



Musculoskeletal Problems and Manual Therapy Awareness in Office Workers Ofis Çalışanlarında Kas İskelet Sistemi Problemleri ve Manuel Tedavi Farkındalığı

Erkan EROL^{1*}, Ayla GÜNAL¹, Muhammed KURTBOĞAN², Ömer Buğra SOYLAR³, Kardelen ÖZÇELİK SARI⁴, Gülsen AKTAŞ⁵, Zehra BULUT⁶, Gülümser AKAR⁷, Arzu GABİLAYEVA⁸,
Arife Beyzagül DURUPUNAR³, Ayşe KARTAL⁴

¹Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Tokat Gaziosmanpaşa University, Tokat, Turkey

²Independent Researcher, Muş, Turkey

³Independent Researcher, Tokat, Turkey

⁴Independent Researcher, İstanbul, Turkey

⁵Independent Researcher, Samsun, Turkey

⁶Independent Researcher, Kayseri, Turkey

⁷Independent Researcher, İzmir, Turkey

⁸Independent Researcher, Baku, Azerbaijan

*Corresponding author: erkanerol@gmail.com

ABSTRACT

Purpose: Work-related musculoskeletal disorders are frequently associated with ergonomic risk factors, particularly poor posture, commonly affecting the neck, back, and shoulders. Manual therapy is a treatment modality rooted in manual assessment and encompassing various techniques to alleviate pain, enhance function, and reduce disability. The current study compares the levels of musculoskeletal discomfort among office workers based on their levels of manual therapy. **Material and Method:** A total of 272 office workers employed in different departments of Tokat Gaziosmanpaşa University were included in the study. Participants' musculoskeletal problems were evaluated with the Cornell Musculoskeletal Discomfort Questionnaire, and their levels of manual therapy awareness were assessed with the Manual Therapy Awareness Questionnaire. **Results:** The Cornell Musculoskeletal Discomfort Questionnaire spine score and total score were statistically higher among those aware of manual therapy ($p=0.041$, $p=0.024$). However, no difference was found in the upper and lower extremity scores ($p=0.342$, $p=0.173$). **Conclusion:** It was concluded that as the musculoskeletal disorders of office workers increased, their awareness of manual therapy also increased. It is thought that office workers with musculoskeletal pain may need health-related research, thereby increasing their level of knowledge.

Keywords: Manual therapy, Office workers, Musculoskeletal discomfort

ÖZ

Amaç: İşle ilgili kas-iskelet sistemi rahatsızlıkları sıklıkla ergonomik risk faktörleriyle, özellikle de kötü postürle ilişkilendirilir ve genellikle boyun, sırt ve omuzları etkiler. Manuel terapi, manuel değerlendirmeye dayanan ve ağrıyı hafifletmek, fonksiyonu artırmak ve engelliliği azaltmak için çeşitli teknikleri kapsayan bir tedavi yöntemidir. Mevcut çalışma, ofis çalışanlarının manuel terapi seviyelerine göre kas-iskelet sistemi rahatsızlık seviyelerini karşılaştırmaktadır. **Gereç ve Yöntem:** Çalışmaya Tokat Gaziosmanpaşa Üniversitesi'nin farklı bölümlerinde çalışan toplam 272 ofis çalışanı dahil edildi. Katılımcıların kas-iskelet sistemi sorunları Cornell Kas-iskelet Sistemi Rahatsızlıkları Ölçeği ile değerlendirildi ve manuel terapi farkındalık düzeyleri Manuel Terapi Farkındalık Anketi ile değerlendirildi. **Bulgular:** Cornell Kas-iskelet Sistemi Rahatsızlıkları Ölçeğinin omurga skoru ve toplam skoru, manuel terapiyi bilenlerde istatistiksel olarak anlamlı şekilde daha yüksekti ($p=0,041$, $p=0,024$). Ancak, üst ve alt ekstremité skorlarında bir fark bulunamadı ($p=0,342$, $p=0,173$). **Sonuç:** Ofis çalışanlarının kas-iskelet sistemi rahatsızlıkları arttıkça, manuel terapiye ilişkin farkındalıklarının da arttığı sonucuna varılmıştır. Kas-iskelet sistemi ağrısı olan ofis çalışanlarının sağlık ile ilgili araştırmaya ihtiyaç duyabileceği ve dolayısıyla bilgi düzeylerinin artabileceği düşünülmektedir.

Anahtar Kelimeler: Manuel terapi, Ofis çalışanları, Kas-iskelet sistemi rahatsızlığı

INTRODUCTION

Most of today's jobs involve office work, typically requiring extensive use of computers and other electronic devices (1, 2). Despite not necessitating significant muscle strength, office work can contribute to the development of musculoskeletal disorders due to prolonged periods of inactivity and repetitive tasks (3). Office work necessitates prolonged maintenance of static postures in the trunk and lower extremities, coupled with repetitive movements of the upper extremities, increasing the susceptibility to musculoskeletal disorders.

Work-related musculoskeletal disorders are frequently associated with ergonomic risk factors, particularly poor posture, and commonly affect areas such as the neck, back, and shoulders (4). In developed countries, the prevalence of work-related musculoskeletal disorders has been reported to range from 70% to 80%, underscoring the significant impact of this issue (5). Recent research has revealed a correlation between the duration of computer work and the experience of pain, particularly in areas such as the shoulders, neck, back, and upper extremities (6).

Manual therapy is a treatment modality rooted in manual assessment and encompassing various techniques. Physical therapists employ these techniques to alleviate pain, enhance function, and reduce disability. While the overall strength of evidence supporting manual therapy may be limited, numerous studies have demonstrated positive outcomes, particularly in the short term (7, 8). Manual therapy has been identified as a low-cost and low-risk treatment approach associated with improvements in pain (9).

Compelling evidence indicates that individuals experience improved health outcomes with increased awareness of health-related matters. Köppen et al. conducted a study involving 121 individuals suffering from chronic pain, revealing a notable decrease in pain intensity as participants' health literacy levels rose (10). Similarly, Özcan et al. observed that a decline in health literacy corresponded with heightened severity of shoulder pain (11). The current study compares the levels of musculoskeletal discomfort among office workers based on their levels of manual therapy.

MATERIAL and METHOD

The study was approved by Tokat Gaziosmanpaşa University Social and Human Sciences Research Ethics Committee (Date: 25.04.2023, Number: 01-37). Informed consent was obtained from the participants involved in the study. The research was designed as a cross-sectional study. The sample size for the study was determined using an a priori power analysis with the G*Power 3.1.9.7 program, developed at the University of Düsseldorf, Germany. The analysis indicated that a minimum sample size of 270 participants is required to achieve 90% power and 95% confidence, assuming a medium effect size ($d=0.30$). In the analysis, the effect size was considered medium ($d=0.30$) due to the absence of a reference study. A total of 272 office workers employed in different departments of Tokat Gaziosmanpaşa University were included in the study between May 15, 2023, and June 16, 2023. Office workers who had not previously received manual therapy and were willing to participate in the study were included. Having neurological or orthopaedic impairment or having received manual therapy previously were determined as exclusion criteria.

Data Collection Tools

Before starting the study, participants were informed about the research. Socio-demographic information (age, gender, height, weight, marital status, number of children, family structure, current place of residence, years of employment, daily working hours, daily computer usage time, daily lunch break duration, duration of breaks given other than lunch break, daily sitting time) was recorded using a pre-assessment form. Participants' musculoskeletal problems were evaluated with the Cornell Musculoskeletal Discomfort Questionnaire, and their levels of manual therapy awareness were assessed with the Manual Therapy Awareness Questionnaire.

Cornell Musculoskeletal Discomfort Questionnaire: Developed in 1999 by Hedge et al., it is an ergonomic scale based on the pain, discomfort, and complaints experienced by workers in their musculoskeletal systems within the past week (12). Adaptation to Turkish and reliability studies of the scale were conducted by Erdiñç et al (13).

Manual Therapy Awareness Questionnaire: The questionnaire consists of 14 questions regarding the application method of manual therapy, practitioners, the diseases in which it should be applied, the effectiveness of manual therapy, and their knowledge levels. It was developed by İnce in 2021 (14).

Statistical Analysis

SPSS 22 software was used for statistical analysis. Descriptive statistics were presented as mean±standard deviation or n(%). The conformity of the variables to the normal distribution was examined using the Histogram and Shapiro-Wilk test. Since they did not show normal distribution, the Mann-Whitney U test was used for pairwise group comparisons, and the Kruskal-Wallis test was used for comparisons among three groups.

RESULTS

The demographic characteristics of the participants are shown in Table 1.

Table 1: Characteristics of Individuals

	Mean±SD
Age (years)	41.00±9.83
Height (meters)	1.69±0.09
Weight (kilograms)	76.03±14.75
Number of children	1.52±1.20
Working years	16.25±10.39
Working hours per day	8.13±0.49
Daily computer usage time (hours)	6.22±1.98
Daily lunch break time (hours)	1.02±0.44
Daily break time other than lunch break (minutes)	32.73±29.95
Fixed sitting time per day (hours)	6.62±2.02
	n (%)
Gender	
Female	114 (41.9)
Male	158 (58.1)
Marital status	
Married	200 (73.5)
Single	72 (26.5)
Educational status	
Primary school	3 (1.1)
Middle school	1 (0.4)
High school	32 (11.8)
University	198 (72.8)
Master's degree	34 (12.5)
Doctorate	4 (1.5)

SD: Standard deviation

Some of the questions asked in the Manual Therapy Awareness Survey and the responses provided by the participants are presented in Table 2.

Table 2: Manual Therapy Awareness Survey

	n (%)
Manual therapy knowledge level	
I've never heard of it.	114 (41.9)
I heard about it through television/social media/my circle. But I don't know exactly what it is.	127 (46.7)
I have researched manual therapy and am knowledgeable about it.	31 (11.4)
What is manual therapy?	
It is a form of treatment applied to the body through physical therapy methods such as electrotherapy, hot/cold packs, and massage.	72 (26.5)
It is a form of treatment performed by applying pressure, stretch or resistance to the muscles, bones and joints at various velocities.	118 (43.4)
It is a treatment applied entirely by hand, without any tools.	141 (51.8)
It is a form of treatment which uses injection applications to painful areas in the body.	16 (5.9)
It is a form of treatment popularly known as "snapping or cracking" in the society.	68 (25.0)
It is a form of treatment applied by bonesetters without a medical basis.	15 (5.5)
I believe traditional and complementary treatment methods could be effective.	
Yes	208 (76.5)
No	64 (23.5)
Sometimes, I ask my children or close relatives to massage my back for my pain.	
Yes	119 (43.8)
No	153 (56.3)
I have previously sought help from individuals who are not healthcare professionals for my muscle and joint pains.	
Yes	38 (14.0)
No	234 (86.0)
Manual therapy has been used as a traditional treatment method in ancient times, but no medical evidence supports its use today.	
True	79 (29.0)
False	193 (71.0)
Manual therapy can completely eliminate lumbar and cervical hernias.	
True	78 (28.7)
False	194 (71.3)

The remaining questions and the responses provided by the participants are as follows:

70.2% of individuals reported that manual therapy is indicated for neck pain, 66.5% for low back pain, 11.4% for fractures and dislocations, 67.3% for back pain, 15.8% for rheumatic diseases, 3.7% for inflammatory diseases, 52.6% for joint pain such as shoulder, knee, hip, 25% for headaches, and 0.4% for cancer.

Participants' 42.6% believe that manual therapy is effective in 1-5 sessions, 35.3% think it is effective in 10-15 sessions, 12.9% believe it is effective in 20-30 sessions, and 9.2% consider it ineffective. 44.9% of office workers stated that manual therapy has a similar effect to physiotherapy methods, 12.5% mentioned that its effect is short-term, 4% considered it ineffective, 2.2% believed it is superior to other treatments, and 36.4% expressed no opinion.

66.9% of participants stated that a doctor should decide on the suitability of manual therapy for the individual, 66.5% mentioned a physiotherapist, 14.3% mentioned other trained healthcare personnel, and 3.7% mentioned a masseur. Additionally, 83.1% of participants mentioned that a physiotherapist should administer manual therapy, 39.7% mentioned a doctor, 24.6% mentioned other trained healthcare personnel, and 4.4% mentioned a masseur.

89.7% of participants agreed that manual therapy could be harmful when performed by untrained individuals, 90.1% agreed that it could be harmful when administered in inappropriate circumstances, and 82.8% agreed that it could be ineffective when administered in inappropriate circumstances. 58.1% of individuals reported that they would consider receiving manual therapy if

recommended by a doctor, 25.7% mentioned they would consider it if they didn't benefit from other treatment options, 7.4% stated it as their first choice, and 8.8% reported they would never consider it.

The participants' Cornell Musculoskeletal Discomfort Questionnaire scores are provided in Table 3. The difference between the participants' manual therapy knowledge and musculoskeletal discomfort is given in Table 4. Comparison of musculoskeletal discomfort according to the answer to the question "What is manual therapy?" is given in Table 5.

Table 3: Cornell Musculoskeletal Discomfort Questionnaire Scores

	Mean±SD
Spine	24.71±35.57
Upper extremity	19.59±42.08
Lower extremity	23.76±61.51
Total	68.06±110.75

SD: Standard deviation

Table 4: Comparison Of Musculoskeletal Discomfort According to Manual Therapy Knowledge

	Participants who have never heard of manual therapy (n=114)	Participants who have heard of manual therapy but do not know exactly what it is (n=127)	Those who have knowledge about manual therapy (n=31)	P
Spine	21.93±33.18	23.62±33.69	39.39±47.50	0.041
Upper extremity	16.91±30.94	17.09±41.18	39.68±69.26	0.342
Lower extremity	21.10±58.72	21.06±55.76	44.60±87.31	0.173
Total score	59.94±98.54	61.77±100.85	123.66±167.01	0.024

Table 5: Comparison Of Musculoskeletal Discomfort According to The Answer to The Question "What Is Manual Therapy?"

	Those who gave at least one correct answer (n=229)	Those who could not provide any correct answer (n=43)	P
Spine	26.18±36.23	16.86±30.98	0.048
Upper extremity	20.88±44.94	12.71±20.06	0.517
Lower extremity	25.86±65.90	12.58±26.20	0.183
Total score	72.92±117.07	42.15±62.60	0.109

DISCUSSION and CONCLUSION

Although manual therapy is becoming more widespread today, humanity has used hands-on treatments for therapeutic purposes for centuries (15). In the current study, which aimed to examine the awareness of manual therapy among office workers, the higher the individual's musculoskeletal discomfort, the greater their awareness of manual therapy.

The number of participants declaring that they researched manual therapy and had knowledge about it constituted only 11.4%. However, 84.2% of the participants provided at least one correct answer to the question, "What is manual therapy?" This suggests that the participants have some understanding of manual therapy. İnce also obtained similar results in his study on the Turkish community. Those who researched and knew about manual therapy: 16.3%, those who provided at least one correct answer to the question "What is manual therapy?": 79.6%. İnce suggested that although the name or definition may change, manual therapy has been practised in our society for centuries, and therefore, participants have some understanding of manual therapy (14). This situation remains the same for office workers as well. Although the number of individuals specifically researching manual therapy may be low, the number of those who know what manual therapy is remains high. In the current study, similar to İnce's study, only a small portion of the participants

(14.0%) sought non-healthcare professionals for manual therapy. Most participants believe that the suitability of manual therapy for a patient should be determined by a doctor (66.9%) or a physiotherapist (66.5%). Most participants believe that physiotherapists should administer manual therapy (83.1%). These results indicate that when office workers need manual therapy, they tend first to consult a doctor or a physiotherapist.

Negative effects can occur after manual therapy. While mild negative effects are more common, serious adverse effects are rare and may be linked to the patient's pre-existing conditions. Therefore, it is crucial to conduct a comprehensive assessment of the patient before administering manual therapy (16). To minimize the risk of adverse effects, manual therapy should be performed by healthcare professionals. In the current study, the majority of office workers believe that manual therapy should be administered by a physiotherapist. This suggests that participants are aware of the potential risks associated with manual therapy and prefer to consult qualified healthcare professionals rather than individuals who are not in the medical field.

Studies in the literature indicate that manual therapy has positive effects on musculoskeletal problems (17, 18). In studies examining participant opinions, including ours, participants believe that manual therapy is effective (14, 19). In our study, the majority of participants think that manual therapy is effective within 1-5 sessions. While the literature does not provide a clear consensus on the optimum number of sessions, frequency, or dosage for manual therapy (20), our findings suggest that participants have confidence in its effectiveness.

Patients frequently seek manual therapy for neck and lower back pain. In his study evaluating the awareness of manual therapy in the community, İnce reported that most participants believed that manual therapy was indicated for lower back and neck pain (14). Thomas et al. examined beliefs and attitudes about manual therapy in individuals with low back pain. They suggested that participants believed manual therapy to be an effective method for treating low back pain (19). In the current study, office workers similarly thought that the most common reasons for seeking manual therapy were neck (70.2%), upper back (67.3%), and lower back (66.5%) pain. Studies have also reported that the primary reason for seeking manual therapy, consistent with the participants' beliefs, is spine problems (14, 21). In present study, consistent with the literature, participants believed that manual therapy was most indicated for spine problems.

In the current study, office workers who knew about manual therapy had higher spine and overall musculoskeletal discomfort. Additionally, it was observed that those who provided at least one correct answer regarding manual therapy had more spine discomfort. As there is no other study in the literature comparing musculoskeletal discomfort based on manual therapy awareness, there are no studies available to compare our results with. Awareness of manual therapy, which is knowledge about a treatment option, can be considered part of health literacy. Some studies have reported that musculoskeletal pain and discomfort decrease as individuals' health literacy increases (22, 23). However, some authors have reported that musculoskeletal pain and discomfort increase as health literacy increases. Agarwall et al. reported that in elderly individuals, as health literacy increased, pain and discomfort also increased (23). They suggested that as pain increases, individuals seek more health information and thus, their knowledge increases. Similarly, in our study, it can be concluded that individuals with more musculoskeletal disorders conducted more research on manual therapy and had more knowledge about it.

The current study determined that those with higher awareness of manual therapy experienced more discomfort in the spine region, according to the Cornell Musculoskeletal Discomfort Questionnaire. The literature reports that office workers frequently experience neck, back, and lower back pain (24, 25). Individuals with spine pain (neck, lower back, upper back) frequently seek manual therapy (21). In our study, it is possible that office workers with more spine pain conducted more research on manual therapy.

The current study has strengths and limitations. Its strength lies in being the first study to investigate manual therapy awareness among office workers. Our study was conducted with office workers at Tokat Gaziosmanpaşa University. Therefore, the limitation of our study is that these results cannot be generalised to all office workers. In the future, there is a need for larger-scale studies with bigger sample groups.

It was concluded that as the musculoskeletal disorders of office workers increased, their awareness of manual therapy also increased. It is thought that office workers with more musculoskeletal pain may need more health-related research, thereby increasing their level of knowledge. However, knowing treatment options before experiencing pain can guide individuals in choosing the correct treatments when they do have painful experiences. Therefore, efforts to educate people about manual therapy could be planned.

Declaration of Ethical Code: In this study, we undertake that all the rules required to be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" are complied with, and that none of the actions stated under the heading "Actions Against Scientific Research and Publication Ethics" are not carried out. The study was approved by Tokat Gaziosmanpaşa University Social and Human Sciences Research Ethics Committee (Date: 25.04.2023, Number: 01-37).

Conflict of Interest: No conflict of interest was declared by the authors.

Authorship Contribution: Study design: EE, AG, MK, ÖBS, KÖ, GA, ZB, GA, AG, ABD, AK; Data acquisition: AG, MK, ÖBS, KÖ, GA, ZB, GA, AG, ABD, AK; Data analysis: EE; Drafting of the manuscript: EE, AG; Critical revision for content: EE, AG; Final approval of the version to be published: EE, AG, MK, ÖBS, KÖ, GA, ZB, GA, AG, ABD, AK.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Luttmann A, Schmidt KH, Jäger M. Working conditions, muscular activity and complaints of office workers. *Int J Ind Ergon*. 2010;40(5):549-559. doi: 10.1016/j.ergon.2010.04.006
2. Akyürek G, Üstün B. Akademik Personelin Ofislerindeki Ergonomik Düzenlemeye Göre Ağrı, Stres ve Fiziksel Aktivite Düzeylerinin Karşılaştırılması. *Süleyman Demirel Üniversitesi Sağlık Bilimleri Dergisi*, 2021;12(3):386-394. doi: 10.22312/sdusbed.1005156
3. Wahlström J. Ergonomics, musculoskeletal disorders and computer work. *Occup Med*. 2005;55(3):168-176. doi: 10.1093/occmed/kqi083
4. Guduru RKR, Domeika A, Obcarskas L, Ylaite B. The Ergonomic Association between Shoulder, Neck/Head Disorders and Sedentary Activity: A Systematic Review. *J Healthc Eng*. 2022;2022. doi: 10.1155/2022/5178333
5. Landau K, Brauchler R, Diaz-Meyer M, Kiesel J, Lenz A, Meschke H, et al. Occupational stress factors and musculo-skeletal disease in patients at a rehabilitation center. *Occup Ergon*. 2012;10(4):139-153. doi: 10.3233/OER-2012-0198
6. Mohammadipour F, Pourranjbar M, Naderi S, Rafie F. Work-related Musculoskeletal Disorders in Iranian Office Workers: Prevalence and Risk Factors. *J Med Life*. 2018;11(4):328. doi: 10.25122/jml-2018-0054
7. Babatunde OO, Legha A, Littlewood C, Chesterton LS, Thomas MJ, Menz HB, et al. Comparative effectiveness of treatment options for plantar heel pain: a systematic review with network meta-analysis. *Br J Sports Med*. 2019;53(3):182-194. doi: 10.1136/bjsports-2017-098998
8. George SZ, Fritz JM, Silfies SP, Schneider MJ, Beneciuk JM, Lentz TA, et al. Interventions for the Management of Acute and Chronic Low Back Pain: Revision 2021. *J Orthop Sports Phys Ther*. 2021;51(11):CPG1-CPG60. doi: 10.2519/jospt.2021.0304
9. Short S, Tuttle M, Youngman D. A Clinically-Reasoned Approach to Manual Therapy in Sports Physical Therapy. *Int J Sports Phys Ther*. 2023;18(1):262-271. doi: 10.26603/001c.67936
10. Köppen PJ, Dorner TE, Stein KV, Simon J, Crevenna R. Health literacy, pain intensity and pain perception in patients with chronic pain. *Wien Klin Wochenschr*. 2018;130(1-2):23-30. doi: 10.1007/s00508-017-1309-5
11. Özcan F, Gürçay E. The Relationship Between Demographic and Clinical Characteristics and Health Literacy in Patients with Shoulder Pain. *Fiz Tıp ve Rehabil Bilim Derg*. 2023;26(2):167-173. doi: 10.31609/jpmrs.2022-92942
12. Hedge A, Morimoto S, McCrobie D. Effects of keyboard tray geometry on upper body posture and comfort. *Ergonomics*. 1999;42(10):1333-1349. doi: 10.1080/001401399184983
13. Erdinc O, Hot K, Ozkaya M. Turkish version of the Cornell Musculoskeletal Discomfort Questionnaire: cross-cultural adaptation and validation. *Work*. 2011;39(3):251-260. doi: 10.3233/WOR-2011-1173
14. Ince B. The Awareness of Manual Therapy in Turkish Society: A Cross Sectional Survey Study and an Overview of Manual Therapy. *Fiz Tıp ve Rehabil Bilim Derg*. 2021;24(1):45-51. doi: 10.31609/jpmrs.2020-78636
15. Kerry R, Young KJ, Evans DW, Lee E, Georgopoulos V, Meakins A, et al. A modern way to teach and practice manual therapy. *Chiropr Man Therap*. 2024;32(1):17. doi: 10.1186/s12998-024-00537-0

16. Swait G, Finch R. What are the risks of manual treatment of the spine? A scoping review for clinicians. *Chiropr Man Therap*. 2017;25(1):37. doi: 10.1186/s12998-017-0168-5
17. Bronfort G, Haas M, Evans R, Leininger B, Triano J. Effectiveness of manual therapies: the UK evidence report. *Chiropr Man Therap*. 2010;18(1):3. doi: 10.1186/1746-1340-18-3
18. Borrella-Andrés S, Marqués-García I, Lucha-López MO, Fanlo-Mazas P, Hernández-Secorún M, Pérez-Bellmunt A, et al. Manual Therapy as a Management of Cervical Radiculopathy: A Systematic Review. *Biomed Res. Int*. 2021;2021(1), 9936981. doi: 10.1155/2021/9936981
19. Thomas M, Thomson OP, Kolubinski DC, Stewart-Lord A. The attitudes and beliefs about manual therapy held by patients experiencing low back pain: a scoping review. *Musculoskelet Sci Pract*. 2023;65:102752. doi: 10.1016/j.msksp.2023.102752
20. Pasquier M, Daneau C, Marchand AA, Lardon A, Descarreaux M. Spinal manipulation frequency and dosage effects on clinical and physiological outcomes: a scoping review. *Chiropr Man Therap*. 2019;27(1): 23. doi: 10.1186/s12998-019-0244-0
21. van Ravensberg CDD, Oostendorp RAB, van Berkel LM, Scholten-Peeters GGM, Pool JJM, Swinkels RAHM, et al. Physical Therapy and Manual Physical Therapy: Differences in Patient Characteristics. *J Man Manip Ther*. 2005;13(2):113-124. doi: 10.1179/106698105790825058
22. Kim K, Yang Y, Wang Z, Chen J, Barandouzi ZA, Hong H, et al. A systematic review of the association between health literacy and pain self-management. *Patient Educ Couns*. 2022;105(6):1427-1440. doi: 10.1016/j.pec.2021.09.037
23. Agarwal G, Habing K, Pirrie M, Angeles R, Marzanek F, Parascandalo J. Assessing health literacy among older adults living in subsidized housing: a cross-sectional study. *Can J Public Heal*. 2018;109(3):401-409. doi: 10.17269/s41997-018-0048-3
24. Ardahan M, Simsek H. Analyzing musculoskeletal system discomforts and risk factors in computer-using office workers. *Pakistan J Med Sci*. 2016;32(6):1425-1429. doi: 10.12669/pjms.326.11436
25. Cho C-Y, Hwang Y-S, Cheng R-J. Musculoskeletal Symptoms and Associated Risk Factors Among Office Workers With High Workload Computer Use. *J Manipulative Physiol Ther*. 2012;35(7):534-540. doi: 10.1016/j.jmpt.2012.07.004