Levels of catastrophizing pain and kinesiophobia in patients with osteoarthritis and their association

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Abstract

Aim of the present study was to assess the level of catastrophizing pain and kinesiophobia in patients with osteoarthritis and to investigate the association between catastrophizing pain and kinesiophobia. This follow-up study included 170 osteoarthritis patients undergoing surgery. They completed the Pain Catastrophizing Scale and the Tampa Scale for Kinesiophobia preoperatively (T_0) and then postoperatively, at one (T_1) and six months (T_2). The mean score of catastrophizing pain preoperatively indicates moderate to high level of catastrophic pain. Multivariable linear regression analysis with total score of Pain Catastrophizing Scale preoperatively as the dependent variable found that increased age was associated with increased total score of Pain Catastrophizing Scale. The mean kinesiophobia score preoperatively indicates moderate to high level of kinesiophobia. Multivariable linear regression analysis with total score of the Tampa Scale for Kinesiophobia preoperatively as the dependent variable found that increased age and increased patients' inability to manage pain (helplessness) were associated with increased total score of the Tampa Scale for Kinesiophobia. Increased age and catastrophizing pain are predictors of kinesiophobia. Surgical interventions tend to reduce both catastrophizing pain and kinesiophobia.

Key Words: osteoarthritis, kinesiophobia, pain catastrophizing.

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Osteoarthritis (OA) constitutes a significant public health concern, being a chronic condition that impacts a substantial portion of the global population. OA affected 7.6% of the global population in 2020 (equivalent to 595 million individuals). OA prevalence was higher in women than men, with a 2020 global age-standardized prevalence of 8058.9 per 100,000 for women and 5780.1 per 100,000 for men. The prevalence increased by 132.2% over 30 years and is projected to rise by 60 to 100% by 2050. The condition appears to disproportionately impact some racial and ethnic groups and individuals with lower socioeconomic status, with prevalence escalating with age, as ageing-associated changes promote the development of OA.[1] The two main modifiable risk factors for developing (OA) are obesity and joint injury.

Pain is the primary symptom of OA. A European study of patients with non-tumoral pain revealed that OA was the cause in almost 23% of reported pain instances.[2] The pain associated with OA considerably restricts patients' normal activities, both indoors and outside, diminishing their quality of life and adversely affecting their mental health.[3] Patients with OA and compromised mental health exhibited increased pain, more frequent hospital visits, higher medication usage, and reported suboptimal outcomes.[4] As a result, individuals with OA find themselves in a vicious cycle where their pain deteriorates their mental health, which further exacerbates the pain they experience. Furthermore, the pain of OA increases the chance of mortality as it discourages patients from walking and exercising-related benefits.[5] The pain associated with OA leads to heightened utilization of healthcare services, and when coupled with additional diseases such as insomnia and depression, the demand for healthcare services escalates further.[6]

Often patients with OA experience pain catastrophizing, which is defined by the propensity to exaggerate the perceived threat of pain stimuli, experience helplessness regarding pain, and have a diminished capacity to suppress pain-related thoughts before, during, or after a painful experience.[7] Patients exhibiting heightened catastrophizing pain also endure more severe pain following their usual

activities.[8] Severe catastrophizing pain in the morning among OA patients adversely impacts their physical activity levels throughout the day, resulting in increased sedentary behavior. Thus, patients with OA are ensnared in a vicious cycle of negative consequences stemming from the pain associated with their condition, and specifically from the catastrophizing pain they experience. Catastrophizing pain may be the only independent variable influencing pain and functionality post-operatively in individuals with OA.[9]

In addition to the catastrophizing pain that affects their activities, patients with OA may also experience kinesiophobia, which is defined as an excessive, irrational and debilitating fear to carry out a physical movement, due to a feeling of vulnerability to a painful injury or reinjury.[10] Approximately 50-85% of individuals with OA exhibit kinesiophobia.[11] Patients with OA who exhibit elevated levels of kinesiophobia experience a decline in both their physical and mental quality of life, diminished physical activity, greater disability, heightened pain, and functional limitations.[12]

Evidence suggests that there are many effective interventions for kinesiophobia and catastrophizing pain, encompassing surgical intervention, patient education, physiotherapy, cognitive behavioral therapy, psychologist-led therapy, nursing-led therapy, and pharmaceutical treatments.[13] Interventions including rehabilitation programs, cognitive behavioral therapy, psychoeducation regarding pain, pain self-management instruction (e.g., reduction of pain behaviors, activity pacing), stress and mood management, biofeedback and relaxation training, occupational therapy, psychotherapy, and physiotherapy have proven effective.[14] In the realm of patient rehabilitation, non-immersive exergames serve as an effective approach for alleviating pain and mitigating kinesiophobia.[15]

Although there are a significant number of studies examining the effect of catastrophizing pain and kinesiophobia in patients with OA, there is a significant gap in investigating the association between catastrophizing pain and kinesiophobia. In this context, the aim of the present study was to preoperatively assess the level of catastrophizing pain and kinesiophobia in patients with OA and to investigate the existence of an association between catastrophizing pain and kinesiophobia. A secondary aim was to explore pain perception levels, including catastrophizing and kinesiophobia, before and after surgery, and to correlate these levels with certain demographic characteristics.

Materials and Methods

Study Design

This was a follow-up study. The study enrolled patients who were hospitalized in the orthopaedic departments of two public hospitals in Greece waiting to undergo surgery for the treatment of OA. The method of data collection was that of convenience sampling. The study duration was from August 1st 2021 to September 4th 2022. We assessed pain catastrophizing and kinesiophobia before surgery (T_0), and postoperatively at one (T_1) and six months (T_2), in an attempt to keep track of their progress during the rehabilitation period.

The inclusion criteria included the following: (a) diagnosis of OA, (b) sufficient knowledge of the Greek language, and (c) hospitalization in orthopaedic department and upcoming surgery for OA. The exclusion criteria included: (a) insufficient knowledge of the Greek language, (b) patients who were hospitalized in an orthopedic department, with a diagnosis other than OA, (c) patients with a diagnosis of OA but who would not undergo surgery to treat it, and (d) patients who, when completing the questionnaire, wanted to stop the procedure for any reason. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Instruments

The Pain Catastrophizing Scale (PCS) is a 13-item instrument and is currently one of the most widely used measures of catastrophic thinking related to pain.[16] The PCS instructions ask participants to reflect on past painful experiences, and to indicate the degree to which they experienced each of 13 thoughts or feelings when experiencing pain, on 5-point scales with the end points (0) not at all and (4) all the time. Possible scores range from 0 to 52. Higher values indicate worse catastrophizing pain. The PCS yields a total score and three subscale scores assessing rumination, magnification and helplessness.[16] We used the Greek validated version.[17]

The Tampa Scale for Kinesiophobia (TSK) was used to assess the degree of kinesiophobia.[18] The TSK consists of 17 items and participants record their degree of agreement or disagreement on a 4-point Likert scale (Strongly Disagree-Disagree-Agree-Strongly Agree). Individual item scores range from 1-4. The 17 items TSK total scores range from 17 to 68 where the lowest 17 means no or negligible kinesiophobia, and the higher scores indicate an increasing degree of kinesiophobia. The scale has two sub-scales, namely activity avoidance and somatic focus. We used the Greek validated version.[19]

Ethical Issues

The Ethics Committees of both the General University Hospital of Patras “Rio” and the General Hospital of Patras “Agios Andreas” approved our study protocol (Committee Sitting 25/16.07.2021 and Committee Sitting 14/28.07.2021 respectively). We conducted our study on an anonymous and voluntary basis after providing full information to participants upon which they gave their written consent.

Statistical analysis

We use frequencies and percentages to describe categorical variables, while we use mean, standard deviation, median, minimum value and maximum value to describe continuous variables. We used repeated measures analysis of variance to assess the changes of scores on scales during the three measurements. We used independent samples t-test, Pearson’s correlation coefficient and Spearman’s correlation coefficient to investigate bivariate relationships between demographic and clinical characteristics of patients and total score on scales. Then we performed multivariable linear regression analysis with total score on scales as the dependent variables in order to eliminate con-

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founding. In multivariable models, we added independent variables with a p-value<0.2 in bivariate analysis conducting backward method. In that case, we calculated coefficient beta, 95% confidence interval and p-values. The alpha significance level was set at the level of 0.05. Statistical analysis was performed with the Statistical Package for Social Sciences software (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.).

Results

Demographic characteristics

The study population included 170 patients and their demographic characteristics are presented in Table 1. The mean age of the patients was 51.3 years, and about half of them were female (51.8%). Half of the patients were university educated (50%) and 57% of the patients were married/cohabiting, 74.1% had children and 77.1% were living with others.

Clinical characteristics

Table 2 displays the clinical characteristics of the patients. 46.5% of patients had a chronic disease, with the most prevalent being cardiovascular issues, respiratory disorders, and diabetes. 45.3% had previously undergone surgery, with the most prevalent treatments being to orthopedic, gynecological, and ophthalmological issues. 42.4% of patients were undergoing pharmacological treatment for chronic disease.

Catastrophizing pain

The Cronbach's alpha coefficient of internal consistency for the PCS on the three consecutive measures ranged from 0.71 to 0.94 indicating very good reliability. The descriptive results for the PCS at the three consecutive measurements (preoperatively, one and six months postoperatively) are presented in Table 3. Higher values indicate worse catastrophizing pain. In all scores, a statistically significant decrease in catastrophizing pain was found over time (p<0.001 in all cases) indicating that patients' experience of catastrophizing pain improved over time. The mean score of catastrophizing pain preoperatively and after one month indicates moderate to high level of catastrophic pain, while the mean score after six months indicates low level of catastrophic pain.

The effect of demographic and clinical characteristics on total catastrophizing pain scores preoperatively was then investigated. Bivariate analysis between demographic and clinical characteristics of patients and total score on PCS preoperatively is shown in Table 4. Bivariate analysis revealed that increasing age and decreasing educational level were associated with worse experience of catastrophizing pain. In addition, patients with children, unemployed, patients with comorbidities, patients with past surgery and patients receiving medication for chronic disease experienced worse experience of catastrophizing pain. Then, we conducted multivariable linear regression analysis with total score on PCS preoperatively as the dependent variable. We found that only age was a significant predictor. In particular, increased age was associated with increased total score of PCS preoperatively (coefficient beta=0.28, 95% confidence interval=0.21 to 0.35, p<0.001).

Table 1. Demographic characteristics of patients.

Characteristic	N	%
Gender		
Female	88	51.8
Male	82	48.2
Age (mean, standard deviation)	51.3	17.9
Educational level		
Primary school	4	2.4
Secondary school	15	8.8
High school	23	13.5
Graduate of post-secondary education	43	25.3
University	60	35.3
Postgraduate degree	19	11.2
PhD degree	6	3.5
Family status		
Unmarried	39	22.9
Married	83	48.8
Cohabiting	14	8.2
Divorced	10	5.9
Widowed	24	14.1
Children		
No	61	35.9
Yes	10.9	74.1
Residence		
Alone	39	22.9
With parents	17	10
With roommate	1	0.6
With partner	100	58.8
With relatives	13	7.6
Place of residence		
Capital city	15	8.8
City	113	66.5
Rural town	16	9.4
Village	26	15.3
Employment		
Full-time	79	46.5
Part-time	11	6.5
Student	7	4.1
Household	18	10.6
Retired	48	28.2
Unemployed	7	4.1
Financial status		
Not good	5	2.9
Somewhat good	18	10.6
Fair	77	45.3
Fairly good	64	37.6
Very good	6	3.5

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Kinesiophobia

The internal consistency coefficient Cronbach's alpha for the TSK in the three consecutive measurements was 0.87, 0.82 and 0.76 respectively indicating very good reliability. The descriptive results for the TSK on the three consecutive measures are presented in Table 5. A statistically significant decrease in patients' kinesiophobia was found over time (p<0.001). The mean kinesiophobia score preoperatively indicates moderate to high level of kinesiophobia, the mean score after one month indicates moderate kinesiophobia and the mean score after six months indicates moderate to low level of kinesiophobia. Bivariate analysis between demographic, clinical characteristics of patients and the three subscale scores of PCS and total score of TSK preoperatively revealed that increasing age, decreasing educational level and increasing catastrophizing pain were associated with an increase in kinesiophobia. In addition, it was found that patients with children, unemployed, patients with a chronic disease, patients with past surgery and patients receiving medication for a chronic disease had greater kinesiophobia. Then, we conducted multivariable linear regression analysis with total score on TSK preoperatively as the dependent variable. We found that age and patients' inability to manage pain (helplessness) were significant predictors. In particular, increased age (coefficient beta=0.13, 95% confidence interval=0.07 to 0.19, p<0.001) and increased patients' inability to manage pain (coefficient beta=0.83, 95% confidence interval=0.62 to 1.04, p<0.001) were associated with increased total score on TSK preoperatively.

Table 2. *Clinical characteristics of patients.*

Characteristic	N	%
Chronic disease		
No	91	53.5
Yes	79	46.5
Type of chronic disease		
Cardiovascular	36	45.6
Respiratory	15	11.4
Diabetes	9	11.4
Renal	8	10.1
Orthopaedic	6	7.6
Other	5	6.3
Previous surgery		
No	93	54.7
Yes	77	45.3
Type of previous surgery		
Orthopedic	29	37.7
Gynaecological	21	27.3
Ophthalmological	12	15.6
Other	6	7.8
Medication for chronic disease		
No	98	57.6
Yes	72	42.4

Table 3. *Descriptive results for the PCS at the three consecutive measurements*

	Mean	Standard deviation	Median	Minimum value	Maximum value	P-value[a]
Rumination						<0.001
Preoperatively	12.4	2.8	13	1	16	
After one month	11.7	3.3	12	0	16	
After six months	3.2	3	2.5	0	13	
Magnification						<0.001
Preoperatively	8.4	2.5	8	0	12	
After one month	9.1	2.4	9.5	2	12	
After six months	4.9	2.5	5	0	12	
Helplessness						<0.001
Preoperatively	16.9	5.2	18	0	24	
After one month	16.1	5.0	17	0	24	
After six months	3.6	3.7	2	0	18	
Overall score						<0.001
Preoperatively	37.7	9.4	39.5	4	52	
After one month	36.9	9.8	39	3	52	
After six months	11.7	8.1	10	0	37	

[a]*Repeated measures analysis of variance.*

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Table 4. *Bivariate analysis between demographic and clinical characteristics of patients and total score on PCS preoperatively.*

Characteristic	Mean score	Standard deviation	P-value
Gender			0.6[a]
Female	37.4	9.8	
Male	38.1	9	
Age		0.5[b]	<0.001[b]
Educational level		-0.3[c]	<0.001[c]
Family status			0.2[a]
Unmarried/Divorced/Widowed	36.6	9.9	
Married/Cohabiting	38.6	9	
Children			<0.001[a]
No	33.3	9.7	
Yes	40.2	8.3	
Residence			0.2[a]
Alone	36.1	9.6	
Living with others	38.2	9.3	
Place of residence			0.3[a]
Capital city/City	37.2	9.5	
Rural town/Village	39.2	9.1	
Employment			<0.001[a]
No	40.6	8.1	
Yes	35.1	9.8	
Financial status		-0.1[c]	0.3[c]
Chronic disease			<0.001[a]
No	35.3	9.7	
Yes	40.5	8.3	
Previous surgery			0.01[a]
No	35.9	10	
Yes	39.8	8.2	
Medication for chronic disease			<0.001[a]
No	35	9.9	
Yes	41.4	7.3	

[a]Independent samples t-test; [b]Pearson's correlation coefficient; [c]Spearman's correlation coefficient.

Table 5. *Descriptive results for the TSK at the three consecutive measurements.*

	Mean	Standard deviation	Median	Minimum value	Maximum value	P-value[a]
Kinesiophobia score						<0.001
Preoperatively	52.4	8.6	52.5	29	68	
After one month	48	7.3	48	33	65	
After six months	37.2	6.5	37	19	53	

[a]Repeated measures analysis of variance.

Discussion

This study assessed preoperatively the extent of pain catastrophizing and kinesiophobia in patients diagnosed with OA and examined the relationship between the levels of pain catastrophizing and kinesiophobia. Findings showed that patients experienced high levels of catastrophizing pain and kinesiophobia preoperatively, with increased age positively influencing catastrophizing pain and kinesiophobia, while the PCS subscale, helplessness, positively influenced kinesiophobia. Moreover, despite the reduction in the values of catastrophizing pain and kinesiophobia postoperatively, they nevertheless persisted at levels signifying those patients encountered moderate degrees of both catastrophizing pain and kinesiophobia. Our results align with existing literature, indicating a reduction in both catastrophizing pain and kinesiophobia levels over time.[20] Elevated levels of catastrophic pain and kinesiophobia postoperatively impede patient mobilization and rehabilitation. Their alleviation can be efficiently accomplished through a variety of interventions.

Advanced patient age is a prognostic risk factor for heightened catastrophizing pain and kinesiophobia, as indicated by our data. This finding is consistent with similar findings in the literature.[21] Kinesiophobia and catastrophic pain are prevalent among elderly patients, necessitating special attention for this age group to ensure their inclusion in rehabilitation programs (incorporating both pharmacological and non-pharmacological interventions) and to promote adherence to these programs.[22] Telecare emerged as a significant form of intervention during and following the COVID-19 pandemic. This therapy modality offers advantages such as decreased patient travel and enhanced safety concerning infectious infections. Systematic reviews and meta-analyses have demonstrated the efficacy of telecare programs for patients with OA, which may also advantage older individuals.[23-25]

According to our findings the PCS subscale, helplessness, positively influenced kinesiophobia. The studies use catastrophizing pain and kinesiophobia as independent variables and examine their effect on the physical and mental health of patients with OA. The present study is the first to explore and highlight the relationship between catastrophizing pain and kinesiophobia. Studies have associated the existence of pain and perceptions of pain, but not catastrophizing pain, with kinesiophobia.[26] Consequently, therapies aimed at alleviating catastrophizing pain may also diminish kinesiophobia. A substantial body of studies has evidenced the efficacy of interventions aimed at alleviating catastrophizing pain, such as cognitive-behavioral therapy, including internet-based interventions, multimodal treatment, self-efficacy and acceptance and commitment therapy. Moreover, therapies targeting sleep can markedly diminish pain catastrophizing.[27-29]

Our study had several limitations. First, we cannot establish a causal relationship between catastrophizing pain and kinesiophobia since the estimation of these variables was cross-sectional. Second, we employed a convenience sample to collect our data. Thus, our sample cannot be representative of the OA population in Greece. In addition, the sample is relatively small, as it consists of 170 patients from two hospitals. And finally, as our study included patients who were hospitalized in public hospitals, the quality of services provided in these hospitals may have influenced their perceptions of catastrophizing pain and kinesiophobia. A comparison with private hospitals in Greece might have been useful, as patients receiving private surgical care have greater expectations for their treatment and increased satisfaction.[30]

Conclusions

OA constitutes a serious public health concern, since the pain endured by patients markedly impacts their quality of life and utilization of healthcare resources. A significant percentage of these patients exhibit catastrophizing pain and kinesiophobia, with older individuals being the most impacted, as per our findings. The tendency to catastrophize pain influences the level of kinesiophobia in preoperative OA patients, necessitating interventions to alleviate this pain to diminish kinesiophobia and optimize rehabilitation outcomes for these individuals.

List of abbreviations

OA, Osteoarthritis
PCS, Pain Catastrophizing Scale
TSK, Tampa Scale of Kinesiophobia

Contributions

AV prepared the research protocol, conducted the study and drafted the manuscript. IM helped in drafting the manuscript.PG provided the statistical analysis of the data. AM critically appraised the article. EP critically appraised the article. PS was responsible for the research protocol and critical review of the article.

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Conflict of interest

The authors declare no conflict of interest.

Ethics approval

The Ethics Committees of both the General University Hospital of Patras "Rio" and the General Hospital of Patras "Agios Andreas" approved our study protocol (Committee Sitting 25/16.07.2021 and Committee Sitting 14/28.07.2021 respectively). We conducted our study on an anonymous and voluntary basis after providing full information to participants upon which they gave their written consent.

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