ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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Indicators of Work-related Musculoskeletal Disorders and Risk Factors Among Young Adults

Genç Yetişkinler Arasında İşe Bağlı Kas İskelet Sistemi Rahatsızlıkları ve Risk Faktörlerinin Göstergeleri

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ABSTRACT Objective: The aim of this study is to determine work-related musculoskeletal system disorders (WMSDs) and risk factors that occur during the work experience of young adults aged 18-22. **Material and Methods:** Sixty-one volunteered participants who were in their first work experience participated in the study. A questionnaire including socio-demographic information, health status, workplace risk factors, occupational health and safety of participants and the Nordic Musculoskeletal Questionnaire (NMQ) were used. In statistical analysis, the chi-square test was used to compare qualitative data, and the Mann-Whitney U test was used to compare quantitative data. Multivariate logistic regression analysis was performed in the analysis of risk factors. **Results:** The ratio of the participants who reported WMSDs after starting the job was 78.7%. Most discomfort regions were reported as low back (70.5%), neck (68.9%) and back (65.6%),respectively. A statistically significant difference was found between the presence of heavy object/person lifting activity at work and the presence of hand/wrist discomfort and general musculoskeletal disorder (p=0.001, p=0.046). There was a statistically significant difference between doing actions that strain the hand/wrist and elbow, hand/wrist, and WMSD (p=0.003, p<0.000, p=0.041). The heavy lifting action of the participants at the workplace and excessive hand/wrist straining increased the symptoms in the hand/wrist up to 5-7 times. **Conclusion:** WMSDs was found to be high in young adults aged 18-22 years due to their first work experience. WMSDs were associated with ergonomic risk factors, as a result, monitoring preventive assessments for young adult employees might be useful. Further arrangements are needed to develop ergonomics for employees for promoting a healthy workplace.

Keywords: Young adults; musculoskeletal disorders; first work experience; occupational health

ÖZET Amaç: Bu çalışmanın amacı, 18-22 yaş grubu genç yetişkinlerin iş tecrübeleri esnasında ortaya çıkan mesleki kas iskelet sistemi rahatsızlıklarını (MKİSR) ve risk faktörlerini saptamaktır. **Gereç ve Yöntemler:** Çalışmada ilk iş tecrübesinde olan 61 gönüllü katılımcı yer aldı. Çalışmada, katılımcıların sosyo-demografik bilgileri, sağlık durumları, iş yeri risk faktörleri, iş sağlığı ve güvenliğine yönelik soruları içeren anket formu ile İskandinav Kas-İskelet Sistemi Anketi (İKSA) kullanıldı. İstatistiksel analizde, nitel verileri karşılaştırmak için ki-kare testi, nicel verileri karşılaştırmak için Mann-Whitney U testi kullanıldı. Risk faktörlerinin analizinde çok değişkenli lojistik regresyon analizi yapıldı. **Bulgular:** İşe başladıktan sonra MKİSR bildiren katılımcıların oranı %78,7'dir. En çok rahatsızlık bildirilen bölgeler sırasıyla, bel (%70,5), boyun (%68,9) ve sırttır (%65,6). İstatiksel olarak işte ağır obje/kişi kaldırma eyleminde bulunma durumu ile el/bilek rahatsızlığı ve genel kas iskelet sistemi rahatsızlığı ortaya çıkma durumu arasında anlamlı bir fark saptanmıştır (p=0,001, p=0,046). İstatistiksel olarak el bileğini aşırı zorlama eyleminde bulunma durumu ile dirsek, el/el bileği ve MKİSR arasında anlamlı bir fark bulunmuştur (p=0,003, p<0,000, p=0,041). Katılımcıların iş yerlerinde yaptıkları ağır kaldırma eylemi ve el/el bileği aşırı zorlama eyleminde bulunma el/el bileğindeki semptomları 5-7 kata kadar artırmaktadır. **Sonuç:** İlk iş tecrübelerine bağlı MKİSR 18-22 yaş grubu genç yetişkinlerde yüksek bulunmuştur. Katılımcılarda ergonomik risk faktörleriyle ilişkili MKİSR geliştiği için koruyucu değerlendirmelerin hazırlanması yararlı olacaktır. Sağlıklı bir iş yeri oluşturmak için çalışanların ergonomisini geliştirecek ilave düzenlemelere ihtiyaç vardır.

Anahtar Kelimeler: Genç yetişkin; kas-iskelet rahatsızları; ilk iş deneyimi; iş sağlığı

Work is important for individuals and their families. Individuals establish the family, and families establish the social structure. Therefore, improving the working conditions of individuals means a healthier society.[1] Investigating the first work experience of young adults who are at the beginning of their work-

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ing life and examining what kind of musculoskeletal disorders they experience and what related risk factors are essential in terms of maintaining their health status. Beginning to work in a job has different financial, social and health consequences for young adults. At the beginning of their working life, they may face disadvantages caused by starting to work for the first time. They may experience musculoskeletal problems sometimes due to their inexperience and sometimes due to the lack of necessary measurements in the workplace environment or working under different working conditions. As a result of this, being unemployed or failing in business life causes physical and mental discomforts in young adults.[2,3] Work-related musculoskeletal disorders (WMSDs) may later develop a risk of persistent pain. Persistent pain in the musculoskeletal system can adversely affect multiple and interrelated aspects of young people's lives, including working, participation in the labor force, fear of living a life in pain, sleep, physical activity, daily works, and general lifestyle.[4]

Musculoskeletal disorders (MSDs) refer to the health problems of muscles, tendons, skeleton, cartilages, ligaments, and nerves. MSDs cover all kinds of unhealthy conditions, from mild, temporary disorders to permanent, disabling injuries.[5] WMSDs are injuries and discomforts that develop during work and while working, are observed in the musculoskeletal system and result in ache, pain, and limitation of movement.[6] Each of the physical, ergonomic and psychosocial risk factors in the workplace environment prepares the basis for the occurrence of WMSDs. Factors such as working in the same or incorrect position for a long time, excessive working hours, heavy physical work, heavy lifting, and doing repetitive movements may be physical and ergonomic factors, and psychological exposures such as mental load and effort-reward imbalance are among the psychosocial factors.[5,7-11] In Europe, WMSDs are frequently observed among occupational diseases.[12,13] Furthermore, musculoskeletal disorders observed in different body regions are associated with the type of work done.[14]

The protection of the health of individuals is among the primary objectives of public health. For this reason, human beings should be considered with their environment as a whole, and their working life should not be ignored. Especially, the determination of WMSDs and risk factors for young adults who have just started to work and who are healthy at the same time is of great importance. WMSDs have severe consequences for both employees and employers. In employees who cannot do their job correctly because of pain and discomfort, the quality of life decreases, and losing their confidence about doing the work correctly brings mental problems. Therefore, work efficiency decreases and social and economic losses can be experienced.[15] It is evident that informing young adults about occupational risks is an essential preventive measure for reducing or eliminating occupational accidents and occupational diseases.[3] Studies on WMSDs in the literature have in general focused on heterogeneous age groups and different occupational groups. In Turkey and in the world, the number of specific studies on young adults aged 18-22 is limited. WMSDs which can affect the lives of young adults should be investigated. In this context, the present study aims to determine WMSDs that occur during the first work experience of young adults aged 18-22 years to detect the risk factors.

MATERIAL AND METHODS

STUDY DESIGN

This study is a descriptive cross-sectional study.

SETTING

This study, in which young adults who experienced their first work experience took part as participants, was carried out in Tokat-Turkey between May-June 2018 in private and public preschool education centers and special patient care homes for the elderly and patients.

PARTICIPANTS AND PROCEDURE

The study participants consisted of young adults who experience their first work experience. The participants are from different provinces of Turkey and have different socio-cultural characteristics. In order to carry out the study with low cost by reaching young adults, students, who were in Tokat Gaziosmanpaşa University Pazar Vocational High School, who were

between the ages of 18-22 years, and who were experiencing the first work experience, were selected as participants. Furthermore, the study was carried out on this group because the participants had a standard education degree at the level of associate degree, participant diversity was ensured because 29.5% of the participants were from Tokat and 70.5% were from different provinces, there was easiness in reaching the participants with different region diversity, it was easy to reach the participants according to the age group, they were experiencing their first work experience, and carrying out the study was easy.

All students were invited to the study, and it was aimed to include the whole student group in the study. According to the aim of the study, the criteria for inclusion in the study were as follows: being between 18 and 22 years of age, having a normal body mass index, and having previously not experienced any chronic disease and musculoskeletal disorder. A total of 22 young adults whose body mass index (BMI) was not at the normal level (n=5), who had experienced musculoskeletal system disorders previously (low back, shoulder and neck pain, scoliosis) (n=16), and who had a chronic disease (n=1) were excluded from the study. In the determination of chronic diseases and previous MSD, the participants' statements were taken as a basis. A total of 61 young adults, who were in the home patient care programme (30 young adults) and child development programme (31 young adults) were included in the study (Figure 1). The participants work two working days per week. While young adults in the home patient care programme receive theoretical training for 12 hours per week and work for 16 hours, young adults in the child development programme receive theoretical training for 19 hours per week and work for 12 hours. The first working place of young adults in the home patient care programme is private care homes. Each young adult takes care of at least 3 and at most 5 patients. The practices for which the employees of the home patient care program are responsible at their first workplace are determined according to the principles of the "Regulation about work and duty descriptions of health professionals and other professionals working in health services" published by the Ministry of Health in the Official Gazette No. 29007 dated 22.05.2014. [16] During the work, young adults are responsible for the following practices:

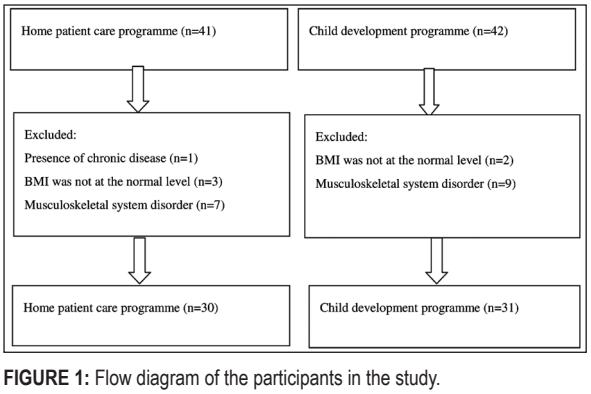

FIGURE 1: Flow diagram of the participants in the study.

- Evaluates the physical, mental and social care needs of patients. Supports the protection, maintenance, and use of daily life activities at the highest level.
- Feeds the patient following the nutrition program recommended by the dietician, monitors the patient's weight and evaluates the changes with the members of the health care team.
- Evaluates the living area in terms of accident risk and safety, ensures that the necessary arrangements are made.
- Monitors the medical care planned by the health care team and informs the health care professional about the situation if he/she detects a problem related to the implementation of medical care.
- Assists with daily personal care such as oral and dental care. He/she performs personal care and cleaning practices in the cases of dependence caused by being bedbound, having an illness or disability.
- Helps to reach health services and accompanies when necessary.
- Protects from abuse, and informs the family and the relevant institutions in cases where necessary about this situation.
- Directs to social activities and supports participation in them.

Young adult employees in the child development programme receive their first working experience at private and public preschool education centers. Each young adult employee takes care of at least two chil-

dren and at most seven children. Practices that they are responsible for during the work are as follows:

- Gets children to perform drama, painting, music, computer and physical development studies in preschool education institutions, special education institutions, and in the game rooms of children's clinics.
- Monitors the behaviors of children for whose education and training he/she is responsible, and organizes activities that may improve their abilities.
- Through being a model for children, ensures that they gain positive habits, and takes preventive measures against unwanted behaviors.
- Helps children with special needs to meet self-care needs when necessary.
- Applies first aid rules when necessary.
- Prepares some simple materials for educational activities.

This study complied with the Declaration of Helsinki, Gaziosmanpaşa University Faculty of Medicine Ethics Committee approval (Date: 06.06.2018) Approval no:18-KAEK-105) and institutional permission were obtained for the study. Volunteers who agreed to participate in the study read and signed an informed consent form.

INSTRUMENTS

The data of the study were collected using the questionnaire form prepared by the researchers after reviewing the literature and using the Nordic Musculoskeletal Questionnaire (NMQ).[17] The questionnaire consists of 27 items. Each item of the questionnaire is evaluated as "yes" or "no". The questionnaire consists of 69 questions in total about the participants' socio-demographic information, health status, workplace risk factors (physical, ergonomic and psychosocial), exposure to risk factors, and occupational health and safety. The Nordic Musculoskeletal Questionnaire evaluates the presence of ache, pain, and discomfort in the last 12 months, falling behind work due to ache, pain, and discomfort in the last 12 months, and the presence of ache, pain, and discomfort in the last 7 days in 9 symptom regions (neck, shoulders, back, elbows, wrists-hands, low back, thighs, hips, knees, and feet-ankles) which are marked by being mapped with standardized questions. Kahraman et al. demonstrated that the Turkish version of the questionnaire has appropriate psychometric features including the test-retest reliability, internal consistency, and construct validity and that it is an appropriate evaluation in the screening of musculoskeletal system problems.[18]

DATA ANALYSIS

The data obtained from the study were evaluated using SPSS (Statistical Package for Social Sciences) for Windows 20.0 program. As the descriptive statistics, the quantitative data were presented with the mean (±) and standard deviation (sd), and qualitative data were presented with frequency and percentage. Kolmogorov-Smirnov test was benefited to find whether the distribution was normal for the comparison of the measurement results. Because the measurement results did not create a normal distribution, non-parametric tests were preferred. In statistical analysis, the chi-square test was used to compare qualitative data, Fisher Exact test was used when the frequency expected in the chi-square test was less than 5, and the Mann-Whitney U test was used to compare quantitative data since the data were not normally distributed. The discomforts in 9 separate body regions (neck, shoulders, back, elbows, wrists-hands, low back, thighs-hips, knees, and feet-ankles), and general musculoskeletal system discomforts form separately the dependent variables. The risk factors (standing for a long time, heavy object/person lifting, heavy object pushing, weights of objects, excessive hand/wrist straining, the number of bending down in apprenticeship, working in an improper posture, etc.) were taken as independent variables in the study. Risk factors in response to each dependent variable were tested by binary logistic regression analysis one by one. In the single-variable analysis, potential risk factors that were p=0.250 or less were included in multivariate analysis. A statistically significant model was obtained from the independent variables (heavy object/person lifting, and excessive hand/wrist straining) that influence the dependent variable (discomfort in the hand/wrist). A p value smaller than 0.05 was considered significant.

RESULTS

Fifty-two (85.2%) of the study participants were female and 9 (14.8%) were male. Their mean age was 20.3±0.7 years and BMI average is 21.9±2.1 kg/m^2. More than half of the participants (60.7%) stated moderate economic situation. The ratio of those who think that their health status is good was 42.6%. Some of the participants exercised regularly (26.1%). The ratio of the participants who reported musculoskeletal system disorders after starting to work (in the last year) was 78.7%. The ratio of the participants who were trained about ergonomics was 1.6%, and the ratio of those who were trained on occupational health and safety was 32.8%.

The participants reported the regions in which they experienced most discomfort as low back (70.5%), neck (68.9%) and upper back (65.6%), respectively. 36.1% of the participants reported that they could not do their usual work due to discomfort in the back and low back regions. It was found out that they experienced discomfort mainly in the neck (62.3%), low back (59.0%) and upper back (57.4%) regions during the last 7 days (Table 1).

Experiencing general and regional WMSDs by the participants does not differ according to the gender (p=0.121, p=0.067, p=0.669, p=0.718, p=0.706, p=1.000, p=0.706, p=0.724, p=0.065, p=1.000). The number of young adults reporting neck pain, foot/ankle pain, and WMSDs after starting to work is higher in the child development programme, and this difference is significant (p=0.010, p=0.015, p=0.024). In the participants with sleep problems, experiencing discomfort in the shoulder region causes a significant difference (p=0.033). A significant correlation was determined between pushing heavy objects/persons and observing hand/wrist, knee, foot/ankle and WMSDs (p=0.044, p=0.030, p=0.020, p=0.002) (Table 2). In heavy object/person pushing action, the weight of the object/person was 24.19± 21.12 kg, and it was performed 2.86± 0.79 times.

There was a significant correlation between the heavy lifting activity at work and hand/wrist pain and the development of WMSDs (p=0.001, p=0.046). The weight of the object/person in the heavy lifting action was 33.54± 19.86 kg, and the heavy lifting action was performed 5.53± 4.10 times. Although the participants' pulling heavy objects at the workplace has no significant correlation with regional musculoskeletal system disorders, it has a significant correlation with WMSDs (p=0.021). The rate of neck pain and back pain development in the participants who perform the bending down and turning action is significantly different from those who do not perform these actions (p=0.002, p=0.044).

The rate of incidence of the risk factor for excessive hand/wrist straining was high both in regional and WMSDs. However, a significant correlation was determined only between elbow, hand/wrist and WMSDs (p=0.003, p<0.000, p=0.041). It was deter-

TABLE 1: Distribution of the participants complaints about the musculoskeletal system by body regions.

Body area	Have you had trouble at any time during the last 12 months (such as ache, pain, discomfort, numbness)? n (%)	During the last 12 months, have you been from carrying out normal activities (e.g. job, housework, hobbies) n (%)	Have you had trouble during the last 7 days? n (%)
Neck	42 (68.9)	21 (34.4)	38 (62.3)
Shoulder	33 (54.1)	18 (29.5)	36 (59.0)
Elbow	13 (21.3)	9 (14.8)	10 (16.4)
Hand/wrist	27 (44.3)	14 (23.0)	16 (26.2)
Upper back	40 (65.6)	22 (36.1)	35 (57.4)
Low back	43 (70.5)	22 (36.1)	36 (59.0)
Hip/thighs	21 (34.4)	14 (23.0)	15 (24.6)
Knee	29 (47.5)	11 (18.0)	18 (29.5)
Ankle/Feet	34 (55.7)	23 (37.7)	29 (47.5)

TABLE 2: Comparison of complaints about the musculoskeletal system with some risk factors associated with body regions.

Variables	Neckn (%)	Shouldern (%)	Elbown (%)	Hand/wristn (%)	Upper backn (%)	Low backn (%)	Hip/thighsn (%)	Kneen (%)	Ankle/Feetn (%)	WMSDs
Pain, discomfort, numbness (yes)	4 (44.4)	2 (22.2)	1 (11.1)	3 (33.3)	5 (55.6)	6 (66.7)	4 (44.4)	5 (55.6)	2 (22.2)	7 (77.8)
Gender (Male, n=9)	38(78.1)	31 (59.6)	12 (23.1)	24 (46.2)	35 (67.3)	37 (71.2)	17 (32.7)	24 (46.2)	32 (61.5)	41 (78.8)
Gender (Female, n=52)	0.121	0.067	0.669	0.718	0.706	1.000	0.706	0.724	0.065	1.000
p										
Job department										
Home patient care (n=30)	16 (53.3)	14 (46.7)	7 (23.3)	14 (46.7)	19 (63.3)	18 (60.0)	9 (30.0)	13 (43.3)	12 (40.0)	20 (66.7)
Child development (n=31)	28 (83.9)	19 (61.3)	6(19.4)	13 (41.9)	21 (67.7)	25 (80.6)	12 (38.7)	16 (51.6)	22 (71.0)	28 (90.3)
p	0.010*	0.252	0.704	0.710	0.710	0.077	0.474	0.512	0.015*	0.024*
Work satisfaction										
Satisfied (n=22)	16 (72.7)	11 (50.0)	4 (18.2)	6 (27.3)	13 (59.1)	15 (68.2)	3 (13.6)	10 (45.5)	17 (77.3)	18 (81.8)
Unsatisfied (n=39)	26 (66.7)	22 (56.4)	9 (23.1)	21 (53.8)	27 (69.2)	28 (71.8)	18 (46.2)	19 (48.7)	17 (43.6)	30 (76.9)
p	0.624	0.629	0.753a	0.045*	0.423	0.766	0.010*	0.806	0.011*	0.753a
Sleep problem										
Yes (n=45)	33 (73.3)	28 (62.2)	9 (20.0)	22 (48.9)	32 (71.1)	33 (73.3)	17 (37.8)	22 (48.9)	27 (60.0)	37 (77.1)
No (n=16)	9 (56.3)	5 (31.3)	4 (25.0)	5 (31.3)	8 (50.0)	10 (62.5)	4 (25.0)	7 (43.8)	7 (43.8)	11 (68.8)
p	0.205	0.033*	0.728a	0.222	0.127	0.526a	0.356	0.724	0.261	0.297a
Regular exercise										
Yes (n=16)	9 (56.3)	5 (31.3)	2 (12.5)	5 (31.3)	9 (56.3)	11 (68.8)	3 (18.8)	4 (25.0)	7 (43.6)	11 (68.8)
No (n=45)	33(73.3)	28 (62.2)	11 (24.4)	22 (48.9)	31 (68.9)	32 (71.1)	18 (40.0)	25 (55.6)	27 (60.0)	37 (82.2)
p	0.224a	0.033*	0.316	0.222	0.361	1.000a	0.124	0.036*	0.261	0.297a
Working in an unsuitable posture										
Yes (n=11)	8 (72.7)	8 (72.7)	3 (27.3)	8 (72.7)	11 (100.0)	9 (81.8)	5 (45.5)	6 (54.5)	7 (63.6)	11 (100.0)
No (n=50)	34 (68.0)	25 (50.0)	10 (20.0)	19 (38.0)	29 (58.0)	34 (68.0)	16 (32.0)	26 (46.0)	27 (54.0)	37 (74.0)
p	1.000a	0.171	0.687a	0.048a*	0.011a*	0.481a	0.488a	0.607	0.740a	0.100a
Standing for a long time										
Yes (n=47)	34 (72.3)	26 (55.3)	12 (25.5)	23 (48.9)	32 (68.1)	35 (74.5)	16 (34.0)	26 (55.3)	30 (63.8)	38 (80.9)
No (n=14)	8 (57.1)	7 (50.0)	1 (7.1)	4 (28.6)	8 (57.1)	8 (57.1)	5 (35.7)	3 (21.4)	4 (28.6)	10 (71.4)
p	0.332a	0.726	0.264a	0.178	0.527a	0.316a	1.000a	0.026*	0.020*	0.472a
Pushing heavy objects/persons										
Yes (n=21)	17 (81.0)	12 (57.1)	7 (33.3)	13 (61.9)	16 (76.2)	18 (85.7)	10 (47.6)	14 (66.7)	16 (76.2)	21(100.0)
No (n=40)	25 (62.5)	21 (52.5)	6 (15.0)	14 (35.0)	24 (60.0)	25 (62.5)	11 (27.5)	15 (37.5)	18 (45.0)	27 (67.5)
p	0.139	0.730	0.113a	0.044*	0.206	0.059	0.116	0.030*	0.020*	0.002a**

Note: p values were calculated by using the chi-square test. Fisher's exact test was used when the expected frequency was less than 5 in the chi-square test. a: Fisher exact test values were indicated with "a", *p < 0.05, ** p < 0.01

TABLE 3: Comparison of the participants' numbers of bending down at work by the Mann-Whitney U test for experiencing musculoskeletal system disorder.

The situation of experiencing musculoskeletal system disorder	n	Minumum	Maximum	Median	z	p
Yes	48	15	80	20	-1.968	0.049*
No	13	15	50	40		

z: Standard deviation *p < 0.05.

mined that the participants do excessive straining 5.53± 4.10 times.

Table 3 demonstrates that the number of bending down at the workplace of the participants, who reported WMSDs, was higher. This number differs significantly in relation to experiencing WMSDs (z=-1.968, p=0.049).

According to the results obtained from the logistic regression model, the independent variables of heavy lifting and excessive hand/wrist straining are the risk factors for experiencing pain and discomfort in the hand/wrist. The heavy lifting action of the participants at work increases the symptoms in the hand/wrist at the OR (Odds ratio)=5.755 (95% confidence interval (CI): 1.632-20.293). This means that they had 5.755 times risk more likely to experience the symptoms in the hand/wrist than those who do not perform heavy lifting action at work. The OR of the participants who perform the excessive hand/wrist straining action is 7.168. This means that they had 7.16 times risk more likely to experience pain in the hand/wrist than those who do not perform the action of excessive hand/wrist straining (CI: 1.971-26.067) (Table 4).

DISCUSSION

In this study, it was observed that young adults experienced ergonomic risks in the workplace. There was also a relationship between the defined ergonomic risks and WMSDs. As a result, monitoring preventive assessments for young adult employees might be useful.

In a systematic analysis study in which assistant health workers were enrolled as participants, it was reported that being a younger therapist and having less experience were the high risk factors for WMSDs.[19] In another study involving nurse assistants and kindergarten teacher assistants at the age of 23-26, complaints about the musculoskeletal system were reported in the first work experiences.[20] The results of a small number of studies conducted on young adults close to the age range of 18-22 years in the literature support the results of our study. It can be stated that the high incidence of WMSDs in the present study was caused by work inexperience and the lack of training on occupational health and safety. As an opinion supporting this, in a study in which medical students aged 19-29 were enrolled as participants, 87.4% of the participants reported to be suffering from musculoskeletal system pain after starting to work in the clinic.[21] As a matter of fact, the rate of WMSDs in young adults was determined to be 78.7% in the present study.

In the present study, the participants reported discomfort mainly in the low back region (70.5%). The participants' rate of experiencing low back pain was determined to be 47% in a study conducted on young employees employed for the first time, 19% at the end of the first year in another study conducted on young employees and 27.3% in another study in-

TABLE 4: Summary of final multivariate logistic regression models for hand/wrist symptom regions.

								95.0% CI[b] for Exp (B)	
Region	Risk Factor	B	SE	Wald	df	Significance	OR[a]	Lower bound	Upper bound
Hand/wrist	Heavy lifting	1.750	0.643	7.409	1	0.006*	5.755	1.632	20.293
	Excessive hand/wrist straining	1.970	0.659	8.942	1	0.003*	7.168	1.971	26.067
	Constant	-2.121	0.607	12.205	1	P<0.000	0.120		

Note: The results presented here include only the variables that show statistical significance in the final multivariate logistic regression models. *p < 0.01. [a] OR: odds ratio. When the factor demonstrates statistical significance, an OR of 1 or greater is a contributor and an OR less than 1 is a protective factor towards discomfort/disorder. [b] CI: confidence interval.

volving medical students.[22-24] In this study, the high incidence of low back discomfort in the participants may be caused by the difference of the work done by the participants, the workplace conditions, exposure to different physical and psychosocial loads other than the work done, the high number of female participants in the study group, and the difference in receiving education on occupational health and safety and ergonomics during vocational training. In our study group, the ratio of receiving occupational health and safety education (32.8%) and the ratio of receiving ergonomics education (1.6%) were found to be low. The fact that individuals receive occupational health and safety and ergonomics education at the beginning of their working life significantly reduces the probability of WMSDs development. The studies support the opinion that WMSD rates decrease with ergonomics education.[25,26]

Sleep problems in adolescent females and males are found to cause neck and low back pain and at the same time shoulder pain in females.[27] It was reported that complaints about the musculoskeletal system increase as sleep time decreases in individuals who are in the age range of 17-23 years and are preparing for university exams.[28] In working individuals, sleep problems were determined to be associated with low back pain and burnout syndrome.[29] In the present study, a significant relationship was found between sleep problems and experiencing discomfort in the shoulder region. The results support that sleep is a determinant factor in musculoskeletal system discomforts and it especially affects the upper part of the body.

Exposure of young employees to psychosocial risk factors at work increases the likelihood of painless MSDs development.[30] In this study, psychological risk factors, such as psychological pressure at work, the presence of social support, and job satisfaction, of young employees were investigated. In the participants, a significant relationship was found only between work dissatisfaction and reporting of hand/wrist, leg, and foot/ankle discomforts. Psychological risk factors at the workplace are generally associated with low back and neck discomforts.[31] In this study, work dissatisfaction causes to report discomfort in different regions, but in fact, it is thought that young adults experience work dissatisfaction due to the discomfort in these regions.

In this study, the number of young adults who reported neck pain, foot/ankle pain, and general MSDs after they started to work was found to be statistically higher in the child development programme. Kristiansen and Kvåle reported that health care workers' risks of experiencing musculoskeletal system pain in the future are high, but the widespread pain complaints of school and kindergarten workers are higher than those of health workers.[32]

In the studies conducted on young and new employees, it was found out that even short-term exposure to physically challenging occupational biomechanical loads (object lifting, pushing and pulling, etc.) can cause permanent or temporary discomforts in the neck, shoulder, back, and low back regions.[23,33-37] However, in the present study, a statistically significant correlation was determined between heavy object/person pushing and experiencing hand/wrist, knee, foot/ankle, and general MSDs. This situation demonstrates that during pushing objects/persons small body areas such as hands are used and that large muscle groups are not used.

One of the most frequently reported biomechanical risk factors in the development of WMSDs is lifting a heavy object/person.[7] Poole Wilson and Davis emphasized that safe patient lifting is vital in reducing WMSDs in health workers.[38] Similarly, it is emphasized that nursing students are involved in activities such as patient lifting at the beginning of the training, and that teaching safe patient handling techniques during the training process and lifting patients with the necessary equipment are important.[39] According to the results of a cohort study in which young employees were followed up for two years, the heavy lifting was defined as a risk factor for knee pain/discomfort.[40] In the present study, a significant correlation was found between heavy object/person lifting and the incidence of hand/wrist and general MSDs. In young adults, heavy lifting and excessive hand/wrist straining are risk factors for the condition of experiencing pain and discomfort in the

hand/wrist. The action of the heavy lifting done by the participants at the workplace increases the symptoms in the hand/wrist at the rate of 5.755. Furthermore, those who perform the excessive hand/wrist straining action are 7.16 times more likely to experience discomfort in the hand/wrist. Repetitive and intensive hand use leads to the formation of MSDs in the hand/wrist alone or in combination with other physical and non-physical risk factors.[41] In the present study, the incidence of both regional and general musculoskeletal system discomforts was high in individuals who used their wrist by straining it excessively. However, it was determined that it has a significant relationship only with the elbow, hand/wrist and general MSDs. The results can be explained by the inadequate ergonomics knowledge of young adult individuals involved in the study. Musculoskeletal system complaints also arise with regard to the high loading of the small joints. It was thought that the fact that individuals do not have adequate knowledge about ergonomics causes them to strain the hand/wrist excessively and not to use the large muscle groups sufficiently, and this situation could cause a series of WMSDs.

CONCLUSION

In the first work experiences of young adults aged 18-22 years, WMSDs have appeared at a high rate. The region in which the most discomfort is reported is the low back. Ergonomic risk factors related to especially physical overloads at the workplace have caused WMSDs to occur. The actions of lifting heavy objects/persons, pulling and pushing, doing movements but strain the hand/wrist excessively, bending down and turning by bending down are important risk factors related to WMSDs in young adults in their first working year. Heavy lifting and doing movements that strain the hand/wrist excessively increase the likelihood of experiencing hand/wrist discomfort up to 5-7 times. Preventive ergonomis assessments and arrangements might reduce these risk factors related to WMSDs. However, it has been observed that conservation-based approaches are needed for body regions found to be most affected. In this context, corporate ergonomics and occupational health and safety training programs are needed for young employees during both vocational training and at workplaces. These programs should primarily include working in the right position at the workplace, protecting small joints, and the use of ancillary tools.

There are some limitations to our study. First, the number of participants were enough for the statistical analysis but limited to make general estimations for young adults. Second, repetitive measurements were not made in the study. In this context, it is predicted that long-term follow-up of young adults is needed in future studies.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Gonca Soysal, Ayla Günal, Rengin Erdal;* ***Design:*** *Gonca Soysal, Ayla Günal, Rengin Erdal;* ***Control/Supervision:*** *Gonca Soysal, Ayla Günal, Rengin Erdal;* ***Data Collection and/or Processing:*** *Gonca Soysal, Ayla Günal;* ***Analysis and/or Interpretation:*** *Gonca Soysal, Ayla Günal, Rengin Erdal;* ***Literature Review:*** *Gonca Soysal, Ayla Günal;* ***Writing the Article:*** *Gonca Soysal, Ayla Günal;* ***Critical Review:*** *Gonca Soysal, Ayla Günal, Rengin Erdal;* ***References and Fundings:*** *Gonca Soysal, Ayla Günal, Rengin Erdal;* ***Materials:*** *Gonca Soysal, Ayla Günal, Rengin Erdal.*

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