

# DOES PHYSICAL ACTIVITY LEVELS HAVE EFFECT ON PAIN IN PATIENTS UNDERGOING PHYSICAL THERAPY? A SURVEY STUDY

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**Abstract:** The aim of this study was to investigate the effects of current physical activity levels on pain in patients included in a physical therapy program for various musculoskeletal diseases. The data were collected from 250 patients aged 35 to 65 years who were included in a physical therapy program, and diagnosed as cervical or lumbar spondylosis, lumbar or cervical herniated nucleus pulposus, carpal tunnel syndrome and gonarthrosis, Pain was assessed with visual analog scale (VAS) and physical activity was measured with a Physical Activity Assessment Questionnaire (PAAQ) and categorized based on metabolic equivalent value minutes per week (MET, min/weeks). Our results showed that physical activity levels were low in the majority of the cases and it was found that physical activity levels had no effect on pain. Male patients consumed more energy at workplace while female patients spent more energy in the household. It was found that gonarthrosis, obesity, being retirement or a housewife, and advanced age had negative effect on physical activity levels. Patients' physical activity levels must be increased without arising pain and weight control should be implemented.

**Keywords:** Osteoarthritis, physical activity, pain, physical therapy

## INTRODUCTION

Physical activity has many effects on the musculoskeletal system such as preservation and improvement of muscle strength, regulation of muscle tone, enhancement of stability by increasing muscle and joint control, preservation and increasing joint mobility, protection and improvement of the elasticity of muscles and joints (flexibility), enhancing physical activity tolerance and motion (fitness and endurance), and increasing physical protection against accidents, injuries, and disabilities (Bek, 2008). Joint destruction due to osteoarthritis (OA) occurs in most adults aged 35 to 65 years. This condition causes pain in the majority of people and adversely affects their daily lives. Physical activity strengthens the musculoskeletal system, particularly in the neck, back, and waist region, and may play an important role in preventing the development of diseases such as osteoarthritis that causes joint pain. Physical activity increases peoples' capacity to perform their duties and daily work (Rejeski et. al. 2006). Decrease in physical activity leads to decrease in muscle strength and muscle mass. The density of joint cartilage and the strength of bones, muscles, ligaments, and tendons also increase with physical activity (Soyuer et. al., 2008). Physiotherapy is especially applied in patients with hip, knee, and spine problems. Physical therapy decreases pain, stiffness, and muscle spasms and strengthens periarticular structures which improves patients' functional capacity and quality of life (Beyazova et al., 2000). Hot-packs, ultrasound therapy, shortwave diathermy, paraffin baths, and interferential currents are useful methods in reducing pain and muscle spasms, preventing contractures, and relieving stiffness (Beyazova et al., 2000). Muscle relaxation can be achieved with superficial and deep heaters, massage, or hydrotherapy. Local heat application improves blood flow, reduces pain, releases spasms, and provides general relaxation. Increased

blood flow accelerates the elimination of cellular metabolites. By acting on the free nerve endings, local heat application also provides analgesia and sedation (Oguz et al., 2004).

The source of pain in OA are the intra-articular and/or periarticular structures. It is important to determine the source of pain before initiating analgesic therapy. Cold application reduces muscle spindle activity and reduces pain by resolving spasms. Heat may be applied to deep tissues by means of physical therapy modalities such as shortwaves, microwaves, or ultrasound therapy (Oguz et al., 2004).

How a patient's physical activity level affects treatment of musculoskeletal diseases is unclear. The aim of this study was to determine the effect of existing physical activity levels on pain in patients undergoing physical therapy for musculoskeletal diseases.

## **MATERIAL AND METHOD**

The study included 250 patients who were admitted to an outpatient clinic of a tertiary level rehabilitation center and included in a physical therapy program with a diagnosis of various musculoskeletal system diseases. Age, gender, height, weight, body mass index (BMI), current diagnosis, medical history, education level, occupation, marital status, socio-demographic characteristics, and interrogated income status of each patient were recorded. The duration and types of physical therapy modalities which were included in the treatment (hot-pack, transcutaneous electrical nerve stimulation, ultrasound, short-wave diathermy and traction) program were noted for each patient.

Patients with acute radicular signs or symptoms and those who had radiographic evidence of inflammatory disease affecting the spine, neoplastic diseases, fractures, spondylolysis, spondylolisthesis, or scoliosis were excluded from the study. This study was approved by the Baskent University Hospital's Ethics Committee (KA10/10) and carried out according to the institutional guidelines and principles of the Declaration of Helsinki. All participants provided written informed consent form.

The clinical analysis on pain was performed by using visual analog scale (VAS) from one to ten before and after the treatment (Parmaksiz, 2007). Survey items to assess physical activity were based on those developed by Karaca et al, a validated and reliable measure (Karaca et al., 2000). Physical activity assessment questionnaire (PAAQ) was used to report the frequency and time duration in the previous week spent at work, during transportation, on household activities, on leisure activities, stairways, and during exercise. A physical activity score was calculated as the sum of the products of total time in each of the six categories of activity and the metabolic equivalent value (MET) assigned to each category. Previous studies have established that the amount of energy expended during household cleaning is 3.5 METs, food preparation is 2.0 METs, participating in hobbies such as playing music instruments is 2.0 METs, and jogging and swimming is 7.0 METs (Ainsworth et al., 2000). Patients' weekly physical activity levels were than categorized based on total METs minutes per week as (7): none (less than 40 METs minutes per week); very low (40–300 METs minutes per week); low (300–600 METs minutes per week); medium (600–1200 METs minutes per week); high (1200 METs minutes or more per week).

## Statistical Analysis

Statistical analyses were performed with SPSS software (statistical Package for the Social Sciences, version 16.0, SPSS Inc, Chicago, IL, USA). Descriptive statistics were reported as frequencies and means with standard deviations. One-way analysis of variance was used to evaluate gender, BMI, age, income level, education level, employment status, diagnosis, and physical activity level. The t-test was used to evaluate gender and physiotherapy. The Pearson Correlation Analysis was used to determine the correlation between PAAQ, age, BMI and VAS. A *P* value of less than 0.05 with 95 % confidence level was considered statistically significant.

## RESULTS

A total of 250 (193 women, 57 men) patients completed the survey. The patients' mean age, height, weight, and BMI were  $53.62 \pm 8.22$  years,  $163.62 \pm 7.02$  cm,  $75.87 \pm 11.80$  kg, and  $28.24 \pm 4.21$  kg/m<sup>2</sup> respectively. There were no significant differences between age, height, weight, or BMI ( $p > 0.05$ ), all the patients showed a homogeneous distribution. Most common diagnosis were lumbar spondylosis (20.8 %) and lumbar herniated nucleus pulposis (15.9 %). The diagnosis and physical activity levels of the patients are given in Table 1.

**Table 1. Descriptive characteristics of the patients.**

<b>Diagnosis</b>	<b>N</b>	<b>%</b>
Lumbar spondylosis	52	20.8
Cervical spondylosis	32	12.8
Lumbar herniated nucleus pulposis	39	15.6
Cervical herniated nucleus pulposis	12	4.8
Carpal tunnel syndrome	9	3.6
Gonarthrosis	32	12.8
Other (Coxarthrosis, Frozen shoulder)	74	29.6
Previous physiotherapy performed	130	52.0
Previous physiotherapy not performed	120	48.0
<b>Physical Activity Level</b>	<b>N</b>	<b>MET minutes per week</b>
None	5	2.0
Very low	232	92.8
Medium	13	5.2
High	0	0.0

None = 40 metabolic equivalent (METs) minutes per week; Very low = 40–300 METs minutes per week; Medium = 600–1200 METs minutes per week; High = 1200 METs minutes or more per week.

Physical activity levels were very low in 92.8 % (232 patients) of the patients. According to the PAAQ, men spent significantly more energy than women at work and during sports ( $p < 0.05$ ). While the majority of the women spent significantly more energy on household activities ( $p < 0.05$ ). There was no difference between men and women in total METs spent in one week (Table 2).

**Table 2: The relationship between PAAQ values and analysis of variance results by gender.**

PAAQ Parameters	Gender	N	Mean $\pm$ SD	T	P
METs spent at workplace	F	193	12.43 $\pm$ 32.05	-6.558	0.000**
	M	57	49.68 $\pm$ 52.60		
METs spent on transportation	F	193	10.02 $\pm$ 16.79	-1.825	0.069
	M	57	14.95 $\pm$ 21.39		
METs spent on household activities	F	193	132.20 $\pm$ 55.53	7.076	0.000**
	M	57	78.55 $\pm$ 25.61		
METs spent on leisure activity	F	193	27.00 $\pm$ 1.69	-0.987	0.325
	M	57	57.59 $\pm$ 3.20		
METs spent on stairs	F	193	2.79 $\pm$ 5.00	-0.056	0.956
	M	57	2.83 $\pm$ 3.83		
METs spent at sports	F	193	9.34 $\pm$ 13.99	-3.046	-0.003*
	M	57	18.22 $\pm$ 31.40		
Total METs spent in 1 week	F	193	166.10 $\pm$ 72.93	0.273	0.785
	M	57	163.14 $\pm$ 77.41		

PAAQ, physical activity assessment questionnaire; MET, metabolic equivalent; F, female; M, male; SD, standard deviation.

It was found that gonarthrosis, obesity, retirement or being a housewife and advanced age had negative effect on physical activity levels. The pre-treatment pain scores were higher in women than in men and similarly obese patients had higher pretreatment pain scores. It was found that income levels had no significant effect on neither physical activity levels nor pain VAS scores, however it was found that higher education levels also increase MET scores. When the patients' age groups and income levels were examined, no significant difference was found between the pre-treatment and post-treatment pain scores ( $p > 0.05$ ). Although patients VAS scores significantly decreased after physical therapy treatment (Table 3). It was found no relationship between physical activity levels and pain neither before nor after treatment (Table 4).

**Table 3. VAS scores before and after treatment.**

	<b>Pretreatment Pain Assessment (mean ± SD)</b>	<b>Post-treatment Pain Assessment (mean ± SD)</b>	<b>T</b>	<b>P</b>
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**Table 4. Relationship between physical activity levels and pain values**

	<b>Physical Activity Level</b>	<b>n</b>	<b>Pain Assessment (mean ± SD)</b>	<b>F</b>	<b>p</b>
<b>Pretreatment Pain</b>	None	5	6.20 ± 1.92	1.427	0.242
	Very low	232	6.77 ± 2.55		
	Low	13	7.92 ± 1.97		
<b>Post-treatment Pain</b>	None	5	2.60 ± 2.60	1.052	0.351
	Very low	232	2.71 ± 2.15		
	Low	13	3.61 ± 2.46		
<b>Difference (Pretreatment Pain – Post-treatment Pain)</b>	None	5	3.60 ± 2.88	0.126	0.882
	Very low	232	4.05 ± 2.66		
	Low	13	4.30 ± 3.44		

None = 40 metabolic equivalent (METs) minutes per week; Very low = 40–300 METs minutes per week; Low = 300–600 METs minutes per week.

<b>VAS (cm)</b>	6.82 ± 2.52	2.76 ± 2.18	23.71	<b>0.00*</b>
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\*p < 0.05 VAS, visual analog scale; SD, standard deviation.

## **DISCUSSION and CONCLUSION**

How physical activity levels of an individual affect the treatment of musculoskeletal diseases such as OA remains unclear. It was found that the majority of our patients (92.8 %) had an activity level of 40 to 300 METs minutes/week. This shows that patients undergoing physical therapy have a very low level of physical activity. Physical activity levels are reportedly influenced by gender, age, socioeconomic status, education, environmental factors (climate, weather, air pollution, etc.), and biological and psychological factors (Tucker et al., 2009; Clarke et al., 2007). Age, gender, and developmental properties affect participation in physical activity, and the socio-economic and cultural structure has a supportive role (Loland, 2004). Examination of

the PAAQ values according to gender revealed no difference in terms of the total METs spent in 1 week in our study. Hootman et al., (2003) found that physical activity was lower in women than men. The primary reason for the lower level of physical activity in women was lack of time due to responsibilities associated with childcare, housework, and business and other associations. We also found that women spent more METs on housework and men spent more METs in the workplace and on sports. However the number of women were significantly higher in the current study. Another study showed that, compared with women, men were found to more often maintain their physical activity habits into adulthood (Telama, 2005). Married women reportedly could not set aside time for physical activity and had increased responsibilities associated with having a child.

In the current study examination of the relationship between PAAQ parameters and BMI showed that the METs of 1 week spent at work and the total METs of 1 week were higher in patients with normal weight. The increasing prevalence of obesity was determined to be due to decreased levels of physical activity. Many other studies have also confirmed this inverse relationship between BMI and physical activity in all ages and both sexes (Parmaksiz, 2007).

Current study revealed that time spent performing physical activity decreases with age; in particular, physical activity spent in the workplace decreases. In another study, regular participation in physical activity by individuals aged >50 years was very low (Loland, 2004). Eck et al., (1992) examined the relationships of physical activity with age, education level, smoking status, and BMI. They found that physical activity is inversely proportional with education level and directly proportional with age.

Examination of the relationship between the PAAQ parameters and education level revealed that an increased education level was associated with an increased frequency of physical activity and that education level was associated with significant differences in some PAAQ parameters. Primary school graduates and university graduates spent significantly different amounts of METs in the workplace. These findings are consistent with the literature. When the level of education increases, participation in physical activity also increases (Kolt et al., 2004). Examination of the relationship between PAAQ values and occupation showed significant differences between the groups. The least active groups were pensioners and housewives, and the most active groups were patients working in other occupations.

Comparison of pain levels before and after treatment in all patients revealed significant differences consistent with the literature. Jamtvedt et al., (2008) found that electrotherapeutic agents reduced the pain associated with OA. It was difficult to fully measure the effectiveness of physiotherapy in this study because of the complex structure and communication between the patient and physiotherapist, the various physiotherapy agents, the treatment doses, and the type and frequency of predisposing factors.

Many studies have also evaluated the short-term effect of exercise on pain. This type of evaluation is useful with respect to patients' physical function and perception because physical activity is important to lead an active life; lack of physical activity is an important risk factor for dysfunction of patients with OA (Pisters et. Al.,2010). Examination of the relationship between education level and pain (difference between pretreatment and post-treatment pain) showed significant differences between university

graduates and patients with a primary education in our study. In one study, the incidence of arthritis was higher in patients with lower levels of education, and the authors stated that this situation indirectly affects pain (Zakkak et al.,2009).

An important limitation of our study was lack of sample size calculation. Physical activity levels of patients undergoing physiotherapy were very low in our study group, and the majority of such patients were overweight or obese. Again the diagnosis of the patients undergoing physical therapy were heterogeneous. Further studies should be well considered with more detailed and precise measurements of physical activity levels. Additionally, patients with similar diseases should be selected and the impact of physical activity on parameters such as muscle strength, endurance, balance, and daily living activities should be evaluated.

To help achieve these goals, the effectiveness of the physiotherapy program should be improved and weight control should be added to prevent arthritis. Our results show that being a housewife and retirement are important risk factors for physical inactivity. The importance of physical activity should be explained to especially to housewives and retirees, and physical activity recommendations should be submitted.

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