

Ergonomic Evaluation of Furniture and Equipment Elements Used in Offices: Kastamonu University Example

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Graphical/Tabular Abstract (Grafik Özet)

According to the results of the research, it was understood that some of the furniture and equipment elements used in the workspaces are not ergonomic for the employees and this situation causes health problems in the users. The health problems were identified as pain in the shoulder, neck, head, back, waist and leg areas of the users and it was determined that the frequency of pain was higher in female users than male users. / Araştırma sonuçlarına göre, çalışma mekânlarında kullanılmakta olan bazı mobilya ve donatı elamanlarının çalışanlar için ergonomik olmadığı, bu durumun da kullanıcılarda sağlık sorunları oluşturduğu anlaşılmıştır. Belirlenen sağlık sorunları, kullanıcıların omuz, boyun, baş, sırt, bel ve bacak bölgelerindeki ağrılar olarak tespit edilmiş ve ağrı sıklığının kadın kullanıcılarda erkek kullanıcılardan daha fazla olduğu belirlenmiştir.

Number of Kastamonu University Staff	Number of	Number of Surveys
Academic	595	90
Administrative	376	90
Total	971	180

Table1. Number of surveys distributed and collected / **Tablo 1.** Dağıtılan ve toplanan anket sayısı

Highlights (Önemli noktalar)

- It has been determined that the seat depth of the chairs used in the offices of Kastamonu University is 51-53 cm, which causes discomfort to users. /Kastamonu Üniversitesi ofislerinde kullanılan sandalyelerin oturma derinliğinin 51-53 cm olduğu ve bu durumun kullanıcılara rahatsızlık verdiği tespit edilmiştir
- The average upper leg length of people in our country is 46.8 cm for men and 46.6 cm for women/Ülkemizde erkeklerin ortalama üst bacak uzunluğu 46,8 cm, kadınların ise 46,6 cm'dir.
- The sitting depth for work chairs has been determined as 47.8 cm, and for office chairs, it has been determined as 36-43 cm. / Çalışma sandalyeleri için oturma derinliği 47,8 cm, ofis sandalyeleri için ise 36-43 cm olarak belirlenmiştir

Aim (Amaç): This study conducted an ergonomic evaluation of some furniture and equipment used in workplaces, and identified health problems that users experienced./ Bu çalışmada, çalışma mekânlarında kullanılan bazı mobilya ve donatı elamanlarının ergonomik yönden değerlendirilmesi yapılmış ve değerlendirme sonucu kullanıcılarda ortaya çıkan sağlık problemleri belirlenmiştir

Originality (Özgünlük): It is a unique study in terms of determining the demographic characteristics of the employees of Kastamonu University and the problems they face while using the facilities./Kastamonu Üniversitesinin çalışanlarının demografik özellikleri ve donatılar kullanırken karşılaştıkları sorunların belirlenmesi açısından benzersiz bir çalışmadır.

Results (Bulgular): It was determined that 51.4% of the academic and administrative staff participating in this research at Kastamonu University had undergraduate education, while 46.5% had graduate education. / Kastamonu Üniversitesi'nde bu araştırmaya katılan akademik ve idari personelin %51,4'ünün lisans eğitimi, %46,5'inin ise lisansüstü eğitimi olduğu tespit edilmiştir.

Conclusion (Sonuç): This study identified the health problems experienced by academic and administrative staff at Kastamonu University based on their demographic characteristics, work desks, work chairs, and computer equipment, and presented solutions./ Bu çalışma, Kastamonu Üniversitesi'ndeki akademik ve idari personelin demografik özellikleri, çalışma masaları, çalışma koltukları ve bilgisayar ekipmanlarına göre yaşadıkları sağlık sorunlarını belirlemiş ve çözüm önerileri sunmuştur.



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Abstract

This study conducted an ergonomic evaluation of some furniture and equipment used in workplaces, and identified health problems that users experienced. For this purpose, a data collection survey was administered to 173 academic and administrative staff at Kastamonu University, aged between 21 and 52, and the results were compared with literature and standards. The study concluded that some furniture and equipment used in workplaces were not ergonomic for employees, leading to health problems for users. The identified health problems included pain in the shoulders, neck, head, back, waist, and legs, with a higher prevalence of pain among female users than male users. Based on these results, it can be argued that ergonomic working conditions should be provided for Kastamonu University academic and administrative staff, which could reduce or eliminate pain complaints. Furthermore, training on ergonomic working conditions and appropriate exercises could contribute to a more productive academic and administrative staff. To this end, a total of 173 surveys were administered to office users, 86 administrative and 87 academic staff between the ages of 21 and 52. The survey results, determined using frequency analysis, were compared with literature and standards. The study found that some office furniture and fittings were not ergonomically designed for employees, leading to a higher incidence of pain in the shoulders, neck, head, back, waist, and legs among female users than male users. These results suggest that providing ergonomic working conditions for Kastamonu University's academic and administrative staff may reduce or eliminate pain complaints. Furthermore, ergonomics training may be beneficial, as it could contribute to the more productive work of academic and administrative staff.

Bürolarda Kullanılan Mobilya ve Donatı Elemanlarının Ergonomik Açıdan Değerlendirilmesi: Kastamonu Üniversitesi Örneği

Makale Bilgisi

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Öz

Bu çalışmada, çalışma mekânlarında kullanılan bazı mobilya ve donatı elemanlarının ergonomik yönden değerlendirilmesi yapılmış ve değerlendirme sonucu kullanıcılarda ortaya çıkan sağlık problemleri belirlenmiştir. Bu amaçla, veri toplama aracı olarak hazırlanan anket 21 ve 52 yaş aralığındaki toplam 173 kişinin bulunduğu Kastamonu Üniversitesi akademik ve idari personeline uygulanarak, elde edilen sonuçlar literatür ve standartlar ile karşılaştırılmıştır. Araştırma sonuçlarına göre, çalışma mekânlarında kullanılmakta olan bazı mobilya ve donatı elemanlarının çalışanlar için ergonomik olmadığı, bu durumun da kullanıcılarda sağlık sorunları oluşturduğu anlaşılmıştır. Belirlenen sağlık sorunları, kullanıcıların omuz, boyun, baş, sırt, bel ve bacak bölgelerindeki ağrılar olarak tespit edilmiş ve ağrı sıklığının kadın kullanıcılarda erkek kullanıcılardan daha fazla olduğu belirlenmiştir. Bu sonuçlara göre, Kastamonu Üniversitesi akademik ve idari personeli için ergonomik çalışma koşulları sağlanması gerektiği, bu sayede ağrı şikâyetlerinin azaltılmasının veya tamamen giderilmesinin mümkün olabileceği söylenebilir. Ayrıca, ergonomik çalışma koşulları ve yapılması gereken egzersizler hakkında verilecek bir eğitim, akademik ve idari personelin daha verimli çalışmasına katkı sağlayabilecektir. Bu amaçla, 21 ve 52 yaş aralığında ki 86 idari 87 akademik personel olmak üzere toplam 173 anket büro kullanıcılarına uygulanmıştır. Frekans analizi yöntemiyle belirlenen anket sonuçları, literatür ve standartlar ile karşılaştırılmıştır. Araştırma sonuçlarına göre, bürolarda kullanılmakta olan bazı mobilya ve donatı elemanlarının çalışanlar için ergonomik olmadığı, bu durumun kadın kullanıcıların omuz, boyun, baş, sırt, bel ve bacak bölgelerindeki ağrı sıklığının erkek kullanıcılardan daha fazla olduğu belirlenmiştir. Bu sonuçlara göre, Kastamonu Üniversitesi akademik ve idari personeli için ergonomik çalışma koşulları sağlanırsa ağrı şikâyetlerinin azalması veya tamamen giderilmesi mümkün olabilir. Ayrıca, ergonomi hakkında alınacak bir eğitim, akademik ve idari personelin daha verimli çalışmalarına katkı sağlayabileceği düşüncesiyle faydalı olabilir.

1. INTRODUCTION (GİRİŞ)

Ergonomics is an interdisciplinary field of research and development that applies anatomical, psychological, and physiological knowledge to the relationships between the workplace layout, work environment, and the worker, as well as the problems arising from these relationships, taking into account human anthropometric measurements, physiological capacity, and tolerances [1, 2]. The most important goals of ergonomics include improving the quality of life by making work environments conducive to health, planning work schedules, and ensuring work arrangements with designs suitable for the individual's physiological characteristics. According to these goals, an ergonomic design should be suitable for the user, easy to use, and should increase comfort, efficiency, health, and safety [3-7].

One of the conditions for increasing productivity is that the space in which the individual lives and the equipment they use are suitable for human anthropometric and biomechanical characteristics. Anthropometry, which determines the measurements of the human body, is the most important criterion in organizing the work environment and designing tools and equipment, defining the biological and physical limits of humans. Without knowing the standard measurements, which are a prerequisite for ergonomic design, optimal interaction between humans and the work environment and productivity cannot be achieved. The mental and physical health of people can only be ensured if the tools and equipment they use are designed to fit their body measurements [8-12].

Products intended for long-term mass production were not designed to fit everyone's measurements, as this was considered impractical, but were manufactured to suit the majority of the population [2]. As a result, the use of non-ergonomic equipment, time pressure, and a demanding work pace have led to numerous health problems, primarily work-related musculoskeletal disorders [13-18]. These problems, which hinder daily activities, stem from incorrect sitting or poorly designed chairs and sofas [19]. This issue, which is extremely important for human health, must be addressed seriously [20].

Some researchers have examined seating comfort in trains, schools, offices, and gyms. The results obtained have helped determine the principles of seating design [20], and ideal measurements have been established. In this type of research, it has been

stated that the height of work chairs should be 40.4 cm, the depth of the seat should be 47.8 cm, the width of the seat should be 36.7 cm, the height of the armrests should be 24.7 cm, the height of work desks should be 68.4 cm, the length should be 121.5 cm, and the width should be 61.4 cm [21]. Work desks and chairs currently manufactured to these dimensions do not provide comfort to all users, necessitating additional accessories in different sizes. The most commonly preferred accessory is lumbar support. However, it should be noted that each user must select lumbar support specifically for themselves to reduce discomfort [22].

Another health problem is the stress experienced by those working in a non-ergonomic work environment. Ensuring workplace-employee harmony improves performance, health, and safety, thereby reducing stress on employees, increasing productivity, and minimizing errors. Therefore, the concept of work organization forms the basis of ergonomics [5, 23-26].

Some studies report that eye and musculoskeletal complaints among computer workers [27] are related to typing time [28] and mouse usage frequency [29], while complaints among female workers are more prevalent than among males [30, 31]. Skeletal symptoms are the most common ailment among office workers, and they have been reported to be related to stress-related problems [30, 32-34]. Individual, organizational, and ergonomic factors causing musculoskeletal disorders have been examined. As a result, they determined that problems were identified in the neck, back, and wrist-elbow, respectively, and that arm, neck, and shoulder disorders were more common in women, while back disorders were more common in men.

Improvements in employee health, knowledge and skills, productivity, job satisfaction, and a reduction in musculoskeletal disorders, among other things, can be achieved by correcting workplace habits through training in ergonomics [35-38]. Indeed, it has been determined that in groups that received workplace ergonomics training, postural disorders and psychosocial risk factors were eliminated, resulting in a significant decrease in musculoskeletal disorders [18, 25, 36, 39-41] and that the use of ergonomic office furniture provided benefits [42]. Furthermore, it has been noted that ergonomic adjustments in the workplace reduce complaints related to musculoskeletal disorders and improve the overall physical health and quality of life of employees [43-46]. Karaman [47], conducted a survey investigating the ergonomics of office furniture and equipment among academic staff at

Uşak University. The findings revealed that 73.6% of the participants considered the office furniture to be suitable for their body size.

Findings from previous studies on the subject were evaluated, and it was planned to determine the ergonomic status of office workers, which is the subject of this study, with the aim of contributing to the field. The main objective of this study is to determine whether the office furniture used by academic and administrative staff at Kastamonu University meets ergonomic criteria and to propose solutions to complaints and negative issues. In addition to this main objective, another goal is to inform designers about the necessity of adjustable furniture based on health issues.

2. MATERIALS AND METHODS (MATERİYAL VE METOD)

2.1. Selection of Participants (Katılımcıların Seçimi)

Since the research results were intended to reflect the opinions of a wide range of users, particular attention was paid to ensuring an equal distribution of demographic characteristics when selecting the subjects participating in the research. The survey

data was obtained through face-to-face interviews. The sample consisted of participants randomly selected from among the academic and administrative staff working in various departments at Kastamonu University. Table 1 shows the number of questionnaires distributed and collected. A total of 971 staff members work at the university, including 595 academic staff and 376 administrative staff. The sample size was calculated based on the number of employees as follows:

$n = (N \cdot t \cdot p \cdot q) / (d^2 \cdot (N - 1) + t^2 \cdot p \cdot q)$ formula was used.

n = Number of people to be sampled

N = Number of individuals in the target population (universe) = 971

p = Probability of the event occurring in the target population = 50%

q = Probability of the event not occurring in the target population (1-p) = 50%

t = Value found in the t-table at a specific significance level (95% confidence level) (1.96)

d = Accepted sampling error (10%)

$n = (971 \times 1.962 \times 0.5 \times 0.5) / (0.102 \times (971 - 1) + 1.962 \times 0.5 \times 0.5)$

$n = 932.5484 / 10.6604$

n=87 equation was used.

Table 1. Number of surveys distributed and collected (Dağıtılan ve toplanan anket sayısı)

Number of Kastamonu University Staff	Number of Surveys Distributed	Number of Surveys
Academic	90	87
Administrative	90	86
Total	180	173

According to Table 1, a total of 180 questionnaires were distributed to 90 administrative and 90 academic staff members, and a total of 173 questionnaires were collected, 86 from administrative staff and 87 from academic staff.

Copper material with 99.5% purity was preferred as a tool (electrode). The tools were prepared by cutting on a wire erosion bench based on the keyseat dimensions. In Figure 2, the dimensions of the workpiece and tool, and the processing principle are shown. The experiments were carried out on the Furkan compact 1 Z-NC type die-sinking electro erosion bench. Belone EDM F liquid with high flash point and low viscosity was used as dielectric fluid.

2.2. Survey Design (Anket Tasarımı)

The issues raised in the study were measured using a questionnaire. The questionnaire form was categorized into two groups. The first part consisted of questions about the demographic characteristics of the subjects. The second part consisted of

questions about office furniture and employee health problems. The questionnaire design benefited from questionnaires conducted on similar topics in the past [48, 49, 50].

2.3. Data Evaluation (Verilerin Değerlendirilmesi)

The survey data was analyzed using the SPSS 19 software package. The demographic characteristics of the participants, such as gender, educational status, position, length of service, age, height, and weight, were examined using frequency analysis. Survey data on health problems among employees were rated on a five-point Likert scale, frequency tables were generated, and the chi-square (X^2) test was applied to determine whether the differences between variables covering participants' preferences were statistically significant. In the statistical analyses in the study, comparisons with a p-value below 0.05 were considered statistically significant.

3. RESULTS (BULGULAR)

3.1. Characteristics of desks and chairs used in offices (Ofislerde kullanılan masa ve sandalyelerin özellikleri)

The vast majority of L-shaped desks and two different types of office chairs with similar characteristics are used in the offices of Kastamonu University. Table 2 shows the measurements of the desks and office chairs used in the offices.

Table 2. Dimensions of desks and office chairs used in offices (Ofislerde kullanılan masa ve ofis koltuklarının boyutları)

Desk dimensions (cm)	Width	Depth	Height
Front desk	160	80	75.5
L-shaped desk extension	80	52	75.5
A-type seat cushion	53	53	41-52 (min-max)
A-type seat backrest	53	-	58
A-type seat armrest	-	-	20
B-type seat cushion	50	51	43-53 (min-max)
B-type seat backrest	50	-	58
B-type seat armrest	-	-	18

3.2. Demographic Characteristics of Employees (Çalışanların Demografik Özellikleri)

The values for participants' gender, education, and positions are provided in Table 3.

Table 3. Values related to participants' gender, education, and job positions (Katılımcıların cinsiyeti, eğitimi ve iş pozisyonlarıyla ilgili değerler)

Participant		n	%
Gender	Male	103	60.2
	Female	68	39.8
Education	High school	3	1.7
	Associate degree	7	4.0
	Bachelor's degree	82	47.4
	Master's Degree	32	18.2
	Doctorate	49	28.3
Staff	Academic Staff	87	50.0
	Administrative Staff	86	49.7

Table 3 shows that the distribution of participants according to their positions is equally determined, with the majority having undergraduate and

graduate education, but 60.2% are male and 39.8% are female. The average values for the participants' age, height, and weight are given in Table 4.

Table 4. Average values for participants' age, height, and weight (Katılımcıların yaş, boy ve kilo ortalamaları)

Participant	n	Mean ± Standard Deviation	Median (Min-Max)
Age	172	33.65 ± 7.01	32.00 (21-52)
Height	173	1.69 ± 0.09	1.70 (1.36-1.96)
Weight	173	72.04 ± 13.64	72.00 (44-110)

According to Table 4, the average age of the participants was 33.65, the average height was 1.69 m, and the average weight was 72.04 kg. Table 5

shows the average values for age, height, and weight according to the participants' gender.

Table 5. Age, height, and weight values of participants by gender (Katılımcıların cinsiyete göre yaş, boy ve kilo değerleri)

Participant	Male (n=102)	Female (n=68)
Age	34.19 ± 7.51	32.49 ± 5.81
Height (m)	1.75 ± 0.06	1.62 ± 0.06
Weight (kg)	79.62 ± 10.89	60.19 ± 7.81

According to Table 5, the average age was determined to be 34.19 for men and 32.49 for women, and it was observed that the majority of participants were young people. The average height of participants was 1.75 m for men and 1.62 m for women, while the average weight was 79.62 kg for men and 60.19 kg for women. Our findings are close to the data reported in the literature, which indicates

an average height of 1.73 m for men and 1.62 m for women [2].

3.2. Health Problems Among Employees (Çalışanların Arasındaki Sağlık Sorunları)

The results regarding pain in the right and left hands of participants in office work according to gender are presented in Table 6.

Table 6. Pain occurrence in the right and left hands by gender (Cinsiyete göre sağ ve sol ellerde ağrı görülme sıklığı)

Pain frequency	Right hand				Left hand			
	Female		Male		Female		Male	
	n	%	n	%	n	%	n	%
Always	3	4.4	0	0	1	1.5	0	0
1-2 times a day	5	7.4	9	8.7	2	2.9	3	2.9
1-2 times per	9	13.2	8	7.8	5	7.4	4	3.9
Once or twice a	16	23.5	28	27.2	6	8.8	13	12.6
Never	35	51.5	58		54	79.4	83	80.6
Chi-square result	X ² : 7.224 df: 4 P:0.125				X ² : 3.310 df: 4 P:0.507			

n: Number of participants, X²: Chi-square, df: Degrees of freedom, P: Significance level

According to Table 6, there was no statistically significant difference between genders in terms of pain in the right and left hands during office work ($p>0.05$). Depending on their work, 51.5% of female participants and 56.3% of male participants reported never experiencing pain in their right hands, while 79.4% of female participants and 80.6% of male participants reported never experiencing pain in their left hands. Depending on their work, 23.5% of female participants and 27.2% of male participants reported experiencing pain in their right hands 1-2 times a month, while 8.8% of female participants and 12.6% of male participants

reported experiencing pain in their left hands 1-2 times a month. In general, it was determined that workers experienced more pain in their right hands than in their left hands; the fact that the majority of workers prefer to use their right hand when using a mouse may be the cause of this situation. The literature supports our study by stating that discomfort in the hand used for the mouse is concentrated in the palm, fingers, and wrist [2, 29]. The results regarding pain in the right and left wrists of participants in office work according to gender are given in Table 7.

Table 7. Frequency of pain in the right and left wrists by gender (Cinsiyete göre sağ ve sol bileklerdeki ağrı sıklığı)

Pain frequency	Right wrist				Left wrist			
	Female		Male		Female		Male	
	n	%	n	%	n	%	n	%
Always	3	4.4	0	0	1	1.5	0	0
1-2 times a day	5	7.4	8	7.8	2	2.9	3	2.9
1-2 times per	10	14.7	8	7.8	3	4.4	3	2.9
Once or twice a	18	26.5	26	25.5	8	11.8	15	14.6
Never	32	47.1	60	58.8	54	79.4	82	79.6
Chi-square result	X ² : 8.355 df: 4 P:0.079				X ² : 2.344 df: 4 P:0.673			

n: Number of participants, X²: Chi-square, df: Degrees of freedom, P: Significance level

According to Table 7, there was no statistically significant difference between genders in terms of pain in the right and left wrists during office work ($p>0.05$). Depending on their work, 4.4% of female participants reported pain in their right wrists and 1.5% in their left wrists all the time; male participants reported no pain in their right or left wrists all the time, but 7.8% reported pain in their right wrists and 2.9% in their left wrists 1-2 times a day. Overall, 52.9% of female participants and

41.2% of male participants reported pain in their right wrists. To prevent wrist pain, the most important rule is to adjust the chair height properly so that the elbow and wrist are positioned at natural angles, which supports our view [17, 51]. Sehnal [52] states that split keyboards can help maintain a natural wrist position. The results regarding pain in the right and left elbows of participants in office work according to gender are presented in Table 8.

Table 8. Frequency of pain in the right and left elbows according to gender (Cinsiyete göre sağ ve sol dirseklerde ağrı sıklığı)

Pain frequency	Right elbow				Left elbow			
	Female		Male		Female		Male	
	n	%	n	%	n	%	n	%
Always	1	1.5	1	1	0	0	0	0
1-2 times a day	2	3	7	6.9	2	3	4	4
1-2 times per week	8	12.1	6	5.9	3	4.5	4	4
Once or twice a month	9	13.6	17	16.7	7	10.6	12	11.9
Never	47	69.7	71	69.6	54	81.8	81	80.2
Chi-square result	χ^2 : 3.345 df: 4 P:0.. 03				χ^2 : 0.201 df: 3 P: 0.977			

n: Number of participants, χ^2 : Chi-square, df: Degrees of freedom, P: Significance level

According to Table 8, there was no statistically significant difference between genders in terms of pain in the right and left elbows during office work ($p>0.05$). Overall, the percentage of participants who stated that they never experienced pain in their right and left elbows due to their work was very similar for both women and men. 30.3% of female

participants and 30.4% of male participants reported pain in their right elbows, while 18.2% of female participants and 19.8% of male participants reported pain in their left elbows. The results regarding the occurrence of pain in the neck and shoulders among participants in office work according to gender are presented in Table 9.

Table 9. Frequency of neck and shoulder pain by gender (Cinsiyete göre boyun ve omuz ağrısı sıklığı)

Pain region	Neck				Shoulders			
	Female		Male		Female		Male	
	n	%	n	%	n	%	n	%
Always	18	26.5	11	10.7	9	13.4	6	5.8
1-2 times a day	14	20.6	10	9.7	15	22.4	11	10.7
1-2 times per week	20	29.4	27	26.2	15	22.4	16	15.5
Once or twice a month	8	11.8	33	32.0	17	25.4	35	34.0
Never	8	11.8	22	21.4	11	16.4	35	34.0
Chi-square result	χ^2 : 18.800 df: 4 P:0.001				χ^2 : 12.958 df: 4 P:0.011			

n: Number of participants, χ^2 : Chi-square, df: Degrees of freedom, P: Significance level

According to Table 9, there was a statistically significant difference between genders in terms of neck and shoulder pain in office work ($p<0.05$). It was determined that female participants experienced neck and shoulder pain most frequently 1-2 times per week, while male participants experienced pain 1-2 times per month. Overall, 88.2% of female participants and 78.6% of male participants reported pain in the neck region. In the shoulder region, 83.6% of female participants and 66% of male users reported pain. Female users may

feel pain more frequently than male users due to their sensitivity to pain. Ergonomic work furniture, hand, wrist, and neck supports, and short breaks during work are thought to reduce neck and shoulder pain in workers. Aaras et al. [39] and Sharp [40] reported a reduction in skeletal system disorders in the shoulders and neck with the use of new chairs, furniture, and neck supports, as well as alternative work schedules. The results regarding participants experiencing back pain associated with the use of back supports are presented in Table 10.

Table 10. Status of experiencing back pain associated with back support device use (Sırt destek cihazı kullanımıyla ilişkili sırt ağrısı yaşama durumu)

Back support usage status	Yes		No	
	n	%	n	%
Frequency of back pain				
Always	8	(10.1)42.1	11	(11.8)57.9
1-2 times a day	10	(12.7)33.3	20	(21.5)66.7
1-2 times per week	16	(20.2)45.7	19	(20.4)54.3
Once or twice a month	18	(22.8)43.9	23	(24.8)56.1
Never	27	(34.2)57.4	20	(21.5)42.6
Chi-square result	χ^2 : 4.607		df: 4	P: 0.330

n: Number of participants, χ^2 : Chi-square, df: Degrees of freedom, P: Significance level

According to Table 10, there was no statistically significant difference in the results regarding participants experiencing back pain related to the use of back braces ($p>0.05$). The fact that 57.4% of participants did not use back support, while the rest reported experiencing back pain even when using back support, indicates that back pain is a serious problem. It is thought that participants could alleviate their discomfort to some extent by

thoroughly researching and obtaining a back support that fits their body measurements and is comfortable for them. De Rosario et al. [22] reported that the height of back supports made according to standards may vary depending on the user. The results regarding the occurrence of pain in the back and spine region among participants in office work according to gender are given in Table 11.

Table 11. Frequency of lower back and back pain by gender (Cinsiyete göre bel ve sırt ağrısı sıklığı)

Pain region	Lower back				Back			
	Female		Male		Female		Male	
	n	%	n	%	n	%	n	%
Always	12	17.6	11	10.7	20	29.4	13	12.7
1-2 times a day	16	23.5	13	12.6	17	25.0	15	14.7
1-2 times per week	15	22.1	24	23.3	16	23.5	21	20.6
Once or twice a	18	26.5	36	35.0	13	19.1	38	37.3
Never	7	10.3	19	18.4	2	2.9	15	14.7
Chi-square result	χ^2 : 7.942		df: 4	P: 0.094	χ^2 : 18.418		df: 4	P: 0.001

n: Number of participants, χ^2 : Chi-square, df: Degrees of freedom, P: Significance level

According to Table 11, there was no statistically significant difference between genders in terms of pain in the lumbar region during office work ($p>0.05$), but there was a statistically significant difference in terms of pain in the back region ($p<0.05$). While 26.5% of female participants reported experiencing lower back pain at least once a month, this rate was determined to be 35% among males. 10.3% of female participants and 18.4% of male participants stated that they had never experienced lower back pain. 29.4% of female participants reported always experiencing pain in the back region, while 37.3% of male participants reported experiencing pain in the back region 1-2 times a month. Overall, 89.7% of female participants and 81.6% of male participants reported experiencing pain in the lower back region. Regarding back pain, 97.1% of female participants and 85.3% of male participants reported

experiencing pain. The fact that a significantly higher percentage of women than men experience back pain on a regular basis will affect their work performance. It was concluded that the dimensions of the furniture in the study did not match the anthropometric measurements of the users, which is why the percentage of those experiencing lower back pain was high. Considering that the seat depth of the work chairs was only 5-6 cm more than the standard and that there was no forward-backward adjustment for the backrest, it is inevitable that there would be a high incidence of lower back pain. Amick et al. [36] reported that the implementation of ergonomics training in the workplace will reduce musculoskeletal disorders among employees and help maximize employee health and productivity. The frequency of eye discomfort according to participants' attention to eye and screen distance is shown in Table 12.

Table 12. Participants' attention to eye and screen distance according to eye discomfort (Göz rahatsızlığına göre katılımcıların göz ve ekran mesafesine verdikleri önem)

Frequency of eye discomfort	Attention to eye and screen distance			
	Yes		Yes	
	n	%	n	%
Always	8	42.1	11	57.9
1-2 times a day	10	33.3	20	66.7
1-2 times a week	16	45.7	19	54.3
Once or twice a month	18	43.9	23	56.1
Never	27	57.4	20	42.6
Chi-square result	X^2 : 4.607		df: 4	P: 0.330

n: Number of participants, X²: Chi-square, df: Degrees of freedom, P: Significance level

According to Table 12, there was no statistically significant difference in the frequency of eye discomfort when the minimum distance between the eyes and the screen was 50 cm ($p>0.05$). While 42.1% of participants who paid attention to the distance between their eyes and the screen stated that they always experienced eye discomfort and 57.4% stated that they never experienced eye

discomfort, 57.9% of those who did not pay attention to the distance between their eyes and the screen stated that they always experienced eye discomfort, and 42.6% stated that they never experienced eye discomfort. The results regarding the occurrence of headaches and eye pain among participants in office work by gender are presented in Table 13.

Table 13. Frequency of headaches and eye pain among employees by gender (Çalışanlarda cinsiyete göre baş ağrısı ve göz ağrısı sıklığı)

Pain area	Head				Eye			
	Female		Male		Female		Male	
	n	%	n	%	n	%	n	%
Always	8	11.8	5	4.9	11	16.2	8	7.8
1-2 times a day	7	10.3	10	9.8	12	17.6	17	16.6
1-2 times per week	19	27.9	16	15.7	9	13.2	26	25.5
Once or twice a	25	36.8	40	39.2	18	26.5	22	21.6
Never	9	13.2	31	30.4	18	26.5	29	28.4
Chi-square result	X^2 : 10.934		df: 4	P: 0.027	X^2 : 6.088		df: 4	P: 0.199

n: Number of participants, X²: Chi-square, df: Degrees of freedom, P: Significance level

According to Table 13, there was a statistically significant difference between genders in office work; there was a statistically significant difference in the results regarding pain in the head region ($p<0.05$); there was no statistically significant difference in the results regarding pain in the eyes ($p>0.05$). 39.2% of male participants and 36.8% of female participants reported experiencing headaches 2 times per month. Both gender groups were found to experience headaches with the same frequency. 7.8% of male participants and 16.2% of female participants reported always experiencing

eye discomfort. Overall, 86.8% of female participants and 69.6% of male participants reported experiencing pain in the head region. Regarding the eyes, 73.5% of female participants and 71.6% of male participants reported experiencing pain. The eye pain experienced by participants may be caused by prolonged viewing of computer screens. It is thought that taking breaks at regular intervals would be beneficial for participants. The results regarding the occurrence of pain in the leg area among participants in office work according to gender are given in Table 14.

Table 14. Frequency of leg pain among employees by (Çalışanlar arasında bacak ağrısı sıklığı)

Frequency of leg pain	Gender					
	Female		Male		Overall	
	n	%	n	%	n	%
Always	6	8.8	3	3.0	9	5.3
1-2 times a day	9	13.2	8	7.9	17	10.1
1-2 times per week	17	25.0	14	13.9	31	18.3
Once or twice a month	13	19.1	31	30.7	44	26.0
Never	23	33.8	45	44.6	68	40.2
Chi-square result	$X^2: 9.759$		df: 4		P: 0.045	

n: Number of participants, X₂: Chi-square, df: Degrees of freedom, P: Significance level

According to Table 14, there was a statistically significant difference between genders in office work; in the results regarding the occurrence of pain in the leg regions ($p < 0.05$). % of female participants reported experiencing leg pain 1-2 times a week, while 30.7% of male participants reported experiencing leg pain 1-2 times a month. Overall, 66.2% of female participants and 55.4% of male

participants reported experiencing leg pain. It was observed that women experienced leg pain more often than men. It is thought that leg pain stems from sitting immobile throughout the day and that office exercises may reduce the frequency of leg pain. The results regarding whether participants took breaks at specific intervals during office work according to gender are presented in Table 15.

Table 15. Taking breaks at regular intervals by gender (Cinsiyete göre düzenli aralıklarla mola vermek)

Break-taking status	Gender					
	Female		Male		Overall	
	n	%	n	%	n	%
Yes	60	88.2	88	85.4	150	86.7
No	8	11.8	15	14.6	23	13.3
Chi-square result	$X^2: 0.088$		df: 1		P: 0.767	

n: Number of participants, X₂: Chi-square, df: Degrees of freedom, P: Significance level

According to Table 15, there was no statistically significant difference between genders in office work regarding whether they took breaks at regular intervals ($p > 0.05$). 88.2% of female participants and 85.4% of male participants stated that they took breaks during work. This rate is quite good for employees who need both physical and mental rest.

Erkan [1], Gülçubuk [53], and Baslo [54] stated that taking periodic rest breaks during work can eliminate or alleviate discomfort such as pain and stiffness in various muscles. The results regarding whether participants performed office exercises in office work according to gender are presented in Table 16.

Table 16. Office exercise status of employees by gender (Cinsiyete göre çalışanların ofiste egzersiz durumu)

Exercise participation status	Gender					
	Female		Male		Overall	
	n	%	n	%	n	%
Yes	12	17.6	13	12.6	25	14.5
No	56	82.4	90	87.4	148	85.5
Chi-square result	$X^2: 0.475$		df: 1		P: 0.491	

n: Number of participants, X₂: Chi-square, df: Degrees of freedom, P: Significance level

According to Table 16, there was no statistically significant difference between genders in office work; in the results regarding whether or not they did office exercises ($p > 0.05$). 82.4% of female participants and 87.4% of male participants did not

exercise at work. It is thought that when office exercises are not performed, health problems arise from sitting continuously for hours, that employees cannot focus sufficiently on their work due to these problems, and that productivity will decrease as a

result. Akalın [51] supports our recommendation by stating that stretching exercises should be performed during breaks.

4.RESULTS AND DISCUSSION (SONUÇLAR VE TARTIŞMA)

This study identified the health problems experienced by academic and administrative staff at Kastamonu University based on their demographic characteristics, work desks, work chairs, and computer equipment, and presented solutions.

It was determined that 51.4% of the academic and administrative staff participating in this research at Kastamonu University had undergraduate education, while 46.5% had graduate education. Based on this result, it can be said that all participants were knowledgeable about the subject and had sufficient information.

It has been determined that the seat depth of the chairs used in the offices of Kastamonu University is 51-53 cm, which causes discomfort to users. The average upper leg length of people in our country is 46.8 cm for men and 46.6 cm for women [2]. The sitting depth for work chairs has been determined as 47.8 cm [21], and for office chairs, it has been determined as 36-43 cm [17]. Based on this information, it is considered that the office chairs in our study are not suitable for the majority of employees from an anthropometric perspective. The seating area depth is too great (51-53 cm), and the chairs do not provide sufficient lumbar support, meaning they do not support the lower back. This situation creates an uncomfortable seating environment for the user, inviting muscle and skeletal discomfort.

Some academic and administrative staff have tried to find solutions for themselves with hand, wrist, back, and neck supports, thinking that their pain might decrease. Some have also changed their work chairs. The literature [1, 39, 40, 52, 53] reports that the use of new chairs, furniture, and neck supports, as well as alternative work programs, has reduced skeletal system discomfort in the shoulders and neck. However, another piece of literature [22] suggests that back supports produced in standard sizes may not be beneficial for everyone.

Another problem seen in office chairs is that the back section cannot be adjusted separately forward-backward and up-down. For those who spend their entire workday in front of a computer, the most important point to consider when purchasing a chair is that the seat and back section can be adjusted

forward-backward and up-down independently of each other. With the help of these adjustments in the backrest, workers can achieve different sitting postures. This can reduce pain in the back and lumbar region.

Discomfort in the palms, fingers, and wrists of computer users has been identified in the offices of Kastamonu University, related to mouse use. Jensen et al. [29], noting that this discomfort in the palms, fingers, and wrists stems from prolonged mouse use, recommended using the mouse appropriately and even performing most tasks with the keyboard. They also stated that the most important rule for preventing wrist pain is to position the elbow and wrist at natural angles and to adjust the chair height properly [17, 50]. According to Sehna [51], split keyboards can help maintain a natural wrist position.

The results of the study reveal that participants experienced pain at a very high rate, particularly in the back, neck, and waist regions. We believe that designers do not pay enough attention to ergonomics, especially in the production of office chairs. Therefore, innovations in the design of office furniture and equipment, taking into account the anthropometric measurements of our country's population, are very important for the health and productivity of employees. In addition, it is recommended that every employee receive training on ergonomics in order to increase productivity in the workplace.

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DECLARATION OF ETHICAL STANDARDS (ETİK STANDARTLARIN BEYANI)

Ethics committee approval for the face-to-face surveys conducted at Kastamonu University was obtained in accordance with the decision of the Kastamonu University Ethics Commission dated 25.11.2014 and numbered 804.

Kastamonu Üniversitesinde yüz yüze uygulanan anketlere ilişkin gerekli etik kurul izni, Kastamonu Üniversitesi Etik Komisyonunun 25.11.2014 tarih ve 804 sayılı kararı doğrultusunda alınmıştır.

AUTHORS' CONTRIBUTIONS (YAZARLARIN KATKILARI)

Elif TİFTİK: She conducted the surveys, organized the survey results, analyzed the findings, and wrote the manuscript.

Anketlerin gerçekleştirilmesi, anket sonuçlarının düzenlenmesi, sonuçların analizi ve makale yazımını gerçekleştirdi.

Hacı İsmail KESİK: He carried out the evaluation of the survey analyses, wrote the manuscript, and supervised the process.

Anket analizlerinin değerlendirilmesi, makale yazımı ve denetimi işlemlerini gerçekleştirdi.

CONFLICT OF INTEREST (ÇIKAR ÇATIŞMASI)

There is no conflict of interest in this study.

Bu çalışmada herhangi bir çıkar çatışması yoktur.

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