IZMIR DEMOCRACY UNIVERSITY HEALTH SCIENCES JOURNAL
IDUHES
e-ISNN:2651-4575

IDUHeS, 2023; 6(2): 264-273
Doi: 10.52538/iduhes.1345656

Research Paper – Araştırma Makalesi

ERGONOMIC RISK FACTORS AND MUSCULOSKELETAL SYSTEM PROBLEMS IN WOMEN PRODUCING TRADITIONAL HANDICRAFTS

GELENEKSEL EL İŞİ ÜRÜNLER YAPAN KADINLARDA ERGONOMİK RİSK FAKTÖRLERİ VE KAS-İSKELET SİSTEMİ SORUNLARI

Tuba INCE PARPUCU[1], Sabriye ERCAN[2] , Ferdi BASKURT[3], Zeliha BASKURT[4]

Özet

Bu çalışmanın amacı, geleneksel el işi ürünler yapan kadınlarda ergonomik risk düzeyinin, kas-iskelet sistemi sorunlarının ve ergonomik risk puanına etki eden değişkenlerin belirlenmesidir. Düzenli olarak geleneksel el işi ürün yapma alışkanlığı olan kadınlar araştırmaya dahil edilmiştir. Kadınların kas-iskelet sistemi değerlendirmesi yapılıp vücut bölgelerine özgü ağrı anketi ve RULA ergonomik risk değerlendirmesi yapılmıştır. Çalışmaya yaşı 46,15±0,71 yıl olup 25,78±0,84 yıldır geleneksel el işi ürünler yapan 197 kadın katılmıştır. Katılımcıların postür değerlendirmesinde başın öne tilti (%61,9) en sık rastlanan bulgu olmuştur. Kas-iskelet sistemi ağrılarının sıklığı; dominant ön kol (%36), dominant el-el bileği (%34) ve dominant omuz (%30,5) bölgelerinde belirginleşmiştir. Şiddetli ağrı ise baş ağrısı (%21,8), dominant el-el bileği (%18,3) ve dominant ön kol (%17,8) sıralamasıyla gözlenmiştir. Kadınların RULA final puanı 3,29±0,05 bulunmuştur. Postürdeki olumsuz değişimlerin ve kas-iskelet sistemi yakınmalarının bazıları, ergonomik risk puanına etki etmiştir (Ayarlanmış R^2 değeri =0,436). Geleneksel el işi ürünler yapan kadınlarda postüral değişimler ve kas-iskelet sistemi ağrıları yaygındır. Katılımcıların ergonomik riskleri düşük-orta düzeyde olmakla birlikte postüral değişimler ve kas-iskelet sistemi ağrıları RULA final puanına etki etmektedir.

Anahtar Kelimeler: El işi, ergonomi, postür, ağrı

Abstract

The study aimed to determine the ergonomic risk level, musculoskeletal system problems, and variables affecting ergonomic risk scores in women producing traditional handicrafts. Women who regularly produce traditional handicrafts were included in the study. The participants underwent a musculoskeletal system and Rapid Upper Limb Assessment (RULA) ergonomic risk assessment and were asked to answer pain questionnaire. A total of 197 women aged 46.15±0.71 years who have been producing traditional handicrafts for 25.78±0.84 years were included in the study. The posture evaluation of the participants revealed that most of them (61.9%) had an anterior head carriage. Participants most pronouncedly experienced musculoskeletal pain in their dominant forearm (36%), wrist (34%), and shoulder (30.5%). Participants also experienced the most severe pain in their heads (21.8%), dominant hand wrists (18.3%), and forearms (17.8%), respectively. The final RULA score of the participants was found to be 3.29±0.05. Deterioration in posture and worsening of musculoskeletal complaints affected the ergonomic risk scores of the participants (Adjusted R^2 value=0.436). Postural changes and musculoskeletal pain are common in women who produce traditional handicrafts. The participants had low to moderate ergonomic risks, and their postural changes and musculoskeletal pain were found to affect their final RULA scores.

Keywords: Handicrafts, ergonomics, posture, pain

Geliş Tarihi (Received Date): 18.08.2023, Kabul Tarihi (Accepted Date): 12.09.2023, Basım Tarihi (Published Date): 30.09.2023. [1] Suleyman Demirel University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Isparta, Türkiye, [2] Suleyman Demirel University, Faculty of Medicine, Department of Sports Medicine, Isparta, Türkiye, [3] Suleyman Demirel University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Isparta, Türkiye, [4] Suleyman Demirel University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Isparta, Türkiye. **E-mail:** sabriyeercan@gmail.com **ORCID ID's:** T.I.P.; https:/orcid.org/0000-0002-5619-4284, S.E.; https:/orcid.org/0000-0001-9500-698X, F.B.; https:/orcid.org/0000-0002-8997-4172, Z.B.; https:/orcid.org/0000-0001-7488-9242.

1. INTRODUCTION

Handicrafts produced by craftspeople without using machines and mass production methods are considered luxury consumer goods in Western or high-income societies (Rathore et al., 2020, pp. 103043). However, handicrafts made in lower-middle-income countries may be perceived as daily-use objects or represent a way to achieve economic gain (Bouzgarrou et al., 2023, pp. 148). The impact of design and institutionalization on the handicrafts sector cause the economic and political tendencies of countries to focus on this field (Melkani et al., 2020, pp. 54-57).

Designer traditional handicrafts are mainly produced individually or in small batches in small workshops or at home. In today's world, the handicrafts sector represents a significant part of the labor force in countries such as Türkiye, Iran, Pakistan, Bangladesh, and China (Atalay, 2017, pp. 25-29; Shakerian et al., 2023, pp. 109). Women's labor and efforts contribute to handicraft activities and micro-credit practices carried out in Türkiye to a great extent (Bayramoğlu, Dökmen, 2017, pp. 41-64; Tandoğan, 2007, pp.166-167). Thus, regardless of whether workers produce handicrafts at home or in small-scale enterprises, their occupational health should be closely monitored (Singh et al., 2021, pp. 29-40).

Making handicrafts may involve specific necessary repeated movements (Mahmood et al., 2021, pp. 494-498). Maintaining a natural body posture may be problematic due to the labor involved in producing handicrafts. Moreover, the fact that production takes place in small workshops/homes where industrial ergonomic features are not readily available may increase the load on the musculoskeletal system of workers and cause strain (Demirkol Akyol, 2022, pp. 72-83). The repetitive movements involved in making handicrafts, causing repetitive strain injuries in muscles, tendons, and nerves, along with muscle fatigue secondary to the static posture, have to be maintained (Akin et al., 2022, pp. 43-54; Das et al., 2020, pp. 55-77), and these movements affect the health of craftspeople. In addition, many women in Türkiye produce handicrafts as a hobby proven to support physical, emotional, social, cognitive, psychological, and dexterity development (Chaze et al., 2022, pp. 1-31).

Prior research in the literature has focused on the health-related consequences of risks to which workers in different sectors (gemstone, glass art ware, carpet, textile, leather, hand-woven shoe production, embroidery, knitting, weaving, etc.) are exposed (Das et al., 2020, pp.55-70; Das, Singh, 2022, pp.1-18; Rathore et al., 2020, pp. 103043; Singh, 2019, pp.88-102). However, no studies on the ergonomic characteristics of women who crochet and knit as a hobby exist in the literature. This study aimed to determine the ergonomic risk level, musculoskeletal system problems, and variables affecting ergonomic risk scores in women producing traditional handicrafts (crocheting/knitting).

2. METHODS

The research was approved by Suleyman Demirel University's Ethics Committee, dated 03.03.2023 and numbered 64/9. Through field surveys, women who regularly produced

traditional handicrafts (crochet/knitting) were invited to participate in the study, and those who volunteered were included in the research. One of the inclusion criteria was to regularly produce traditional handicrafts (crochet/knitting) for at least one hour every day in the last year. Exclusion criteria consisted of making traditional handicrafts irregularly (once a week, once a year, etc.) or producing traditional handicrafts for less than one hour daily and having an acute orthopedic injury.

After the descriptive characteristics of the women meeting the inclusion criteria were determined, their musculoskeletal systems were assessed using goniometric measurements. The body-region-specific pain questionnaire, inspired by the pain questionnaire proposed by Griegel-Morris (Griegel-Morris et al., 1992, pp. 425-431) and the RULA method was given to the participants during face-to-face interviews.

2.1. Musculoskeletal system assessment: Musculoskeletal assessment involved examining posture, active neck movements, and active shoulder movements. Measurements were made using a goniometer (Baseline Stainless Steel Goniometer; Fabrication Enterprises Inc., Elmsford, NY, USA) (Başkurt, 2002, pp. 50-53).

2.2. Pain questionnaire: The frequency and intensity of body-region-specific pain were examined. This questionnaire was inspired by the pain questionnaire proposed by Griegel-Morris (Griegel-Morris et al., 1992, pp. 425-431). The frequency of pain was categorized as rare (1 time per month or less), intermittent (2–3 times per month), and often (1–3 times per week or more). The severity of pain was scored over a range of 0–10 points. Accordingly, 0 points indicated no pain, 1–3 points indicated mild pain, 4–7 points indicated moderate pain, and 8–10 points indicated severe pain.

2.3. Rapid upper limb assessment: The participants' posture during the production of traditional handicrafts was examined. RULA method scores were recorded and shown in RULA's Tables A and B separately; the final score was calculated over data presented in RULA's Table C. The risk level of each participant was calculated over a range of scores (no risk = 1–2 points, low risk = 3–4 points, moderate risk = 5–6 points, high risk = 7 points and above), the results of which are presented in Table C (McAtamney, Corlett, 1993, pp. 91-99).

2.4.Statistical analysis

Following descriptive analyses, the conformity of the data to normal distribution was evaluated using the Shapiro–Wilk test. The difference between the independent groups, formed according to daily hours allocated to handicrafts, was analyzed using the T-test and the Chi-square test with Monte Carlo correction. Variables affecting the ergonomic risk scores of the participants were determined using multiple linear regression analysis with forward step-wise model elimination. Results are presented as percentages (%), frequency (n), and mean ± standard error (min–max). SPSS version 23.0 was used in the analyses, and a p-value of 0.05 was considered significant.

3. RESULTS

The study included 197 women aged 46.15 ± 0.71 (18–75) with a body mass index of 29.23 ± 0.31 (18.83–43.15) kg/m^2. The age at which participants started to produce traditional handicrafts was 20.36 ± 0.53 (6–55) years; the daily time allocated to making handicrafts was 3.11 ± 0.11 (1–10) hours. The participants have produced traditional handicrafts for 25.78 ± 0.84 (1–60) years.

Of the women, 99.5% (n = 196) were right-side dominant, and 36% (n = 71) had chronic systemic diseases. Precisely 6.1% (n = 12) of the participants were smokers, and 13.2% (n = 26) exercised regularly.

Exactly 36.5% (n = 72) of the participants had received regular pain medication for musculoskeletal pain in the last week, and 23.4% (n = 46) had received medical treatment, such as physical therapy for upper extremities/trunk/neck. Precisely 16.8% (n = 33) of the women had a history of surgical operation.

As a result of the ergonomic evaluation, the patients received a RULA hand/wrist posture score of 3.83 ± 0.04 (3–5), a RULA neck-trunk-leg posture score of 2.82 ± 0.06 (1–7), and a RULA final score of 3.29 ± 0.05 (3–7). According to the RULA risk classification, 94.4% (n = 186) of the participants showed low risk, 5.1% (n = 10) moderate risk, and 0.5% (n = 1) high risk. Participant complaints and posture evaluation results showed at Table 1. Body-region-specific pain evaluation results showed at Table 2.

Table 1. Participant complaints and posture evaluation results.

	%	**N**
Dizziness	51.8	102
Tingling, numbness, pins and needles in upper extremity (Dominant/Nondominant)	69.0 / 60.4	136 / 119
Posture evaluation		
Anterior head carriage	61.9	122
Kyphosis	26.4	52
Shoulder protraction (Dominant/Nondominant)	42.1 / 41.1	83 / 81
Active neck movements		
Flexion		
Normal mobility	87.3	172
Moderately restricted mobility (25°-45°)	12.7	25
Very limited mobility (<25°)	0	0
Rotation (Dominant/Nondominant)		
Normal mobility (>70°)	62.0 / 59.4	122 / 117
Moderately restricted mobility (45°-70°)	36.5 / 38.6	72 / 76
Very limited mobility (<45°)	1.5 / 2.0	3 / 4
Lateral flexion (Dominant/Nondominant)		
Normal mobility (>40°)	48.7 / 49.2	96 / 97
Moderately restricted mobility (20°-40°)	49.7 / 49.2	98 / 97

Very limited mobility (<20°)	1.5 / 1.5	3 / 3
Active shoulder movements		
Ability to pass the arm over the head and touch the opposite ear with the hand (Right/Left)	99.0 / 99.0	195 / 195
Ability to touch the angulus inferior of the other scapula with the fingertip while the arm is behind (Right/Left)	67.0 / 83.2	132 / 164

Table 2. Body-region-specific pain evaluation results.

	Frequency of pain % (n)			**Severity of pain % (n)**			
	Rare	**Intermittent**	**Often**	**No pain**	**Mild**	**Moderate**	**Severe**
Headache	6.1 (12)	28.4 (56)	27.9 (55)	38.1 (75)	5.6 (11)	34.5 (66)	21.8 (43)
Dominant pectoral region	0.5 (1)	6.1 (12)	8.6 (17)	84.8 (167)	1.0 (2)	8.6 (17)	5.6 (11)
Nondominant pectoral region	0.5 (1)	4.6 (9)	8.1 (16)	86.8 (171)	1.0 (2)	8.6 (17)	3.6 (7)
Right side of neck	0.5 (1)	19.8 (39)	29.9 (59)	49.7 (98)	1.0 (2)	33.5 (66)	15.7 (31)
Left side of neck	0.5 (1)	18.8 (37)	29.4 (58)	50.8 (100)	1.5 (3)	34.0 (67)	13.7 (27)
Dominant shoulder	0 (0)	20.3 (40)	30.5 (60)	49.2 (97)	2.0 (4)	34.0 (67)	14.7 (29)
Nondominant shoulder	0 (0)	20.8 (41)	29.4 (58)	49.2 (97)	3.6 (7)	34.0 (67)	13.2 (26)
Interscapular region	0 (0)	15.7 (31)	21.8 (43)	62.4 (123)	2.0 (4)	28.4 (56)	7.1 (14)
Dominant arm	1.0 (2)	16.8 (33)	28.9 (57)	53.3 (105)	1.0 (2)	31.0 (61)	14.7 (29)
Nondominant arm	0.5 (1)	12.2 (24)	20.3 (40)	67.0 (132)	1.0 (2)	19.8 (39)	12.2 (24)
Dominant forearm	1.0 (2)	21.3 (42)	36.0 (71)	41.6 (82)	2.5 (5)	38.1 (75)	17.8 (35)
Nondominant forearm	0.5 (1)	15.7 (31)	24.4 (48)	59.4 (117)	2.5 (5)	24.4 (48)	13.7 (27)
Dominant hand wrists	1.0 (2)	19.8 (39)	34.0 (67)	45.2 (89)	2.5 (5)	34.0 (67)	18.3 (36)
Nondominant hand wrists	0.5 (1)	14.2 (28)	24.9 (49)	60.4 (119)	2.0 (4)	22.3 (44)	15.2 (30)

Since posture and musculoskeletal problems linked to continuous habits can be affected by the daily duration of activity, the participants were grouped according to daily hours allocated to making handicrafts as Group $_{short}$ (3 hours or less/day, n = 130) and Group $_{long}$ (over 3 hours/day, n = 67). The characteristics of these two groups were then compared. Accordingly,

Group $_{short}$ was found to produce handicrafts for 2.26 ± 0.06 (1–3) hours/day, while Group $_{long}$ did so for 4.76 ± 0.17 (3.5–10) hours/day ($p < 0.001$). Differences were also found between the body mass indices (Group $_{short}$ = 28.71 ± 0.39 kg/m^2 (18.83–43.15) versus Group $_{long}$ = 30.24 ± 0.47 kg/m^2 (19.14–37.78), p = 0.018), RULA hand/wrist posture scores (Group $_{short}$ = 3.74 ± 0.59 (3–5) versus Group $_{long}$ = 4.01 ± 0.59 (3–5), p = 0.002), and RULA final scores (Group $_{short}$ = 3.20 ± 0.53 (3–6) versus Group $_{long}$ = 3.46 ± 0.89 (3–7), p = 0.023) of the two groups. While there was no significant difference between the other descriptive characteristics of the two groups ($p > 0.05$), the prevalence of neurologic complaints in the dominant and nondominant upper extremities (Group $_{long}$ = 80.6%/70.1% versus Group $_{short}$ = 63.1/55.4%, p = 0.018/p = 0. 045), the prevalence of dominant and nondominant shoulder protraction (Group $_{long}$ = 56.7%/55.2% versus Group $_{short}$ = 34.6%/33.8%, p = 0.003/p = 0.004), and the rate of normal lateral flexion of the neck to the left (Group $_{long}$ = 38.8% versus Group $_{short}$ = 54.6%, p = 0.031) differed between them. Regarding musculoskeletal complaints, the groups exhibited different rates of the absence of intense pain in the interscapular region (Group $_{short}$ = 67.7% versus Group $_{long}$ = 52.2%, p = 0.010), absence of frequent pain in the dominant and nondominant arm (Group $_{short}$ = 59.2%/72.3% versus Group $_{long}$ = 41.8%/56.7%, p = 0.019/p = 0.017), severe pain in the dominant and nondominant arm (Group $_{short}$ = 9.2%/7. 7% versus Group $_{long}$ = 25.4%/20.9%, p = 0.005/p = 0.010), absence of frequent pain in the dominant forearm (Group $_{short}$ = 46.9% versus Group $_{long}$ = 31.3%, p = 0.040), severe pain in the dominant forearm (Group $_{short}$ = 10% versus Group $_{long}$ = 32.8%, p = 0.003), and severe pain in the nondominant forearm and nondominant hand/wrist (Group $_{short}$ = 8.5%/10.8% versus Group $_{long}$ = 23.9%/23.9%, p = 0.021/p = 0.030). In addition, significantly more participants in Group $_{short}$ had a low RULA risk level compared to participants in Group $_{long}$ (96.9% versus 89.6%, p = 0.037).

Considering all participants, the variables affecting RULA ergonomic risk scores were as follows: severe pain in the dominant arm, severe pain in the nondominant arm, frequent pain in the dominant shoulder, shoulder mobility in those who could touch their left scapula, pain medication usage, severe pain in the nondominant forearm, protraction in the dominant shoulder, severe pain in the nondominant hand/wrist, and shoulder mobility in those who could touch their right ear, with an adjusted R^2 value of 0.436 (Table 3).

Table 3. Variables affecting RULA ergonomic risk scores.

	Coefficient	**Standard Error**	**t**	**p**	**Predictor Importance**
Severe pain in dominant arm	1.066	0.193	5.531	<0.001	0.291
Severe pain in nondominant arm	-1.191	0.252	-4.722	<0.001	0.212
The dominant shoulder is often painful	-0.284	0.090	-3.159	0.002	0.095
Mobility of the shoulder in those who can touch the left scapula	-0.319	0.104	-3.057	0.003	0.089
Pain medication use	-0.215	0.081	-2.666	0.008	0.068
Severe pain in nondominant forearm	0.495	0.210	2.353	0.020	0.053
The presence of protraction in dominant shoulder	0.204	0.087	2.347	0.020	0.052

Nondominant hand-severe pain in the wrist	0.387	0.171	2.261	0.025	0.049
Mobility of the shoulder in those who can touch the right ear	-0.796	0.394	-2.020	0.045	0.039

4. DISCUSSION

Although most participants (94.4%) showed low ergonomic risk, they frequently reported complaints about their upper extremities/trunks/necks in this research. The posture and neck/shoulder mobility of the participants were also affected. The body parts where pain was reported to occur most frequently were the dominant forearm (36%), dominant hand/wrist (34%), and dominant shoulder (30.5%), respectively. The most severe pain was reported to occur in the head (21.8%), dominant hand/wrist (18.3%), and dominant forearm (17.8%) regions. Since handicraft production is a continuous activity with cumulative effects, the ergonomic risk level of those who repeated this activity for less than three hours a day was expectedly lower. Some independent variables evaluated within the scope of this study affected this result. In addition, ergonomic risk scores were affected by pain in the upper extremities, shoulder mobility, postural change in the shoulder (protraction), and pain medication usage.

Handicraft production is one of the most important sectors providing economic gain worldwide (Rathore et al., 2020, pp. 103043). Thus, the health of workers in this field interests researchers. In their study on the ergonomic risks and musculoskeletal problems of workers in the Indian glass art ware industry, Rathore et al. identified the ergonomic risk level of these workers as high (Rathore et al., 2020, pp. 103043). Since this measurement tool was more suitable for the ergonomic assessment of the Indian glass art ware workers, they examined the ergonomic risks of the patients using REBA. They found that they had an average risk level of 7.22. The musculoskeletal problems of Indian glass art ware workers were reported as concentrated in the lower back, thigh, and foot regions. The variables affecting musculoskeletal problems were work characteristics and personal factors. Rathore et al. argued that musculoskeletal problems could be alleviated by reducing ergonomic risks (Rathore et al., 2020, pp. 103043). Since traditional Turkish handicrafts are often produced while sitting, complaints related to lower extremities were excluded in the current study. Upper extremity complaints were prominently examined due to the nature of the work being assessed.

In Türkiye, sewing, knitting, and lacemaking are commonly done as a hobby or a profession to generate income. According to the results of a prior study on women who sew in Türkiye, although the postures of the participants were very good, unevenness (58.1%) and slight protraction (62.9%) in the shoulders and anterior tilt of the head (80.6%) in the neck were frequently observed. There was a negative correlation between posture scores and neck complaints (Derdiyok, Atalay, 2022, pp. 573-590). Another study reported that 47% of handicraft workers in artwork, adda work, botanical arrangement, textile production, fashion designing and stitching, fine arts, embroidery, and knitting had high RULA ergonomic risk scores. The participants most frequently reported neck and shoulder complaints. It was also reported that there is an association between RULA scores and wrist pain (Mahmood et al., 2021, pp. 494-498). The fact that the participants in our study were producing handicrafts in their homes as a hobby may have caused their ergonomic risk levels to be lower than workers

in the handicraft sector. However, the participants' postural afflictions and complaints regarding upper extremities were similar to those of handicraft workers in other fields, which may be due to the similarity between these activities.

Hand-grip strength, expectedly, differs according to gender. However, there may also be differences in hand-grip strength between women working in handicraft production. Handicraft production requires hand-eye coordination and repetitive movements, which can cause fatigue in the hand muscles, depending on the duration of the work and the duration of rest between work sessions. Therefore, work efficiency can be increased with equipment and measures that reduce fatigue in the hand muscles (Melkani et al., 2020, pp. 54-57). The results obtained in this study, in which the participants, separated into two groups according to the daily time allocated to handicraft work, were evaluated, confirmed data reported in previous studies. Even as a hobby, making handicrafts for more than three hours daily increased body mass index and ergonomic risk, caused negative effects on posture, and led to an increase in musculoskeletal complaints.

To the best of our knowledge, the current study is the first to evaluate the ergonomic status, posture, and musculoskeletal problems of women who produce traditional handicrafts as a hobby. However, this study has some limitations. The fact that the descriptive characteristics of the participants, such as time allocated to handicrafts, were self-reported and that the ergonomic risk assessment was carried out in a set period and in an environment where the participants knew that they were being observed were limitations.

The production and use of traditional handicrafts are widespread in Turkish culture. Making handicrafts is a sociocultural habit performed by some women from childhood/adolescence to adulthood (Tandoğan, 2007, pp. 166-167). The results of our study suggest that postural changes and musculoskeletal pain are common in women producing handicrafts. The participants had low to moderate ergonomic risks, and their postural changes and musculoskeletal pain were found to affect their final RULA scores. Therefore, these women can reduce the rate of musculoskeletal problems connected to producing traditional handicrafts by integrating habits that protect posture, such as exercise interventions, ergonomics training into their daily lives.

5. REFERENCES

Akin, N. M., Aydin, F., Yildiz, B., Gündüz, T., Özalp, T. (2022). Tekrarlı manuel işlerde fizyolojik zorlanmaların değerlendirilmesi ve önlenmesi. *Ergonomi*, *5*(1), 43–54. https://doi.org/10.33439/ergonomi.1036740

Atalay, D. (2017). "Crafting the waste" as a stimulus to collaborative learning and collective production: An example from Turkey. In *PLATE: Product Lifetimes And The Environment* (1st ed., Vol. 9, pp. 25–29). IOS Press.

Başkurt, F. (2002). *Diş Hekimlerinde Servikobrakial Problemler* [Yüksek Lisans Tezi]. Dokuz Eylül Üniversitesi, Sağlık Bilimleri Enstitüsü.

Bayramoğlu, A., Dökmen, G. (2017). Türkiye'de Kadın İstihdamı ve Mikro Kredi Uygulamaları İlişkisi Üzerine Bir Değerlendirme. *Bartın Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *8*(16), 41–64.

Bouzgarrou, L., Kheder, A., Afia, L., Ormrane, A., Hermassi, F. (2023). Biomechanical risk factors of the upper limbs' musculoskeletal disorders among carpet weavers in Tunisia: Semi-quantitative ergonomic assessment. *Indian Journal of Occupational and Environmental Medicine*, *27*(2), 148. https://doi.org/10.4103/ijoem.ijoem_109_22

Chaze, F., Lints, K., Anderson, K. (2022). Crafting Well-being: A Scoping Review of the Benefits of Participation in Fibre Craft Communities and Implications for Activities for Older Adults. *Faculty of Applied Health and Community Studies, Sheridan College*. https://source.sheridancollege.ca/fahcs_publications/21

Das, D., Kumar, A., Sharma, M. (2020). A systematic review of work-related musculoskeletal disorders among handicraft workers. *International Journal of Occupational Safety and Ergonomics*, *26*(1), 55–70. https://doi.org/10.1080/10803548.2018.1458487

Das, D., Singh, A. K. (2022). Ergonomic design and evaluation of gemstone polishing workstation. *International Journal of Occupational Safety and Ergonomics*, 1–18. https://doi.org/10.1080/10803548.2022.2120282

Demirkol Akyol, Ş. (2022). Bir tekstil işletmesinde ergonomik risk değerlendirme uygulaması. *Ergonomi*, *5*(2), 72–83. https://doi.org/10.33439/ergonomi.1086636

Derdiyok, F. B., Atalay, E. S. (2022). Dikiş Diken Kadınlarda Boyun Ağrısının ve Postüral Özelliklerin İncelenmesi. *H.Ü. Sağlık Bilimleri Fakültesi Dergisi*, *9*(3), 573–590. https://doi.org/10.21020/husbfd.1024417

Griegel-Morris, P., Larson, K., Mueller-Klaus, K., Oatis, C. (1992). Incidence of common postural abnormalities in the cervical, shoulder, and thoracic regions and their association with pain in two age groups of healthy subjects. *Physical Therapy*, *72*(6), 425–431.

Mahmood, W., Bashir, M. S., Ehsan, S., Qureshi, M. A. (2021). Upper extremity musculoskeletal disorders and exposure to Ergonomic risk factors among handicraft workers. *Pakistan Journal of Medical Sciences*, *37*(2), 494–498. https://doi.org/10.12669/pjms.37.2.749

McAtamney, L., Corlett, E. N. (1993). RULA: a survey method for the investigation of work-related upper limb disorders. *Applied Ergonomics*, *24*(2), 91–99.

Melkani, E., Mehta, M., Gandhi, S. (2020). Drudgery Reduction and Grip Fatigue Review of Indian Women Making Handicrafts. *Asian Pacific Journal of Health Sciences*, *7*(2), 54–57. https://doi.org/10.21276/apjhs.2020.7.2.13

Rathore, B., Pundir, A. K., Iqbal, R. (2020). Ergonomic risk factors in glass artware industries and prevalence of musculoskeletal disorder. *International Journal of Industrial Ergonomics*, *80*, 103043. https://doi.org/10.1016/j.ergon.2020.103043

Shakerian, M., Esmaeili, R., Rismanchian, M. (2023). Association of ergonomics risk factors among Iranian calico crafts-men and musculoskeletal discomforts: A cross-sectional study. *BMC Musculoskeletal Disorders*, *24*(1), 109. https://doi.org/10.1186/s12891-023-06219-x

Singh, A. K. (2019). Comparative assessment of shift in hearing threshold among handicraft operatives in India. *Ergonomics*, *62*(1), 88–102. https://doi.org/10.1080/00140139.2018.1519121

Singh, A. K., Meena, M. L., Chaudhary, H. (2021). Measuring static muscular strength among female operatives: A cross-sectional comparison in different handicraft occupations. *International Journal of Occupational Safety and Ergonomics*, *27*(1), 29–40. https://doi.org/10.1080/10803548.2018.1506537

Tandoğan, Z. (2007). Women, gender and crafts: Turkey. In *Encyclopedia of women and Islamic cultures* (Vol. 6, pp. 166–167). Brill Academic Publishers.