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The Relationship Between Kinesiophobia and Mobilization of Patients with Brain Tumor Surgery

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ABSTRACT

This study investigated the relationship between kinesiophobia and mobilization levels of patients with brain tumor surgery. This descriptive and correlation study was conducted between April and October 2022. The sample consisted of 80 patients who had brain tumor surgery. Data were collected using a personal information form (PIF), the Tampa Scale of Kinesiophobia (TSK), the Patient Mobility Scale (PMS), and the Observer Mobility Scale (OMS). Participants had a significantly higher mean TSK score on day one after surgery than on days two, three, and four after surgery. Participants had significantly higher PMS scores on the day immediately following surgery compared to two, three, and four days after surgery. Furthermore, they had significantly higher OMS scores on the day immediately following surgery compared to two, three, and four days after surgery. Participants with a history of falls had significantly higher TSK, PMS and OMS scores on days one, two, three, and four after surgery compared to those without a history of falls ($p<0.05$). Similarly, participants who experienced a fear of falling during mobilization exhibited significantly higher TSK, PMS and OMS scores on days one, two, three, and four after surgery compared to those without such fear. There was a moderate positive correlation between TSK, PMS, and OMS scores on days one, two, three, and four after surgery. As a result of this study, nurses should be aware that they experience kinesiophobia when mobilizing patients after neurosurgery. Therefore, they should develop nursing care to prevent this fear from preventing them from moving. In addition, for patient safety, patient falls that may occur together with fear of movement must be handled carefully. It was determined that the mobilization levels of patients who underwent brain tumor surgery decreased as their fear of movement increased after surgery. As a result, it is important that nurses should take fall prevention measures to reduce patients' fear of movement, ensure that they do not move alone during their mobilization, and provide patient training to help them move more. Our findings have the potential to serve as a foundation for future research endeavors and offer practical solutions for nurses working in neurosurgery clinics.

Keywords: brain tumor; kinesiophobia; mobilization; nursing; fear of movement

INTRODUCTION

Brain tumors are characterized by healthy cells' atypical and unregulated proliferation (Walbert T., 2023). According to the World Health Organization (2020) and the International Agency for Research on Cancer (IARC), brain tumor cancers are the 19th most commonly diagnosed cancers worldwide, with a mortality rate of 0.30%. In Türkiye, the incidence rate of brain tumors is reported to be 0.63%, with a corresponding mortality rate of 0.51% (WHOb). The primary objective of brain tumor surgery is to either completely remove all tumor tissue prior to the onset of neurological deficits or to alleviate symptoms through decompression with partial removal (Lutz K. et al., 2022; Mezzacappa F., 2022). During both the early and late postoperative stages, patients commonly experience various signs and symptoms, with neurological manifestations such as pain, numbness, tingling, and weakness being the predominant ones (Rojaye JO., 2024; Walbert T., 2023; Kocaslı et al., 2023). As a result of these symptoms, patients often refrain from engaging in movements that may potentially cause trauma to the surgical site due to fear of further harm. In the presence of pain, patients exhibit reluctance

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to move, indicating the presence of kinesiophobia (Çapaklı E., 2021; Sunar İ., 2021; Mete Z., 2020; Van Den Eeden et al., 2017).

Kinesiophobia, defined as the fear of movement, encompasses the apprehension and avoidance behavior individuals develop towards physical activity in order to prevent re-injury following a fall or previous injury. The restriction of movement and the reluctance to engage in walking activities due to kinesiophobia have a detrimental impact on the healing process (Karaca T. 2021; Aktürk S..2019). Encouraging early mobilization following surgery is strongly recommended based on substantial evidence (Walbert T., 2023; Hagan et al, 2016). According to Kural (2017), surgical complications like deep vein thrombosis and pulmonary infection can be prevented. Moreover, there exists a correlation between enhancing physical function by initiating standing and mobilization, provided there is no motor sensory dysfunction impeding such activities. According to Çapaklı (2021), patients who encounter kinesiophobia during the postoperative period face challenges in mobilization, ultimately leading to a negative impact on their recovery process.

Alterations in consciousness during the postoperative period, coupled with symptoms associated with the tumor's location (such as visual disturbances, balance issues, headaches, dizziness, etc.), contribute to a fear of falling (Damar H. et al., 2021; Karaca T., 2021). Fear of falling is characterized as an excessive apprehension or heightened sensitivity towards the possibility of falling during routine activities of daily living. When there is a history of prior falls, patients tend to limit activities that may evoke a fear of falling once more, leading to the development of kinesiophobia. Fear of falling and kinesiophobia trigger each other (Lee R. et al., 2022; Damar H. et al., 2021; Karaca T., 2021). Metastasis is recognized as one of the risk factors for falls due to its association with disruptions in the level of consciousness, ultimately increasing the likelihood of falling incidents (Yeşilbakan et al., 2019). Patients with neurologic disorders are particularly vulnerable to falls, emphasizing the need for nurses to establish interdisciplinary teams that incorporate educational programs aimed at bridging knowledge and practice gaps to prevent such incidents (Habiba et al., 2018). Neurosurgical patients face an elevated risk of falls, which can result in immobilization that significantly impacts their daily activities (Çelik et al., 2016). Patients diagnosed with frontal lobe neoplasms also commonly encounter a fear of falling. If patients do not move after brain surgery and are not mobilized early, complications such as pulmonary problems, deep vein thrombosis will develop, and the hospital stay will be prolonged. Early movement of patients accelerates recovery. One of the most important factors in the desire to move is a previous history of falling or the development of a fear of falling after surgery. Therefore, in order to eliminate the fear of falling in patients, behavioral therapy training should be developed for patients, patients should be encouraged in this regard, their social support should be increased, and safe spaces should be created. Thus, patients' mobility abilities will increase, their recovery will accelerate and their comfort level will increase. (Palese et al., 2012).

While limited research exists on postoperative kinesiophobia and fear of falling (Damar H. et al., 2021; Habiba et al., 2018; Çapaklı, 2021; Yeşilbakan et al., 2019; Güzel et al., 2021) no prior investigations have explored the correlation between kinesiophobia and mobilization among patients following brain tumor surgery. Consequently, this study aims to address this gap in the literature and examine this specific relationship.

METHOD

Design and Sample

This descriptive and cross-sectional study was conducted in the brain surgery clinic of a university hospital in Ankara, Türkiye, between April 2022 and October 2019. Data were collected using a survey. The study population consisted of all patients who had brain tumor surgery in the brain and neurosurgery wards of a city hospital and a university hospital in Ankara, Türkiye. A power analysis (G* Power 3.0.10.) was performed to determine the sample size based on Karaca (2021). The results showed that a sample of 52 would be large enough to detect significant differences (90% power, 5% margin of error, and an effect size of 0.40). The initial sample consisted of 81 patients to avoid missing data. However, one patient decided to withdraw from the study. Therefore, the final sample consisted of 80 patients. The inclusion criteria were (1) volunteering, (2) being over 18 years of age, (3) having had brain tumor surgery, and (4) having no physical disabilities. The exclusion criteria were (1) having had a different type of surgery and (2) withdrawing.

Data Collection Tools

The data were collected using personal information form (PIF), the Tampa Scale of Kinesiophobia (TSK), the Patient Mobility Scale (PMS), and the Observer Mobility Scale (OMS).

Personal Information Form (PIF); The personal information form (PIF) was developed by the researchers (Karaca T., 2021; Nambi G. & Abdelbasset W. K., 2020). The form consisted of nine items on descriptive (age, gender, education, marital status, etc.) and kinesiophobia-related characteristics. Cronbach's alpha score was 0.84 in this study.

The Tampa Scale of Kinesiophobia (TSK); The Tampa Scale of Kinesiophobia (TSK) was developed by Miller et al. (1991) and published by Vlaeyen et al. (1995). The scale consists of 17 items on fear avoidance, fear of work-related activities, fear of movement, and fear of re-injury. The items are rated on a four-point Likert-type scale (1=Strongly disagree, 2=Disagree, 3=Agree, 4=Strongly agree) (Tütün Yümin E. et al., 2017). The total score ranges from 17 to 68, with scores above 37 indicating kinesiophobia. The original scale has a Cronbach's alpha score of 0.77 (Vlaeyen J et al., 1995). The scale was adapted to Turkish by Tunca et al. (2011). The Turkish version has a Cronbach's alpha score of 0.80, which was 0.82 in this study. Authorization was received from the authors who developed the scale.

Patient Mobility Scale (PMS); The Patient Mobility Scale (PMS) was developed by Heye et al. (2002) and adapted to Turkish by Ayaoğlu (2011). The scale assesses the pain and difficulty caused by four activities performed after surgery (turning from one side to the other, sitting on the bedside, standing up on the bedside, and walking in the patient's room). The score is calculated using a 15-cm visual analog scale. The numerical value of the degree of pain and difficulty is determined by measuring the distance between the mark and 0 placed on the scale with a calibrated ruler. Each activity has two subgroup questions. The questions are rated on a five-point Likert-type scale [(1) had no pain, (2) had some pain, (3) had moderate pain, (4) had much pain, (5) was the worst pain I could imagine]. The score of each item ranges from 0 to 15. The total score ranges from 0 to 120, with higher scores indicating more pain and difficulty. The original scale has a Cronbach's alpha score of 0.94 to 0.98 (Heye et al., 2002). The Turkish version has a Cronbach's alpha score of 0.90 (Ayoğlu, 2011), which was 0.89 in this study. Authorization was received from the authors who developed the scale.

Observer Mobility Scale (OMS); The Observer Mobility Scale (OMS) was developed by Heye et al. (2002) and adapted to Turkish by Ayaoğlu (2011). The scale assesses objective observations regarding four activities performed after surgery (turning from one side to the other, sitting on the bedside, standing up on the bedside, and walking in the patient's room). Dependence/independence status is scored on a scale of 1 to 5. The total score ranges from 4 to 20, with higher scores indicating more dependence. The original scale has a Cronbach's alpha score of 0.93 to 0.94(Heye et al., 2002). The Turkish version has a Cronbach's alpha score of 0.73 (Ayoğlu, 2011), which was 0.82 in this study. Authorization was received from the authors who developed the Scale.

Data Collection

Research data were collected by the researcher from patients who agreed to participate in the research after obtaining permission from the ethics committee and institutions. All data collection forms were applied one-on-one by the researcher. One day before the surgery, the patients were visited in their rooms and the purpose of the study was explained. Written and verbal consent was obtained from the patients and PIF was applied. TSK before mobilization on the 1st, 2nd, 3rd and 4th postoperative days; After mobilization, PMS and OMS were applied. Taking into account the literature (Kavrazlı S., 2015; Danç E., 2019; Aktürk 2019) and the hospitalization period of the patient group, the number of measurements was continued for 4 days after surgery. The following steps were followed in the first postoperative mobilization; (i) changing the patient's in-bed position, (ii) placing the patient in the semi-fowler position in the bed, (iii) having the patient sit on the edge of the bed for 5 minutes, (iv) making the patient stand up next to the bed, (v) walking around the room (Meşe S. & Güler S., 2023). Mobilization of the patients was done personally by the researcher. Patient mobilization and application of data collection tools took an average of 35-40 minutes. The flow diagram of the research is shown in Figure 1.

Data Analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS, v. 26). Prior to analysis, normality was assessed. Parametric tests were employed for normally distributed data, while non-parametric tests were utilized for non-normally distributed data. The findings were presented through frequency tables and descriptive statistics. The Mann-Whitney U test (Z-table) was employed to compare two independent groups, whereas the Kruskal-Wallis H test (χ^2 table) was utilized for comparing more than two independent groups. Post-hoc comparisons were conducted using the Bonferroni correction. The Spearman correlation coefficient was employed to examine the relationship between two variables exhibiting a non-normal distribution.

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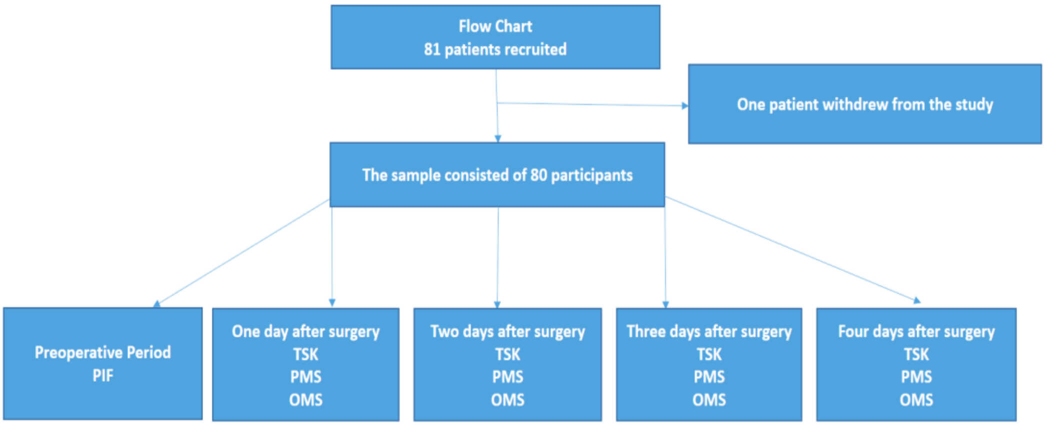

Figure 1. Flow Chart

Ethical Considerations

The study was approved by the Social Sciences and Humanities Ethics Committee of Ankara Yıldırım Beyazıt University (No: 2021-464 & Date: 09.12.2021). Permission was obtained from the hospitals (No: E-90739940-799 & Date 19.04.2022; No E-27043162-300-00002091365 & Date: 16.03.2022). Informed consent was obtained from all participants.

Research Questions

What TSK score do participants have? What PMS score do participants have? Is there a correlation between TSK and PMS scores? Do participants' sociodemographic characteristics affect their TSK scores? Do participants' sociodemographic characteristics affect their PMS scores?

RESULTS

Table 1. Sociodemographic Characteristics

Variable (N=80)	n	%	Variable (N=80)	n	%
Gender			**Marital status**		
Man	37	46.3	Married	66	82.5
Woman	43	53.7	Single	14	17.5
Age[$\bar{X} \pm$ S.D.→46.78±15.71 (year)]			**BMI**[$\bar{X} \pm$ S.d.→28.09±5.41 (kg/m^2)]		
< 40	28	35.0	Underweight (< 18.5 kg/m²)	2	2.4
40 - 49	13	16.3	Normal (18.5 - 24.9 kg/m²)	25	31.3
50 - 59	21	26.3	Overweight (24.9 - 29.9 kg/m²)	25	31.3
≥ 60	18	22.4	Obese (≥ 30 kg/m²)	28	35.0
Education			**Chronic disease**		
Illiterate	8	10.0	No	48	60.0
Primary school- Middle school	54	67.5	Yes	32	40.0
Bachelor's and Master's	18	22.5			
History of falls			**Fear of falling during mobilization**		
No	47	58.7	No	55	68.7
Yes	33	41.3	Yes	25	31.3

Participants had a mean age of 46.78±15.71 years. More than half of the participants were women (53.7%). More than half of the participants had primary or middle school degrees (67.5%). Most participants were married (82.5%). More than a quarter of the participants were obese (35%). Less than half of the participants had chronic diseases (40%). More than half of the participants had a history of falls (58.7%). More than half of the participants feared falling during mobilization (68.7%) (Table 1).

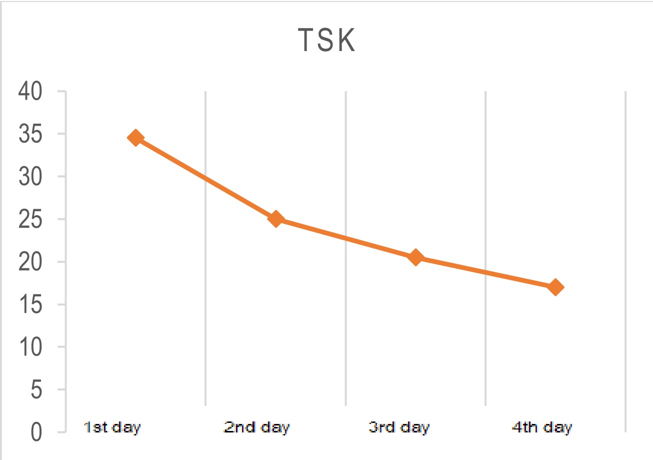

Figure 2. The Distribution of TSK Scores by Days

There were significant variations in participants' TSK scores across different days ($\chi2=156.210$; $p=0.000$). Specifically, participants had significantly higher TSK scores on the day immediately following surgery compared to two, three, and four days after surgery. Furthermore, they had significantly higher TSK scores two days after surgery than three and four days after surgery. However, there was no significant difference in TSK scores between three and four days after surgery (Figure 2).

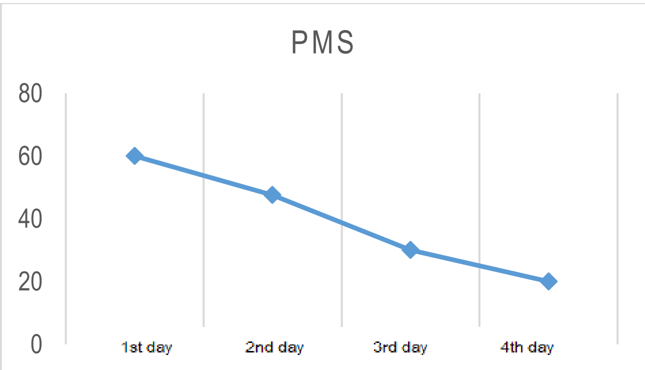

Figure 3. The Distribution of PMS Scores by Days

There were significant variations in participants' PMS scores across different days ($\chi2=162.920$; $p=0.000$). Specifically, participants had significantly higher PMS scores on the day immediately following surgery compared to two, three, and four days after surgery. Furthermore, they exhibited significantly higher PMS scores two days after surgery than three and four days after surgery. Additionally, participants displayed significantly higher PMS scores three days after surgery compared to four days after surgery (Figure 3).

There were significant variations in participants' OMS scores across different days ($\chi2=193.442$; $p=0.000$). Specifically, participants had significantly higher OMS scores on the day immediately following surgery compared to two, three, and four days after surgery. Furthermore, they had significantly higher OMS scores two days after surgery compared to three and four days after surgery. Additionally, participants exhibited significantly higher OMS scores three days after surgery compared to four days after surgery (Figure 4).

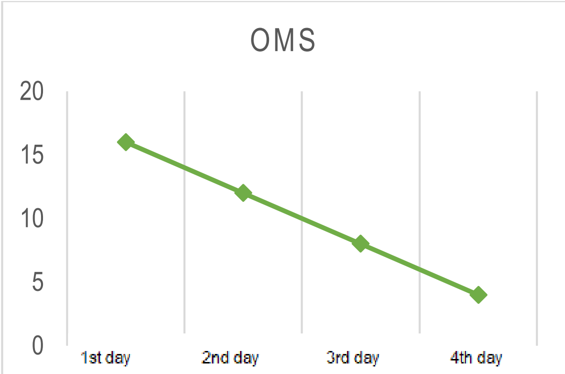

Figure 4. The Distribution of OMS Scores by Days

There were statistically significant differences in TSK scores between male and female participants (p<0.05). Female participants consistently exhibited significantly higher TSK scores compared to their male counterparts on days one, two, three, and four after surgery. Additionally, participants aged over 60 displayed significantly higher TSK scores on days two, three, and four after surgery compared to those younger than 40 and those between the ages of 50 to 59. Participants with chronic diseases had significantly higher TSK scores on days one and two after surgery compared to those without chronic diseases (p<0.05) (Table 3). Furthermore, participants with a history of falls had significantly higher TSK scores on days one, two, three, and four after surgery compared to those without a history of falls (p<0.05). Similarly, participants who experienced a fear of falling during mobilization exhibited significantly higher TSK scores on days one, two, three, and four after surgery compared to those without such fear (p<0.05) (Table 3).

Table 2. The Correlations Between the Scales

Correlation* (N=80)			PMS	OMS
TSK	Day One	r	0.701	0.606
		p	0.000	0.000
	Day Two	r	0.647	0.679
		p	0.000	0.000
	Day Three	r	0.673	0.737
		p	0.000	0.000
	Day Four	r	0.620	0.754
		p	0.000	0.000

*The Spearman correlation coefficient was used to assess the relationship between two variables that demonstrated a non-normal distribution.

There was a moderate positive correlation between TSK, PMS, and OMS scores on days one, two, three, and four after surgery (p<0.05). This result suggested that the higher the PMS and OMS, the higher the TSK score (p<0.05). (Table 2).

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Table 3. The Distribution of TSK Scores by Sociodemographic Characteristics

		TSK							
		Day One		Day Two		Day Three		Day Four	
Variable (N=80)	n	$\bar{X} \pm SD$	Median [Min-Max]	$\bar{X} \pm SD$	Median [Min-Max]	$\bar{X} \pm SD$	Median [Min-Max]	$\bar{X} \pm SD$	Median [Min-Max]
Gender									
Man	37	29.89±15.07	23.0 [17.0-68.0]	25.97±13.68	20.0 [17.0-68.0]	23.78±12.43	17.0 [17.0-64.0]	21.38±10.53	17.0 [17.0-60.0]
Woman	43	44.76±19.59	51.0 [17.0-68.0]	39.14±18.29	43.0 [17.0-68.0]	35.09±16.58	35.0 [17.0-65.0]	29.88±14.18	30.0 [17.0-65.0]
Statistical analysis*		Z=-2.919		Z=-2.869		Z=-2.980		Z=-3.177	
Probability		p=0.004		p=0.004		p=0.003		p=0.001	
Age (year)									
<40(1)	28	33.36±18.58	24.0 [17.0-68.0]	29.43±17.83	18.0 [17.0-68.0]	26.11±14.62	17.0 [17.0-65.0]	23.75±12.80	17.0 [17.0-65.0]
40-49(2)	13	40.54±19.86	37.0 [17.0-68.0]	33.77±15.59	30.0 [17.0-60.0]	30.69±15.52	26.0 [17.0-60.0]	26.85±13.37	20.0 [17.0-56.0]
50-59(3)	21	28.67±14.90	22.0 [17.0-64.0]	25.52±12.57	20.0 [17.0-60.0]	23.48±11.23	17.0 [17.0-51.0]	19.95±6.46	17.0 [17.0-38.0]
≥60(4)	18	53.78±13.73	55.5 [30.0-68.0]	46.94±16.32	49.0 [18.0-68.0]	42.56±15.92	44.0 [17.0-64.0]	35.72±15.04	34.0 [17.0-64.0]
Statistical analysis		χ^2=19.365		χ^2=17.409		χ^2=14.712		χ^2=17.746	
Probability		p=0.000		p=0.001		p=0.002		p=0.000	
Difference		[1.3-4]		[1.3-4]		[1.3-4]		[1.3-4]	
Chronic disease									
No	48	33.81±18.61	25.0 [17.0-68.0]	29.94±16.62	20.0 [17.0-68.0]	27.29±14.63	17.0 [17.0-64.0]	23.98±12.06	17.0 [17.0-64.0]
Yes	32	44.00±18.34	45.0 [17.0-68.0]	37.72±18.04	35.5 [17.0-68.0]	33.72±16.84	30.0 [17.0-65.0]	28.91±14.55	21.0 [17.0-65.0]
Statistical analysis*		Z=-2.407		Z=-2.116		Z=-1.826		Z=-1.894	
Probability		p=0.016		p=0.034		p=0.068		p=0.058	
History of falls									
No	47	28.51±14.79	22.0 [17.0-68.0]	24.17±11.98	18.0 [17.0-61.0]	21.62±9.54	17.0 [17.0-55.0]	19.42±6.55	17.0 [17.0-51.0]
Yes	33	51.24±16.41	51.0 [17.0-68.0]	45.70±16.44	47.0 [17.0-68.0]	41.61±15.53	47.0 [17.0-65.0]	35.24±14.83	34.0 [17.0-65.0]
Statistical analysis		Z=-5.115		Z=-5.235		Z=-5.469		Z=-5.585	
Probability		p=0.000		p=0.000		p=0.000		p=0.000	
Fear of falling during mobilization									
No	55	29.25±13.55	23.0 [17.0-64.0]	25.16±11.87	19.0 [17.0-61.0]	23.00±10.51	17.0 [17.0-55.0]	20.38±7.24	17.0 [17.0-51.0]
Yes	25	56.88±15.37	64.0 [17.0-68.0]	50.40±15.38	55.0 [17.0-68.0]	44.96±14.99	47.0 [17.0-65.0]	38.20±15.24	35.0 [17.0-65.0]
Statistical analysis		Z=-5.642		Z=-5.670		Z=-5.415		Z=-5.505	
Probability		p=0.000		p=0.000		p=0.000		p=0.000	

*The Mann-Whitney U test (Z-table) was employed to compare two independent groups, whereas the Kruskal-Wallis H test (χ2 table) was utilized for comparing more than two independent groups

As a result of the study findings and analyses, there is a negative correlation between kinesiophobia and mobilization level after brain tumor surgery. Both age and gender significantly affect patients' kinesiophobia levels. Different age groups and genders may also exhibit different levels of fear of falling depending on their mobility and movements. Therefore, it is important for nurses to evaluate patients' kinesiophobia and mobilization levels in the postoperative period.

Limitations

This study has three limitations. First, the results are sample specific and cannot be generalized to all brain tumor patients. Second, the sample consisted of patients from only two hospitals. Third, we could not evaluate the effect of nursing interventions on mobilization levels because hospital nurses did not make any interventions to reduce patients' kinesiophobia (fear of movement).

DISCUSSION

This study investigated the relationship between kinesiophobia and mobilization in patients who underwent brain tumor surgery. Movement and early mobilization following brain tumor surgery have proven to be effective in facilitating patients' recovery. However, patients may exhibit reluctance or encounter difficulties when it comes to movement, primarily due to the pain they experience, the presence of various care equipment attached to their bodies, and the fear of potential damage to the surgical site (Wang et al., 2019; Feng et al., 2021). Patients who have undergone spinal surgery (Archer K et al., 2014), as well as those with lumbar disc herniation (Svensson et al., 2011) and lumbar spinal surgery (Kemani et

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al., 2020), often experience fear of movement, which subsequently leads to reduced participation in physical activities. However, no researchers have investigated how patients feel about mobilization after brain tumor surgery. Therefore, this is the first study to address this topic. The results showed that the fear of movement among our participants was significantly higher during the initial postoperative days (p=0.000), with a gradual decrease observed in the subsequent days. Therefore, the planning and implementation of nursing interventions aimed at alleviating kinesiophobia in patients with brain tumors throughout their hospitalization can greatly contribute to providing holistic care.Following brain tumor surgery, kinesiophobia significantly impacts patients' fear of falling (Damar H. et al., 2021; Karaca T., 2021). Kinesiophobia and fear of falling trigger each other. Patients with brain tumors are reported to experience twice as many falls compared to other patient populations (Yeşilbakan et al., 2019). Neurosurgical patients are at a heightened risk of falls, which can result in immobilization and significantly impact their ability to perform activities of daily living (Çelik et al., 2016). Patients with frontal lobe neoplasm also experience fear of falling (Palese et al. 2012). Less than half of our participants had a history of falls prior to the research (41.3%). More than a quarter of our participants reported experiencing a fear of falling during mobilization. (31.3%) (Table 1). In addition, participants with a history of falls had significantly higher TSK scores on days one, two, three, and four after surgery compared to those without a history of falls (p<0.05). Similarly, participants who experienced a fear of falling during mobilization exhibited significantly higher TSK scores on days one, two, three, and four after surgery compared to those without such fear (p<0.05) (Table 3). This result suggests that the experience of falling can have an impact on the development or exacerbation of kinesiophobia in subsequent surgeries.

Older adults generally exhibit a higher level of kinesiophobia compared to their younger counterparts (Turgay et al., 2020; Karaca T., 2021, Yıldız N., 2019). Women generally have a higher level of kinesiophobia than men (Turgay et al., 2020; Karaca T., 2021; Özel A. et al., 2018). Moreover, people with a high BMI generally suffer from a higher level of kinesiophobia than those with a low BMI (Knapik A. et al., 2017, Vincent HK ve Ark..2013; Erden A., 2016). Our findings also indicated that participants over 60 had significantly higher TSK scores on days two, three, and four after surgery compared to their younger counterparts. Moreover, female participants had significantly higher TSK scores than males. However, our results showed that BMI levels had no significant impact on TSK scores. This may be attributed to the fact that previous studies have primarily focused on different patient groups, leading to varying findings in relation to the association between BMI and kinesiophobia. Patients undergoing brain tumor surgery often have heightened concerns regarding potential permanent damage to their cognitive function. As a result, they may prioritize these concerns over factors that contribute to physical limitations, such as obesity.

There were significant variations in participants' PMS ($\chi2$=162.920; p=0.000) and OMS scores ($\chi2$=193.442; p=0.000) across different days. Participants had significantly higher PMS scores on the day immediately following surgery compared to two, three, and four days after surgery. Furthermore, they exhibited significantly higher PMS scores two days after surgery than three and four days after surgery. Additionally, participants displayed significantly higher PMS scores three days after surgery than four days after. Participants had significantly higher OMS scores on the day immediately following surgery compared to two, three, and four days after surgery. Furthermore, they had significantly higher OMS scores two days after surgery compared to three and four days after surgery. Additionally, participants exhibited significantly higher OMS scores three days after surgery than four days after. High scores on the PMS suggest that patients are experiencing activity-related pain and strain. On the other hand, high scores on the OMS indicate that patients are facing challenges in performing activities independently. Danç (2019) and Heye et al. (2002) observed that patients exhibited greater ease in performing movements, lower pain and strain scores, and increased independence in mobility two days after surgery compared to one day after the procedure. Ayoğlu (2011) similarly discovered that both intervention and control groups exhibited significantly lower PMS and OMS scores two days after surgery in comparison to one day after the procedure. All in all, these results suggest that patients may encounter challenges with mobilization, particularly in the initial days following surgery, primarily due to factors such as pain, the incision site, cognitive changes, dizziness, and other related factors. Hence, the nurse must be present during the patient's mobilization process and provide continuous support, encouragement, and motivation to facilitate their movement.

Several factors influencing delayed postoperative mobilization have been identified, including gender (Ahmetoğlu 2019, Yolcu et al., 2016, Buecking B. et al., 2015), age (Ahmetoğlu Y., 2019; Yolcu S. et al., 2016), and body mass index (Liang et al., 2020; Ahmetoğlu Y., 2019). Patients who have previously experienced a fall often develop kinesiophobia, because of which they do not want to move (Bozkurt A. & Balkanay O., 2017). Participants with a history of falls displayed significantly higher PMS scores on days one, two, three, and four after surgery compared to those without a history of falls (p<0.05). Similarly, participants with a history of falls had significantly higher OMS scores on days one, two, three, and four after surgery compared to those without a history of falls (p<0.05). These results indicate that patients who have a history of previous falls and exhibit fear of falling tend to experience decreased levels of mobilization during the postoperative period, in contrast to patients without a history of falls. Therefore, it is crucial for nurses to identify patients

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who have a history of falls and experience a fear of falling, as they require special attention and support during mobilization. Additionally, providing these patients with comprehensive education about falls can be beneficial in preventing future incidents and enhancing their overall well-being.

There was a moderate positive correlation between TSK, PMS, and OMS scores on days one, two, three, and four after surgery ($p<0.05$), suggesting a relationship between kinesiophobia and falling experience and mobilization. In other words, patients with a history of falls often exhibit reduced mobility or tend to engage in less movement. Limited mobility and, consequently, delayed mobilization can lead to prolonged recovery periods for patients. Despite our participants undergoing fall-risk assessments and receiving related training, their fear of falling remained high. This finding highlights the importance for nurses to provide more comprehensive and effective training to address and alleviate this fear. Nurses can support patients in overcoming their fear of movement and promote mobilization by employing various techniques such as providing verbal education, developing personalized movement programs, and implementing effective mobilization protocols. By using these strategies, nurses can help patients build confidence and encourage them to engage in mobilization activities. Consequently, by helping patients overcome their fear of movement and facilitating early mobilization, nurses can contribute to shorter hospital stays and a reduced incidence of complications.

CONCLUSION

There is a negative correlation between the fear of movement in the postoperative period after brain tumor surgery and the level of mobilization. In other words, the higher the level of fear of movement, the lower the degree of mobilization observed in patients. Both age and gender significantly influence patients' fears of movement and falls. Different age groups and genders may exhibit varying levels of fear of falls in relation to their mobility and movement. During the postoperative period, it is essential for surgical nurses to assess patients' levels of fear of movement and mobilization. Based on these evaluations, nurses should provide appropriate support, encouragement, and guidance to promote patient mobilization and mitigate fear, thereby aiding in the recovery process. Hospitals should prioritize the development and implementation of comprehensive training programs aimed at addressing any knowledge gaps and practice deficiencies among nurses regarding fall prevention. By investing in such training programs, hospitals can enhance nurses' expertise and ensure the effective implementation of fall prevention strategies for the benefit of patient safety. Our findings have the potential to serve as a foundation for future research endeavors and offer practical solutions for nurses working in neurosurgery clinics. These results can contribute to advancing knowledge and improving patient care in the field, ultimately benefiting both healthcare professionals and the patients they serve.

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CONFLICTS OF INTEREST

All authors contributed to the conception and design of the manuscript. Sema Koçaşlı and Emine Öner Karaveli performed material preparation, data collection, and analysis. All authors read and approved the final manuscript. The authors declare no conflicts of interest.

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