examined according to characteristic features, it was seen that individuals with masters and doctorate qualifications had higher levels of AI knowledge, which was consistent with the findings of Alsobhi. However, the current study results showed that PTs working in the academic sector had more AI knowledge than PTs working in non-academic positions, in contrast to the findings of Alsobhi. The results of the current study showed no difference in AI knowledge according to gender or duration of experience. Alsobhi et al. (11) and Pinto dos Santos et al.(17) reported that male participants had more AI knowledge than females. As the number of females in the current study population was approximately twice that of male participants, this may have affected the comparison results. Alsobhi et al.(11) found that

Table 4. Comparisons of the demographic characteristics, AI readiness, and anxiety level

Groups	Total MAIRS	p-value; MD (95 % CI)	Total AI-AS	p value; MD (95 % CI)
Gender				
Female, mean± SD	73.59±15.00	p=0.063 Female/Male 2 (-1 to 5)	52.65±22.92	**p= 0.002*** Female/Male: -7 (-12 to -2)
Male mean ±SD	73.59±13.92		45.97±21.75	
Education degree				
Bachelors, mean±SD	72.13±15.00	**p=0.003*** Bachelors / Master -3 (-7 to -1) Bachelors / Doctorate: -6 (-11 to -1) Master / Doctorate: -3 (-8 to 2)	51.43±23.02	p =0.806 Bachelors / Master -1 (-7 to 5) Bachelors/ Doctorate: 2 (-6 to 9) Master / Doctorate: 0 (-9 to 8)
Master, mean±SD	75.38±13.93		50.11±22.93	
Doctorate, mean±SD	78.33±11.11		49.80±21.84	
Employment sector				
Hospital, mean±SD	73.42±13.94	p=0.106 Hospital /Rehabilitation centre 0 (-4 to 4) Hospital/Academician -3 (-7 to 1) Rehabilitation centre, Academician -3 (-8 to 2)	51.88±22.98	p=0.422 Hospital /Rehabilitation centre 3 (-3 to 10) Hospital/Academician 1 (-5 to 7) Rehabilitation centre, Academician -2 (-10 to 6)
Rehabilitation centre, mean±SD	73.44±14.86		48.41±22.67	
Academician, mean±SD	76.55±12.80		50.55±22.47	
Speciality field				
General mean±SD	71.79±14.57	p=0.082 General/Cardiopulmonary -6 (-13 to 1) General/Musculoskeletal -4 (-9 to 1) General/ Neurological -3 (-7 to 2) Cardiopulmonary/ Musculoskeletal 2 (-6 to 9) Cardiopulmonary/ Neurological 3 (-4 to 10) Musculoskeletal/ Neurological -1 (-6 to 3)	53.54±23.99	p=0.177 General/ Cardiopulmonary 7 (-5 to 18) General/Musculoskeletal 1 (-7 to 9) General/ Neurological 5 (-2 to 12) Cardiopulmonary/ Musculoskeletal -5 (-18 to 7) Cardiopulmonary/ Neurological -2 (-13 to 10) Musculoskeletal/ Neurological -4 (-12 to 4)
Cardiopulmonary mean±SD	77.65±15.16		46.91±21.33	
Musculoskeletal mean±SD	75.78±13.59		52.41±24.97	
Neurological mean±SD	74.46±14.00		48.50±20.65	

AI: Artificial Intelligence, AI-AS: Artificial Intelligence Anxiety Scale, CI: Confidence Interval, MAIRS: Medical Artificial Intelligence Readiness Scale, MD: Mean difference, SD: Standart deviation.

PTs with less than 10 years of experience had favourable attitudes toward AI. The fact that approximately three-quarters of the current study participants had less than ten years of experience may have affected the finding of no change in the level of AI knowledge according to years of experience in this study. In the study by Abuzaid et al.(10), 25.0% of the subjects obtained knowledge about AI only from news and media, while the majority of the respondents in the current study stated that information sources such as scientific organizations and schools could be more reliable. Only one-third of PTs in the current study had received training on AI in the bachelor's degree curriculum, which showed that the physiotherapy and rehabilitation curriculum is insufficient in terms of AI. However, all the respondents thought that AI should be included in the physiotherapy and rehabilitation curriculum. This finding supports that it may be important to provide AI knowledge together with the traditional physiotherapy and rehabilitation curriculum(5). Srivastava et al.(18) reported that AI should be included in medical education curricula to realize its full potential in healthcare.

AI-based applications are widely used in physiotherapy and rehabilitation and in different populations for evaluation and treatment (19-21). In the current study, mobile applications were the AI-based applications most used by PTs. Noblin et al. (19) showed that PTs believe mobile applications can

Table 5. Comparisons of the knowledge of AI, AI readiness, and anxiety level

Group	Total MAIRS	p-value MD (95 % CI)	Total AI-AS	MD (95 % CI)
Q1.				
Yes	79.09±11.17	*p<0.001**	50.29±21.77	*p=0.798*
No	64.01±14.61	-15 (-18 to -13)	51.63±24.77	1 (-3 to 6)
Q3.				
Yes	70.84±14.70	*p<0.001**	51.58±22.12	*p=0.473*
No	80.82±10.59	-10 (-13 to -7)	50.29±23.12	-1 (-6 to 3)
Q5.				
Yes	82.99±10.61	*p<0.001**	49.19±21.90	*p=0.517*
No	72.18±14.23	-10 (-14 to -8)	51.08±22.98	2 (-4 to 8)
Q7.				
Yes	80.82±10.23	*p<0.001**	47.21±21.93	*p=0.013**
No	70.53±14.84	-10 (-13 to -8)	52.67±23.03	5 (1 to 10)
Q10.				
Yes	77.54±12.98	*p<0.001**	48.81±21.88	*p=0.329*
No	78.02±14.84	Yes/No	49.60±19.08	Yes/No
Unknown	68.81±14.00	0 (-5 to 6) Yes/Unknown 9 (5 to 12) No/Unknown 9 (4 to 15)	53.48±24.69	1 (-8 to 9) Yes/Unknown -7 (-10 to 1) No/Unknown -4 (-13 to 5)
Q11.				
Yes	74.98±13.72	*p<0.001**	49.46±21.55	**p<0.001***
No	61.96±16.93	-13 (-19 to -7)	70.32±31.37	21 (8 to 34)
Q12.				
Yes	70.23±16.08	*p=0.004**	71.23±23.33	**p<0.001***
No	75.62±13.28	5 (2 to 8)	43.38±17.48	-28 (-33 to -23)

AI: Artificial Intelligence, AI-AS: Artificial Intelligence Anxiety Scale, CI: Confidence Interval, MAIRS: Medical Artificial Intelligence Readiness Scale, MD: Mean difference, SD: Standart deviation.

improve their work and increase efficiency and productivity. It was also stated that cost and the clinician's knowledge, skills and experience are major barriers to applications, which is in line with the current study findings. The current findings also support the results of the Alsobhi et al.(22) study, which showed that the cost and resources of AI are the major factors limiting the use of AI-based technologies in rehabilitation. Almost half of the current study respondents thought that AI-based applications are as effective as traditional physiotherapy approaches. Castagno et al.(7) found that the majority of healthcare staff, including medical doctors, nurses, therapists, and managers, believe AI can be a useful tool in their field.

When focusing on the publications examining the attitudes of healthcare professionals towards AI, Oh et al.(23) reported that positive opinions of AI in the field of medicine are shared by doctors and medical students. A systematic review investigating attitudes toward AI among physicians and medical students found that most participants appeared to be aware of clinical AI (24). European Society of Radiology reported that radiologists on average have favourable

attitudes to AI systems (25). Castagno et al. reported agreement on the usefulness of AI in the field of healthcare (7). A study conducted among PTs found that AI-based technologies were integrated into physiotherapy practices by PTs, and they had positive perspectives on AI approaches (11). In another study of PTs, it was shown that PTs appreciated the inclusion of AI applications in physiotherapy and rehabilitation implementation (10). The majority of PTs in the current study were satisfied with the inclusion of AI in the rehabilitation field, which was consistent with the findings of previous research, although 26.4% of the respondents were worried about AI. Abuzaid also reported that, as in the current study, PTs were worried that they may only cause confusion in their work (10). The findings of the current study also showed that PTs, like most healthcare professionals (7, 22, 26) were not worried that AI would replace them. Contrary to popular belief, AI-based applications were acceptable to PTs as they would improve clinical decision-making, analysis, evaluation and application areas.

Readiness indicates the degree of mental and behavioural readiness of individuals for technological

change, and it is divided into two areas of individual and organizational (27). In a study of PTs assessing whether their institutes were ready to integrate AI into practice, Abuzaid et al. found that the majority of respondents stated that there were no personnel or units specialized in AI preparation and integration in practice, while 45.8% of the PTs stated that their institution had a strategy regarding AI in the future. Abuzaid et al. evaluated only the readiness of institutions and did not examine the readiness of individual PTs in that study (10). The level of AI readiness was examined in the current study with a valid and reliable scale that has been previously used to evaluate the readiness of medical students for AI technologies and applications. When the AI readiness level of PTs was examined individually, the results showed a high level of readiness for AI of the PTs, similar to the findings reported by Karaca et al. These results supported that PTs have an attitude of adaptation to developing technology and fulfilling their requirements (5). The readiness level was also examined according to having AI awareness and previous training in AI (undergraduate or scientific activities), and the readiness levels of individuals who had AI knowledge and training were found to be higher. From these results, it can be thought that the level of readiness can be improved with education and awareness.

With the inclusion of AI applications in the field of health, negative thoughts against the scientific, professional and social effects of this technology, its application to current practice and ethical considerations can trigger AI-induced anxiety (28, 29). Baser et al.(9) studied the concerns of family doctors related to AI, and found that their anxiety level in the total score and sub-dimensions was close to the median value. In the current study evaluating the anxiety levels of PTs regarding AI by PTs, the anxiety level was seen to be low, in parallel with the study by Baser (9). Factors such as the fact that PTs do not think that AI will take over their jobs, the younger age of the participants, and the high level of education may have contributed to the low level of AI-related anxiety of PTs. In this study, the low level of anxiety related to AI of PTs shows that they do not have prejudices against the need for technology and the reflection of AI applications on their practices. In addition, in our study, unlike the findings of Baser et al. the anxiety score was higher in women. Sinderman et al. (30) stated in their study that neuroticism, which indicates the level of anxiety and

worry, may affect the fear of AI, and neuroticism is higher in women. The fact that the level of AI-induced anxiety is higher in women may be due to the fact that attitudes and changes towards technology are more easily acceptable by men. To reduce AI-induced anxiety, the effect of gender should be taken into consideration in the algorithms to be developed. Furthermore, according to our results, PTs who included these applications in their physiotherapy and rehabilitation practices had lower levels of anxiety caused by AI. This supports that AI-induced anxiety may be caused by prejudice. We think that including AI-based applications in educational programs and exposing them to these applications at the undergraduate level may increase compliance with AI and reduce AI-related anxiety.

This is the first study of AI readiness, and anxiety associated with AI using a validated questionnaire and investigating the use of applications of PTs working in the field of physiotherapy and rehabilitation, where AI-based applications are becoming more and more widespread. Another strong aspect of this study was that it included a large number of PTs with different training who were working in different fields throughout the country. However, there were also some limitations, primarily that the online design may have limited a detailed discussion of the barriers. Semi-structured qualitative studies are needed to examine the barriers affecting the use of AI-based applications in more detail. In addition, the online delivery of electronic surveys may have led to sample selection bias.

CONCLUSION

In conclusion, physiotherapists have low levels of AI-induced anxiety and high readiness. It was seen that AI-based applications are willingly applied in clinical practice by physiotherapists. The cost of AI-based applications is the most important barrier limiting the use of these approaches. Despite the positive attitudes of PTs towards AI-based approaches, there is a need for undergraduate-level training to be better applied in clinical practice. It can be considered that the adoption of AI-based approaches by PTs may be considerably increased with the future elimination of limitations such as lack of knowledge, infrastructure, and cost.

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COMPARISON OF EFFICACY OF HYPERTHERMIC INTRAPERITONEAL CHEMOTHERAPEUTICS MITOMYCIN C VERSUS OXALIPLATIN IN EXPERIMENTAL COLORECTAL PERITONEAL METASTASIS MODEL

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ABSTRACT

Aim: Our study aimed to establish a mouse model with colorectal cancer-induced peritoneal metastasis(PM) and to compare the efficacy of hyperthermic intraperitoneal chemotherapeutic agents, mitomycin C and oxaliplatin.
Materials and Methods: The peritoneal metastasis model was established in nude mice using the CC531 colon carcinoma cell line. Models with PM were randomized into four groups of seven animals each: Group-1, control group; Group-2, hyperthermic intraperitoneal chemotherapy(HIPEC) with mitomycin C(MMC), and Group-3, HIPEC with Oxaliplatin(OXA).
Results: Tumor development was achieved in all animals. While the tumor burden decreased significantly in the treatment Group-2(p=.013). In the PM mouse model, hyperthermic intraperitoneal administration of MMC had a higher tumoricidal effect than hyperthermic intraperitoneal administration of OXA.
Conclusions: Our PM model provided a good opportunity to examine the efficacy of HIPEC and IPIP. Hyperethermic intraperitoneal mitomycin applied in the colorectal PM animal model was found to have higher tumoricidal activity than oxaliplatin. In future studies, we plan to evaluate efficacies of different drugs in the PM models we have created.

Keywords: peritoneal metastasis model, colorectal cancer, HIPEC

INTRODUCTION

According to the data of the World Health Organization, colorectal cancer is the third most common cancer in both genders in Turkey [1]. 25 % of recurrences in colorectal cancer(CRC) patients are located in the peritoneum [2-4]. Approximately 5% of CRC patients are simultaneously diagnosed with peritoneal metastases (PM) at the time of initial diagnosis. During the course of their disease, PM develop in 2-19% of them [5-8]. While an average of

one year survival can be achieved with systemic chemotherapy in patients with peritoneal metastases of CRC, 5-year survival rates can reach 40-58% with cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) [9]. Therefore, it is recommended that CRS&HIPEC be performed as standard treatment in selected patients [10]. Although they are more successful when compared with systemic chemotherapy, there is not enough scientific evidence about CRS&HIPEC. Although hyperthermia per se has a cytotoxic effect on cancer cells, CRS&HIPEC potentiate each other's effects with chemotherapy[11]. When compared with systemic chemotherapy, intraperitoneal administration of chemotherapy provides a more intense concentration of chemotherapeutic agents on tumor cells with lower systemic toxicity[12]. Because of all these effects, when HIPEC is applied, 20-50 times more tumoricidal effect occurs compared to systemic chemotherapy [13].

In our study, we planned to create a PM model in athymic mice by using CC-531 (colon adenocarcinoma cell line) and to administer intraperitoneal chemotherapy using the infusion pump we developed in this model. We compared the efficacy of mitomycin C versus oxaliplatin, which we use as hyperthermic intraperitoneal chemotherapeutic agents in patients with colorectal PM.

MATERIAL AND METHODS

Our study was conducted at Dokuz Eylül University Faculty of Medicine Experimental Animals Laboratory (DEUFMEAL) between January and July 2022, with the approval of the Dokuz Eylul University Multidisciplinary Laboratory Animal Experiments Local Ethics Committee (Date: 23.01.2018, Decision No: 03/2018). In the process of establishing the peritoneal metastasis model, 7-8 week- old 21 male athymic nude mice bred by Experimental Animals Laboratory were used. Nude mice being caged in groups of seven under laboratory conditions in air-filtered laminar flow cabinets were monitored. Mice were fed with irradiated food and autoclaved reverse osmosis treated water, and all treatments were carried out under sterile conditions in a laminar flow hood.

İntraperitoneal Tumor cell inoculation: Cancer cells from the CC531 colon adenocarcinoma cell line were harvested during the logarithmic growth stage by incubating them at 37 °C under a humidified 5% CO_2 atmosphere. Cells were then resuspended in phosphate- buffered saline (PBS) for intraperitoneal injection. By providing the necessary sterilization in the laminar flow hood, suspended cells were given by intraperitoneal (IP) injection using a 16 mm long and 0.45 mm diameter needle.The amount to be injected into all groups was determined as 5×10^6 cells, 0.3cc, in 200µl PBS, taking the previous studies as an example [11]. We detected development of distension and palpable nodular lesions due to the formation of intraabdominal ascites between the 7th and 10th days in the subjects who were checked daily by inspection and palpation starting from the 5th day. After the presence of tumor was detected (day 10), the subjects were divided into three groups [Group-1(G-1), Control Group, (0.9% NaCl), Group-2(G-2), hyperthermic chemotherapy with mitomycin C(MMC); Group-3(G-3), hyperthermic chemotherapy with Oxaliplatin(OXA) groups (Table 1).

Surgical Intervention and HIPEC Procedure:
Athymic nude mice were weighed before administration of anesthesia.Their mean weight was 34 ± 2g . Diethyl ether inhalation anesthesia was applied. After anesthesia; the abdominal skin was cleaned with povidone-iodine. Necessary sterilization conditions were provided by covering the mouse with sterile covers. A midline abdominal incision of approximately 1 cm was made and the abdomen was entered. Peritoneal metastases were found. After the inlet and outlet catheters of the intraperitoneal infusion pump (IPIP) were placed lateral to the abdomen, the midline incision was closed primarily with 4/0 prolene sutures (Figure-1). Then, different chemotherapeutic agents were infused under hyperthermic (41ºC) (mitomycin C 20mg/m², oxaliplatin 100mg/m²) conditions for 45 minutes to

Table 1. Groups and intraperitoneal treatment procedures.

GROUPS	Intraperitoneal Treatment Procedure
Group I (Control)	Normothermic (37º) 0.9%NaCl
Group II	Hyperthermic (41º) MMC
Group III	Hyperthermic (41º) OXA

MMC: Mitomycin C, OXA: Oxaliplatin

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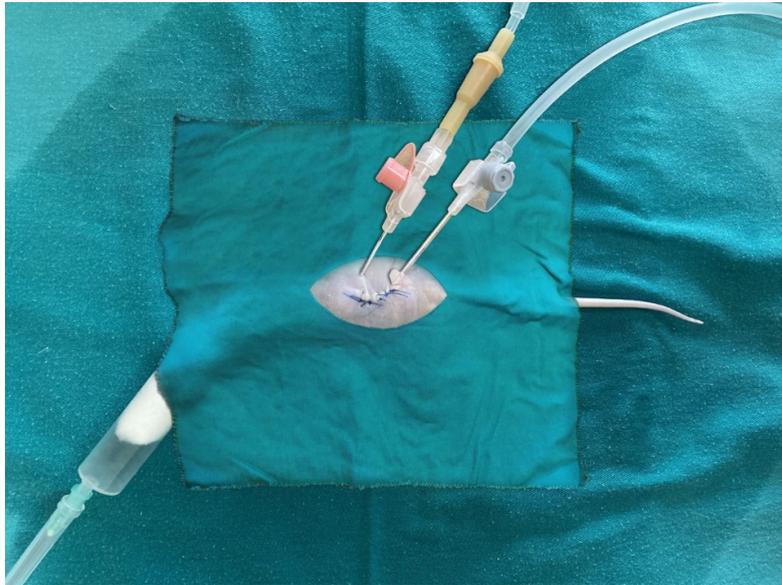

Figure 1. Preparation of model before the application of intraperitoneal chemotherapy, placement of the catheters.

the previously determined groups. This process was developed by us as a prototype and was carried out with IPIP (Figure-2). Intraoperatively, the required tissue temperature was reached within 4-6 minutes in the HIPEC group. Steady temperatures were then maintained for an additional 45 minutes with an average of 40.5 ± 0.5°C, and approximately 5 ml of the solution was required to fill the abdomen. Using the thermostat of the device, the temperature of the fluid given and instilled into the abdomen was controlled and the temperature was kept constant. Chemotherapeutic agents were given as MMC (20 mg/m²), and OXA (100mg/m²) prepared in 30cc 0.9% NaCl and 5% glucose solution served as carrier. This process was done in a laboratory environment, taking

safety precautions. Body surfaces area was estimated usin Meeh's with an empirical Meeh constant of *k=9.6*[14]. formula of mice were calculated in square meters (m²) using the formula: (A(m²) = k x W⅔/100). Intraperitoneal perfusion was maintained for 45 minutes. After the procedure was completed, the perfusion cannulas were taken out of the abdomen.The liquid boiler of the system was sterilized after each operation.All infusion tubing and cannulas were changed after each procedure. Sterilization was provided under optimal conditions for each mouse.

Intraperitoneal Infusion Pump (IPIP): It consists of intraperitoneal infusion pump (IPIP), 1000 milliliter
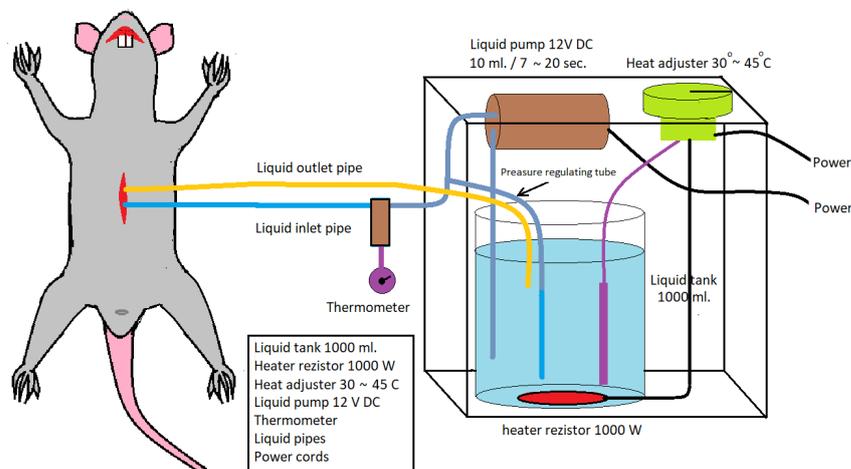
Figure 2. Intraperitoneal infusion pump system working diagram.
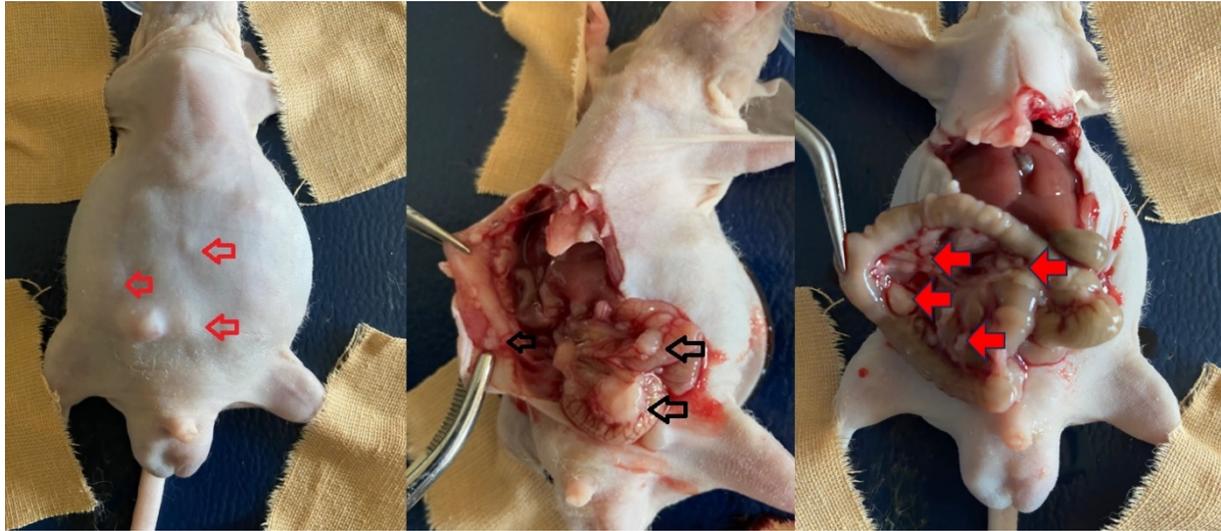
Figure 3. Determination of peritoneal carcinomatosis index in animals, acid amount measurement.

liquid tank, liquid pump, thermostat that can control the range of temperature between 30-45°C, heater resistance (1000W), liquid temperature control probe, liquid flow and collection cannulas, liquid pressure adjustment cannula designed and developed by us. The temperature of the fluid coming from the fluid outlet cannula and the inside of the abdomen passes through the second control cannula and a constant temperature is provided. The flow rate of the liquid pump can be adjusted. Intraperitoneal chemotherapy can be applied to CPC models created in different types with the IPIP system we have developed.

Follow-up, Sacrification and Evaluation of Subjects: Subjects undergoing daily follow-ups were evaluated by performing laparotomy 5 days after intraperitoneal infusion of chemotherapeutic agents. Peritoneal cancer index (PCI) was determined and scoring was done. Scoring was done considering the involved organ and tumor diameter, and evaluated out of 8 points as follows: small bowel and/or mesenteric involvement: 1 point; peritoneal involvement: 1 point; diaphragmatic involvement: 1 point, ascites (+): 1 point; involvement of other organs: 1 point. Tumor diameters were measured and scored as follows: 0 : no tumor growth; 1 point:nodule diameter ≤ 2 mm; 2 points: nodule diameter 2-5mm or > 5 tumor nodules; 3 points: nodule diameter ≥ 5mm or >10 tumor nodules (Figure-3). Ascitic fluid was aspirated, and its quantification was carried out. Small intestine, peritoneum, intraabdominal fluid and blood samples were taken and the subjects were sacrificed.Tissue and intraabdominal fluid samples

were then evaluated histopathologically and biochemically. Tissue samples were fixed in 10% formaldehyde, cassetted, and embedded in a paraffin block after tissue follow-up. Frozen sections of 5 μm thickness were obtained from the optimum section surface. Sections were then stained with hematoxylin and eosin (H&E) and examined under Olympus X50 light microscope.Tissues were evaluated for the presence of tumor, tumoral pattern, differentiation, apoptosis, mitosis and necrosis.Evaluation was made by calculating the total number of mitoses in 10 different tumor areas by magnifying the field of vision 400 times under a 40X objective of a light microscope.The number of apoptosis was calculated by evaluating 5000 cells and determining its percentage in 1000 cells. Tissue samples were evaluated for tumor necrosis. The intensity and expression levels of lymphatic vessel endothelial hyaluronan receptor-1(LYVE-1), Angiopoietin-1(Ang-1) and Angiopoietin-2(Ang-2) in cancerous tissue were examined by immunohistochemical methods. Supernatants remaining after centrifugation of intraabdominal fluid samples of the mice were studied using Lysyl Oxidase-like protein 1(LOXL1) and TWIST Transcription factor (TWIST) mouse compatible ELISA kits.Vascular endothelial growth factor(VEGF) levels were studied by diluting the samples in fluids, taking into account the mouse-compatible ELISA kit application steps. According to the absorbance values obtained from the standards, standard graphs of each test were created. Concentrations were expressed by calculating the absorbances obtained from the samples. The

Table 2. Group II mean PCI, tumor diameter and amount of ascites were significantly less than the other groups (Kruskal-Wallis test, T-test)

Mean(std±) Median(25-75th)	G-I	G-II	G-III	
PCI	6.71(±1.38)	4.42(±0.53)	6.28(±1.60)	.013
	7(6-8)	4(4-5)	7(6-7)	
Tumor diameter(mm)	5.85(±3.28)	2.42(±0.53)	5.71(±1.79)	.001
	5(4-8)	2(2-3)	5(4-7)	
Ascites(ml)	4(±1.93)	1.28(±1.77)	3.57(±1.74)	.032
	4.5(3-5)	0(0-2.5)	4(3-5)	

PCI: peritoneal cancer index, std: standard deviation.

Table 3. The mean of tumor tissues in the groups; mitosis counts, apoptosis counts and tumor necrosis rates(Kruskal-Wallis Test, T-Test, p=.003, .008, .015).

Mean(std±) Median(25-75th)	Mitosis count(40X)	Apoptosis count/1000cell	Tumor Necrosis (+) Subject Ratio in Groups (%)
G I *(Control)*	12.714(std 1.79)	5.42(std 2.29)	14.2
	12(12-15)	5(4-6)	
GII *(Hyperthermic MMC)*	5.857(std 1.34)	131.42(std 48.79)	100
	6(5-7)	130(80-180)	
GIII *(Hyperthermic OXA)*	9.000(std1.82)	65.71(std 23.70)	42.8
	8(8-11)	60(50-80)	
	.003	*.008*	*.015*

MMC: Mitomycin C, OXA: Oxaliplatin, std: standard deviation.

measuring range of the LOXL1 ELISA kit was 78-5000 pg/mL and the measurement sensitivity of the test kit was 29 pg/ml.The measuring range of the kit for the TWIST test was 0.156-10 ng/mL, and the measurement sensitivity of the test kit was 0.056 ng/mL.The measuring range of the kit for the VEGF test was 15-1000 pg/mL, and the measurement sensitivity of the test kit was 9.375 pg/mL.

Statistical analysis: Before the study, the number of subjects was determined by power analysis.The maximum number of animals allowed by the animal experimentation ethics committee was used to obtain statistically significant results. Statistical analysis was performed using IBM SPSS 24.0 statistics. The significance of differences was assessed by the Kruskal-Wallis-test. Continuous variables were compared by independent samples t-test. Descriptive statistics were presented in median (25-75th percentile) format.Fisher exact chi-square test and T-test were used in the analysis of qualitative data, and descriptive statistics were shown in the form of frequency. P values <0.05 were defined as statistically significant.

RESULTS
There was no mortality in the postoperative period in the mice that received intraperitoneal chemotherapy. Mild side effects (anorexia and lethargy) were observed in five animals in the group given hyperthermic chemotherapy which disappeared within two days (G-2 n=2, G-3 n=3). Although minimal dehiscence was observed in the incision line in seven animals, no infection or wound dehiscence, which would cause mortality, was observed until the sacrification process.

Macroscopic findings: When the peritoneal cancer index (PCI) was compared between the groups, G-2 had the lowest mean and statistically significant PCI (p=.013) value [4.42±0.53]. When tumor diameters and amount of ascites were compared between groups, G-2 again had the lowest, and statistically significant values [2.42±0.53 mm vs 1.28±1.77 ml, and p=.001 vs p=.032, respectively]. However, in our
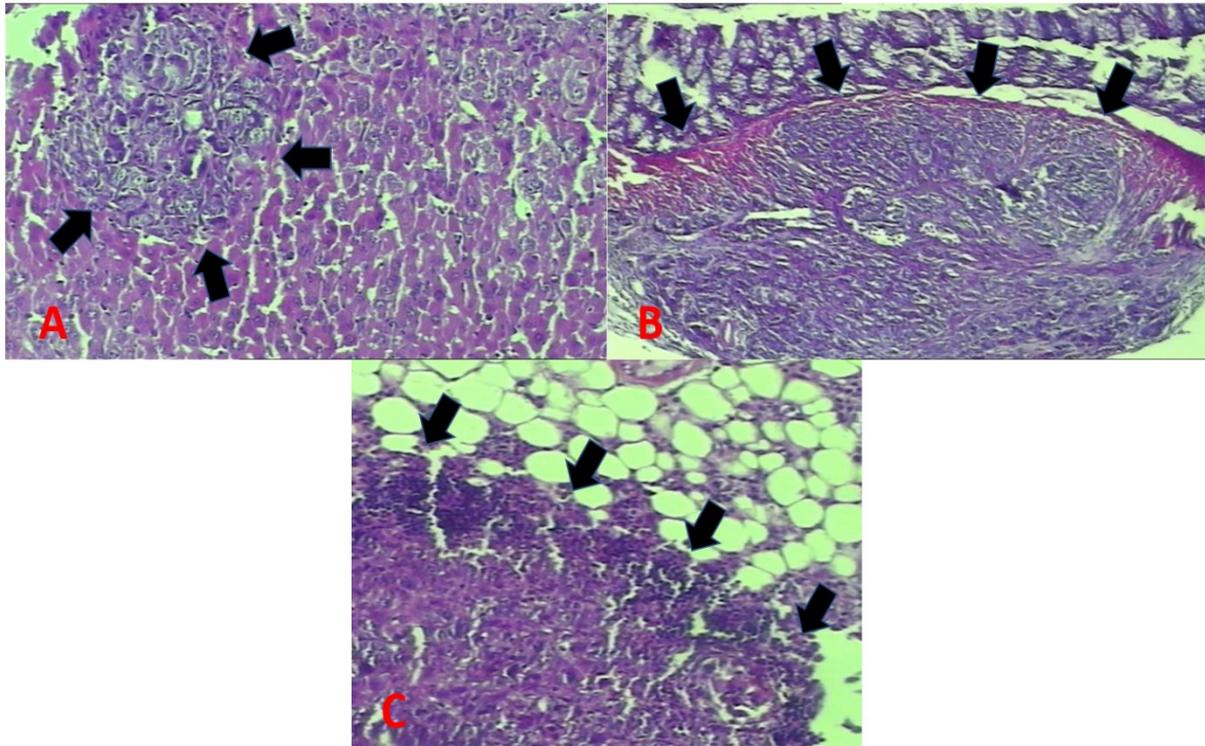
Figure 4. Group 1 (control) tumor images; A: Nodular tumor implanted in the liver, B: Tumor implantation in the intestinal wall, C: Tumor infiltrating the peritoneal adipose tissue.

study, no significant difference was found between the groups in terms of these parameters, except for G-2(Table 2).

Microscopic findings: When the tissue samples obtained from the intestinal system, peritoneum, liver after sacrifice were evaluated under microscope, tumor cell infiltration was observed in all tissues.The tumor was found to be nodular and undifferentiated.When the groups were compared in terms of number of mitotic, and apoptotic cells and

tumor necrosis, statistically significant intergroup differences were found (p<0.05). In G-2, the number of apoptotic cells and areas of tumor necrosis were found to be statistically significantly higher than the other groups (p=.008, p=.015). The number of mitosis was found to be significantly lower than the other groups. (p=.003) (Table 3) (Figures 4 and 5).

Biochemical findings:The mean values of VEGF, LOX1 and TWIST in the intraabdominal ascites fluid
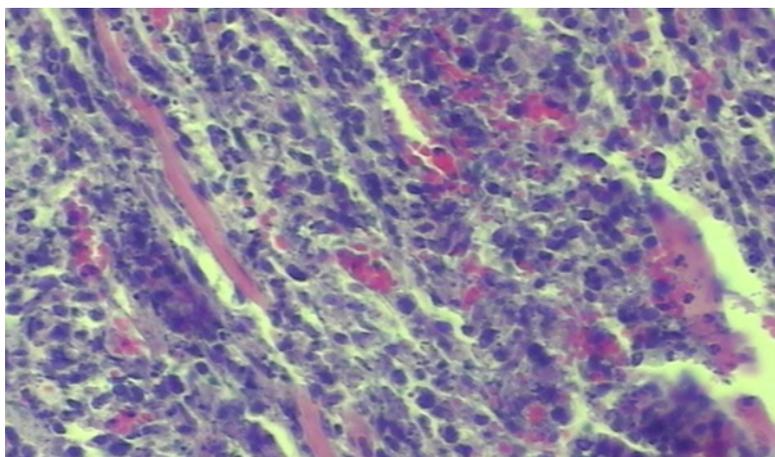
Figure 5. Group II (Hyperthermic MMC) tumor images; areas of increased apoptosis and tumor necrosis in tumor cells.

Table 4. VEGF, LOX1 ve TWIST values in intra-abdominal fluid (Kruskal-Wallis Test, T-Test, p=0.004, 0.037, 0.012).

	VEGF Mean(std±) Median(25-75th)	LOX1 Mean(std±) Median(25-75th)	TWIST Mean(std±) Median(25-75th)
GI	274.625 (std±192.498) 267 (165-314)	552.142 (std±326.622) 525 (415-745)	1.416 (std±1.164) 1.13 (1.05-1.49)
GII	17.960 (std±24.728) 0(0-31)	225.000 (std±308.801) 0 (0-430)	0.254(std±0.407) 0 (0-0.83)
GIII	150.782 (std±97.396) 149 (107-235)	553.571 (std±204.587) 540 (320-800)	1.799 (std±1.328) 2.18 (0-2.96)
	.004	**.037**	**.012**

VEGF:Vascular Endothelial cell Growth Factor, LOX1: Lysyl Oxidase Like Protein-1, TWIST: Twist Transcription Factor, std: standard deviation

were found to be statistically significantly lower in G-2 compared to the other groups [VEGF; 17.960±24.728 pg/mL, LOX1; 225.000 ±308.801 pg/mL, TWIST; 0.254 ±0.407 ng/mL (p=.004, .037, and .012, respectively)]. No significant difference was found between the other groups in terms of these parameters (Table 4).

Immunohistochemical Findings: Tumors from all groups had LYVE-1 positivity. The strong positivity rate in the control group and group III were found to be statistically significantly higher than G-2(p<.001, p=.031). There was no significant difference between the groups in terms of Ang-1 staining intensities. Ang-2 was found to be significantly stronger positive in the control group compared to the groups that received intraperitoneal chemotherapy (p=0.002).

DISCUSSION

Hyperthermic intraperitoneal chemotherapy (HIPEC) with mitomycin C has been applied following cytoreductive surgery for various peritoneal surface malignancies. Spratt et al. first performed HIPEC in a patient with pseudomyxoma peritonei [15]. A significant survival benefit has been shown for HIPEC when compared to systemic chemotherapy alone [16,17]. The complete cytoreductive surgery is the most important prognostic factor. Incomplete cytoreduction results in limited survival [18,19].

The drugs used in the HIPEC procedure have a limited depth of penetration. For this reason, HIPEC is applied in patients whose macroscopic tumor burden was eliminated or minimal residual tumor remained following radical cytoreductive surgery [20]. Therefore, tumor cells can be implanted into an intraperitoneal fat pad to simulate cytoreductive surgery as described by Veenhuizen et al.[21]. Using

this technique, the spread of tumor implants is limited. This simulates an abdomen that has undergone cytoreductive surgery and has a reduced tumor burden. In our study, we provided widespread implantation of tumor cells by injecting tumor cells into the intraperitoneal cavity. Diffuse peritoneal implants formed in all subjects within 7-10 days. In many studies, and tumors are produced by intraperitoneal injection [22,23]. The widespread creation of peritoneal implants made it easier for us to determine the macroscopic PCI score. Apart from this, we think that this approach enables us to better detect the differences in efficacies of different drugs administered to the groups. In some studies, the tumor formation rate after intraperitoneal tumor transplantation was reported as 80% [24,25], while tumor formation rate of 100% was reported in a study where tumor cells were implanted in an intraperitoneal fat pad [21].In our study, tumor formation was observed at a rate of 100% after intraperitoneal inoculation.

We have seen that with the IPIP system we developed, HIPEC can be performed effectively in the athymic mouse PM model. There was no loss of subjects during and after perfusion. Animals were observed for 5 days after administration of intraperitoneal chemotherapy. No serious complications were observed. Mild side effects (anorexia and lethargy) were observed in four animals in the group given only hyperthermic chemotherapy. All these side effects disappeared within two days. Late-term effects, morbidities, and effects of sacrification on the 5th day could not be fully evaluated. Basically, HIPEC is a proven procedure with cytoreductive surgery. However, in our study, only HIPEC was applied since it was not appropriate

to perform cytoreductive surgery on the model. In this case, the administered chemotherapeutic drugs demonstrated limited effectiveness.

It is difficult to achieve homogeneous distribution of temperature, and cytotoxic drugs, but it is crucial for ensuring the tumoricidal efficacy of this procedure. For this reason, an open abdomen approach can be chosen to ensure homogeneous temperature and drug distribution [11]. The biggest disadvantage of this method is exposure to cytotoxic drugs. In our study, after perfusion catheters were placed, the abdominal wall was closed and then peritoneal infusion was started. Optimal intraperitoneal circulation was ensured by continuous temperature control and adjustment of the infusion rate in the fluid outflow and inflow catheters, and the desired temperature and homogeneous drug distribution were maintained.The closed abdomen facilitated the control and maintenance of the same drug temperature. After the treatment period was completed, the cannulas were withdrawn and the procedure was terminated.

In the study of Liesenfeld et al.[26] on dose-related side effects and mortality in the mouse model, the doses of mitomycin and oxaliplatin with the lowest loss of subjects were determined. In our study, we applied the same doses in this study Liesenfeld et al.[26] by calculating MMC as 20mg/m² and OXA as 100mg/m². In the postoperative follow-up, mild side effects (anorexia and lethargy) were observed in five mice in the group that hyperthermic chemotherapy was given, which disappeared within two days. Mortality was not observed in the early period.

Oxaliplatin and Mitomycin C are the most commonly used chemotherapeutics as intraperitoneal agents in HIPEC[27,28]. The reason why oxaliplatin and MMC are suitable for intraperitoneal use is that due to the large molecular weight of the chemotherapeutics, they may undergo limited systemic absorption and reach high intraperitoneal concentrations. In this case, it increases their intraperitoneal activity[29]. In recent years, the use of oxaliplatin as a HIPEC regimen in patients with colorectal PM has become increasingly popular[30]. Studies have been conducted comparing MMC, which is commonly used in PM patients with colorectal cancer, and oxaliplatin [31-34]. In the study by Zhang X.[31] et al., no significant difference was found in terms of survival between patients who underwent cytoreductive surgery and hyperthermic oxaliplatin and those who underwent MMC in colorectal PM patients. However,

the rate of major complications (bleeding, renal toxicity, hepatic toxicity, neurotoxicity) was higher in the group receiving Oxaliplatin. In our study, no significant difference was found in terms of complications in the two groups until the sacrification process, which is the 5th day. In general, the perfusion time is about 30 minutes for oxaliplatin, which is significantly shorter than that of MMC (60-90 minutes) [32]. This is one of the reasons why it has been preferred in recent years. In our study, however, we applied HIPEC for equal duration (45 minutes) to both groups in order to avoid inconsistency in the results, since their efficacy may vary depending on the duration. Leung V.[33], et al. reported that oxaliplatin provides a better overall survival advantage than MMC in colorectal PM patients. In the study by Eden W. J. V.[34] et al., it was determined that the survival times were significantly longer in the patient group given oxaliplatin compared to the patient group given MMC. When the two groups were compared in terms of postoperative complications, no significant difference was found. When these studies are examined, it is seen that oxaliplatin given for a shorter time comes to the fore. However, the cytoreductive surgery technique applied to the patients, the different drug doses and durations applied in the HIPEC procedure may affect these results. In the study of Delhorme J P[35] et al., it was determined that disease-free survival in patients with colorectal peritoneal metastasis was significantly higher in the group that underwent MMC. In the study of Villaverde A P[36] et al., it was shown that the median overall survival was significantly longer in the MMC group. In the study of Woeste M R. [37] et al. it is reported that hyperthermic intraperitoneal administration of MMC or Oxaliplatin together with an effective cytoreductive surgery is a safe and effective treatment in colorectal PM patients. They argued that both perfusion treatments should be considered in all patients receiving modern induction chemotherapy. In the PM animal model study conducted by Raue W.[38] and his colleagues, MMC was applied hypertemic intraperitoneally and it was shown to have high tumoricidal activity.

In our study, when we evaluate all the findings, macroscopic, microscopic, biochemical and immunohistochemical examination results jointly have shown that the strongest tumoricidal activity was achieved in the hyperthermic MMC group. However, no significant difference was found between the early complication rates. Long-term survival could not be

evaluated because it was an experimental study on an animal model.

Limitations of this study can be stated as small number of mice included in the nude mouse peritoneal carcinomatosis model, and very dificult application of chemotherapy procedure. The mice were followed up and sacrificed until the 5th postoperative day. Therefore, the long-term efficacy of the drugs and the late-term postoperative complications could not be evaluated. Due to the limited number of studies in this area, it was not possible to foresee the difficulties that may be encountered. Before this experiment, preliminary experimental studies were carried out in order to establish peritoneal carcinomatosis and to gain experience in IPIP procedure.

CONCLUSION

Hyperthermic intraperitoneal chemotherapy procedure can be applied in the created peritoneal carcinomatosis model and the results can be evaluated qualitatively and quantitatively. We compared the two most effective chemotherapeutic agents used in cytoreductive surgery and the HIPEC procedure in an animal model of colorectal peritoneal metastasis and found that tumoricidal activity was statistically significantly higher in the MMC group. In addition, we observed that there were tolerable side effects in two different groups that underwent hyperthermic intraperitoneal chemotherapy, and there was no difference between two groups in terms of postoperative complications. We also aim to further increase the efficiency of the HIPEC procedure and further reduce its side effects by conducting experimental in vitro and in vivo studies in the future.

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RELATIONSHIP BETWEEN PHYSICAL ACTIVITY LEVEL AND SLEEP QUALITY IN MOTHERS OF INDIVIDUALS WITH SPECIAL NEEDS

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ABSTRACT

Purpose: The study aimed to investigate the relationship between physical activity level and sleep quality in mothers of individuals with special needs.
Material and Methods: Three hundred twenty-one mothers (average age: 41.92±9.53 years) with a disabled child participated in the study from Osmangazi county of Bursa province in Türkiye. Demographic characteristics of the mothers were collected through a personal information form prepared by the researchers. The mothers' physical activity level was determined using the International Physical Activity Questionnaire-short form (IPAQ-SF). The mothers' sleep quality was determined using the Pittsburgh Sleep Quality Index (PSQI). The physical activity level of the disabled individuals was determined based on their mothers' statements.
Results: The mean IPAQ-SF score of the mothers was found to be 1080.58±986.88 MET-min/week, and their mean PSQI score was determined to be 7.46±3.62. The disabled individuals' physical activity level was evaluated as a)15.9% (n=51) of the disabled individuals regularly participated in a sporting activity, b) 32.4% (n=104) did not participate in sports but made efforts to stay active, and c) 51.7% (n=166) were considered inactive. Pearson correlation analysis revealed that a) there was no relationship between IPAQ-SF and PSQI scores (r: -0.056, p=0.313), b) the physical activity level of individuals with special needs did not correlate with PSQI scores of the mothers (r: -0.95, p=0.089), and c) no relationship was determined between the age of individuals with special needs and mothers' sleep quality and physical activity level.
Conclusion: It can be concluded that increasing the physical activity level of mothers cannot be an effective intervention to improve sleep quality in mothers of individuals with special needs. Further research is needed to explore the relationship between physical activity level and sleep quality in mothers of individuals with special needs.

Keywords: individual with special needs, mother, sleep quality, physical activity level

INTRODUCTION
Sleep is an essential biological function with major roles in recovery, energy conservation, and survival (1). Sleep also appears to be important for vital functions such as neural development, learning, memory, emotional regulation, cardiovascular and

metabolic function, and cellular toxin removal (2-5). Sleep disturbances impair cognition, psychomotor function, and mood and lead to lapses in attention and inability to stay focused; reduced motivation; compromised problem solving; confusion, irritability, and memory lapses; impaired communication; slowed or faulty information processing and judgment; diminished reaction times; and indifference and loss of empathy (6-7). Sleep disturbances also affect human life by increasing the risk of heart attacks, stroke, hypertension, obesity, diabetes, depression, and mortality (6,8-10).

Sleep disturbance may occur as a symptom of another physical or mental illness. It can also be seen as a primary disorder (11). Unhealthy sleep patterns and sleep disturbances throughout childhood and adulthood are common across different cultures (12,13). Furthermore, various factors including unhealthy diet, poor emotional and cognitive status, physical or psychological diseases, pain, and fatigue may be associated with sleep disturbances, but the relationships are very complicated and remain unclear (12,13).

One of the predisposing factors of sleep disturbances in a child or an adolescent is having a disability. It is well known that children with a wide range of special health care needs experience poor sleep (14).

Saletovic, Pasalic and Memisevic (15) reported that most common sleep problems in children with intellectual disability (ID) are settling difficulties, night waking, long sleep latencies and early waking. Soytaç, Kahraman and Genç (16) also reported that mothers of children with autism spectrum disorder (ASD) had a higher anxiety level, and lower sleep quality and health-related quality of life.

Anxiety, depression, fatigue, low life quality and burnout are leading health problems in mothers of children with special needs, and these are caused primarily by sleep disturbances (16-18). Higher rates of sleep problems among children with disabilities are likely to have a direct impact on the sleep habits of mothers, and impact maternal subjective health and well-being (19).

Meltzer and Mindell (20) stated that the quality of a child's sleep predicts the quality of the mother's sleep. Several physical activities, including walking, yoga, and aerobic gymnastics, have been suggested for mothers of children with special needs to participate in, in order to improve their sleep quality (21-25). A study by Karakaş and Yaman (24) argued that the quality of life of parents who had disabled individuals

and performed regular physical activity was found to be at a higher level than that of those who had disabled individuals but did not perform physical activity. Therefore, this study aimed to investigate the relationship between physical activity level and sleep quality in mothers of individuals with special needs. This study also hypothesized that as physical activity levels increase, sleep quality also increases.

MATERIAL AND METHODS

Three hundred twenty-one mothers (average age: 41.92±9.53 years) with a disabled individual participated in the study from Osmangazi county of Bursa province in Türkiye. The simple random sampling method was used to ensure the consistency of participants in the study. The information obtained from the Bureau of Enquiry of the Presidency of the Republic of Türkiye, Directorate of Communications reveals that there are 3 Special Education and Rehabilitation centers in Osmangazi county of Bursa, serving a total of 834 students with special needs. Based on these 834 students, the study requires a

Table 1. Descriptive characteristics of mothers of individuals with special needs (n=321)

Descriptive Characteristics	n	%
Educational Status		
Literate	4	1.2
Primary school graduate	104	32.4
Secondary school graduate	49	15.3
High school graduate	97	30.2
University graduate	57	17.8
Postgraduate	9	2.8
Working status		
Working	100	31.2
Not working	216	67.3
Part-time job	5	1.6
Income status /Monthly /TL		
0-12.000	115	35.8
12.000-20.000	92	28.6
More than 20.000	114	35.5
Family structure		
Nuclear Family	232	72.3
Traditional family	51	15.9
Single mother	38	11.8

Table 2. Characteristics of mothers of individuals with special needs (n=321)

Descriptive Characteristics	n	%
Where do you live?		
Province	306	95.3
County	11	3.4
Rural area	4	1.2
Who takes care of children/supported by		
Myself	162	51.4
Father	137	42.7
Childminder	22	6.9
Who sleeps with you?		
My child and I sleep in the same room	85	26.5
My child and I sleep in different rooms	236	73.5

Table 3. Descriptive characteristics of individuals with special needs (n=321)

Descriptive Characteristics		
Age	13.49 ±7.81	
	n	%
Gender		
Girl	128	39.9
Boy	193	60.1
Type of Disability		
Intellectual disability	148	46.1
Learning disability	53	16.5
Autism spectrum disorder	100	31.2
Cerebral palsy	12	3.7
Attention deficit hyperactivity disorder	8	2.5
Physical activity level		
Regularly participates in a sporting activity	51	15.9
Does not participate in sports but makes efforts to stay active	104	32.4
Inactive	166	51.7

minimum of 263 mothers according to the formula for proportional sample size used to determine the sample size (26). This will enable the study to provide a 95% confidence interval with a 5% error margin. Descriptive characteristics of mothers of individuals with special needs are presented in Tables 1-2. Descriptive characteristics of individuals with special needs are given in Table 3.

Data Collection Tools
Personal information form: The demographic characteristics of the mothers were assessed using a form consisting of 11 items that was developed and prepared by the researchers. This form allowed the researchers to gather information about various demographic factors related to the mothers participating in the study. The form consisted of

multiple choice questions and open-ended questions including age, educational status, occupation of the mothers, income of the mother/family, current employment status, physical activity level of the child/children, other family members in the home, etc.

Physical activity level of the mothers: Physical activity level of the mothers was determined through the International Physical Activity Questionnaire-short form (IPAQ-SF). The questionnaire was administered to individuals aged 15 to 65 in order to gather information about their physical activity habits and behaviors (27). Tests of Turkish validity and reliability were previously performed by Saglam et al. (28). The IPAQ measurement, which advises engaging in physical activity for at least 10 minutes at a time, was used in the study. The questionnaire

Table 4. Relationship between mothers' PSQI score and physical activity level of individuals with special needs, and relationship between mother's IPAQ-SF score and PSQI score

		PSQI
MET-min/week	Pearson Correlation (*r*)	-0.056
	p	0.313
Physical activity level of individuals with special needs	Pearson Correlation (*r*)	0.095
	p	0.089

Table 5. Relationship between age of individuals with special needs and sleep quality and physical activity level of mothers of individuals with special needs

		PSQI	MET
Age of Individuals with Special needs	Pearson Correlation (*r*)	0.073	-0.98
	p	0.193	0.08

asked individuals about the amount of time they spent participating in vigorous exercise, moderate exercise, walking, and sitting throughout the day. To convert the durations of walking and intense and moderate physical activity into the corresponding metabolic equivalent (MET) units, the following formula was employed: MET value = duration (minutes) × MET level. In this formula, 1 MET is equivalent to 3.5 ml/kg/min. The overall physical activity score (expressed as MET minutes per week) was then calculated by summing the MET values for each activity and multiplying by the corresponding duration. In the calculation of the MET values of the subjects, the study by Maddison et al. (29) was referred to.

Sleep quality of mothers: The Pittsburgh Sleep Quality Index was initially developed by Buysse et al. (30) in 1989 and later adapted to Turkish by Ağargün et al. (31) in 1996. It is designed to evaluate sleep quality and sleep disorders experienced within the past month. The scale consists of a total of 24 questions, with 19 of them being self-report questions and the remaining five questions answered by the spouse or roommate. The scale assesses various aspects of sleep through seven components: Subjective Sleep Quality, Sleep Latency, Sleep Duration, Sleep Efficiency, Sleep Disturbances, Use of Sleeping Pills, and Daytime Dysfunction. Each component is rated on a scale of 0 to 3 points. The scores from the seven components are summed to obtain the total score, which ranges from 0 to 21. A total score greater than 5 is indicative of "poor sleep quality."

Physical activity level of the individual with special needs: One of the questions in the personal information form was, "How would you rate the physical activity level of your child with special needs?" Researchers asked mothers to evaluate their children's physical activity level using the following options: a) He/she participates in a sport regularly, b) He/she does not participate in sports but makes efforts to stay active, c) He/she is inactive.

Data Collection
The data were collected by the researchers using the face-to-face interview technique. The participants were informed about the study and given the necessary explanations, and then, their consent was obtained.

Data Analysis
All statistical analyses were performed using IBM SPSS Statistics version 23.0 (IBM Inc., Armonk, NY, USA). Data were presented as mean and standard deviation. Mothers' physical activity level (IPAQ-SF), physical activity level of individuals with special needs, and sleep quality of mothers (PSQI) were tested for normality using the Kolmogorov-Smirnov test. The Kolmogorov-Smirnov test revealed that the data were not normally distributed ($p \leq 0.05$). Since the relationship between all variables was evaluated

using the Pearson correlation coefficient, the level of statistical significance was accepted as p < 0.05.

Ethical Aspects of the Study

This study was approved by the Istanbul 29 Mayıs University Scientific Research and Publication Ethics Committee (Approval date: 31.07.2023 Number: 2023/08). Furthermore, the mothers who participated in the study were given a brief description of the study, and consent was received from those who agreed to participate in the study.

RESULTS

The mean physical activity level of mothers was determined to be 1080.58±986.88 MET-min/week, and their mean PSQI score was determined to be 7.46±3.62. The relationship between mothers' physical activity level and sleep quality is presented in Table 4. Additionally, the relationship between physical activity level of individuals with special needs and mothers' sleep quality can also be observed in Table 4. The relationship between the age of individuals with special needs and mothers' sleep quality and physical activity level are presented Table 5.

There was no relationship between IPAQ-SF and PSQI scores in mothers of individuals with special needs (r: -0.056, p=0.313). Also, the physical activity level of individuals with special needs did not correlate with PSQI scores of the mothers (r: -0.95, p=0.089), (p > 0.05). (Table 4)

No relationship was determined between age of individuals with special needs and mothers' sleep quality and physical activity level (p > 0.05). (Table 5)

DISCUSSION

The main findings of the study are as follows: a) There was no correlation between physical activity level (MET-min/week) and sleep quality (PSQI) in mothers of individuals with special needs. b) The physical activity level of individuals with special needs, as reported by their mothers, did not show any correlation with the sleep quality of the mothers. c) No relationship was determined between age of individuals with special needs and mothers' sleep quality and physical activity level. The study hypothesized that as physical activity levels increase, sleep quality also increases. Based on the findings of the study, we can infer that the hypothesis of the study was not verified.

Several techniques including progressive relaxation training, cognitive behavioral therapy, group coping skills, occupational therapy and mindfulness training have been suggested for mothers of children with mental disabilities (32-34).

Bourke-Taylor et al. (35) reported a strong negative correlation between physical activity level and sleep quality in mothers who had disabled children after the Healthy Mothers Healthy Families workshop intervention in Victoria, Australia. The results of the study revealed that as physical activity level increased, sleep quality also increased. Based on that study, mothers of children with special needs in Turkey may need a guide or motivational program as in the Healthy Mothers Healthy Families workshop intervention in Victoria, Australia to increase their physical activity level and life quality, since it was evaluated that mothers of children with special needs had lower physical activity levels than mothers without disabled children (643.47± 558.78 MET-min/week versus 1151.86±942.62 MET-min/week). In our study, the physical activity level in mothers of a child with special needs was determined as moderately active (1080.58±986.88 MET-min/week) (27). In a study by Skordilis (36), no differences were found between parents with and without children with disabilities in terms of physical activity levels. However, parents with disabled children were found to be less sedentary and more energetic compared to their counterparts. Haegele et al. (37) found mean IPAQ scores in mothers of a child with ASD as 3371 MET-min/week (highly active) and they also found significant correlations between the child's age and mother's physical activity level. They suggested that as parents and children grow older, parents tend to participate in more physical activity. In our study, we found that the mothers' physical activity level was classified as moderately active. This outcome could be attributed to the age of the children (13.49 ± 7.81 years). However, different from the study by Haegele et al. (37), we could not find a relationship between the age of individuals and mothers' sleep quality and physical activity level. It is important to consider this variable in future studies that aim to determine the physical activity level in mothers of children with disabilities.

Yan and Chen (38) reported that practicing aerobic gymnastic exercise at least three times (15 min per section) a week for three months had positive and significant effects on the perceived stress, fatigue and

sleep quality of postpartum women. The postpartum period is characterized by psychosocial problems, including fatigue, depression, stress, tiredness, sleep disturbances and daytime functional problems as in mothers who have children with special needs (39-42).

Ullas et al. (23) concluded that 1.5 hours of integrated yoga practice, consisting of physical postures, breathing techniques, relaxation techniques, and meditation every other day for 1 month, decreased anxiety, depression, and stress, and improved sleep quality in mothers of children with intellectual disabilities.

In a study conducted by Karakaş and Yaman (24), the physical activity levels and life quality of 164 parents with disabled individuals were evaluated. The researchers used the International Physical Activity Questionnaire-Short Form (IPAQ-SF) and the World Health Organization Quality of Life-BREF Form (WHOQOL-BREF) for the assessment. The study in question found that parents who had a disabled individual and engaged in regular exercise had a higher quality of life compared to those who had a disabled individual but did not perform regular exercise.

In the study conducted by Karakaş and Yaman (24), although sleep quality was not directly evaluated, the WHOQOL-BREF questionnaire consisted of five sub-dimensions, including the physical area, psychological area, social area, environmental area, and environmental TR (Transport) area. The sleep quality of 164 parents was indirectly assessed through the physical area sub-dimensions of the WHOQOL-BREF, which included items related to pain and discomfort, energy and fatigue, and sleep and rest.

This study has some limitations. First, the mothers were recruited from only Osmangazi county of Bursa province in Turkey, and as a result, the findings may not be generalizable to all mothers of individuals with special needs. To improve the generalizability of the results, future studies should replicate the research with a larger and more diverse sample by recruiting mothers from different provinces in Turkey.

Second, the study only focused on the physical activity levels of both individuals with special needs and mothers, as well as the age of individuals with special needs, in order to evaluate the mothers' sleep quality. Other independent variables of the mothers, such as work status, education level, monthly income of the family, etc., which could potentially impact sleep quality, were not evaluated. Considering and evaluating these additional factors in future studies could lead to obtaining different and more comprehensive results.

CONCLUSION

Based on the findings of this study, it can be concluded that increasing the physical activity level of mothers cannot be an effective intervention to improve sleep quality in mothers of individuals with special needs. It is well known that the positive impact of physical activity on reducing anxiety, depression, and stress, as well as improving sleep quality, suggests that incorporating regular physical activity routines in the lives of mothers with special needs individuals may have beneficial effects on their overall well-being. Since no relationship was found in the current study between physical activity level and sleep quality in mothers of individuals with special needs, further research is needed to explore the relationship between the physical activity level and sleep quality in mothers of individuals with special needs. A group will be planned with the participation of mothers in a pre-post test design, and the results obtained from experimental studies that test the response of the exercise group to physical activity in comparison to the control group in terms of sleep quality may provide a better understanding of the relationship between physical activity level and sleep quality.

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RETROSPECTIVE EVALUATION OF RISK FACTORS FOR ISCHEMIC HEART DISEASE IN PATIENTS WITH DERMATITIS HERPETIFORMIS

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ABSTRACT

Purpose: Some have proposed that the cardiovascular risk among individuals with dermatitis herpetiformis (DH) differs from that of the general population. This study aimed to analyze cardiovascular risk factors in DH patients and compare them to a matched control group without DH or celiac disease.
Material and Methods: This was a retrospective hospital-based study involving patients diagnosed with DH, both clinically and histopathologically, along with age- and sex-matched control subjects without the disease. The presence of ischemic heart disease, and the risk factors including laboratory values, treatment and comorbidity histories were evaluated comparatively (SPSS version 29.0).
Results: Thirty-five patients with DH and 49 controls were included. No significant difference was found between the DH patients and controls regarding the prevalence of ischemic heart disease (22.9% vs. 14.3%, p: 0.312). Diabetes mellitus was significantly higher and HDL cholesterol levels were significantly lower in the DH group (respectively, p: 0.044 and p: 0.018). Celiac autoantibodies, the laboratory values, or treatments did not show any significant correlation with heart disease in DH.
Conclusion: This study revealed that HDL cholesterol were significantly lower in DH patients compared to general population. More research is needed to optimize the cardiovascular health of DH patients

Keywords: Dermatitis herpetiformis, ischemic heart disease, cardiovascular disease, risk factors

INTRODUCTION

Dermatitis herpetiformis (DH) is a rare disorder featuring severe pruritic inflammatory vesicles and papules on skin. This autoimmune cutaneous disorder is considered to be related with gluten sensitivity. Most patients with cutaneous disease (dermatitis herpetiformis) have also celiac disease (enteropathy). Enteropathy in these patients is mostly asymptomatic or minimally symptomatic (1).

Some researches have noted that celiac disease is associated with increased cardiovascular risk, including stroke, ischemic heart disease, and thromboembolic complications. However, the evidence is inconsistent (2, 3). In addition, many

studies have shown increased mortality in celiac patients (3, 4).

On the other hand, mortality studies in DH are limited and have been associated with lower mortality rates than in the population (3). More data on the relationship between cardiovascular diseases and DH are needed. Some have proposed that the rate of cardiovascular disease in these patients differs from that of the general population due to differences in cardiovascular risk factors such as lipid profile (5).

The purpose of the present study was to compare cardiovascular disease risk factors in patients with DH with a matched control cohort without DH or celiac disease. In addition, it was aimed to compare these risk factors between those with and without cardiovascular disease in the patient group with DH.

MATERIAL AND METHODS

This retrospective hospital-based study aimed to assess ischemic heart disease risk factors in patients with DH and matched control subjects without DH. The study was approved by Dokuz Eylül University Noninvasive Clinical Studies Ethics Committee (Date: 19.07.2023, Decision No: 2023/23-08). It included all patients diagnosed with DH clinically and histopathologically at Dokuz Eylül University Hospital Dermatology Clinic between 2000 and 2023. The control group comprised patients without DH, admitted to our hospital outpatient clinics during the same period, matched in terms of age and gender,

and consecutively enrolled in the study. Patients with unavailable data or unclear diagnoses were excluded from the study.

Demographic data and data on risk factors of ischemic heart disease in DH patients and controls were collected from the hospital's electronic data recording system. The patient's anamnesis notes, laboratory values examined by our clinic during patient follow-up, and ICD codes in the patient file for comorbidities matching ischemic heart disease, hypertension, and diabetes mellitus were recorded. Risk factors examined retrospectively included protein in urine, glucose in urine, LDL cholesterol, HDL cholesterol, triglycerides, CRP levels, fasting glucose. Celiac disease antibodies, treatment history, and signs of malabsorption (deficiency in at least one of iron, folate, calcium, vitamin D or hemoglobin) were also evaluated.

Statistical analyses

The analysis of the data involved using t-tests and Mann-Whitney U tests for comparing numerical parameters. For categorical variables, we employed the Pearson chi-square test and Fisher's exact test. All statistical analyses were conducted using SPSS software version 29.0.

RESULTS

A total of 84 participants, 35 with DH and 49 in the control group, were included in our study. Age, sex,

Table 1. Basic Characteristics of the Patient and Control Group

		DH Patients (n=35)		Control Group (n=49)		All participants (n=84)		p values
		Mean ± SD or n	Median (min-max) or %	Mean ± SD or n	Median (min-max) or %	Mean ± SD or n	Median (min-max) or %	
Age, years		52.77 ± 16.96	52 (23 - 89)	57.9 ± 14.92	57 (21 - 89)	55.76 ± 15.91	54.5 (21 - 89)	0.137[1]
Sex	Female	20	57.10%	31	63.30%	51	60.70%	0.571[2]
	Male	15	42.90%	18	36.70%	33	39.30%	
Smoking		8	22.90%	9	18.40%	17	20.20%	0.671[2]
Family History of Ischemic Heart Disease		2	5.70%	2	4.10%	4	4.80%	0.729[2]
Family History of Celiac Disease		0	0.00%	0	0.00%	0	0.00%	N/A[2]

Abbreviations; DH: Dermatitis Herpetiformis, SD: standard deviation. N/A: Non-applicable.
[1]Mann-Whitney u test was used, [2]Pearson chi-square test was used

Table 2. Evaluation of ischemic heart disease and related risk factors in DH patients and Control group

	DH Patients (n=35)		Control Group (n=49)		
	n	%	n	%	p values
Ischemic Heart Disease	8	22.90%	7	14.30%	0.312
Hypertension	11	31.40%	21	42.90%	0.288
Diabetes Mellitus	14	40.00%	10	20.40%	**0.044****
Protein in Urine	2	5.70%	5	10.20%	0.463
Glucose in Urine	2	5.70%	2	4.10%	0.729

Abbreviations; DH: Dermatitis Herpetiformis. Pearson chi-square test was used. Significant p values were shown in bold and with double star superscript (**) sign.

Table 3. Comparison of laboratory parameters between DH patients and Control Group

	DH Patients (n=35)		Control Group (n=49)		p values
	Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)	
LDL cholesterol, mg/dL	122 ± 29.97	118 (73 - 206)	121.41 ± 25.32	119 (72 - 178)	0.863
HDL cholesterol, mg/dL	46.14 ± 10.54	45 (26 - 71)	53.33 ± 15.34	55 (22 - 86)	**0.018****
Triglyceride, mg/dL	155.71 ± 151.8	121 (42 - 927)	133.12 ± 64.81	117 (58 - 376)	0.885
CRP levels, mg/dL	4.6 ± 4.45	2.5 (0 - 15)	4.1 ± 3.58	3 (0 - 14)	0.972
Fasting Glucose, mg/dL	106.34 ± 33.71	99 (74 - 254)	101.13 ± 31.32	93 (76 - 269)	0.348

Abbreviations; DH: Dermatitis Herpetiformis, LDL: Low-density lipoprotein, HDL: High-density lipoprotein, CRP: C-Reactive Protein, SD: standard deviation. Mann-Whitney U test was used. Significant p values were shown in bold and with double star superscript (**) sign.

smoking history, and ischemic heart disease in family members were similar in DH and control groups. None of our participants had a family history of celiac disease (Table 1).

The prevalence of ischemic heart disease was 22.9% (8/35) in DH patients and 14.3% (7/49) in the control group (p:0.312). Although there was no significant difference between the two groups, parameters that have the potential to predict ischemic heart disease in DH patients were tested. Accordingly, the presence of hypertension, protein in the urine, and glucose in the urine were similar in DH patients and control group (all p>0.05) (Table 2). The prevalence of diabetes mellitus (DM) was significantly higher in DH patients (20.4% vs. 40%, p:0.044) (Table 2). HDL cholesterol levels, which are protective against ischemic heart disease, were significantly lower in DH

patients (p: 0.018). LDL cholesterol levels, triglyceride, CRP, and fasting glucose levels were also similar between the DH group and the control group (p: 0.863, p: 0.885, p: 0.972, and p: 0.348, respectively) (Table 3).

The prevalence of celiac presence was 37.1% (13/35) in DH group. 28.6% of DH patients were followed without treatment, but the most commonly used treatment was dapsone (11/35, 31.4%). Antiendomysium-IgA positivity was 22.9% (8/35), antigliadin-IgA positivity was 28.6% (10/35), anti-tissue transglutaminase IgA positivity was 20% (7/35) and tissue transglutaminase IgG positivity was 5.7% (2/35) in DH patients.

The occurrence of ischemic heart disease was notably greater among male DH patients compared to females (p: 0.36). Again, the prevalence of ischemic

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Table 4. Comparison of basic demographic and comorbidity parameters between DH patients with and without ischemic heart disease

		DH patients without IHD (n=27)		DH patients with IHD (n=8)		
		n	%	n	%	p values
Sex	**Female**	18	66.70%	2	25.00%	**0.036****
	Male	9	33.30%	6	75.00%	
Smoking		5	18.50%	3	37.50%	0.261
Family History of Ischemic Heart Disease		2	7.40%	0	0.00%	0.428
Hypertension		7	25.90%	4	50.00%	0.198
Diabetes Mellitus		11	40.70%	3	37.50%	0.869
Signs of Malabsorption		6	22.20%	2	25.00%	0.869
Protein in Urine		1	3.70%	1	12.50%	0.346
Glucose in Urine		2	7.40%	0	0.00%	0.428
Celiac Disease		10	37.00%	3	37.50%	0.981
Treatment	**Dapsone**	8	29.60%	2	25.00%	0.928
	NB-UVB	1	3.70%	0	0.00%	
	Dapsone + NB-UVB	1	3.70%	0	0.00%	
	Fexofenadine Hydrochloride	2	7.40%	1	12.50%	
	No treatment	15	55.60%	5	62.5%	
Anti-Endomysium IgA Positive		6	22.20%	2	25.00%	0.869
Anti-Gliadin IgA Positive		8	29.60%	2	25.00%	0.799
Anti-Tissue Transglutaminase IgA Positive		6	22.20%	1	12.50%	0.867
Tissue Transglutaminase IgG Positive		2	7.40%	0	0.00%	0.648

Abbreviations; DH: Dermatitis Herpetiformis, IHD: Ischemic Heart Disease, IgA: Immunoglobulin A, IgG: Immunoglobulin G, NB-UVB: Narrowband Ultraviolet B. Pearson Chi-Square test was used. Significant p values were shown in bold and with double star superscript (**) sign.

heart disease was significantly higher in older DH patients (p: 0.034). There was no significant relationship between ischemic heart disease and other factors investigated such as smoking, family history of heart disease, presence of hypertension, presence of DM, presence of malabsorption findings, protein positivity in urine, presence of glucose in the urine, presence of celiac diagnosis, treatment received, anti-endomysium IgA positivity, anti-gliadin IgA positivity, anti-tissue transglutaminase IgA positivity and tissue transglutaminase IgG positivity in DH patients (Table 4). Laboratory parameters, including LDL, HDL, triglyceride levels, CRP, and fasting glucose levels, did not exhibit a significant

association with the development of ischemic heart disease in DH patients (Table 5).

DISCUSSION

This study demonstrated that there was no significant difference in the occurrence of ischemic heart disease between the group of DH patients and the matched control group, with similar age, sex, smoking habits, and a family history of ischemic heart disease. Consistently, in a study with large cohorts diagnosed with DH and celiac disease, it was observed that the risk of cardiovascular disease was elevated in those with celiac disease, while no such increase was evident in patients with DH (aHR 1,16; 95% GA 0,91–

Table 5. Comparison of age and laboratory parameters between DH patients with and without ischemic heart disease

	DH patients without IHD (n=27)		DH patients with IHD (n=8)		p values
	Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)	
Age at diagnosis, years	49.5 ± 15.7	47 (23 – 84)	63.9 ± 17.3	65 (30 – 89)	**0.034****
LDL cholesterol, mg/dL	119.8 ± 29.7	113 (74 – 206)	129.5 ± 31.5	137 (73 – 167)	0.323
HDL cholesterol, mg/dL	47.6 ± 10.9	46 (26 – 71)	41.3 ± 7.9	38.5 (33 – 54)	0.104
Triglyceride, mg/dL	152 ± 162.6	121 (43 – 927)	168.4 ± 116.3	133 (42 – 353)	0.743
CRP levels, mg/dL	4.1 ± 4.1	2 (0 – 15)	6.1 ± 5.4	7 (1 – 15)	0.564
Fasting Glucose, mg/dL	104.2 ± 36.7	93 (74 – 254)	112.9 ± 23.3	111 (84 – 163)	0.147

Abbreviations; DH: Dermatitis Herpetiformis, IHD: Ischemic Heart Disease, LDL: Low-density lipoprotein, HD: High-density lipoprotein, CRP: C-Reactive Protein, SD: standard deviation. Mann-Whitney U test was used. Significant p values were shown in bold and with double star superscript (**) sign.

1,47) (3). In our study, no investigated feature showed a significant relationship with the presence of ischemic heart disease among DH patients, except that being male and older was associated with higher ischemic disease as expected in the general population. When DH patients were compared among themselves, celiac autoantibody positivity, laboratory values, or treatments received did not show a significant correlation with the presence of ischemic heart disease. Since this study is in retrospective methodology, these results should be considered as the prevalence of heart disease evaluated at any given time in DH patients. The incidence may vary in long-term follow-up studies.

This study revealed that HDL cholesterol levels, which are protective in terms of ischemic heart disease, were significantly lower in the DH patients than controls, and LDL and triglyceride levels were similar between the patients with DH and the control group. Inconsistently, in a study investigating cardiac risk factors in DH patients, patients with DH showed significantly favorable lipid profile including higher HDL and lower cholesterol and triglycerides (5). In this study, compliance to an appropriate gluten-free diet in DH patients was reported as 76% and use of dapsone was reported as 69% in total (5). In our series, a total of 33.3% of the patients were using

dapsone, but although a gluten-free diet was recommended for all patients, reliable data could not be obtained regarding the dietary compliance of the patients. In a study conducted on celiac patients, it was observed that a gluten-free diet decreased triglycerides and increased HDL (6). Non-compliance with the recommended diet may be one of the reasons why lipids, which show a risk of ischemic heart disease, were not found to be more favorable in DH patients compared to the control group in our study. However, the fact that the DH patients in the aforementioned study were individuals who were not obese, came from upper social class, and smoked less than the control group may also be the reason for the results such as better lipid profile in the DH group, unlike our study (5). Another possible pathogenesis of lipid profile changes in DH patients has been suggested as atrophy of intestinal villi involved in the synthesis of lipids (5). In our series, the prevalence of celiac disease in DH patients was found to be as high as 72.2%.

The prevalence of DM was significantly higher in DH patients in our study. However, urinary protein, urine glucose, and fasting glucose levels were similar between DH patients and controls; this suggests that the difference in DM prevalence may not be

responsible for the lipid profile differences of DH patients.

In terms of risk factors for future ischemic heart disease, the presence of hypertension was similar between the patients with DH and control group. In a comprehensive registry-based investigation, there were no notable differences in the prevalence of hypertension and hypercholesterolemia between the DH group and the control group (3). Hypertension does not appear to be a significant risk factor that can be linked to DH and cardiac morbidity.

The limitation of this study, as in all retrospective studies, is that the frequency of risk factors can be evaluated according to existing patient records. Prospective controlled studies with long term follow-up are needed to evaluate the true prevalence of ischemic heart disease in these patients.

CONCLUSION

In conclusion, this study revealed that the presence of ischemic heart disease and known cardiovascular risk factors, such as LDL cholesterol, triglyceride, fasting glucose levels and hypertension were similar in DH patients compared to general population. However, HDL cholesterol, which is protective in terms of ischemic heart disease, was significantly lower in the DH patients compared to controls. Considering the increased rates of ischemic heart disease among celiac patients, this result indicates the necessity for additional studies to comprehensively understand the connection between DH and cardiovascular conditions along with the potential underlying mechanisms. Prospective studies with long-term follow-up can help determine the true cardiovascular risk for DH patients and therefore optimize their health in this context.

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NAIL CAPILLAROSCOPIC FINDINGS IN PATIENTS WITH HEART FAILURE

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ABSTRACT

Purpose: The nail fold microvasculature can be examined non-invasively with capillaroscopy. The endothelium plays a crucial role in atherosclerosis pathogenesis and, in certain instances, the occurrence of heart failure. This study was designed to explore microcirculatory alterations by employing nail fold capillaroscopy in individuals with heart failure.
Material and Methods: In this observational, prospective study involving individuals with heart failure and controls, nail fold capillaroscopic findings visualized by dermoscopy were evaluated comparatively between the two groups (SPSS version 29.0).
Results: A total of 54 participants, consisting of 24 individuals with heart failure and 30 controls without heart failure were included. Nail fold capillaroscopic characteristics significantly more prevalent in the heart failure group compared to the controls included microhemorrhage (70.8% vs. 36.7%), the irregular vessel distribution (20.4% vs. 11.1%), vascular dilatation (45.8% vs. 20%) and vascular tortuosity (58.3% vs. 3.3%) (all p<0.05). No significant relationship was found between any of the capillaroscopic features and gender, presence of diabetes mellitus, hypertension, thyroid disease, and use of beta-blockers or ACE inhibitors in the last month in heart failure patients (p>0.05).
Conclusion: Nail fold capillaroscopy may serve as a useful and easy method to examine systemic microvascular changes in heart failure patients.

Keywords: Capillaroscopy; heart failure; nail fold capillaroscopy; microcirculatory changes

INTRODUCTION

Coronary artery disease (CAD), also called ischemic heart disease, is one of the major cardiovascular diseases and cause of death affecting the population in Turkiye and worldwide (1). It is a chronic disease that develops gradually over time and remains asymptomatic for many years (2). Narrowing or occlusion of major blood vessels (coronary arteries) due to thickening and hardening of the arterial wall (atherosclerosis) is the main underlying pathological basis for the occurrence of CAD (2, 3).

Nail fold capillaroscopy (NFC) is a relatively simple method that can be used to examine microvasculature noninvasively (4). It has a major role in rheumatology, especially in distinguishing primary Raynaud's phenomenon in systemic sclerosis, which is characterized by calcification, vasculopathy, and endothelial wall damage (5).

Endothelial damage is the basic pathogenesis involved in the development of atherosclerosis and cardiovascular disease (6). As commonly understood, the endothelium has a pivotal role in the initiation of atherosclerosis, an earlier stage in the progression of cardiovascular diseases and, in some instances, subsequent heart failure (6). While the primary role of nail fold capillaroscopy is to differentiate between primary and secondary Raynaud's phenomenon (7), it has also proven as a valuable tool for identifying microvascular abnormalities in various non-rheumatic systemic diseases (8).

This study aims to explore microcirculatory changes and identify capillaroscopic abnormalities in individuals with heart failure using nail fold capillaroscopy, comparing these findings with a healthy population.

MATERIAL AND METHODS

This study was approved by Eylül University Noninvasive Clinical Studies Ethics Committee (Date: 22.02.2023, Decision No: 2023/05-04), and every participant provided written informed consent. This prospective observational study included individuals with heart failure as well as age- and sex-matched healthy controls who visited our Dermatology clinic

consecutively. All participants were aged 18 years or older, and their medical history and current medication information were documented. Those whose hands have undergone any orthopedic intervention or an invasive procedure such as laser, cautery, cryotherapy; patients with neurological problems involving the hand or fingers, patients with rheumatological or connective tissue diseases; and patients with any systemic disease that could potentially impact microcirculation were excluded from the study.

Nail fold capillaries were evaluated using dermoscopy (DermliteTM DL3). The dermoscopic images were evaluated by two experienced dermatoscopists (F.G. and Ö.Ö.) and a comparison was made between the patient and control groups. Before the evaluation, all patients were provided with a rest period of at least 15 minutes in the examination room, which was maintained at an approximate temperature of 23°C. During this time, their hands and forearms were kept at heart level on a seat side support. Eight fingers were examined for each individual except the smallest finger. To enhance image resolution, we applied clear ultrasound gel between the probe and the nail fold of each finger. Capillary morphology was evaluated as normal, enlarged, showing tortuosity and microhemorrhage. "Enlarged capillaries" were

Table 1. Age and Sex Distribution in Patient and Control Groups

	Patient Group (n= 24)	Control Group (n= 30)	P value
Age, years, mean ± SD, min-max	68 ± 11 (40-85)	64±13 (40-91)	0.191[1]
Sex, female, n (%)	12 (50%)	19 (63.3%)	0.325[2]

SD: Standard deviation, [1]Independent samples t-test and [2]Pearson chi-square test was used.

Table 2. Evaluation of Comorbidities, Medication Usage, and Heart Failure Symptomatology in the Heart Failure Patient Group

	Patient Group (n= 24)
Presence of DM, n (%)	7 (29.2%)
Presence of HT, n (%)	12 (50%)
Beta-blocker usage in the last month, n (%)	15 (62.5%)
ACE inhibitor usage in the last month, n (%)	12 (50%)
Presence of dyspnea, n (%)	12 (50%)
Presence of fatigue, n (%)	16 (66.7%)
Presence of ankle swelling/edema, n (%)	9 (37.5%)
Presence of exercise intolerance, n (%)	19 (79.2%)
Frequency of patients with EF≤40%, n (%)	13 (54.2%)

DM: Diabetes Mellitus, HT: Hypertension, ACE: Angiotensin converting enzyme, EF: Ejection Fraction

Table 3. Evaluation of Dermoscopic Findings of Nail fold Capillaries in the Patient and Control Groups

Dermoscopic Findings	Patient Group (n= 24)	Control Group (n= 30)	P value
Microhemorrhages	17 (70.8%)	11 (36.7%)	0.013**
Presence of branching	2 (8.3%)	1 (3.3%)	0.425
Irregular arrangement	11 (45.8%)	6 (20.0%)	0.042**
Tortuous dilatation	14 (58.3%)	1 (3.3%)	<0.001**
Presence of avascular areas	4 (16.7%)	1 (3.3%)	0.093
Decreased capillary density	1 (4.2%)	1 (3.3%)	0.872
Dilated capillaries	11 (45.8%)	4 (13.3%)	0.008**
Giant capillaries	3 (13.5%)	0 (0%)	0.046**

The Pearson chi-square test was employed, and statistically significant p-values were indicated in bold with a double star superscript (**) sign.
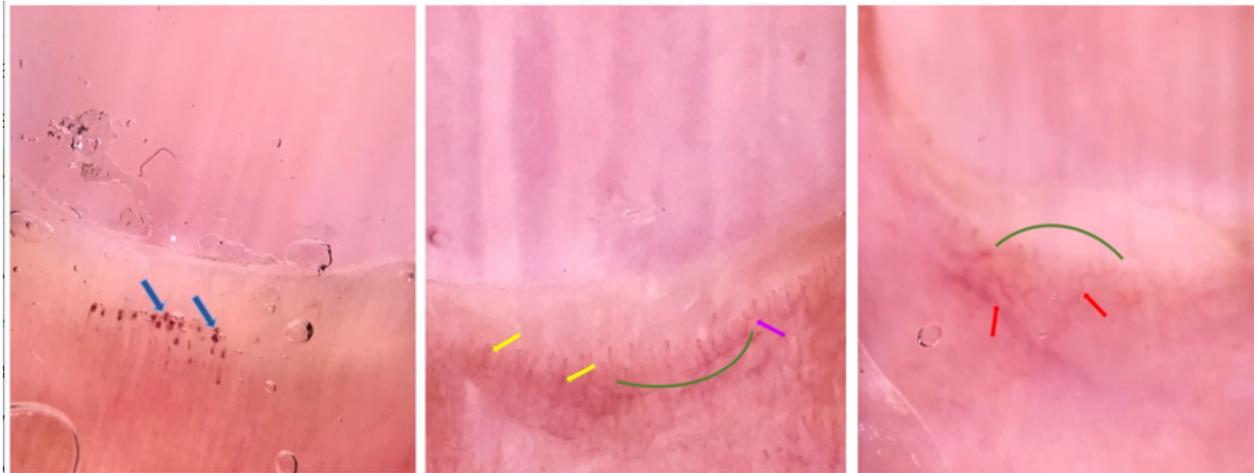
Figure 1. Nail fold capillaroscopy of heart failure patients**.** Microhemorrhage (blue arrows), the irregular distribution of the capillaries (green curved lines), dilation (yellow arrows) and tortuosity (red arrows) of capillaries can be seen in the nail capillaroscopic images of heart failure patients.

designated as a uniform or localized expansion along the capillary's path. Tortuosity was characterized by the distortion of nail fold capillaries and their formation into irregular loops. Microhemorrhage was identified by the presence of at least two pinpoint hemorrhages surrounding a single capillary.

Statistical analyses

We conducted statistical analysis using SPSS software version 29.0. Data normality was assessed with the Kolmogorov-Smirnov test. For comparing normally distributed data between two groups, we employed the independent samples t-test. Pearson's chi-square test was used for comparisons involving categorical data between two groups. All statistical tests were two-tailed with a significance threshold of 0.05 for the p-value.

RESULTS

A total of 54 participants, consisting of 24 patients with heart failure (HF) and 30 controls without heart failure, were included in this observational study. Among the participants in the patient group, half were female, while this ratio was 63.3% in the control group, indicating a similar sex distribution between the two groups (p= 0.32). The mean age of the HF group and the control group was also similar (p= 0.19) (Table 1).

The comorbidities and medication status of patients in the HF group were evaluated (Table 2). In patients with HF, ejection fraction (EF), an indicator of cardiac function, was found to be 30% in 14.8% of the patients (n= 8). The EF was ≤40% in more than half

Table 4. Regression Analysis of Factors for Nail fold Capillary Abnormalities

	Univariate Regression Analysis				*Multivariate Regression Analysis*			
	Sig.	*Exp (B)*	*95% C.I.*		*Sig.*	*Exp (B)*	*95% C.I.*	
			Lower	*Upper*			*Lower*	*Upper*
Age, years	*0.207*	*0.971*	*0.927*	*1.016*	–	–	–	–
Sex	*0.326*	*0.579*	*0.194*	*1.725*	–	–	–	–
Microhemorrhages	*0.015***	*0.238*	*0.075*	*0.754*	*0.496*	*1.631*	*0.399*	*6.670*
Irregular arrangement	*0.047***	*0.295*	*0.089*	*0.983*	*0.483*	*0.449*	*0.048*	*4.195*
Tortuous dilatation	*<0.001***	*0.025*	*0.003*	*0.212*	*0.009***	*48.255*	*2.628*	*886.157*
Dilated capillaries	*0.012***	*0.182*	*0.048*	*0.683*	*0.716*	*1.413*	*0.220*	*9.085*
Giant capillaries	*0.999*	*0.000*	*0.000*	*0.000*	–	–	–	–

Multivariate Logistic Regression model Nagelkerke R Square: 0.475.
Statistically significant p-values were indicated in bold with a double star superscript (**) sign.

of the HF patients (54.2%, n= 13) and was 60% in 7.4% of the patients.

The nail fold capillaroscopic features which were significantly more prevalent in the HF group compared to controls were microhemorrhage (70.8% vs. 36.7%), the irregular distribution of vessels (20.4% vs. 11.1%), dilatation of vessels (45.8% vs. 20%) and tortuosity (58.3% vs. 3.3%) (all p<0.05) (Figure 1). While the prevalence of giant capillaries was 13.5% in the HF group, they were not seen in the control group (p<0.005) (Table 3).

In the nail fold dermoscopic examination, heart failure patients exhibited higher rates of branching of vessels, the presence of avascular areas, and decreased capillary density compared to the control group. Nevertheless, these disparities did not reach statistical significance (p>0.05) (Table 3).

The association of the nail fold capillaroscopic features of HF patients with the sociodemographic characteristics and comorbidities was also evaluated using logistic regression analysis. In HF patients, no significant relationship was found between any of the capillaroscopic features and sex, presence of diabetes mellitus (DM), hypertension (HT) or thyroid disease, use of beta-blockers or ACE inhibitors in the last month (p>0.05). Heart failure symptoms such as dyspnea, fatigue, ankle swelling/edema, and exercise intolerance, and EF also did not show a significant relationship with the development of the mentioned capillary characteristics (p>0.05).

In the univariate regression analysis, no significant associations were found between HF and giant capillary development. However, significant

relationships were observed between HF and observing of microhemorrhage (p= 0.015), irregular arrangement of vessels (p= 0.047), tortuous dilatation (p< 0.001), and dilated capillaries (p= 0.012).

In the multivariate regression analysis, aimed at identifying parameters with a significant association with HF from those showing significance in the univariate analysis and establishing their independent relationship with HF, only tortuous dilatation of vessels was observed to have a significant association with HF (p= 0.009). The results of the regression analysis are presented in Table 4.

DISCUSSION
In this study, we observed that some capillaroscopic features were significantly more common in HF patients than in healthy controls. NFC can assist the diagnostic process as a quick and easy method and can help to understand HF-related microvessel involvement in these patients. Capillary changes that were significantly more common in patients with HF included microhemorrhages, irregular arrangement, tortuosity, and enlarged (dilated) capillaries. Tortuous dilatation of vessels in nail capillaroscopy was also determined to be an independent risk factor for HF, independent of other NFC features. Inflammation and endothelial damage play an important role in the pathogenesis of CAD (9). Atherosclerosis is a long-term progressive disease that develops as a result of endothelial dysfunction, resulting in rupture of the atherosclerotic plaque and thrombosis. This process causes the microvessels to narrow and eventually become completely occluded (9). Atherosclerosis is a

systemic problem (9). These NFC findings, which were detected more frequently in HF patients in our study compared to the healthy population, may have resulted from this systemic microvascular damage. Systemic microvascular damage is important in terms of its involvement in the early pathogenesis of heart failure.

This study found no significant relationship between any of the capillaroscopic features and sex, presence of DM, HT or thyroid disease, use of beta-blockers or ACE inhibitors in the last month, in HF patients. Likewise, in a study examining the capillaroscopic characteristics of nail fold capillary circulation regarding the extent of coronary disease, there were no notable differences between patients with and without DM (P>0.05 for all), or between those with and without HT (p>0.05 for all), regarding NVC findings, including capillary density, the presence of giant capillaries, microhemorrhage, branching, disorganization, tortuosity, and avascular area (9). DM and HT are also conditions with systemic microvascular damage, and abnormal findings have been reported in NFC in both conditions (9). However, in patients with already existing heart disease and possibly associated underlying vascular and endothelial disorders, NFC findings were observed more frequently than in the normal healthy population, therefore the presence of DM or HT may not have caused a significant difference in NFC characteristics.

In our study, it was observed that HF symptoms such as shortness of breath, fatigue, ankle swelling/edema, exercise intolerance, and EF did not show a significant relationship with the development of nail fold capillary characteristics (p>0.05). The study investigating whether CAD-related nail videocapillaroscopic (NVC) findings differ according to the severity of the disease included 100 patients with lesions in the coronary arteries on coronary angiography, and no significant difference was found between the severity of coronary atherosclerosis and NVC findings (p> 0.05 for all) (9).

The reason why endothelial dysfunction is not observed more frequently in patients with severe heart disease than in early-stage patients may be that it is a problem observed at a very early stage in the development of coronary disease. In this respect, NFC findings can be evaluated as helpful tool in early diagnosis rather than of prognostic importance. A study investigating the capillaroscopic abnormalities of asymptomatic chronic smokers with dermoscopy, compared to healthy non-smokers, found that nail fold capillaroscopic abnormalities including enlargement of vessels, tortuosity, and microhemorrhages were more common even among asymptomatic chronic smokers (16, 53.3%) compared to healthy nonsmokers (7, 23.3%) (p < 0.05) (4).

There are limited studies that investigate nail fold capillaroscopy in individuals with HF. In a study conducted in Turkey, capillaroscopic observations of HF patients with decreased and maintained EF were compared to those of healthy controls (10). Capillaroscopic enlargement of vessels and/or hemorrhages was detected in 24% (7) in HF patients with decreased EF, 66% (19) in patients with preserved HF, and 37% (11) in the control group (10). Significantly higher rates of abnormal capillaroscopic characteristics were observed in HF patients with maintained EF when compared to both HF patients with decreased EF (p < 0.05) and healthy controls (p < 0.05) (10). In our study group, EF was decreased in more than half of HF patients (54.2%, n= 13), and microhemorrhage and dilatation of vessels were observed more frequently in capillaroscopy of all HF patients (70.8% and 45.8% n= 13, respectively), independent of HF symptoms or EF (p>0.05). In our study, vascular changes were also observed more frequently in the capillaroscopic examination of healthy controls compared to the aforementioned study; enlargement of vessels and/or bleeding was 43.3%. While examining the vascular structures in this study, we used a technique that we have experienced its ability to observe the vascular structures more prominent in tumoral and inflammatory lesions. In this technique, after the clear ultrasound gel application, the dermoscope glass was lightly contacted with the gel, and then, we pulled back the dermoscope with a slight back force and therefore the negative pressure let the vascular structures to be filled with blood. In this way, it was prevented that any dermoscope would deflate the vessels with pressure. This may be the reason why capillaroscopic features were observed more frequently in both patients and controls in our study.

The primary limitation of this study is that nail fold capillaroscopy findings were exclusively examined in patients with a HF diagnosis, without distinguishing between those with and without microvascular damage using an imaging method like angiography. Future studies could provide more insightful results by investigating the relationship between angiographic findings and the nail fold capillaroscopic

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features identified in our study among patients with HF.

CONCLUSION

In summary, patients with HF have significantly more microhemorrhages, irregular distribution, tortuousity and dilatation of capilleries in their nail folds compared to healthy individuals. Therefore, nail fold capillaroscopy may serve as a useful and easy method to examine systemic microvascular changes in HF patients and to take necessary precautions for these individuals.

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WHICH KINESIO TAPE® APPLICATION AFFECTS STATIC BALANCE: COMBINATION OF CORRECTION AND FACILITATION TECHNIQUES VS FACILITATION TECHNIQUE IN HEALTHY SUBJECTS? A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Purpose: This study aimed to explore whether the correction on the retinaculum of the ankle with facilitation on the peroneal muscle or the facilitation technique on the peroneal muscle had an immediate effect on static balance in healthy subjects.
Material and Methods: Sixty healthy individuals were investigated. Individuals were randomly separated into 3 groups. KT was applied using the facilitation technique on the peroneal muscle, or the facilitation technique on the peroneal muscle, and the correction technique on the retinaculum of the ankle. No KT was applied to the control group. The standing stork test was used to evaluate static balance with opened and closed eyes.
Results: There was no difference in static balance between the groups with opened and closed eyes before and after KT application (p>0.05). There was no difference in static balance before and after KT application with opened and closed eyes in the KT-2 group (p>0.05). However, there was a significant difference in static balance before and after KT application in the KT-1 group with closed eyes (p<0.05).
Conclusion: Applying the facilitation technique on peroneal muscles improved static balance when eyes were closed. No effect was observed when the correction and facilitation techniques were used together on the ankle. Many KT techniques on the ankle are not required to improve static balance; they can even affect static balance negatively.

Keywords: ankle, balance, Kinesiotape®, static balance, standing stork test

INTRODUCTION

The sensory cortex innervation area of the foot and ankle is more extensive than in the hand and wrist. The ankle is important in respect of proprioception; therefore, the ankle joint is called a sense organ (1). Proprioception is the awareness of the position and movement of body parts, and allows them to be coordinated appropriately, maintaining the continuation of static and dynamic posture (2). Proprioception is important for the control of movement and is transmitted by mechanoreceptors to the central nervous system (3). Mechanoreceptors,

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more precisely proprioceptors, are located in tendons, muscles, ligaments, and joint capsules (4). Mechanical changes on mechanoreceptors cause activation of proprioception and the central nervous system (5). Therefore, proprioception is closely related to balance (3). Balance is the ability to integrate the vestibular, visual, and somatosensory systems of the body in the central nervous system (6) to maintain the center of gravity in a vertical position (7). In this way, postural stability can be preserved (8). Postural stability is associated with balance, musculoskeletal injuries, and poor postural control (9). The ankle is closely related to postural stability against gravity during standing or movement (10), and this is very important during sports that require force and contact especially (11).

Kinesio Tape (KT) is a derivative of adhesive tape first applied by Kenzo Kase in 1973. It is a type of tape that stretches up to 55-60% of its length and does not stretch transversely. It is used to reduce pain, edema, and muscle spasms, increase lymphatic circulation, correct mechanical problems, and stimulate mechanoreceptors (12). KT activates muscles firing early (13), improves static and dynamic balance (14), reduces the risk of overuse syndromes and injuries (15), positively affects functional reach performance and static mono pedal leg balance (16), improves proprioception, and provides ankle stability (17). In addition, KT ensures that the relevant body parts are positioned at a more optimal level, and that forces are transmitted and absorbed correctly by activating the muscles early (18, 19).

In the literature, there are many KT application studies evaluating the effect on the ankle for different purposes and at different times after the application. Tekin et al. used a correction technique on the ankle joint with a tension of 50% and distal part of the peroneal muscle group with a tension of 0%. After 10 minutes from the application, KT was seen to improve the dynamic balance performance but not the static balance (14). Huzmeli et al. used KT on the medial-lateral sides of the calf and tibialis anterior muscles. After 45 minutes from the application, KT was found to affect positively the functional reach and single-leg balance parameters (16). The aim of the present study was to discover whether the KT correction technique on the retinaculum of the ankle with facilitation technique on the peroneal muscle or the facilitation technique on the peroneal muscle alone had an immediate effect on static balance in healthy subjects.

MATERIAL AND METHODS
Ethical Consideration
The current study was designed as a randomized controlled trial (RCT). The Istanbul University Clinical Research Ethics Committee approved the study protocol (Date: 26.11.2010, Decision Number: 2010/692-184). The participants were informed about the scope and procedures of the study and were provided with written informed consent before participating in the study. The Helsinki Declaration was abided by throughout the study.

Subjects
Individuals who had no pain, history of neurological or systemic disorders, or surgical operations were accepted. Individuals who had pes cavus or third-degree pes planus deformities, body mass indexes above 30 kg/cm2 or under 18 kg/cm2, or who participated in sports at least three days a week regularly were excluded.

All individuals were divided into three groups (KT-1, KT-2, and Control groups) by the lottery method; a simple randomization procedure. The groups were defined as the facilitation technique on peroneal muscle (KT-1 group), correction technique on retinaculum of the ankle with facilitation technique on peroneal muscle (KT-2 group), and no application (Control group). While the facilitation technique is used over the muscle from origo to insertion, the correction technique is used over ligaments (12). Since gender could directly affect the results of evaluations, the number of men and women was evenly distributed between the groups.

Evaluation
The age, gender, size, body weight, and dominant leg kick side were recorded for each volunteer. Pes cavus is evaluated according to the scaphoid tubercle of the navicular bone above the line. The line is determined by drawing with a pencil from the center of the medial malleolus to the center of the metatarsophalangeal joint of the thumb. It is decided visually whether there would be a pes cavus or not. Third-degree pes planus is defined as ground contact of the scaphoid tubercle (20). If the subject matched the study criteria, the evaluation continued by measuring static balance with the standing stork test with eyes open and eyes closed before and after KT application on the dominant ankle.
*Standing Stork Test*
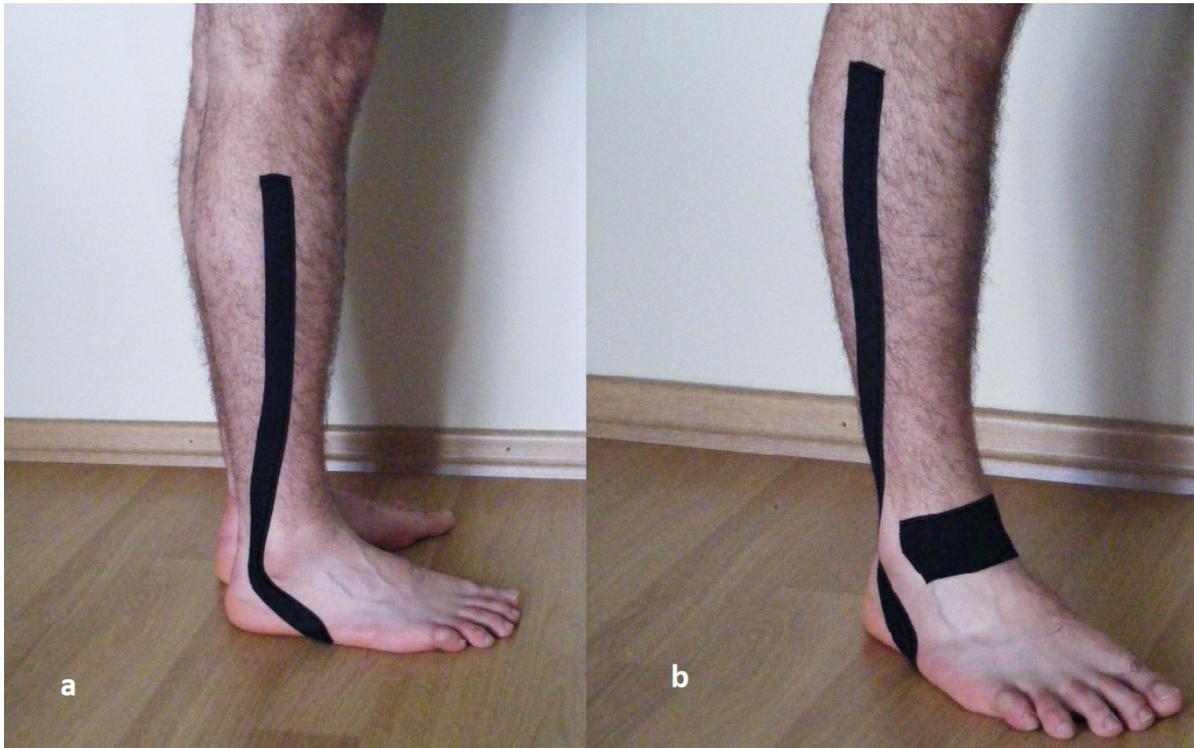
Figure 1. KT application a. The facilitation technique on the peroneal muscle (KT-1 group) b. The correction technique on the extensor retinaculum of the dominant side with the facilitation technique on the peroneal muscle (KT-2 group).

The standing stork test can be used to evaluate static balance (21). After the non-dominant foot is placed on the inside of the dominant leg, the heel of the dominant side is raised. The individual puts his hands on his buttocks and lifts the ball of his supporting foot from the floor upon the sign from the physiotherapist. The individual tries to keep this position as long as possible with the eyes open and then with the eyes closed. If the heel touches the ground or the hands are removed from the hips and/or breaks contact, or the foot disrupts contact on the inside of the other leg, the test is completed and the time is recorded. Standing Stork Test duration is classified as poor level under 5 seconds in men and 3 seconds in women during eyes open while over 50 seconds in men and 27 seconds in women is classified as excellent level (21). During the study, three trials were allowed before the time was measured. After experimenting, the participants were asked to take this position with their eyes open three times and the timing was recorded. The longest of the recorded times was included in the study. After five minutes rest, the same procedure was repeated with the eyes closed and the timing was recorded. After application of KT, the standing stork test with eyes open and closed was repeated and the effects were assessed

immediately. After the application of KT, the evaluation was continued without waiting for any time. The control group was evaluated only three times at the beginning. In present study, since the immediate effect was evaluated and no application was made in control group, the participants were not re-evaluated in order not to be exposed to repeated evaluation.

In the standing stork test it was noted that healthy male and female subjects were not significantly different in respect of the period of standing on the dominant and non-dominant legs. In the present study, the dominant side was evaluated before and after the application of KT. The validity and reliability of the test has been proven, and found suitable for all ages (22).

Kinesiotape Application

Two different KT application techniques were used in this study by the same physiotherapist who was certified as a practitioner. The first technique was the facilitation technique on the peroneal muscle of the dominant side (KT-1 group), and the second was the mechanical correction technique on the extensor retinaculum of the dominant side with the facilitation technique on the peroneal muscle (KT-2 group) (Fig. 1).
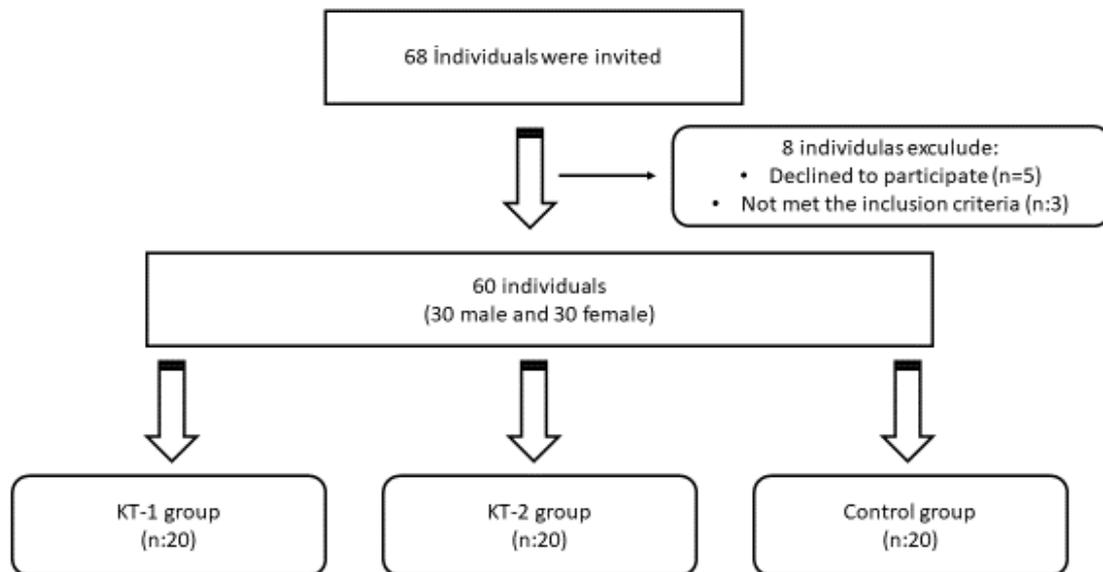
Figure 2. Consolidated standards of reporting trials (CONSORT) table

The muscle facilitation technique was applied to the peroneal muscles of the participant whose ankle was fixed in the maximum dorsiflexion and inversion in a long sitting position. In this position, KT was 2.5 cm wide, and 40 cm long with 0% tension (paper off method), and was applied in the origo-insertio direction of the peroneal muscle group, posterior to the lateral malleolus, and inferior to the fifth metatarsal head. For the correction technique; when individuals were lying on the back while knee extension and ankle dorsiflexion position, KT was 5 cm in width and 10 cm length with 100% tension was applied to the dorsal retinaculum of the ankle (12). After the application of KT, the evaluation was continued without waiting for any time in two groups (KT-1 group and KT-2 group).

Statistical analysis
Statistical analyses were performed with the IBM-SPSS for Windows version 20 software (IBM Corp., Armonk, New York, United States). Descriptive statistics were given as mean ±standard deviation for numerical data. The normal distribution of the numerical variables obtained were determined with visual (histogram) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk Tests). Age, weight, and body mass index were not of a normal distribution while height and stand stork test results were of a normal distribution. The Kruskal Wallis Test was used to compare age, weight, and body mass index, and the One Way Variance Analysis (ANOVA) was used to compare height and standing stork test results between groups. The paired t-test was used to analyze the standing stork test results with eyes open and closed before and after KT application in the KT-1 and KT-2 groups. The significance level was accepted as $p<0.05$.

RESULTS
Sixty-eight individuals were invited to participate in this study. Sixty individuals met the inclusion criteria and accepted the study. The Consolidated Standards of Reporting Trials (CONSORT) table depicts patient flow throughout the study (Fig. 2).
Sixty individuals (30 females and 30 males) were divided into three groups randomly. Each group was composed of 10 females and 10 males. The mean age, height, weight, and body mass index of all individuals were 20.73±2.4 years, 170.65±6.5 cm, 62.75±8.9 kg and 21.51±2.46 kg/m2, respectively. There were no differences in terms of demographic characteristics (age, height, weight, and body mass index) between groups (Table 1) ($p>0.05$). There were no differences in static balance between groups

Table 1. . Demographic characteristics of individuals according to groups.

Group	CONTROL (Mean ±SD)	KT-1 (Mean ±SD)	KT-2 (Mean ±SD)	p
Age (years)	20.40 ±0.568	20.65 ±0.488	21.05 ±0.583	0.745[++]
Weight (kg)	64.65 ±2.852	63.50 ±1.881	63.85 ±2.806	0.891[++]
Height (m)	1.70 ±0.014	1.69 ±0.013	1.71 ±0.014	0.565[*]
BMI (kg/m^2)	22.18 ±0.919	22.11 ±0.538	21.76 ±1.006	0.412[++]

[++]: Kruskal Wallis Test; [*]: One Way Variance Analysis (ANOVA); SD: Standard Deviation; $p < 0.05$.

before and after KT application with eyes open and closed ($p > 0.05$) (Table 2). There were no differences in static balance before and after KT application with eyes open in the KT-1 group, or before and after KT application with eyes opened and closed in the KT-2 group ($p > 0.05$). However, a significant difference was found in static balance before and after KT application with eyes closed in the KT-1 group ($p = 0.036$). The time duration of static balance was longer after KT application than before KT application in the KT-1 group (Table 2).

DISCUSSION
The aim of the present study was to discover whether the KT correction technique on the retinaculum of the ankle with facilitation technique on the peroneal muscle or the KT facilitation technique on the peroneal muscle alone had an immediate effect on static balance in healthy subjects. The primary finding of the present study was that the facilitation technique was applied to the peroneal muscle improved static balance during eyes closed. But it did not affect static balance during eyes opened. The second finding of the present study was that the correction technique on the retinaculum of the ankle with facilitation technique on the peroneal muscle did not affect static balance during eyes opened or closed. Finally, there were no differences between the facilitation technique on the peroneal muscle and the correction technique on the retinaculum of the ankle with the facilitation technique on the peroneal muscle statistically. Although there was no statistically significant difference, the static balance duration was observed to increase in facilitation technique on the peroneal muscle more than the correction technique on the retinaculum of the ankle with the facilitation technique on the peroneal muscle.

When visual input is cut or altered, the somatosensory system tries to support proprioceptive feedback with the vestibular system to maintain balance (23). Proprioception is important to control movement and is transmitted by mechanoreceptors to the central nervous system (3). These mechanoreceptors are in muscles, joint capsule tendons, ligaments, and skin (24). KT application can stimulate proprioception in healthy individuals (25). Stimulating proprioception could modulate sensorimotor integration and motor facilitation of ankle muscle (26). In the present study, the facilitation technique used to stimulate muscle mechanoreceptors (12), affected static balance positively in the facilitation technique on the peroneal muscle alone during eyes closed. Activation of ankle mechanoreceptors can improve balance ability with the correct KT application on the ankle. Postural stability can be maintained with improved balance (3), and so injuries that may occur during force and contact in sports can be avoided (11).

In the present study, the facilitation technique of KT on peroneal muscles affected static balance when the eyes were closed, but the correction technique on the retinaculum of the ankle with facilitation technique on the peroneal muscle did not affect static balance positively. KT induces an illusory perception of movement (16). For this reason, using several KT applications together on ligaments and muscles around the ankle might interrupt sensorimotor integration. An extreme mechanoreceptor stimulation around the ankle might adversely affect static balance. A similar result to the present study was found by Tekin et al. They used a correction technique on the ankle joint from the sole of the lateral to the medial malleolus with a tension of 50% and the distal part of the peroneal muscle group with a tension of 0%. In the result of their study, the correction technique of KT did not affect static balance with opened or closed eyes (14). These results can be explained since the correction technique can be used

Table 2. Static balance before and after KT application with eyes opened or closed in groups and between groups.

		KT-1 (Mean ±SD)	KT-2 (Mean ±SD)	CONTROL (Mean ±SD)	p[++]
Eyes opened time (s)	**Before application**	5.25 ±4.35	4.01 ±3.01	3.50 ±1.47	0.208
	After application	6.15 ±5.41	4.40 ±2.68		0.067
	p[*]	0.130	0.560	-	-
Eyes closed time (s)	**Before application**	1.67 ±0.65	1.73 ±0.47	1.68 ±0.41	0.993
	After application	2.19 ±0.87	1.85 ±0.77		0.079
	p[*]	0.036	0.225	-	-

++: One Way Variance Analysis (ANOVA); *: Paired t test; s: second; SD: standard deviation; $p<0.05$.

to correct a misalignment (12). Therefore, the changing of the alignment after the correction technique and the deterioration of the stimulus coming from the ankle might disrupt the mechanoreceptors' ability to adapt to the new situation and prevent the muscles from responding quickly. Since the individuals in both studies (the present study and the study of Tekin et al.) did not have a misalignment, the correction technique might have negatively affected the balance. However, contrary to these results, static balance had been seen to affect positively when only the facilitation technique on the peroneal muscle was used during closed eyes. Proprioception stimulated by KT application can modulate sensorimotor integration and motor answer of ankle muscles (26). In this way, the ankle muscles may have been able to react more quickly to the instantaneous changes that occur during static balance and to maintain the equilibrium. When visual information is removed or altered, the sensorimotor system must compensate using proprioceptive feedback and information from the vestibular system to maintain balance (23). It is highly likely that this positive effect could not be achieved with opened eyes owing to visual stimulation being more dominant than proprioceptive sense during balance.

After 10 minutes from the applying, the using correction technique on the ankle joint from the sole of the lateral to the medial malleolus and the distal part of the peroneal muscle group was not seen to improve the static balance (14). Similar to this result, the correction technique on the retinaculum of the ankle with the facilitation technique on the peroneal

muscle had not an immediate effect on static balance in healthy subjects in the present study. In another study, after 45 minutes from applying of the mechanical correction technique (with a tension of 30-40%) on the tibialis anterior muscle and mediolateral side of the calf muscle, there had been to see an improvement in static balance (16). However, in the present study, the KT facilitation technique on the peroneal muscle alone had an immediate effect on static balance during eyes closed in healthy subjects. Although the application of KT on ligaments did not improve static balance in these studies (the present study and the study of Tekin et al.), the application of KT on muscles (the present study and the study of Huzmeli et al.) improved it. Consequently, if the correct application of KT on target tissues is used, it was thought there is no need to wait for it to take effect. However, new studies that examine the time required for the correct technique to show its effectiveness are needed.

Taping improves the joint position sense in athletes (2). Therefore, taping reduces the risk of injury in players with a previous ankle injury (27). It has been reported that KT does not develop ankle proprioception (28). Examination of the study revealed that proprioception was investigated using too much KT around the ankle. In contrast to this study, an improvement in ankle proprioception after KT application was observed (29). In the present study, KT improved static balance when the eyes were closed. In light of this result, using the facilitation technique on peroneal muscles can affect balance positively and as a result it can reduce the risk of injury. However, while the facilitation technique

affects balance positively, using the facilitation technique in combination with the correction technique is not effective for static balance. We propose that KT practitioners should use KT with appropriate techniques and avoid excessive taping. Using KT for the intended purpose or not using KT at all might give a better result than using too much.

Although the proprioceptive information from the ankle after KT application affected balance when the eyes are open, it may not have been effective in both the facilitation technique on the peroneal muscle alone and the correction technique on the retinaculum of the ankle with facilitation technique on the peroneal muscle since visual information did not change and visual information was more dominant in maintaining balance. The similar result observed by Tekin et al. further strengthens this hypothesis (14). Although it is not statistically significant in present study, in sports competitions, the relatively small but positive changes between before and after the application of KT can be important in terms of both preventing injuries and athlete can make a differences according to others. Therefore, it is thought that there is a need randomized controlled studies using methods such as functional MRI or electromyograms or special balance devices to research activated cortical neurons or muscles following KT application on both healthy individuals and athletes.

Strengths and Limitations

The present study had some limitations. All the individuals in the study did not have instability. The effect of KT should be investigated on athletes and individuals who have ankle instability. Using a balance platform or isokinetic equipment is important to evaluate proprioception objectively. The effects of KT on balance could be evaluated before and after a warming up program or sport. The effects of sham taping on acute/subacute/chronic subjects should be investigated and the firing time of peroneal muscles should be evaluated with EMG. Moreover, it is thought that studies examining the time required for the correct technique to show its effectiveness are needed.

CONCLUSION

KT is used very often in clinics during sports competitions, rehabilitation, protection from trauma, healing soft tissue, improving performance, and maintaining stability. However, if misused KT may have no effect or may adversely affect performance,

contrary to its purpose. In this study, using the facilitation technique of KT on peroneal muscles improves static balance when the eyes are closed more effectively than using the correction with facilitation technique on the ankle. Furthermore, KT affected positively the static balance during closed eyes after using it immediately. Using KT by choosing a correct technique according to tissues provides more effective results than multiple KT applications.

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ARE THE NEW KAWASAKI-LIKE SYNDROMES IN THE CHILDREN ASSOCIATED WITH COVID-19?

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ABSTRACT

COVID-19 has become a significant public health problem since December 2019, and despite vaccination, people are still infected and have died because of COVID-19. COVID-19 mainly affects older adults and people with comorbidities like cancer, obesity, metabolic syndrome, diabetes, endocrine disorders, cardiovascular diseases, and immune disorders. On the other hand, some young adults infected by COVID-19 show severe symptoms similar to Kawasaki Disease (KD) called Kawasaki-like syndrome (KLS), incomplete Kawasaki disease, atypical Kawasaki disease, SARS-CoV-2-induced Kawasaki-like Hyper-inflammatory Syndrome (SCiKH Syndrome) and Kawa-COVID-19. Children with KD-like syndromes and cardiovascular complications, including aneurysms, left ventricular dysfunction, pericarditis, myocarditis, valvular regurgitation, or coronary arterial ectasia, tested positive for the COVID-19 virus, up to two-thirds of cases. On the other hand, people with glucose-6-phosphate dehydrogenase (G6PD) deficiency are more vulnerable to COVID-19 infection, and KD with G6PD deficiency has been reported previously. Therefore, children with G6PD deficiency or KD disease can be more vulnerable to COVID-19; thus, we discuss the possible role of COVID-19 in KD-like syndrome and G6PD deficiency associated with severe symptoms in children. Also, the possible correlation between COVID-19 infection and Kawasaki disease-like syndromes should be further investigated.

Keywords: COVID-19, children, hyper-inflammatory state, Kawasaki disease, G6PD deficiency

INTRODUCTION

COVID-19 has been a major public health problem since December 2019, affecting millions of people's lives; however, vaccines developed by different companies reduced the mortality and severity of the infection. COVID-19 mainly affects older adults and people with comorbidities like cancer, obesity, metabolic syndrome, diabetes, endocrine disorders, cardiovascular diseases, and immune disorders. On the other hand, thousands of young populations and children without comorbidities reported severe symptoms during the COVID-19 pandemic (1–4). For instance, news about some COVID-19-positive children has started showing Kawasaki disease-like syndromes with a 1-3% mortality rate, and National Health Service (NHS) has warned medical doctors about these syndromes among children. Additionally, WHO has investigated the correlation between COVID-19 and Kawasaki disease-like syndromes in children since April 2020 (5–7).

COVID-19-triggered Kawasaki-like syndromes in children have been named Kawasaki-like syndrome (KLS), incomplete Kawasaki disease, atypical Kawasaki disease, SARS-CoV-2-induced Kawasaki-

like Hyper-inflammatory Syndrome (SCiKH Syndrome) and Kawa-COVID-19 (8). Kawasaki disease, also known as mucocutaneous lymph node syndrome, was first described in 1967 by Tomisaku Kawasaki and defined by a hyper-inflammatory state with several symptoms, including persistent fewer (more than five days), redness in the lips, mouth, and throat, rash, swollen lymph glands, redness in the whites of the eyes and swelling of the hands and feet. KD is described as a rare systemic medium-vessel vasculitis occurring in children between 5 months and 5 years of age. The reason for Kawasaki disease is unknown; however, it is hypothesized that a pathogen, probably a virus, may trigger this disease (9).

Thousands of children and adults have developed COVID-19-induced severe health effects mimicking KD disease, such as a hyperinflammatory state, cardiac dysfunction, respiratory failure, and enhanced inflammation (10). Also, a case report has revealed that COVID-19 triggered a recurrence of Kawasaki disease with symptoms including fever, maculopapular rash, altered sensorium, elevated inflammatory markers, and dilated coronary arteries (11). On the other hand, some HIV-positive patients have been shown Kawasaki disease-like syndromes supporting the correlation between the current COVID-19 infection and Kawasaki symptoms in children (12). Additionally, we have reported that people with glucose-6-phosphate dehydrogenase (G6PD) deficiency are more vulnerable to COVID-19 infection (13), and KD with G6PD deficiency has been reported previously. Therefore, children with G6PD deficiency or KD disease can be more vulnerable to COVID-19 associated with severe symptoms (14,15). In this review, we discuss the possible role of the COVID-19 disease in KD, KD-like syndrome, and G6PD deficiency associated with severe symptoms.

Kawasaki-like syndrome in COVID-19-infected children

KD primarily affects instants and young children between 6 months and 4 years of age, and the causes of this are unknown (16). KD is a multisystem acute inflammation of coronary blood vessels and aorta (17), also known as lymph node disease because this syndrome highly affects lymph nodes (18). In this disease, a classical pathogen response is localized to the coronary arteries, and one of the critical initial symptoms is high fever. KD causes infiltration of inflammatory cells in the arteries, especially the coronary arteries for instance, 25% of KD patients develop coronary artery aneurysm (CAA). Therefore, stopping cardiovascular complications and maintaining hemodynamic stability are vital for KD patients (19).

Some overlapping symptoms between KD and COVID-19, called Kawasaki-like syndromes, include high and persistent fever, gastrointestinal disorders, skin rash, dry and cracked lips, elevated C-reactive protein, and high levels of ferritinaemia (20). On the other hand, COVID-19 infection shares similar symptoms with the multisystem inflammatory syndrome in children (MIS-C), KD, and pediatric inflammatory multisystem syndrome temporarily (21). Multisystem inflammatory syndrome has been observed in most COVID-19 cases of children associated with severe pediatric syndromes such as KD (22). Various viral infections, including retroviruses, enteroviruses, the New Haven coronavirus (HCoVNH), and parvovirus B19, have a significant role in the development of KD (23). Bacterial infections such as Streptococcus pyogenes, Staphylococcus aureus, and Yersinia pseudotuberculosis have been implicated with KD etiology (24). Some HIV-positive patients have been shown Kawasaki disease-like syndromes supporting the correlation between the current COVID-19 infection and Kawasaki symptoms in children (12). Also, the wavelike spread and acute onset of KD have been reported in the winter, a season for viral respiratory illnesses, addressing the correlation of KD with infectious diseases (25–27). Children with KD-like syndromes, along with cardiovascular complications including aneurysms, left ventricular dysfunction, pericarditis, myocarditis, valvular regurgitation, or coronary arterial ectasia, tested positive for COVID-19 virus up to two-thirds of cases (28).

The endothelial dysfunction in COVID-19 and Kawasaki Disease correlated with myocardial dysfunction

COVID-19 and KD induce oxidative stress and inflammation associated with endothelial dysfunction, thrombosis, cytokine storm, organ dysfunction, and myocardial injury in the patients. Endothelial dysfunction is a shared pathogenesis by KD and COVID-19 resulting from enhanced oxidative stress, inflammation, cytokine storm, and coagulopathy, leading to myocardial dysfunction, thrombosis, and multiorgan dysfunction (29). KD is the most common

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acquired heart disease in children due to endothelial dysfunction, acute vasculitis, coronary artery abnormalities, and thrombosis. During acute and subacute phases, KD induces inflammatory cell activation, such as monocytes, neutrophils, and natural killer (NK) cells. Activated inflammatory cells induce the secretion of monocyte chemoattractant protein-1 (MCP-1), e-selectin, IL-6, IL-8, IL-37, IL-1, IL1β, ICAM1 (Intercellular Adhesion Molecule 1), and VCAM1 (vascular cell adhesion molecule 1) associated with endothelial damage, thrombosis, artery damage, and vasculitis in KD (30). On the other hand, activated inflammatory cells induce reactive oxygen species (ROS) release, leading to enhanced oxidative stress and endothelial dysfunction, inflammation, thrombosis, altered microcirculation, and myocardial dysfunction (31). Enhanced ROS attacks lipids, protein, and DNA; for instance, oxidative stress causes the oxidation of low-density protein (LDL), which binds to the lectin-like-oxLDL receptor 1 (LOX1) mainly expressed in the endothelial cells, macrophages, dendritic cells, and lymphocytes. The oxidized LDL and LOX1 interaction is the key mechanism for endothelial cell injury (32).

COVID-19 is considered a microvascular and endothelial disease since endothelial dysfunction is the major pathogenesis of the disease. Spike glycoprotein (S protein) of COVID-19 induces endothelial cell activation and endothelial damage directly by binding to the cell. On the other hand, the S protein triggers macrophages secreting ICAM-1, VCAM-1, IL-6, IL-18, PAI1, and MCP-1 correlated with thrombosis, inflammation, vascular leakage, and endothelial dysfunction. Furthermore, the S protein induces the degradation of endothelial junction proteins such as cadherin, connexin-43, PECAM-1, and junctional adhesion molecule-A (33). COVID-19 induces endothelial dysfunction via several mechanisms, including endothelial cell injury, degradation/damage of endothelial glycocalyx/barrier, endothelial hyperpermeability, endothelial to mesenchymal transition (EMT), endothelial inflammation, enhanced angiogenesis, cytokine storm, increased oxidative stress, altered mitochondrial function, virus-induced senescence of the endothelial cells and complement activation (29). COVID-19 infection triggers the innate immune system, leading to an enhanced inflammatory response and oxidative stress associated with severe symptoms and increased mortality risk in patients. Biomarkers associated with endothelial dysfunction,

thrombosis, coagulopathy, vascular dysregulation, and oxidative stress have been reported in COVID-19 patients associated with disease severity and mortality risk (29,31,34). For instance, circulating neutrophils, many pro-inflammatory effector cytokines, including TNF, IL-1β, IL-6, IL-8, ICAM-1, VCAM-1, G-CSF, and GM-CSF, chemokines such as MCP1, IP10, and MIP1α levels significantly elevated in the severely ill patients infected by COVID-19 compared control to the healthy individuals (35).

On the other hand, syndecan-1 and heparanase are biomarkers of glycocalyx damage correlated with endothelial damage, thrombosis, and microcirculation. The glycocalyx consists of glycoprotein and proteoglycan covering endothelial cells to maintain vascular homeostasis. Altered glycocalyx structure leads to enhanced oxidative stress and inflammation that causes syndecan-1 release. Increased syndecan-1 levels are correlated with elevated levels of thrombomodulin, TNF-α, IL-6, and heparinase, a degrading enzyme of glycocalyx (36). Moreover, some patients infected by COVID-19 showed a hyper-inflammatory state followed by a cytokine storm like KD syndrome due to the overactivation of the innate immune response. Cytokine storm leads to multi-organ dysfunction via enhanced inflammation, thrombosis, and endothelial dysfunction. Thus, hyper-inflammatory state and Kawasaki-disease-like syndromes in COVID-19-positive children may result from COVID-19-infection-induced over-activation of inflammatory responses and altered oxidative stress metabolism (37,38).

Glucose-6-phosphate dehydrogenase enzyme deficiency and COVID-19

G6PD enzyme deficiency is the most common blood disorder and enzymopathy worldwide, affecting 400 million people with 160 variants (39–41). G6PD is the rate-limiting enzyme of the pentose phosphate pathway (PPP) and reduces $NADP^+$ to $NADPH^+ + H^+$. The reduced form of $NADP^+$ plays a vital role in detoxification reactions, redox signaling, oxidative stress, cell proliferation, migration, differentiation, and growth (42,43). $NADPH^+$ is used to convert oxidized glutathione (GSSG) to reduced glutathione (GSH) via the glutathione reductase (GR) enzyme. GSH/GSSG ratio is the major biomarker of oxidative stress, and G6PD deficiency causes depletion of GSH associated with increased oxidative stress in individuals. Since G6PD is one of the most crucial enzymes in antioxidant metabolism, infectious

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diseases such as COVID-19, which induce oxidative stress, may cause severe symptoms via enhanced hemolysis in G6PD-deficient individuals (2,14,15).

G6PD enzyme gene locus is found on the X-chromosome; therefore, males are much more affected than females (44,45). On the other hand, COVID-19 infection has gender-based differences and has much more adverse effects on male patients than female patients, according to the literature (46). Recent studies have revealed that COVID-19 results in hematological alterations because of altered heme and hemoglobin metabolism, leading to hemolysis and dysregulated oxygen transport (47). Since G6PD deficiency is described by the dysfunction of RBCs leading to hemolysis, children with G6PD deficiency can be more vulnerable to COVID-19 infection because of increased hemolysis and impaired oxygen transport (48). Therefore, hyper-inflammatory state and severe symptoms in G6PD-deficient children infected by COVID-19 may result from increased hemolysis and hyperactivation inflammatory response (49). Also, the impact of the G6PD enzyme on KD pathogenesis should be further investigated in KD patients with and without G6PD deficiency.

CONCLUSION

World has been struggling with COVID-19 and its adverse effects since December 2019. Despite vaccination, thousands of people are still infected by COVID-19, and our knowledge is increasing daily via new studies. Older individuals and people with comorbidities like cancer, diabetes, endocrine disorders, metabolic syndrome, cardiovascular diseases, and immunological disorders are reported risk groups. On the other hand, younger individuals and children infected by COVID-19 showed severe symptoms, including KD-like syndromes characterized by endothelial dysfunction, myocardial damage, thrombosis, and cytokine storm. COVID-19 and KD induce endothelial dysfunction as common pathogenesis correlated with enhanced oxidative stress, inflammation, vascular damage, and thrombosis. The exact mechanism or reason for KD-like syndromes in COVID-19-infected children is unknown; however, COVID-19-induced endothelial damage can be the possible reason behind the indicated symptoms. On the other hand, G6PD-deficient individuals showed severe symptoms of COVID-19 because of enhanced oxidative stress and inflammation. No data address the role of the G6PD enzyme in KD pathogenesis; thus, the impact of the

G6PD enzyme can be further investigated in KD and KD-like syndromes.

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