



ORIGINAL RESEARCH

Investigation of the Relationship Between Physical Activity Levels and Depressive Symptoms in Patients with Chronic Musculoskeletal Pain

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ABSTRACT

The objective of the study is to examine the interaction between physical activity levels and depressive symptoms in patients with chronic musculoskeletal pain. The cross-sectional study included 50 patients with moderate or severe musculoskeletal pain (Visual Analogue Scale (VAS) ≥ 4) for more than 12 weeks. Participants' pain levels were assessed by VAS, physical activity levels by International Physical Activity Questionnaire and depressive symptoms by Beck Depression Scale. In the study, 66% of the participants were physically inactive; however, The analysis revealed no significant statistical connection between physical activity levels and depression scores ($p=0.96$). Although it is thought that physical inactivity may be one of the factors affecting depression in individuals with chronic pain, this study showed that other psychosocial factors that are effective on depression may be at the forefront. In conclusion, it was concluded that the effects of chronic pain on depression may not be explained only by physical activity level and more comprehensive and multidimensional studies are needed.

Introduction

Chronic pain, which is basically a group of the temporal classification of pain, is now recognised as a separate disease. It is characterised by a duration beyond the normal tissue healing time of 12 weeks. It causes disability, anxiety, depression, sleep disturbances and reduced quality of life (Geneen ve ark., 2017). It affects more than 30% of people worldwide and poses a serious socioeconomic burden (Cohen ve ark., 2021). In addition to psychological, social and biophysical factors, structural changes in the musculoskeletal system are also important in the chronicity of pain (Mokdad ve ark., 2018). As a result, the biomechanical and biopsychosocial structure of

the individual with chronic pain is disrupted (Ghamkhar ve Kahlaee, 2015).

Before the 1960s, chronic pain conditions were largely regarded as medical problems with clear pathophysiological foundations, treated primarily through physical methods such as surgery or medication. Treatment was recommended with rest and inactivity. However, today, chronic pain has begun to be defined from a biopsychosocial perspective. Furthermore, exercise has been shown to reduce the severity of chronic pain and has physical and psychosocial benefits (Jensen ve ark., 2014). Therefore, physical activity and exercise

programs have increasingly been promoted and offered in healthcare systems (Brønfort ve ark., 2004).

The biopsychosocial approach views pain and disability as the result of a multidimensional, dynamic interaction among physiological, psychological, and social factors, which influence one another and contribute to the development of complex pain syndromes. (Brønfort ve ark., 2004; Jensen ve ark., 2014). The overlap between the psychological state emphasized in this approach and chronic pain is widely accepted (Gatchel ve ark., 2014). Since pain is both a sensory and emotional experience, it is always necessary to assess the discomfort of pain or emotional responses to pain, together with pain intensity and other "sensory" characteristics. For this reason, it is important to determine how emotionally affected patients are, as well as how physically active they are, who have difficulty managing pain.

The positive effects of physical activity and exercise on pain management in patients with chronic pain are known (Geneen ve ark., 2017). On the other hand, physical activity levels and emotional states should be taken into consideration when planning exercise for individuals with chronic pain. In this context, the aim of this study is to investigate whether there is a relationship between physical activity levels and depressive symptoms in patients with chronic pain. Considering the biopsychosocial structure of humans and the fear-avoidance behavior that chronic pain can create, our hypothesis in this study was that physical activity levels would have an effect on the severity of depressive symptoms in patients with chronic pain and that depressive symptoms would be more severe in individuals with low physical activity levels.

Material and Methods

This cross-sectional study included patients with moderate or severe pain (pain intensity 4 and above according to visual analog scale (VAS)) originating from the musculoskeletal system for more than 12 weeks who started physiotherapy sessions at Sivas Numune Hospital between 01.08.2024 and 01.09.2024. 50 participants included in the study. Sample size was determined using the G*Power 3.1.9.7 program with $\alpha=0.05$ and effect size:0. It was calculated with 80% power for 40. Patients with any history of surgery, referred pain, pain originating from visceral organs, cancer history, age under 18, pain level under 4 according to VAS, thyroid dysfunction, anemia, metabolic disorders causing chronic pain such as vitamin D deficiency were not included in the study. A total of 12 patients were not included in the study because 7 of the 62 patients evaluated had pain severity below 4 and 5 had metabolic diseases associated with chronic pain. The research protocol was approved by the Sivas Cumhuriyet University Non-Invasive Procedures Ethics Committee with the date and number 2024/06-10, 27.06.2024. The rules of the Declaration of Helsinki and the Good Clinical Practice Guide were followed.

Age and gender, body anthropometric measurements such as height and weight, pain localization, and time elapsed since the onset of pain were recorded for participants who agreed to participate in the study. Then, pain level, mood, and physical activity levels were evaluated.

Visual Analog Scale (VAS) was used to measure the severity of pain in patients. VAS is a very common scale used in practice for pain assessment. In this scale, which is scored between 0 and 10, "0" indicates no pain, 1-3 mild pain, 4-6 A score of 0 to 10 indicates moderate pain, and a score of 7 to 10 indicates severe pain (Arslan et al., 2016). When applying this scale, patients were asked to give a score between 0 and 10, considering their average pain intensity over the last week.

The International Physical Activity Questionnaire Short Form was used to assess the physical activity levels of individuals. The intra-observer reliability of the Turkish version of this questionnaire was found to be 0.91 with a Cronbach's alpha value (Özdemir ve ark., 2014). For inter-observer reliability, Cronbach's alpha value was calculated as 0.83 (Çolak ve ark., 2011). This insightful scale is a patient-reported tool featuring seven thoughtfully crafted questions that explore the activities you've engaged in over the past week, along with the time dedicated to each. By capturing this information, it unveils your unique physical activity levels. Each recorded duration is multiplied by the corresponding metabolic equivalents for each activity, offering a nuanced understanding of your exertion. Ultimately, the average of these calculations reveals your overall physical activity score, providing a valuable reflection of your active lifestyle. (Saglam ve ark., 2010).

The evaluation of individuals' depressive symptoms was made with the Beck Depression Inventory. The reliability coefficient of the Turkish version of the BDI was reported as Cronbach's alpha value of 0.87 (Hisli, 1988). In the intra-observer reliability study, the Cronbach's alpha value was found to be 0.91, and the inter-observer reliability was determined as 0.85 (Karaoğlu ve ark., 2016). It is a 21-item scale that determines the risk of individuals for depression and evaluates the severity of depressive symptoms. Each item is scored between 0 and 3 on this scale, which has a maximum score of 63. Individuals with a total score between 1-10 are classified as normal, individuals with a score between 11-16 are classified as having mild mental distress, individuals with a score between 17-20 are classified as having depression, individuals with a score between 21-30 are classified as having moderate depression, individuals with a score between 31-40 are classified as having severe depression, and individuals with a score of 40 and above are classified as having very severe depression (Hisli, 1989).

Statistical analysis

Analyses were performed using SPSS v22 program. Visual methods and Shapiro-Wilk test were used to investigate the suitability of variables for normal distribution. Quantitative variables were presented with

mean (SD) or median (min-max) values, categorical variables with n (%). Chi-square test or Mann-Whitney U test was used to compare sociodemographic and clinical data of physically inactive and physically active participants. The relationship between physical activity levels and emotional state was investigated using Spearman correlation analysis. Type 1 error level was accepted as 0.05.

Results

A total of 50 patients, 45 (90%) female and 5 (10%) male, participated in this cross-sectional study. Thirteen (26%) of the participants had chronic knee pain, 10 (20%) hip pain, 13 (26%) low back pain, and 14 (28%) shoulder pain. Participants 33 (66%) were physically inactive and 17 were physically active. The mean age of the patients in the physically inactive group was 61.6 ± 12.5 years, average age of patients in the physically active group was 59.2 ± 10.1 years. The median pain level of physically inactive participants was 7(5-9), and the median pain level of physically active participants was 7(4-9). The sociodemographic data of the groups are shown in Table 1.

Table 1. Sociodemographic data of the participants

	Physically Inactive Participants (n=33)	Physically Active Participants (n=17)	p
Age, mean(SD)	61.6(12.5)	59.2(10.1)	0.34
Gender, female, n(%)	30(91)	15(88.2)	0.76
BMI, kg/m ² , mean(SD)	32.9(6.2)	31.4(5.1)	0.34
Educational Status			0.86
Primary education, n(%)	29(87.9)	15(89.3)	
Secondary education, n(%)	3(9.1)	22(11.8)	
Higher education, n(%)	1(3)		
Active working life, No, n(%)	31(93.9)	16(94.1)	0.98
Comorbidity, Yes, n(%)	18(54.5)	12(70.6)	0.36
Pain localization			0.67
Knee, n(%)	8(24.2)	5(29.4)	
Hip, n(%)	8(24.2)	2(11.8)	
Waist, n(%)	9(27.3)	4(23.5)	
Shoulder, n(%)	8(24.2)	6(35.3)	
Pain intensity, median(min-max)	7(5-9)	7(4-9)	0.95

The median Beck Depression Inventory score of physically inactive participants was 17 (5-44), accounting for 21.2% with minimal depression (n=7), 24.2% with mild depression (n=8), 33.3% of them had moderate depression (n=11), 21.2% of them had severe depression (n=7). The median Beck Depression Inventory score of the physically active participants was 18 (8-39), and when the depression levels were examined, the depression levels of the physically inactive patients were 5.9% with minimal depression (n=1), 35.3% of them were mildly depressed (n=6), 47.1% with moderate depression (n=8), 11.8% of them were at the level of severe depression (n=1) (Table 2).

Table 2. Depression levels of participants

	Physically Inactive Participants (n=33)	Physically Active Participants (n=17)	p
Beck depression inventory, median(min-max)	18(5-44)	18(8-39)	0.95
Depression Level			0.35
Minimal depression, n(%)	7(21.2)	1(5.9)	
Mild depression, n(%)	8(24.2)	6(35.3)	
Moderate depression, n(%)	11(33.3)	8(47.1)	
Severe depression, n(%)	7(21.2)	2(11.8)	

In addition to all our findings, no significant relationship was found between the physical activity level of the patients and the Beck depression score (p=0.96).

Discussion

In this study, which examined the relationship between physical activity levels and depression levels in patients with chronic pain, no statistically significant difference was found in the Beck Depression Inventory scores between physically inactive and physically active participants. Additionally, no relationship was found between physical activity level and depression level.

Chronic pain is a widespread, complex, and distressing issue that has a profound impact on individuals and society (Mills ve ark., 2019). Although the quality of evidence varies, numerous published systematic reviews have shown that physical activity has positive effects on individuals with chronic pain. It has been found to improve quality of life, enhance physical function, and reduce pain severity (Geneen ve ark., 2017; Marley ve ark., 2017). However, many studies have reported that individuals experiencing chronic pain have reduced physical activity levels, which are negatively affected (İncebacak, 2019; Parker ve ark., 2017; Toraman ve ark., 2021). Individuals gradually reduce their daily physical activities due to the fear that their pain will

worsen. In fact, in this study, the majority of participants had a low physical activity level. The inactivity caused by pain is explained by the fear-avoidance model. In this model, in the presence of chronic pain, individuals restrict their physical activity because they believe that activities will either cause pain or exacerbate it (İncebacak, 2019). Low physical activity levels and prolonged inactivity can increase the occurrence of pain or the severity of existing pain. This leads to more pain being felt in daily life, and the individual avoids movement due to the fear of facing the pain (Soysal ve ark., 2013). Thus, a self-reinforcing cycle is formed. Additionally, patients' emotional states, pain duration, and their approach to pain are influential factors in the development of fear-avoidance behaviors (İncebacak, 2019).

Chronic pain has numerous effects on individuals. One of these effects is on mood. Chronic pain has become a common health issue in clinical practice, evolving from just a symptom to a syndrome. It is frequently associated with psychiatric symptoms and signs (Tütüncü ve ark., 2011). Sometimes, chronic pain can be a symptom of depressive disorder, while at other times, it can lead to disturbances in an individual's emotional world as a physical disorder (Altındağ ve ark., 2006). Chronic pain is associated with all forms of depressive disorders. However, this relationship has not yet been fully understood. Some authors emphasize that chronic pain is a potent physical or psychological stressor that affects mood (Ohayon ve Schatzberg, 2003). While the prevalence of depression in the general population is 5-8%, the incidence of depression in patients with chronic pain ranges from 22% to 78% (Haythornthwaite ve ark., 1991). In studies where more specific criteria and structured interview techniques were used, this rate has varied between 8% and 50% (Aslan ve Nazliel, 2002). A meta-analysis conducted on patients with depression showed the pain prevalence to be 65% (Greist ve ark., 2008).

In general, as the duration of chronic pain increases, the emergence of depressive symptoms is expected. A correlation has been shown between pain duration and depression levels (Wenzel ve ark., 2002). There are many factors that affect depression in patients with chronic pain. These include the patient's social environment, age, being female, education level, being overweight, and having other chronic diseases (Fillingim ve ark., 2009; Fiske ve ark., 2009; Luppino ve ark., 2010). Due to the close relationship between physical inactivity and pain, it is believed that inactivity could be one of the contributing factors. The constant perception of discomfort from pain and the reduction of daily activities decrease the individual's pain tolerance, negatively affect quality of life, and create a predisposition to depression (Linton, 2000).

Many studies examining the relationship between physical activity and depression have found a significant association between the two. In a study conducted by Dankel et al. (2016), it was shown that inactive individuals and those with obesity or overweight levels had an increase in depressive symptoms. In a longitudinal study conducted by Camacho et al. (2009), it was observed that

among participants who initially did not have depressive symptoms, those with low levels of physical activity had a higher risk of depression compared to those with high levels of physical activity. Another study stated that physical activity plays a protective role against depression (Babiss ve ark., 2009). In the systematic review conducted by Mammen and Faulkner (2013), it is emphasized that increasing physical activity is an effective strategy in reducing the risk of depression. These studies demonstrate the impact of physical activity on depressive symptoms. However, in our study, while we expected depression to be more common in physically inactive individuals, contrary to our hypothesis, we found both groups to be similar. The cross-sectional nature of the study, the heterogeneity of the primary pain source, and our categorical assessment of physical activity levels using self-reported survey data may have contributed to this result. Additionally, in individuals with chronic pain, there are numerous factors related to depression within the biopsychosocial framework, such as social support, work and home life, and past psychological trauma. In our participants, factors other than physical activity may have been more prominent.

Our study has several limitations. The fact that the research was conducted within a short time frame, at a single center, and with a relatively small sample size, as well as the use of self-reported questionnaires for the scales, are limitations. Additionally, mood was only assessed using the Beck Depression Inventory, without evaluating anxiety levels, and due to the insufficient number of highly active participants, a third group could not be formed. These are the limitations of our study.

Conclusion

In our study examining the relationship between physical activity levels and mood in patients with chronic pain, it was observed that the majority of participants (66%) were physically inactive. However, no significant relationship was found between the physical activity level and depression level in patients with chronic pain. These results suggest that the effects of chronic pain on depression may not be solely explained by physical activity levels, and other factors (such as psychosocial support, pain perception, and quality of life) should also be considered. Further research with a larger sample size, where physical activity levels are assessed through objective measurements and in conjunction with other potential psychological variables, is needed. This could lead to the development of more effective strategies for managing chronic pain.

Declarations

Acknowledgments

Not Applicable

Conflict of Interest

Authors disclose no potential conflicts of interest.

Ethics Statement

Ethical approval for our study was obtained from the Non-Interventional Research Ethics Committee of Sivas Cumhuriyet University, with the decision number 2024/06-10.

Informed Consent

Written informed consent was obtained from all participants during the conduct of the study.

Author Contributions

R.S.Ö. and M.P. conceptualized the study, R.S.Ö. wrote the original draft, M.P. performed the statistical analysis, supervised the research and provided critical revisions. R.S.Ö. and M.P. developed the methodology and ensured compliance with ethical standards, R.S.Ö. conducted the experiments and collected the data. R.S.Ö. and M.P. curated the dataset and created the visualizations. M.P. reviewed and edited the manuscript for intellectual content and clarity.

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Data Availability

The data used to support the findings of this study can be made available upon request to the corresponding author.

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