

Research Article / Araştırma Makalesi

Assessment of Ergonomic Working Conditions and Stress Perceptions of Office Workers: A University Example

Büro Çalışanlarının Ergonomik Çalışma Koşulları ve Stres Algılarının Değerlendirilmesi: Bir Üniversite Örneği

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Abstract: The necessity of organizing the working conditions of a workplace in a way that is suitable for employees and that they can easily do their jobs brings ergonomics to the forefront in terms of occupational health and safety. It is aimed to determine the perception of ergonomic working conditions and the stress levels of a university's office workers. This cross-sectional study was conducted among 530 office workers of a university. The Ergonomic Working Conditions Scale (EWCS) was used to determine the perception of ergonomic working conditions, and the Perceived Stress Scale (PSS), was used to determine stress perception levels. Mann-Whitney U, Kruskal-Wallis tests, Spearman correlation and Multiple linear regression analyses were used. Participants ages ranged between 19-60 years with a mean of 37.2±8.9 years. The participants' scores on the EWCS ranged between 36-130, with a mean score of 83.6±14.2 points. It was found that there was a weak negative correlation between the scores obtained from the EWCS and the scores obtained from PSS ($r = -0.167$, $p = 0.001$). As a result of multiple linear regression analysis, it was found that age, gender, working time and ergonomic arrangement of working conditions by the employee were associated with the scores obtained from the EWCS ($F = 4318$, $p < 0.001$). It was found that the perceptions of university office workers about the ergonomic conditions of the working environment were at a moderate level. As the level of perception of the employees about ergonomic conditions increased, the level of perceived stress decreased.

Keywords: Ergonomics, Stress, Office Worker, University

Özet: Bir işyerinin çalışma koşullarının çalışanlara uygun ve işlerini rahatlıkla yapabilecekleri şekilde düzenlenmesi gerekliliği, iş sağlığı ve güvenliği açısından ergonomiyi ön plana çıkarmaktadır. Bu çalışmada bir üniversitenin büro çalışanlarının ergonomik çalışma koşulları algısı ve stres algısı düzeylerinin belirlenmesi amaçlanmıştır. Bu kesitsel çalışma, bir üniversitenin 530 büro çalışanında gerçekleştirilmiştir. Ergonomik çalışma koşulları algısını belirlemek için Ergonomik Çalışma Koşulları Ölçeği (EÇKÖ) ve stres algısı düzeylerini belirlemek için Algılanan Stres Ölçeği (ASÖ) kullanılmıştır. Mann-Whitney U, Kruskal-Wallis testleri, Spearman korelasyon ve Çoklu doğrusal regresyon analizleri kullanılmıştır. Katılımcıların yaşları 19-60 arasında değişmekte olup ortalama 37.2±8.9 yıl idi. Katılımcıların EÇKÖ puanları 36-130 arasında değişmekte olup, ortalama puan 83.6±14.2'dir. EÇKÖ'den elde edilen puanlar ile ASÖ'den elde edilen puanlar arasında negatif yönde zayıf bir korelasyon olduğu bulundu ($r = -0.167$, $p = 0.001$). Çoklu lineer regresyon analizi sonucunda yaş, cinsiyet, çalışma süresi ve kendisi tarafından çalışma koşullarının ergonomik olarak düzenlenmesi durumları ile EÇKÖ'den alınan puanların ilişkili olduğu saptandı ($F = 4318$, $p < 0,001$). Üniversite büro çalışanlarının çalışma ortamının ergonomik koşullarına ilişkin algılarının orta düzeyde olduğu bulunmuştur. Çalışanların ergonomik koşullara ilişkin algı düzeyi arttıkça algılanan stres düzeyi de azalmaktadır.

Anahtar Kelimeler: Ergonomi, Stres, Büro Çalışanı, Üniversite

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1. Introductions

Work offices are places where they spend an important part of the day for those working in both the private sector and public institutions and organizations. For people who spend more time at work than at home, it is known that workplace working conditions have a direct impact on the productivity of the employee. The necessity of organizing these workplace working conditions in a way that is suitable for employees and that they can do their jobs easily brings ergonomics to the forefront in terms of occupational health and safety (1).

Ergonomics, also known as human factors engineering and design, aims to adapt work to people and each person to their own work. It is essential to implement practices that prioritize the health and productivity of employees. The aim of ergonomics is not only to eliminate risk factors that are important for occupational accidents and occupational diseases, but also to increase the well-being and performance of employees by ensuring occupational safety and improving working conditions in the workplace (2).

Ergonomic conditions of workplaces can be organized in many ways such as anthropometric, physiological, psychological, informational and safety. Employees may be exposed to many physical, chemical, biological and psychosocial risk factors in the workplace (3). While these risk factors may negatively affect the health and therefore work efficiency of employees, the presence of plants and flowers in the same environment and colorful and vivid paintings on the walls may make employees feel more comfortable psychologically (4).

An institutionalized workplace should carefully complete the arrangements to be made for its employees by considering all these methods. In the occurrence of occupational musculoskeletal disorders observed physically due to working conditions in the office environment, problems such as incorrect sitting posture, overloading of muscles due to repetitive static movements, use of incorrect equipment, failure to select ergonomic equipment suitable

for the body structure/anthropometric dimensions of the person or failure to adjust mechanisms according to personal body characteristics must be overcome (5). In other words, workplace working conditions should be designed and organized by taking into account the anthropometric characteristics of the employees.

In order for individuals to work in harmony, prioritizing not only physical but also mental health, and organizing the environment and system to suit the individual, so that they can do their job easily, will not only increase the performance of employees, but also reduce the pressure and stress burden on them (6,7).

As a matter of fact, stress is defined as an introverted reaction that people show against situations that they perceive as a threat or difficulty and it is seen as a factor known to have many negative effects on human health (8). Despite this, studies evaluating the relationship between stress and perception of ergonomic conditions are insufficient in the literature. In our study, it was aimed to determine the level of perception of ergonomic working conditions, to examine some variables thought to be related to this perception, and to evaluate the level of stress perception of Eskisehir Osmangazi University office workers.

2. Materials and Methods

The study is a cross-sectional study, conducted on office workers of a university between March 01 - April 29, 2022. Eskisehir Osmangazi University has 13 faculties, 2 colleges, 5 vocational schools, 4 institutes and affiliated units. There are a total of 821 clerical staff working throughout the university and it was aimed to reach all of them in our study. Ethical and administrative approvals were obtained for the study. A total of 291 people who were not present at the workplace during the data collection period (n=64) and who refused to participate in the study (n=227) were excluded from the study. The study group consisted of 530 people (64.6%).

A questionnaire form prepared by utilizing the literature was used for data collection in the study (9–11). After visiting the office workers in the units where they worked and informing them about the subject and purpose of the study, verbal consent was obtained from those who agreed to participate in the study. The questionnaires were completed by office workers under the supervision of the research team in approximately 15-20 minutes. The dependent variable of the study was the perception of ergonomic working conditions, while the independent variables were age, gender, presence of chronic disease, physical disability, current position and working time in the workplace and perceived stress level.

The 'Ergonomic Working Conditions Scale' developed by Oskaloglu and Cati was used to determine the perception levels of the study group regarding ergonomic working conditions. The scale consists of 26 questions and total scores can vary between 26-130. As the scores increase, it is accepted that working conditions are perceived as more ergonomic (11). 'Perceived Stress Scale' was used to determine stress levels. The scale was developed by Cohen et al. in 1983 and the Turkish validity and reliability study was conducted by Eskin et al. in 2013. The scale consists of 10 questions and it is accepted that the perceived stress level increases as the scores increase (12).

The data obtained were evaluated in SPSS V20.0 statistical package program. Kolmogorov-Smirnov test was used for the conformity of measurable data to normal distribution. Mann-Whitney U test, Kruskal-Wallis test and Spearman correlation and Multiple linear regression analysis (enter method) were used for analysis. For linear regression analysis, logarithmic transformation was performed to approximate the normal distribution of some variables. $p < 0.05$ was accepted as statistical significance value.

3. Results

The study group consisted of 339 (64.0%) females and 191 (36.0%) males. Their ages ranged between 19-60 years, with a mean of 37.2 ± 8.9 years. The "Ergonomic Working Conditions Scale" scores of the participants ranged from 36 to 130, with a mean score of 83.6 ± 14.2 (median: 84). The scores of female employees were lower than the scores of male employees ($p=0.001$). The distribution of the Ergonomic Working Conditions Scale scores of the study group according to some sociodemographic characteristics is given in Table 1.

Table 1. Distribution of the Ergonomic Working Conditions Scale scores of the study group according to some sociodemographic characteristics

Sociodemographic Characteristics	n	%	Ergonomic Working Conditions Scale Score Median (Min-Max)	Statistical Analysis z / KW; p
Age (years)				
≤ 30	134	25.3	83.5 (36-130)	
31-40	201	37.9	84.0 (52-130)	1.938; 0.379
≥41	195	36.8	86.0 (44-127)	
Gender				
Female	339	64.0	82.0 (36-130)	
Male*	191	36.0	86.0 (44-130)	3.454; 0.001
Marital Status				
Married	328	61.9	85.0 (36-130)	
Single	202	38.1	83.5 (37-130)	1.784; 0.074
Education Status				
High school and below	222	41.9	85.5 (37-130)	
University graduate and above	308	58.1	84.0 (36-130)	0.680; 0.496

Position Classification

Manager / consultant	26	4.9	87.5 (37-122)	
Constable	240	45.3	86.0 (44-130)	4.834; 0.081
Secretary / service staff	264	49.8	83.0(36-130)	

History of Chronic Disease

No	412	77.7	85.0 (36-130)	
Yes	118	22.3	82.0 (47-126)	1.377; 0.169

Physical Disability Status

No	494	93.2	84.0 (36-130)	
Yes	36	6.8	83.5 (45-114)	0.374; 0.708

Total	530	100.0	84.0 (36-130)	
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* statistically significant group ($p < 0.05$)

Four hundred thirty two (81.5%) of the employees reported that their employers had not made arrangements for ergonomic conditions. The total working time in the current job of 159 (30%) of the study group was 5 years or less. The scores of this group were lower than the other groups ($p=0.009$). While 23.2% of the participants stated that they had not heard of the definition of

ergonomics before, only 21.6% of those who had heard of it reported that their workplaces were organized for ergonomic conditions. The distribution of the scores obtained by the participants from the Ergonomic Working Conditions Scale according to some factors thought to be related to ergonomic working conditions is given in Table 2.

Table 2. Distribution of the Ergonomic Working Conditions Scale scores of the study group according to some factors thought to be related to ergonomic working conditions

Some factors related to ergonomic working conditions	n	%	Ergonomic Conditions Scale Score Median (Min-Max)	Working Conditions Scale Score	Statistical Analysis z / KW; p
Total Working Time At Current Job (Years)					
5 and below*	159	30.0	80.0 (36-130)		
6-10	127	24.0	86.0 (52-114)		9.414; 0.009
11 and above	244	46	85.5 (44-130)		
Hearing The Concept Of Ergonomics					
No	123	23.2	86.0 (37-130)		
Yes	407	76.8	84.0 (36-130)		0.982; 0.326
Attending An Event On Ergonomics In The Last 1 Year					
No	506	95.5	84.0 (36-130)		
Yes	24	4.5	90.5 (49-130)		1.848; 0.065
Ergonomic Organization Of Working Conditions By The Employer In The Last 1 Year					
No	432	81.5	83.0 (36-127)		
Yes*	98	18.5	88.5 (52-130)		3.455; 0.001
Ergonomic Organization Of Working Conditions By Oneself In The Last 1 Year					
No	263	49.6	83.0 (36-127)		
Yes*	267	50.4	86.0 (45-130)		2.434; 0.015
Total	530	100.0	84.0 (36-130)		

* statistically significant group ($p < 0.05$)

The scores of the study group on the Perceived Stress Scale ranged 0-37, with a mean of 20.8 ± 4.7 (median: 21) points. There was a very weak negative correlation between the office workers' scores on the Ergonomic Working Conditions Scale and their scores on

the Perceived Stress Scale ($p=0.001$, $r=-0.167$). The distribution of the Ergonomic Working Conditions and Perceived Stress Scale scores of the study group is given in Figure 1.

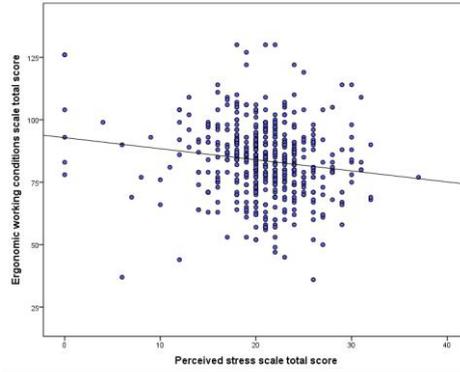


Figure 1. The distribution of the ergonomic working conditions and perceived stress scale total scores of the study group.

As a result of multiple linear regression analysis (enter method), it was found that age, gender, duration of employment and ergonomic organization of working conditions by oneself were associated with the scores obtained from the EWCS (F=4318, p<0.001).

The results of multiple linear regression analysis of the total scores obtained from the ergonomic working conditions scale with the variables considered to be related to ergonomics are given in Table 3.

Table 3. Multiple linear regression analysis results of the ergonomic working conditions scale total score and variables thought to be related to ergonomics

Sociodemographic Characteristics and Related Variables	EWCS Total score		
	Standartize β	Unstandartize β (%95 GA)	p
Age	-0.122	-0.086 (-0.173—0.00)	0.049
Gender	0.109	0.017 (0.004—0.031)	0.014
Marital Status	-0.019	-0.002 (-0.014—0.009)	0.667
Duration Of Employment	0.165	0.015 (0.004 —0.025)	0.007
Position Classification	-0.045	-0.006 (-0.017 — 0.006)	0.312
Attending An Event On The Topic	0.078	0.029 (-0.003 — 0.061)	0.179
Ergonomic Organization Of Working Conditions By Oneself	0,088	0,014 (0,000 — 0,027)	0,050
Ergonomic Organization Of Working Conditions By The Employer	0.092	0,018 (0,000 — 0,036)	0.076
Perceived Stress Scale Scores Total Score	-0,066	-0,05 (-0,117 — 0,015)	0,129
R²	0,06		<0,001
F	4318		

4. Discussion

Although it is known that ergonomics makes life easier to the extent that it is more harmonized with the environment, many workplaces and employers may ignore the regulation of ergonomic conditions for different reasons. The office workers in the study group perceived their ergonomic conditions as moderate level. As the university is a public institution, the administration has strict rules to follow for office spaces, which may prevent office workers from taking the initiative to improve their working conditions.

Work life and the time spent in workplaces occupy almost one third of a person's life (13). Healthy and safe working environments to be provided for human beings, who are the cornerstone of the existence of businesses, increase the contribution of the employee to the structure in which he/she works. Determining the ergonomic conditions of the working environment is a priority for the arrangements that can be made. Similar to our study, Polat et al. measured the level of perception of the conditions and found that the conditions were perceived at a moderate level (14).

As individuals get older, they can be expected to be more selective about ergonomic working conditions in order to cope with health problems more easily. In our study, although no relationship was found between the age groups of office workers and ergonomic working conditions in the univariate analysis, age affected the perception of ergonomic working conditions in the multiple linear regression model. Güneş et al. reported that there was no difference between age groups and ergonomic working conditions (15), and Costa and Sartori reported that ergonomic conditions worsened as the age of employees increased (16).

Although women are actively participating in working life today, the fact that working conditions are designed according to men's anthropometric characteristics and lifestyle may cause women's perception of ergonomic working conditions to be lower. This is also

supported by the fact that women are more sensitive to working conditions due to their physiological characteristics (muscle strength, cardiovascular function, aerobic work capacity, pregnancy, childbirth, etc.). In our study, in parallel with this, it was found that the level of perception of ergonomic working conditions was better among men than women. In a study conducted by Güler et al. on the evaluation of ergonomic conditions, it was reported that women complained more about negative ergonomic working conditions (17). In another study conducted by Güneş and Ceylan, it was reported that women were employed under more unfavorable ergonomic conditions than men (15). In this context, our study is in parallel with other studies in the literature.

It is known that ergonomic working conditions directly affect the physical health of the individual and that desk workers frequently experience musculoskeletal disorders (18). Therefore, it is possible that office workers with physical disabilities evaluate the ergonomics of working conditions as worse. However, in our study, no difference was found between those with and without physical disabilities in terms of the level of perception of ergonomic working conditions. Belgen et al. reported that employees with physical disabilities were employed under worse ergonomic conditions (19). Similar results have been reported in different studies in the literature (20,21).

It can be expected that office workers who have been working in the same workplace for a long time will be more conscious about ergonomics with the experience they have gained in the workplace, and even adopt the environment more and make various arrangements themselves, so that their working conditions will be more ergonomic. In this study, it was found that those with less total working time in their current job had worse perceptions of ergonomic working conditions. While a similar result was reported in the study by Pirvu et al. (22), a positive correlation between working time and the degree of satisfaction with ergonomic

conditions was reported in the study by Parmaksız et al. (23).

Employees who heard the concept of ergonomics and subsequently conduct research on the subject are expected to have more knowledge about the ergonomics. Although there was no difference between those who have heard of ergonomics and those who have not in terms of the level of perception about ergonomic working conditions in our study, it is possible that the workers who have this awareness will organize their working environments accordingly and work in more ergonomic conditions. It is an expected result that those who personally make ergonomic arrangements in their workplaces think that their conditions are better. In this context, in this study, it was found that those who made arrangements for ergonomic conditions by themselves in the last year had better perceptions of ergonomic working conditions. In some studies, it was reported that those who had previously heard the concept of ergonomics worked under more ergonomic conditions (24,25). Similarly, some studies reported that personal arrangements made in the workplace environment created more ergonomic working conditions (26,27). It can be said that the different results reported may be due to the fact that the studies were conducted in societies with different sociocultural structures and/or the measurement methods used in the evaluation of the conditions were different.

In this study, it was found that office workers who reported that the employer had made arrangements for ergonomic conditions within the last year had better perceptions of ergonomic working conditions. In addition, although no statistically significant difference was found, it can be said that employees who are managers or consultants have better perceptions of ergonomic working conditions ($p=0.081$). The fact that the people who should make the necessary arrangements regarding ergonomics are already managers and consultants may have led to this result. As a matter of fact, it is included in many employment contracts that appropriate arrangements should be made by the

employer. In studies, it has been reported that productivity increases at the level where employee conditions are improved by employers' ergonomic working conditions regulations and if these principles are not applied, conditions deteriorate and employee health and productivity are negatively affected (28,29).

Ergonomics plays a very important role in the protection and development of not only physical but also mental health among employees. It is known that good ergonomic conditions such as proper body posture, well-lit environment, and regulation of the temperature of the working environment reduce perceived stress in office workers (30). In our study, it was found that there was a very weak negative correlation between the perceived ergonomic conditions of the working environment of office workers and their perceived stress levels. Although a negative relationship between stress and ergonomic working conditions is expected (31), it has also been reported that no relationship was found between ergonomic working conditions and stress levels (32). One of the reasons for the different results reported in various studies may be that ergonomic conditions differ between sectors.

The limitations of this study include the fact that it was a cross-sectional study, that it was a single-center study and that the scale used only measured how individuals perceived ergonomic working conditions. The answers given are subjective and may change according to the conditions of the day and the participant's willingness to participate in the study.

5. Conclusion

It can be said that the perceptions of university office workers about the ergonomic conditions of the working environment are at a moderate level. The fact that women interpreted the conditions as worse in the study suggested that the conditions may have been designed and organized according to the male gender, as in male-dominated societies. It was observed that the perception of ergonomic working conditions was better

when ergonomic arrangements were made by the employee himself or by his employer. As the level of perception of ergonomic working conditions increased, the level of perceived stress decreased.

It may be useful to organize the working environment in the university in terms of ergonomics and to inform the employees

about the subject. Office ergonomics trainings can be given to employees and employers and incentives can be provided for necessary ergonomic arrangements. It would be useful for future research to conduct more comprehensive studies to reveal the relationship between perceptions of ergonomic conditions and stress level.

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Ethics

Ethics Ethics Committee Approval: The study was approved by Eskişehir Osmangazi University Noninterventional Ethical Committee (Approval Date/ Number: 05.04.2022/70)

Author Contributions: Idea/concept: FNÖM, AÜ, DA. Design: FNÖM, MT, AK, AÜ, DA. Data Collection: FNÖM, MT, AK. Data Processing: FNÖM, MT. Analysis/Comment: FNÖM, MT, AK. Literature research/review FNÖM, MT, AK. Writing: FNÖM, MT, AK. All authors discussed the results and contributed to the final manuscript

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