






Research Article | Araştırma Makalesi

COMPARISON OF MUSCULOSKELETAL SYSTEM PROBLEMS OF UNIVERSITY STUDENTS WHO PLAY AND DO NOT PLAY GUITAR

GİTAR ÇALAN VE ÇALMAYAN ÜNİVERSİTE ÖĞRENCİLERİNİN KAS-İSKELET SİSTEMİ PROBLEMLERİNİN KARŞILAŞTIRILMASI

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ABSTRACT

Objective: Musculoskeletal disorders can be observed in many professions, including professional musicians. The aim of this study is to compare musculoskeletal system problems between university students who play guitar as a leisure activity and those who do not.

Methods: The study included 64 university students aged 18-30, comprising 32 guitar players (guitar players group) and 32 non-guitar players (non-guitar players group). Pain levels of participants were assessed using the Short-Form McGill Pain Questionnaire (SF-MPQ), while the physical condition and functionality of their elbows and upper extremities were evaluated using the Quick Disability of Arm, Shoulder and Hand (Q-DASH) and the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) for musculoskeletal disorders.

Results: At the end of the study, differences were found between the two groups in CMDQ data for the back, right knee, and left knee ($p<0.05$). It was determined that guitar-playing students had more discomfort in the upper back region compared to non-guitar players ($p=0.048$), while non-guitar-playing students reported more discomfort in the right ($p=0.012$) and left knee ($p=0.006$) regions compared to guitar players.

Conclusion: In our study, there was a statistically significant difference in upper back pain in students who played guitar compared to those who did not play guitar. There was a statistically significant difference in knee pain in non-guitar players compared to those who played guitar. It is recommended that students who play guitar should be given physical ergonomics training and strengthening-stretching exercises for possible musculoskeletal problems.

Keywords: Musculoskeletal pain, music, postural disorders, risk factors

ÖZ

Amaç: Çalışma ile ilgili Kas İskelet Sistemi Rahatsızlıkları, profesyonel müzisyenler de dahil olmak üzere birçok meslekte görülebilmektedir. Bu çalışmanın amacı serbest zaman aktivitesi olarak gitar çalan üniversite öğrencileri ile enstrüman çalmayan üniversite öğrencileri arasındaki kas-iskelet sistemi problemlerini karşılaştırmaktır.

Yöntem: Çalışmaya 32 gitar çalan (gitar çalanlar grubu) ve 32 gitar çalmayan (gitar çalmayanlar grubu) olmak üzere 18-30 yaş arasında 64 üniversite öğrencisi dahil edildi. Katılımcıların ağrı seviyelerinin değerlendirilmesi Kısa-Form McGill-Melzack Ağrı Anketi (SF-MPQ), dirsek ve üst ekstremitelerinin fiziksel durumu ve fonksiyonelliği değerlendirilmesi Quick-Disability of Arm, Shoulder and Hand (Q-DASH) ve kas-iskelet sistemi rahatsızlıkları Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) ile değerlendirildi.

Bulgular: Çalışmanın sonunda iki grubun CMDQ sırt, sağ ve sol diz verilerinde farklılık tespit edildi ($p<0,05$). Gitar çalan öğrencilerin sırt bölgesinde rahatsızlıklarının gitar çalmayanlara göre daha fazla olduğu, gitar çalmayan öğrencilerin sağ ve sol diz bölgesi rahatsızlıklarının gitar çalan öğrencilere göre daha fazla olduğu tespit edildi.

Sonuç: Çalışmamızda, gitar çalan öğrencilerde, gitar çalmayanlara kıyasla sırt ağrısı istatistiksel olarak anlamlı bir farklılık göstermiştir. Gitar çalmayanlarda, gitar çalanlara göre diz ağrısı istatistiksel olarak anlamlı bir farklılık göstermiştir. Gitar çalan öğrencilere, oluşabilecek kas-iskelet sistemi problemlerine yönelik fiziksel ergonomi eğitimi ve kuvvetlendirme-germe egzersizleri verilmesi önerilir.

Anahtar Kelimeler: Kas-iskelet sistemi ağrısı, müzik, öğrenciler, duruş bozuklukları, risk faktörleri

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Introduction

Playing an instrument is a complex performance that requires the development and adaptation of the neuromuscular and somatosensory systems. Musicians spend a significant amount of their time practicing over the years to develop these complex movements.¹ Musicians may experience musculoskeletal disorders (MSDs) due to the long-term static activity of the proximal muscles of the torso and upper extremities, as well as the repetitive movements of the small finger and wrist muscles.²

Playing-related musculoskeletal disorders (PRMDs) associated with playing an instrument are defined as conditions that include symptoms such as pain, loss of control, numbness, and tingling that hinder the ability to play the instrument at a comfortable level.³ Risk factors for instrument-related MSDs include instrument size, shape, weight, and type, playing technique, playing position and posture of the musician, duration and intensity of playing, repertoire, and performance stress.^{3,4} Amateur musicians typically spend less time playing instruments compared to professional musicians, and their playing styles and techniques may vary. Sudden increases in playing time can be a risk factor for PRMDs associated with playing instruments in amateur musicians.^{3,4}

Due to the lack of longitudinal studies on the etiology of PRMDs observed in musicians, no causal relationships have been established.⁵ Various etiological factors, including occupational, personal, environmental, and psychosocial factors, may also contribute to these disorders.⁶ Similar to musicians, university students can also experience MSDs.⁷ The prevalence of musculoskeletal pain among university students, particularly medical students, has been found to be high, while it has been noted that there is no relationship between long study hours and computer use and MSDs outside of medical students.⁸ Among university students enrolled in health programs, the highest prevalence of musculoskeletal pain in the last seven days has been reported in the spine, particularly in the cervical and lumbar regions, followed by the upper extremity, especially the shoulder region.⁹

In the literature, there is no study comparing the MSDs of university students who play guitar as a leisure activity with those who do not play any musical instrument. This study aims to compare pain and MSDs between university students who play guitar and those who do not play any musical instrument.

Methods

Participants were selected from students studying at the Faculty of Health Sciences of a university located in western Turkey. No sampling method was used in the study; instead, students who agreed to participate after information was provided in student WhatsApp groups constituted the sample after a pilot study conducted.

Students who agreed to participate were informed about the purpose, duration, the nature of the procedures to be carried out, and the assessment methods, through written, verbal, and visual communication. Among the students who accepted to participate, those meeting the inclusion criteria were divided into two groups: guitar players and non-guitar players. University students who did not play any instrument were referred to as the "Non-Guitar Players Group," while those who played guitar were referred to as the "Guitar Players Group."

Inclusion criteria for the study were determined as being between 18-30 years of age, being a university student, and being willing to participate in the study. The non-guitar players group included students who had never played any instrument and had no musical background, while the guitar players group included students who had been playing guitar for at least one year and had received guitar training at a music institution or had previously received music training and were still playing guitar. Students with injuries that would affect performance, symptoms of nerve compression, those regularly taking medication for chronic pain treatment, those diagnosed with disc lesions, those with inflammatory joint disorders/orthopedic problems, and non-university students were excluded from the study.

Ethical approval was obtained from the ethics committee of a state university (2023, 37/13), institutional permission was granted from the university where the study was conducted, and written and verbal consent was obtained from the participating students. The rules stated in the Declaration of Helsinki were followed throughout the research.

In the assessment, after obtaining individuals socio-demographic information, pain levels were evaluated using the Short-Form McGill Pain Questionnaire (SF-MPQ), the physical condition and functionality of their elbows and upper extremities were evaluated using the Quick Disability of Arm, Shoulder, and Hand (Q-DASH), and musculoskeletal disorders were assessed using the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ). The data collection was conducted face-to-face. The Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was developed at Cornell University, and its Turkish reliability study was conducted by Erdiç O. *et al.* (2009). The CMDQ examines the frequency, intensity, and impact on work ability of musculoskeletal discomfort in 20 body parts over a period of 7 days. Responses on the frequency, severity, and work interference scales can be used for calculations in percentages or weights. The frequency scale assesses the frequency of experiencing musculoskeletal discomfort: "Did not feel at all: 0, felt 1-2 times during the week: 1.5, felt 3-4 times during the week: 3.5, felt once every day: 5, felt several times every day: 10." The severity scale evaluates the intensity of musculoskeletal discomfort: "Mildly severe: 1, moderately severe: 2, very severe: 3." The work interference scale assesses the impact of musculoskeletal discomfort on work ability: "Did not interfere at all: 1, interfered a little: 2, interfered a lot: 3".¹⁰

The Quick Disability of the Arm, Shoulder, and Hand (Q-DASH) is a self-reported questionnaire that measures the physical functions and symptoms of patients with upper extremity problems. The Q-DASH (Quick-DASH) questionnaire is a shortened version of the full thirty-item DASH questionnaire, created to develop a short, reliable, and valid measure of physical function and symptoms related to upper extremity musculoskeletal disorders. It contains eleven items and is similar to the DASH questionnaire in scoring and properties. Each item has five response options, and the total score for the scale is calculated from the individual item scores (0 = no disability and 100 = most severe disability). The first eight items of the Q-DASH measure the patient's daily living functions and social activity limitations. The ninth question assesses pain intensity, and the tenth question evaluates the sensation of "tingling" in the upper extremity. The last question is designed to assess sleep problems related to pain. The Q-DASH has been shown to be a more effective version than the DASH, preserving measurement properties. Its Turkish reliability study was conducted by Doğan S. K. *et al.* (2010).¹¹

The Short-Form McGill Pain Questionnaire (SF-MPQ) was developed by Dr. Melzack at McGill University in Canada in 1971. It is a self-administered pain questionnaire for patients with various diagnoses experiencing severe pain. It assesses both the quality and intensity of pain. The McGill-Melzack Pain Questionnaire (MPQ) is a multidimensional tool for pain assessment, consisting of three main sections. The first section describes how the pain feels, the second relates to the time course of the pain, and the third assesses the strength of the pain. In the first section, words that describe current pains are provided, and the respondent is asked to circle only the words that best describe their pain. The second section asks the respondent to use words that describe the pain and then inquires what alleviates the pain and what exacerbates it. The third section uses words representing increasing pain intensity to answer questions in the survey by writing the corresponding number of the pain descriptor in the space next to each question, totaling six questions. Points for responses are indicated numerically next to each answer in the questionnaire. The scores are summed, resulting in a total score between 0 and 112. In addition to the three main sections, there is a section featuring a human model to describe where the pains are located in the body. The practitioner marks the area of pain and describes it as "deep," "superficial," or "both deep and superficial." The Short-Form McGill Pain Questionnaire (SF-MPQ) consists of 15 defined words rated on the "intensity" scale (11 sensory, 4 perceptual). The total of the intensity levels of the selected words results in three pain scores. There is one question for current pain intensity and a Visual Analog Scale (VAS) for average pain. The Turkish reliability study was conducted by Yakut Y. *et al.* (2006).¹²

In the analysis of data obtained from the study, mean and standard deviation values were used for normally distributed data obtained by measurement, median

(25th – 75th Percentile) values for non-normally distributed data, and frequency and proportion values for categorical data. The normality of the measurement data was assessed using the Shapiro-Wilk test. The t-test was used for comparisons of normally distributed measurement data and the Mann-Whitney U test for comparisons of non-normally distributed measurement data. The Chi-square test was used for the analysis of categorical data. Data were analyzed using the SPSS 29 (IBM Corp., Armonk, NY, USA) software package.

Results

A total of 64 students participated in the study, comprising guitar players (n=32) and non-guitar players (n=32). Among the guitar players group, 15 were female (%46.9) and 17 were male (%53.1), while in the non-guitar players group, 13 were male (%40.6) and 19 were female (%59.4). The average duration of guitar playing for students in the guitar players group was 5.79 ± 6.20 hours per week, or 58.59 ± 54.82 minutes per day. There was no statistically significant difference in gender between the groups ($p=0.453$). The average age of the participants was 21.65 ± 1.72 years, and there was no statistically significant difference in demographic characteristics between the groups (Table 1).

Table 1. Demographic Characteristics of Participants

	Guitar Players Mean \pm SD	Non-guitar Players Mean \pm SD	<i>p</i>
Age (Year)	21.84 \pm 2.23	21.46 \pm 0.98	0.389
Body Mass Index (BMI)	22.89 \pm 3.44	22.43 \pm 3.15	0.578
Gender	15f- 17m	19f- 13m	0.453

f: female, m: male. Significance level $p<0.05$. Mann-Whitney U test and Chi-square test.

There was no statistically significant difference between the Q-DASH and SF-MPQ data of both groups ($p>0.05$) (Table 2).

Table 2. Participants' Q-DASH and SF-MPQ Data

	Guitar Players Median (25th - 75th Percentile)	Non-guitar Players Median (25th - 75th Percentile)	<i>p</i>
Q-DASH	16.00(13.00-21.00)	15.00(12.25-17.00)	0.162
Sensory Pain Score	4.00(3.00-6.00)	2.00(0.00-6.50)	0.094
Perceptual Pain Score	1.00(0.00-2.00)	0.00(0.00-2.00)	0.230
Total Pain Intensity	5.00(3.00-9.00)	2.50(0.25-8.50)	0.092
VAS (Visual Analog Scale)	3.00(1.00-4.00)	1.00(1.00-4.00)	0.101

*Significance level $p<0.05$. Mann-Whitney U test.

No statistically significant difference was found among the participants Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) data for the neck, right shoulder, left shoulder, right upper arm, left upper arm, lower back, right forearm, left forearm, right wrist, left wrist, hip, right thigh, left thigh, right calf, left calf, right foot, and left foot parameters ($p>0.05$).

Table 3. Participants' CMDQ Data

	Guitar Players Median (25th - 75th Percentile)	Non-guitar Players Median (25th - 75th Percentile)	p
Neck	3.00(0.37-6.75)	1.50(0.00-6.00)	0.217
Right shoulder	1.50(0.00-3.50)	0.00(0.00-3.00)	0.343
Left shoulder	1.50(0.00-3.50)	0.00(0.00-3.00)	0.146
Upper Back	3.00(0.00-14.00)	1.50(0.00-3.37)	0.048*
Right Upper Arm	0.00(0.00-0.00)	0.00(0.00-0.00)	0.731
Left Upper Arm	0.00(0.00-0.00)	0.00(0.00-0.00)	0.353
Lower Back	1.50(0.00-6.00)	1.50(0.00-5.75)	0.813
Right Forearm	0.00(0.00-0.00)	0.00(0.00-0.00)	0.226
Left Forearm	0.00(0.00-0.00)	0.00(0.00-0.00)	0.981
Right Wrist	0.75(0.00-1.50)	0.00(0.00-1.12)	0.073
Left Wrist	0.00(0.00-1.50)	0.00(0.00-1.12)	0.105
Hip	0.00(0.00-0.00)	0.00(0.00-1.50)	0.265
Right Thigh	0.00(0.00-1.50)	0.00(0.00-0.00)	0.059
Left Thigh	0.00(0.00-1.50)	0.00(0.00-0.00)	0.082
Right Knee	0.00(0.00-0.00)	0.00(0.00-2.62)	0.012*
Left Knee	0.00(0.00-0.00)	0.00(0.00-3.00)	0.006*
Right Calf	0.00(0.00-0.00)	0.00(0.00-0.00)	0.456
Left Calf	0.00(0.00-0.00)	0.00(0.00-0.00)	0.610
Right Foot	0.00(0.00-0.00)	0.00(0.00-0.00)	0.953
Left Foot	0.00(0.00-0.00)	0.00(0.00-1.12)	0.835

*Significance level $p < 0.05$. : Statistically significant ($p < 0.05$). Mann-Whitney U test.

However, a statistically significant difference was found between the CMDQ data for the upper back ($p = 0.048$), right knee ($p = 0.012$), and left knee ($p = 0.006$) of both groups ($p < 0.05$). The CMDQ data of the participants are presented in Table 3.

Discussion

In our study comparing musculoskeletal disorders (MSDs) among university students who play guitar and those who do not, we found that guitar-playing students reported a higher prevalence of upper back-related complaints than their non-guitar-playing counterparts. Furthermore, non-guitar-playing students reported more issues in their right and left knee regions compared to those who played guitar.

Musicians undergo rigorous training and conditioning to develop the skills necessary for accurate and effective instrument performance. As a result, they typically practice for an average of 5-6 hours per day.¹³ Remaining in a static position for long hours while playing an instrument, can lead to excessive strain on the body, resulting in pain and injuries accompanied by muscle imbalances and postural changes.¹⁴ The prevalence of PRMDs among music students varies between 43% and 63%, whereas this rate exceeds 80% among professional musicians.¹⁵ The average guitar playing duration of the students participating in our study was below the ideal time, and the PRMDs of guitar players were similar to those of non-players. A study conducted by Kaczorowska *et al.* reported a positive relationship between the hours spent playing an instrument weekly, the total years of playing, pain severity, and the frequency of discomfort. They concluded that as the weekly instrument playing time and the total playing years increased, the severity of pain also increased.¹⁶ In another study by Robitaille *et al.*,

involving 488 musicians, it was found that increasing playing time by 7 hours per week resulted in approximately a 15% increase in pain frequency. The study concluded that there is a relationship between playing time and both pain frequency and intensity, but no relationship was found with other risk factors.¹⁷

When we review the literature, in a study conducted by Martins *et al.*, that supports our findings, 140 musicians aged 18-55 were examined. It was reported that 15.7% of musicians experiencing PRMDs did not practice at all, 72.9% practiced only once a week, and 11.4% practiced daily. Participants reported their most common discomforts over the past 12 months in the following order: wrist/hand, shoulder, back, and lower back, foot/ankle, hip, and elbow regions. They concluded that there was no relationship between sociodemographic structure, lifestyle, general health, and instrument practice with musculoskeletal injuries.¹⁸

In another study involving 792 students from health-related departments of universities conducted by Morais *et al.*, the most common musculoskeletal problems were found in the spine region (74.9%). The cervical spine (51.0%) and lumbar spine (54.5%) had the highest prevalence of musculoskeletal problems. The upper extremity (54.1%) (Shoulder region 40.4%), and lower extremity (43.6%) (Knees 26.4%) were also identified as regions with high prevalence.¹⁹ It was found that students without leisure activities experienced more musculoskeletal problems. In our study, the higher incidence of right and left knee problems among non-guitar-playing health department students compared to guitar players may be attributed to the lack of leisure activities among non-players.

According to a study conducted by Zalpour *et al.*, it was found that the complaints related to the spine region were the highest among musicians (57.7%), while

complaints related to the lower extremities were much lower (7.9%). The most common complaints in the upper extremity were found among string instrument players (25.7%), while the lowest complaints were observed in musical groups (5.7%).²⁰ Similar to the result obtained in our study, where students who do not play the guitar have more right and left knee discomfort, a study conducted by Poot E. F. M. *et al.* to evaluate health department students reported that the most common complaints were neck, left shoulder, right shoulder, back, left upper arm, right upper arm, right and left knee.²¹ Similarly, in our study, non-guitar-playing students reported more knee discomfort. In another study examining PRMDs in 60 musicians, the most common problems were lumbar spine (46% in men & 94% in women), cervical spine (27% in men & 50% in women), and upper extremities (27% in men & 50% in women). The region with the least complaints was found to be the lower extremities (7.5% in men & 3% in women).¹⁶ A study by Portnoy *et al.* found that guitar players who sit while playing had a forward and rightward inclination of the spine.²² In our study, 32 total guitar players, 31 of them were playing guitar while seated, and the high incidence of back discomfort may be related to sitting while playing the guitar.

The limitations of our study include its single-center design and the lack of assessment of participants' physical activity levels, cell phone use and joint laxity. We believe that further studies evaluating the physical activity levels and joint laxity of participants are necessary in this area.

In our study, there was a statistically significant difference in upper back pain between guitar-playing students and those who did not play guitar. Conversely, non-guitar-playing students exhibited statistically significant differences in knee pain compared to guitar players. It is recommended that guitar-playing students receive physical ergonomics training and strength/stretching exercises to address potential musculoskeletal issues.

Ethical Approval

The study protocol was approved by Ethics Committee of Sakarya University of Applied Sciences (numbered (2023, 37/13)).

Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contributions

OBD, TE: Concept; OBD, TE, INB: Design; TE, INB, GM: Data Collection and Processing; OBD, CB: Analysis and Interpretation; TE, INB, GM: Literature Search; OBD, TE, CB: Writing, Reviewing and Editing. All the authors read and approved the final manuscript.

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