Ergonomi 9(2), 102 – 110, 2026
e-ISSN : 2651 - 4877

Ergonomics 9(2), 102 – 110, 2026
DOI: 10.33439/ ergonomi.1981963

INVESTIGATION OF THE RELATIONSHIP BETWEEN EMOTIONAL BURDEN AND MUSCULOSKELETAL PAIN AMONG OFFICE WORKERS

Çağlayan Pınar ÖZTÜRK[1*]

[1] Süleyman Demirel University, Isparta Vocational School of Health Services, Department of Therapy and Rehabilitation
ORCID No: http://orcid.org/0000-0002-7049-9746

Keywords

Emotional burden
Musculoskeletal pain
Office workers
Perceived stress
Ergonomics

Abstract

Although ergonomic factors are commonly considered the main causes of musculoskeletal disorders among office workers, the biopsychosocial model emphasizes holistic assessment. This study investigated the relationship between emotional burden and musculoskeletal pain among 101 administrative staff members at Süleyman Demirel University. Data were collected using a sociodemographic form, the Nordic Musculoskeletal Questionnaire, the Visual Analog Scale, the Perceived Stress Scale, and an adverse life events form. Correlation and linear regression analyses were performed. The mean age was 40.78±8.97 years, and 55.4% of participants were male. The most frequently reported painful regions were the neck (50.5%), upper back (44.6%), shoulder (41.6%), and lower back (40.6%). Perceived stress was positively associated with the number of painful body regions and with greater negative effects of pain on work performance, daily activities, concentration, work quality, and mood ($p<0.05$). It was also a significant predictor of pain intensity. These findings highlight the importance of considering psychosocial factors in the assessment and prevention of musculoskeletal pain among office workers.

OFİS ÇALIŞANLARINDA DUYGUSAL YÜK VE KAS İSKELET SİSTEMİ AĞRILARI ARASINDAKI İLİŞKİNİN İNCELENMESİ

Anahtar Kelimeler

Duygusal yük
Kas-iskelet sistemi rahatsızlıkları
Ofis çalışanları
Algılanan stres
Ergonomi

Öz

Ofis çalışanlarında kas-iskelet sistemi rahatsızlıklarının başlıca nedenleri ergonomik faktörler olarak görülse de biyopsikososyal model, bu sorunların bütüncül değerlendirilmesi gerektiğini vurgulamaktadır. Bu çalışmada, ofis çalışanlarında duygusal yük ile kas-iskelet sistemi ağrısı arasındaki ilişki incelenmiştir. Araştırmaya Süleyman Demirel Üniversitesi'nde görev yapan 101 idari personel dahil edilmiştir. Veriler; sosyodemografik bilgi formu, İskandinav Kas-İskelet Sistemi Anketi, Görsel Analog Skala, Algılanan Stres Ölçeği ve olumsuz yaşam olayları formu ile toplanmıştır. Değişkenler arasındaki ilişkiler korelasyon ve doğrusal regresyon analizleriyle değerlendirilmiştir. Katılımcıların yaş ortalaması 40,78±8,97 yıl olup %55,4'ü erkekti. En sık bildirilen ağrılı bölgeler boyun (%50,5), üst sırt (%44,6), omuz (%41,6) ve bel (%40,6) idi. Algılanan stres düzeyi, ağrılı vücut bölgesi sayısı ile pozitif yönde ilişkiliydi ($p<0,05$). Daha yüksek stres düzeyleri, ağrının iş performansı, günlük yaşam aktiviteleri, konsantrasyon, iş kalitesi ve ruh hali üzerindeki olumsuz etkilerinin artmasıyla ilişkiliydi ($p<0,05$). Ayrıca algılanan stres, ağrı şiddetinin anlamlı bir yordayıcısıydı. Bulgular, ofis çalışanlarında kas-iskelet sistemi ağrısının değerlendirilmesi ve önlenmesinde psikososyal faktörlerin dikkate alınması gerektiğini göstermektedir.

Araştırma Makalesi		Research Article	
Başvuru Tarihi	: 30.06.2026	Submission Date	: 30.06.2026
Kabul Tarihi	: 03.08.2026	Accepted Date	: 03.08.2026

* Corresponding author e-mail: caglayanozturk@sdu.edu.tr

1. Introduction

Musculoskeletal disorders (MSDs) are among the most common health problems associated with loss of work capacity, functional limitations, and reduced quality of life. Office workers are at risk of MSD-related pain due to prolonged sitting, computer use, and sedentary work postures (Alencar et al., 2025). Research indicates that more than 80% of office workers have experienced musculoskeletal symptoms in at least one body region within the past year, with the neck, lower back, and shoulders being the most affected regions (AlOmar et al., 2021; Mohammadian et al., 2025; Okan, 2023).

Although MSDs have traditionally been attributed to physical and ergonomic risk factors, it is now widely accepted that pain results from the interaction of biological, psychological, and social factors (Gatchel et al., 2007; Butler & Moseley, 2013). The biopsychosocial model has therefore become a widely adopted approach to the assessment and management of MSD-related pain (Sampath et al., 2021).

2. Review of Scientific Literature

Emotional burden is a broad concept referring to the psychological and emotional strain experienced by individuals when facing stressful, challenging, or negative events. Its scope may vary according to the population studied and the context and may include components such as perceived stress, emotional exhaustion, anxiety, negative affect, traumatic life experiences, and work-related emotional demands. Therefore, there is no single universally accepted operational definition of emotional burden in literature. In this study, the concept was addressed through perceived stress levels and adverse life events to reflect the general psychosocial strain experienced by office workers.

Significant associations have been identified between work-related stress and musculoskeletal symptoms among office workers (Mohammadian et al., 2025). Furthermore, workload and accumulated stress in employee populations have been associated with pain intensity and pain-related impairment (Brenner-Fliesser et al., 2024). Psychosocial work factors, such as effort-reward imbalance, have also been associated with musculoskeletal pain (Koch et al., 2014). Another study reported that the co-occurrence of perceived stress and musculoskeletal pain was associated with reduced work performance and work capacity (Lindegård et al., 2014).

In the current literature, there are very few studies that examine perceived stress, adverse life events, the number of painful regions, and the functional effects of pain together. Therefore, the aim of this study is to examine the relationship between emotional burden and musculoskeletal pain in office workers, to investigate the relationship between emotional burden and the number of painful regions, and to explore the effects of pain on work performance, daily life, concentration, work quality, and mood. In the present study, emotional burden was defined as perceived stress and adverse life events.

3. Method

3.1. Study Design and Participants

This cross-sectional study was conducted among administrative staff at Süleyman Demirel University. Individuals aged 18 years or older who had worked in desk-based jobs for at least one year and used a computer for at least 20 hours per week were eligible for inclusion. The survey link was sent to 150 staff members. Of the 116 individuals who completed the survey, 15 were excluded because of missing data or failure to meet the eligibility criteria, leaving 101 participants for analysis. According to a priori power analysis conducted using G*Power 3.1.9.7, the minimum required sample size was 84 participants, assuming a moderate effect size (r = .30), a significance level of .05, and statistical power of .80 (Faul et al., 2009).

3.2. Assessment Tools

Demographic information and adverse life events experienced during the previous month were collected using forms developed by the researchers. Musculoskeletal symptoms were assessed using the Nordic Musculoskeletal Questionnaire, while pain intensity and the functional impact of pain were evaluated using the Visual Analog Scale (VAS). Perceived stress levels were assessed using the Perceived Stress Scale (PSS) (Hawker et al., 2011; Cohen et al., 1983; Eskin et al., 2013; Kahraman et al., 2016; Kuorinka et al., 1987).

The Nordic Musculoskeletal Questionnaire was used to assess symptoms in various body regions, including the neck, shoulders, upper back, lower back, and upper and lower extremities, during the previous

12 months and 7 days (Kahraman et al., 2016; Kuorinka et al., 1987). The VAS was used to rate pain intensity and the impact of pain on work performance, activities of daily living, concentration, work quality, and mood on a scale from 0 to 10 (Hawker et al., 2011). Perceived stress was assessed using the 14-item Perceived Stress Scale, which evaluates the extent to which individuals perceive their lives as stressful, uncontrollable, and unpredictable during the previous month (Cohen et al., 1983; Eskin et al., 2013). The adverse life events form was prepared by researchers to assess health problems, financial difficulties, increased workload, loss of a loved one, and similar stressful events experienced during the previous month.

3.3. Statistical Analysis

This study aimed at answering the following questions:

(H1) Is there a relationship between perceived stress and adverse life events, the number of painful body regions, and pain intensity?

(H2) Is there a relationship between perceived stress and adverse life events, and the effects of pain on work performance, activities of daily living, concentration, work quality, and mood?

Statistical analyses were performed using IBM SPSS Statistics Version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean ± standard deviation, median, and minimum–maximum values, whereas categorical variables were expressed as frequencies and percentages. The assumption of normality was evaluated based on skewness and kurtosis falling within the range of −2 to +2. Pearson correlation coefficients were calculated to assess the relationships between variables. Statistical significance was set at $p < .05$. Correlation coefficients were interpreted according to their absolute magnitude based on Cohen's classification: values of .10–.29 were considered weak, .30–.49 moderate, and ≥ .50 strong (Cohen, 1988).

4. Results

Among the 101 administrative staff members included in the study, 55.4% were male, 44.6% were female, and 69.3% were married. The participants' mean age was 40.78 ± 8.97 years, and their mean BMI was 28.16 ± 4.90 kg/m^2. Most participants were right-handed (91.1%) and had no chronic illnesses (64.4%). For 76.2% of the participants, daily smartphone usage was 4 hours or less. Exercise patterns were classified as follows: those who did not exercise (54.5%), those who exercised 1–2 days per week (29.7%), and those who exercised 3 or more days per week (15.8%). The duration of uninterrupted work was categorized as those who took a break within one hour (80.2%) and those who worked for one hour or longer without a break (19.8%) (Table 1).

Table 1. Demographic and Work-Related Characteristics of Participants

Variables	Sub-Groups	Mean ± SD	Min-Max	n (%)
Age (years)		40.78 ± 8.97	20–60	
Height (cm)		168.88 ± 8.83	150–190	
Weight (kg)		80.40 ± 15.85	45–135	
BMI (kg/m^2)		28.16 ± 4.90	15.57–40.83	
Gender	Female			45 (44.6)
	Male			56 (55.4)
Marital status	Single			31 (30.7)
	Married			70 (69.3)
Dominant hand	Right			92 (91.1)
	Left			9 (8.9)
Chronic illness	Yes			36 (35.6)
	No			65 (64.4)
Daily smartphone use (hours)	≤4 hours			77 (76.2)
	>4 hours			24 (23.8)
Uninterrupted work time (hours)	≤1 hour			81 (80.2)
	>1 hour			20 (19.8)
Exercise frequency (days/week)	None			55 (54.5)
	1-2 days			30 (29.7)
	≥3 days			16 (15.8)

Total participants: 101, BMI, body mass index; SD, standard deviation; Min, minimum; Max, maximum.

An analysis of musculoskeletal pain reported by participants over the past 12 months revealed that the most affected regions were the neck (50.5%), upper back (44.6%), shoulders (41.6%), and lower back (40.6%). Pain-related limitations in daily activities were most frequently observed in the neck (23.8%), lower back (21.8%), shoulders (16.8%), and upper back (15.8%) regions. While 13.9% of participants reported experiencing no pain in any region over the past 12 months, 52.5% reported experiencing no pain-related functional limitations. Overall, the neck, lower back, shoulders, and upper back emerged as the most affected anatomical regions in terms of both pain prevalence and functional impairment (Table 2).

Table 2. Musculoskeletal Pain-Related Disability Reported by Participants Over the Past 12 Months

Region	Pain Frequency n (%)	Disability Frequency n (%)
Neck	51 (50.5)	24 (23.8)
Shoulder	42 (41.6)	17 (16.8)
Upper Back	45 (44.6)	16 (15.8)
Elbow	19 (18.8)	4 (4.0)

Hand / Wrist	25 (24.8)	10 (9.9)
Lower Back	41 (40.6)	22 (21.8)
Hip / Thigh	20 (19.8)	5 (5.0)
Knee	39 (38.6)	9 (8.9)
Foot / Ankle	28 (27.7)	7 (6.9)
None	14 (13.9)	53 (52.5)

Total participants: 101, n: Number of Participants

When participants' musculoskeletal pain over the past seven days was examined, the most affected regions were found to be the neck (51.5%), upper back (45.5%), shoulders (42.6%), lower back (41.6%), and knees (38.6%). The lowest prevalence of pain was observed in the elbow (19.8%) and hip/thigh (20.8%) regions. In terms of pain intensity, the highest average values were observed in the neck (3.03 ± 3.18), lower back (2.61 ± 3.38), shoulder (2.59 ± 3.27), and upper back (2.57 ± 3.10) regions, while the lowest value was found in the elbow region (0.95 ± 2.09). The median pain intensity was 2 only in the neck region, while it was 0 in all other regions. Overall, pain was concentrated in the upper trunk and trunk-centered regions, and the neck region was found to be the most affected anatomical region in terms of both prevalence and pain intensity (Table 3).

Table 3. Prevalence and Severity of Musculoskeletal Pain Within the Past 7 Days

Regions	Pain Frequency (n (%))	VAS Mean ± SD	VAS Median (IQR	VAS Min–Max
Neck	52 (51.5)	3.03 ± 3.18	2 (6)	0–10
Shoulder	43 (42.6)	2.59 ± 3.27	0 (6)	0–10
Upper Back	46 (45.5)	2.57 ± 3.10	0 (6)	0–10
Elbow	20 (19.8)	0.95 ± 2.09	0 (0)	0–8
Wrist	26 (25.7)	1.21 ± 2.19	0 (2)	0–8
Lower Back	42 (41.6)	2.61 ± 3.38	0 (6)	0–10
Hip/Thigh	21 (20.8)	1.21 ± 2.52	0 (0)	0–8
Knee	39 (38.6)	2.14 ± 2.98	0 (4)	0–10
Foot/Ankle	28 (27.7)	1.50 ± 2.58	0 (4)	0–8

Total participants: 101, SD: Standard Deviation, IQR: interquartile range (25th–75th percentile), Min: Minimum, Max: Maximum, n: Number of participants, VAS: Visual Analog Scale

Participants' total scores on the Perceived Stress Scale averaged 38.38 ± 10.62; scores ranged from 14 to 54. When adverse life events experienced in the past month were examined, it was found that 63.4% of participants reported no adverse events, while 36.6% reported experiencing at least one adverse life event. The most frequently reported adverse life event was health problems that affected daily activities for more than a week (17.8%); this was followed by financial difficulties (10.9%) and a significant increase in workload (8.9%). 3.0% of participants reported experiencing a serious problem or conflict at work, while 3.0% reported the loss of a close family member. In terms of the number of events experienced, 31.7% of participants reported experiencing one, 3.0% reported two, and 2.0% reported three different adverse life events (Table 4).

Table 4. Perceived Stress Levels and Adverse Life Events Experienced in The Past Month

Variables	Mean ± SD	Min–Max	n (%)
PSS Total Score	38.38 ± 10.62	14–54	-
Number of adverse life events experienced			
No adverse life events experienced			64 (63.4)
1 adverse life event experienced			32 (31.7)
2 adverse life events experienced			3 (3.0)
3 adverse life events experienced			2 (2.0)
Adverse life events experienced in the past month*			
Health problem affecting daily activities			18 (17.8)
Experiencing greater-than-usual financial difficulties			11 (10.9)
Significant increase in workload			9 (8.9)
Serious problem/conflict at work			3 (3.0)
Loss of a close family member			3 (3.0)
Hospitalization			0 (0.0)
Unwanted change of residence			0 (0.0)
End of a romantic relationship			0 (0.0)
Being physically assaulted			0 (0.0)
Experiencing theft/robbery			0 (0.0)

Total participants: 101. SD: Standard Deviation. Min: Minimum. Max: Maximum. n: Number of participants PSS: Perceived Stress Scale

According to the results of the correlation analysis, the number of painful areas was correlated with difficulty performing tasks (r=0.582; p<0.001), difficulty with activities of daily living (r=0.544; p<0.001), difficulty concentrating (r=0.602; p<0.001), a decline in work quality (r=0.556; p<0.001), and a negative impact on mood (r=0.565; p<0.001). In addition, a weak but statistically significant positive correlation was found between the total perceived stress score and the number of painful areas (r = 0.221; p = 0.026). These results indicate that an increase in the number of painful areas has a greater negative impact on individuals' daily functioning and psychological well-being (Table 5).

While a weak positive correlation was found between perceived stress levels and difficulty performing tasks (r = 0.272; p = 0.006), a strong positive correlation was found between perceived stress levels and difficulty with daily living activities (r = 0.313; p=0.001), difficulty concentrating (r=0.358; p<0.001), a decline in work quality (r=0.355; p<0.001), and a negative impact on mood (r=0.437; p<0.001). The strongest relationship was observed between perceived stress and the negative impact on mood (r=0.437). These findings indicate that an increase in perceived stress levels is associated with functional limitations and psychological distress (Table 5).

Table 5. Relationships Between the Number of Painful Regions, Pain-Related Impairment, and Perceived Stress

	Number of Painful Regions		Perceived Stress	
Variables	**Correlation coefficient**	***p value***	**Correlation coefficient**	***p value***
Difficulty performing tasks	0.582	<0.001	0.272	0.006
Difficulty in daily life	0.544	<0.001	0.313	0.001
Difficulty concentrating	0.602	<0.001	0.358	<0.001
Decline in work quality	0.556	<0.001	0.355	<0.001
Negative impact on mood	0.565	<0.001	0.437	<0.001
Total perceived stress score	0.221	0.026		

Total participants: 101. r: correlation coefficient. *p*: probability value / significance level. level of statistical significance

According to the results of the hierarchical regression analysis, after controlling gender, work experience, exercise routine, daily smartphone use, and uninterrupted work time, it was found that perceived stress scores did not make a statistically significant contribution to the number of painful areas (β=0.144; p=0.156). In contrast, perceived stress scores were found to be a significant and independent predictor of total pain intensity (β=0.225; p=0.025). With the inclusion of perceived stress in the model, the proportion of variance explained for total pain intensity increased from 13.8% to 18.3%, adding 4.5% to the model's explanatory power (ΔR^2=0.045). These findings indicate that perceived stress is more closely related to pain intensity than to the number of body regions where pain is felt, and that as stress levels increase, the total pain intensity experienced by individuals also increases (Table 6).

Table 6. Results of The Hierarchical Regression Analysis

Variables	**Number of Painful Regions β**	**p**	**Total Pain Intensity (VAS) β**	**p**
Gender	-0.247	0.025	-0.174	0.103
Work Experience	0.071	0.477	0.028	0.772
Exercise routine	-0.065	0.510	-0.092	0.342
Smartphone use ≥4 hours	0.118	0.234	0.145	0.136
Continuous work time	0.086	0.390	0.149	0.129
Perceived stress (PSS)	0.144	0.156	0.225	0.025*
R^2 (Final Model)	0.146		0.183	
Adjusted R^2	0.091		0.131	
ΔR^2 (PSS contribution)	0.019	0.156	0.045	0.025*
Model F	2.668	0.020*	3.511	0.004**

β = standardized regression coefficient. p = significance level (*p<0.05.*p<0.005). R^2 = coefficient of determination. ΔR^2 = the additional explained variance provided by the variable added to the model.

5. Discussion and Conclusion

This study revealed that the most common musculoskeletal pain among office workers is concentrated in the neck, upper back, shoulder, and lower back regions, and a significant positive correlation was found between perceived stress levels and the number of painful regions. Also, it was observed that as perceived stress levels increased, the negative effects of pain on work performance, daily living activities, concentration, work quality, and mood also increased. In particular, the fact that the relationship between stress and mood is stronger than the relationship with other variables points to the psychological dimension of musculoskeletal pain. In addition, although this study found that perceived stress levels were not an independent predictor of the number of painful areas, they were found to be a significant predictor of total pain intensity. This finding suggests that psychosocial factors may influence the intensity of the pain experience rather than the anatomical distribution of musculoskeletal pain. In other words, even if individuals with high stress levels do not report a greater number of painful areas, they may perceive their existing pain as more severe.

In our study, it was determined that the neck region was the most affected anatomical region in terms of both pain prevalence and functional impairment. This finding is consistent with previous studies reporting that the neck, shoulders, and lower back are the most affected regions among office workers (AlOmar et al., 2021; Mohammadian et al., 2025; Mutlu & Yılmaz, 2025). It is believed that prolonged sitting, computer use, and static postures may be associated with this condition because they increase mechanical load, particularly in the cervical region.

Our study found that female employees have a greater number of painful areas compared to male employees. This finding is consistent with previous studies reporting that musculoskeletal pain is more prevalent among women. While Wijnhoven et al. (2006) reported that the prevalence of musculoskeletal pain is systematically higher in women than in men, Overstreet et al. (2023) reported that women exhibit more frequent and more severe clinical symptoms in common musculoskeletal conditions such as neck pain, low back pain, osteoarthritis, and rheumatoid arthritis. It is noted that this difference may stem from hormonal, biological, and pain perception mechanisms, as well as psychosocial factors (Wijnhoven et al., 2006; Overstreet et al., 2023).

The most important finding of the study is that perceived stress levels are associated with both the number of painful regions and the functional effects of pain. This result indicates that musculoskeletal pain cannot be explained by physical factors alone. Systematic reviews examining the relationship between psychosocial work factors and musculoskeletal disorders have reported that factors such as job demands, job control, and social support are associated with the development and progression of pain (Bezzina et al., 2023). Similarly, work-related stress has been associated with musculoskeletal complaints, while accumulated stress has been linked to greater pain intensity and pain-related impairment (Brenner-Fliesser et al., 2024; Darvishi et al., 2024) This finding is consistent with the biopsychosocial model, which posits that musculoskeletal pain is shaped by the interaction of biological, psychological, and social factors (Gatchel et al., 2007; Sampath et al., 2021).

In our study, we found that as perceived stress levels increased, so did the effects of pain on work performance, daily life, and concentration. This finding is consistent with studies reporting that musculoskeletal pain negatively affects work functioning and quality of life (Mutlu & Yılmaz, 2025). Furthermore, it has been reported that the co-occurrence of pain and stress is associated with a decrease in work performance and work capacity (Lindegård et al., 2014). Masłoń et al. (2024) reported an association between perceived stress and musculoskeletal pain among nurses and emphasized the importance of psychosocial factors. Yıkılmaz et al. (2024) showed that musculoskeletal pain increases levels of burnout and reported that pain can have psychological and occupational consequences. The results of this study also point to a similar situation. This indicates that musculoskeletal pain should be addressed not only as a physical health issue but also as an occupational health issue related to workers' productivity and psychological well-being.

The fact that approximately one-third of the participants reported experiencing at least one adverse life event in the past month indicates that psychosocial burdens outside the workplace can also affect office workers' health.

Finally, our study has shown that perceived stress is an independent predictor of total pain intensity. This finding can be explained by various biopsychosocial mechanisms. First, central sensitization has been reported to be associated with pain intensity, functional impairment, and psychological distress (Dahmani et al., 2023). Furthermore, it has been noted that the relationship between stress and pain is bidirectional: while increased stress levels heighten pain sensitivity, pain also elevates stress levels, thereby creating a self-perpetuating cycle (Aboushaar and Serrano, 2024). Furthermore, workplace stressors have been shown to increase muscle activity, particularly in the neck and shoulder regions, and sustained muscle activity may contribute to increased pain intensity (Eijckelhof et al., 2013). When these mechanisms are considered together, it is

expected that individuals with high stress levels will perceive their existing pain as more intense, even if the number of painful areas remains unchanged.

This study has some limitations. Due to its cross-sectional design, causal inferences cannot be drawn. Furthermore, the fact that the data collected based on self-reports may have led to recall bias. Finally, the fact that the sample consisted of administrative staff working at a single institution limits the generalizability of the results.

In conclusion, it has been demonstrated that musculoskeletal pain is associated with psychosocial factors and that stress management should be considered in preventive measures for office workers. It is believed that future longitudinal studies will shed more light on the causal nature of this relationship.

Ethical Approval and Consent to Participate

Ethical approval was obtained from the Süleyman Demirel University Health Sciences Ethics Committee (Decision No. 98/17; June 27, 2025), and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Acknowledgements

The author would like to thank all administrative staff at Süleyman Demirel University who voluntarily participated in this study.

Funding

None

Conflict of Interest

No conflict of interest was declared by the authors**.**

References

Aboushaar, N., Serrano, N. (2024). The Mutually Reinforcing Dynamics Between Pain and Stress: Mechanisms, Impacts and Management Strategies. Frontiers in Pain Research, 5, 1445280. https://doi.org/10.3389/fpain.2024.1445280

Alencar, M. C. B., Silva, N. R., Serranheira, F. (2025). Musculoskeletal Pain and Risk Factors in Office Workers Versus Teleworkers: A Systematic Review. Work, 80(3). https://doi.org/10.1177/10519815241289675

AlOmar, R. S., AlShammari, M. A., AlSaudi, M. A., Almulhem, M. A., AlHashem, A. M., Alhibshi, A. M., et al. (2021). Musculoskeletal Symptoms and Their Associated Risk Factors Among Saudi Office Workers. BMC Musculoskeletal Disorders, 22(1), 308. https://doi.org/10.1186/s12891-021-04652-4

Bezzina, A., Austin, E., Nguyen, H., James, C. (2023). Workplace Psychosocial Factors and Their Association with Musculoskeletal Disorders: A Systematic Review of Longitudinal Studies. Workplace Health & Safety, 71(12), 578–588. https://doi.org/10.1177/21650799231193578

Brenner-Fliesser, M., Houtenbos, S., Ewerton, M., Bontrup, C., Visscher, R., Taylor, W. R., et al. (2024). The Association of Different Types of Stress, and Stress Accumulation with Low Back Pain in Call-Center Workers: A Cross-Sectional Observational Study. BMC Musculoskeletal Disorders, 25, 971. https://doi.org/10.1186/s12891-024-08087-5

Butler, D. S., Moseley, G. L. (2013). Explain Pain (2nd ed.). Noigroup Publications.

Cohen, J. (1988). Statistical Power Analysis for The Behavioral Sciences (2nd ed.). Lawrence Erlbaum Associates.

Cohen, S., Kamarck, T., Mermelstein, R. (1983). A Global Measure of Perceived Stress. Journal of Health and Social Behavior, 24(4), 385–396. https://doi.org/10.2307/2136404

Dahmani, D., Taik, F. Z., Berrichi, I., Fourtassi, M., Abourazzak, F. E., Taik, M. (2023). Impact of Central Sensitization on Pain, Disability and Psychological Distress in Patients with Knee Osteoarthritis and Chronic Low Back Pain. BMC Musculoskeletal Disorders, 24(1), 877. https://doi.org/10.1186/s12891-023-07019-z

Darvishi, E., Osmani, H., Aghaei, A., Moloud, E. A. (2024). Hidden Risk Factors and The Mediating Role of Sleep in Work-Related Musculoskeletal Discomforts. BMC Musculoskeletal Disorders, 25, 256. https://doi.org/10.1186/s12891-024-07387-0

Eijckelhof, B. H. W., Huysmans, M. A., Bruno Garza, J. L., Blatter, B. M., van Dieën, J. H., Dennerlein, J. T., van der Beek, A. J. (2013). The Effects of Workplace Stressors on Muscle Activity in The Neck-Shoulder and Forearm Muscles During Computer Work: A Systematic Review and Meta-Analysis. European Journal of Applied Physiology, 113(12), 2897–2912. https://doi.org/10.1007/s00421-013-2602-2

Eskin, M., Harlak, H., Demirkıran, F., Dereboy, Ç. (2013). The Adaptation of The Perceived Stress Scale into Turkish. New Symposium Journal, 51(3), 132–140.

Faul, F., Erdfelder, E., Buchner, A., Lang, A. G. (2009). Statistical Power Analyses Using G*Power 3.1: Tests for Correlation and Regression Analyses. Behavior Research Methods, 41(4), 1149–1160. https://doi.org/10.3758/BRM.41.4.1149

Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., Turk, D. C. (2007). The Biopsychosocial Approach to Chronic Pain: Scientific Advances and Future Directions. Psychological Bulletin, 133(4), 581–624. https://doi.org/10.1037/0033-2909.133.4.581

George, D., Mallery, P. (2019). IBM SPSS Statistics 26 Step by Step: A Simple Guide and Reference (16th ed.). Routledge.

Hawker, G. A., Mian, S., Kendzerska, T., French, M. (2011). Measures of adult Pain: Visual Analog Scale for Pain (VAS pain), Numeric Rating Scale for Pain (NRS pain), McGill Pain Questionnaire (MPQ), Short-Form Mcgill Pain Questionnaire (SF-MPQ), Chronic Pain Grade Scale (CPGS), Short Form-36 Bodily Pain Scale (SF-36 BPS), and Measure of Intermittent and Constant Osteoarthritis Pain (ICOAP). Arthritis Care & Research, 63(S11), S240–S252. https://doi.org/10.1002/acr.20543

Kahraman, T., Genç, A., Göz, E. (2016). The Nordic Musculoskeletal Questionnaire: Cross-cultural Adaptation into Turkish Assessing Its Psychometric Properties. Disability and Rehabilitation, 38(21), 2153–2160. https://doi.org/10.3109/09638288.2015.1114034

Koch, P., Schablon, A., Latza, U., Nienhaus, A. (2014). Musculoskeletal Pain and Effort-Reward Imbalance: A Systematic Review. BMC Public Health, 14, 37. https://doi.org/10.1186/1471-2458-14-37

Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sørensen, F., Andersson, G., et al. (1987). Standardised Nordic Questionnaires for The Analysis of Musculoskeletal Symptoms. Applied Ergonomics, 18(3), 233–237. https://doi.org/10.1016/0003-6870(87)90010-X

Lindegård, A., Larsman, P., Hadzibajramovic, E., Ahlborg, G., Jr. (2014). The Influence of Perceived Stress and Musculoskeletal Pain on Work Performance and Work Ability in Swedish Health Care Workers. International Archives of Occupational and Environmental Health, 87(4), 373–379. https://doi.org/10.1007/s00420-013-0875-8

Masłoń, A., Kamińska, M., & Kvåle, A. (2024). Workload, General Perceived Stress, Body Function, Musculoskeletal Pain, and Their Mutual Relationships in Nurses: A Pilot Study. International Journal of Occupational Medicine and Environmental Health, 37(3), 257–270. https://doi.org/10.13075/ijomeh.1896.02389

Mohammadian, M., Mollahoseini, S., Naghibzadeh-Tahami, A. (2025). Musculoskeletal Disorders Among Office Workers: Prevalence, Ergonomic Risk Factors, And Their Interrelationships. Scientific Reports, 15, 45425. https://doi.org/10.1038/s41598-025-30155-6

Mutlu, S., Yılmaz, E. (2025). The Impact of Musculoskeletal Pain on The Work Functions and Quality of Life of Office Workers. Work, 81(4), 3369–3375. https://doi.org/10.1177/10519815251332851

Okan, F. (2023). The Relationship of Musculoskeletal System Disorders with Sleep Quality Among Office Workers. Genel Tıp Dergisi, 33(3), 316–321. https://doi.org/10.54005/geneltip.1253098

Overstreet, D. S., Strath, L. J., Jordan, M., et al. (2023). A Brief Overview: Sex Differences in Prevalent Chronic Musculoskeletal Conditions. International Journal of Environmental Research and Public Health, 20(5), 4521.

Sampath, K. K., Darlow, B., Tumilty, S., Shillito, W., Hanses, M., Devan, H., et al. (2021). Barriers and Facilitators Experienced by Osteopaths in Implementing A Biopsychosocial (BPS) framework of care when managing people with musculoskeletal pain: A mixed methods systematic review. BMC Health Services Research, 21(1), 695. https://doi.org/10.1186/s12913-021-06720-w

Wijnhoven, H. A. H., de Vet, H. C. W., Picavet, H. S. J. (2006). Prevalence of Musculoskeletal Disorders Is Systematically Higher in Women Than in Men. Clinical Journal of Pain, 22(8), 717–724. https://doi.org/10.1097/01.ajp.0000210912.95664.53

Yıkılmaz, S. K., Yıkılmaz, İ., Bekmezci, M., Surucu, L., Çetinkaya, B. (2024). Exploring the Moderating Effect of Musculoskeletal Pain on Technostress-Induced Burnout: A Cross-Sectional Study of Bank Employees. Healthcare, 12(20), 2064. https://doi.org/10.3390/healthcare12202064