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Research Article

Work Ergonomics and Risk Factors: Are Laboratory Professionals at Risk?

Çalışma Ergonomisi ve Risk Faktörleri: Laboratuvar Profesyonelleri Risk Altında mı?

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ABSTRACT

Purpose: This study aims to examine in detail the ergonomic risk factors among laboratory professionals in physical, psychological and individual terms. **Material and Methods:** 60 participants included the study. Demographic form, Occupational Balance Questionnaire (OBQ), in which personal factors were examined for individuals who agreed to be included in the research; Work Stress Scale (WSS) and Beck Depression scale were evaluated with online forms prepared by Google Forms to evaluate psychosocial risk factors. REBA was used to determine the physical risk factors during the study and RULA Employee Assessment was used to evaluate the risk factors related to the upper extremity. **Results:** When the ergonomic risk factors were compared, a statistically significant difference was found between REBA, RULA, OBQ and WSS scores ($p<0.05$). **Conclusion:** Microbiology laboratory and pathology laboratory professionals are in the highest risk group in terms of both whole-body score and upper extremity. Biochemistry laboratory professionals, on the other hand, are in the category of moderately severe risk, especially since they are in a standing position for a long-time during device use.

Keywords: Ergonomics; Laboratory Personnel; Risk Factors.

ÖZ

Amaç: Bu çalışma, laboratuvar çalışanları arasında fiziksel, psikolojik ve bireysel açılardan ergonomik risk faktörlerini detaylı bir şekilde incelemeyi amaçlamaktadır. **Gereç ve Yöntem:** Çalışmaya 60 katılımcı dahil edildi. Araştırmaya dahil olmayı kabul eden bireyler için kişisel faktörlerin incelendiği Aktivite Rol Dengesi Anketi (OBQ11-T); psikososyal risk faktörlerini değerlendirmek için çevrim içi olarak hazırlanan Google Forms formları ile İş Stresi Ölçeği (İSÖ) ve Beck Depresyon Ölçeği değerlendirildi. Fiziksel risk faktörlerini belirlemek için çalışma sırasında REBA kullanıldı ve üst ekstremite ile ilgili risk faktörlerini değerlendirmek için RULA Çalışan Değerlendirmesi kullanıldı. **Sonuçlar:** Ergonomik risk faktörleri karşılaştırıldığında, REBA, RULA, OBQ ve İSÖ skorları arasında istatistiksel olarak anlamlı fark bulundu ($p<0,05$). **Tartışma:** Mikrobiyoloji ve patoloji laboratuvarı çalışanları, hem tüm vücut skoru hem de üst ekstremite açısından en yüksek risk grubunda bulunmaktadır. Biyokimya laboratuvarı çalışanları ise özellikle cihaz kullanımı sırasında uzun süre ayakta olduklarından dolayı orta derecede ciddi risk kategorisindedir.

Anahtar Kelimeler: Ergonomi; Laboratuvar Personeli; Risk Faktörleri.

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Work-related musculoskeletal problems have been reported frequently in various occupations (Carayon, Smith and Haims, 1999; Da Costa and Vieira, 2010; David, 2005). Laboratory professionals face numerous ergonomic hazards in their work due to the specific demands of their tasks. The need for unconventional and fixed body positions, frequent repetitions, exertion of excessive force, extended reaching, compression or stress from contact, sustained or forceful efforts, lifting, and repetitive movements exposes them to a heightened risk of developing work-related musculoskeletal disorders. (Agrawal, Maiya, Kamath et al., 2014). In addition, working with a microscope can be tiring for both the visual system and the musculoskeletal system. Lack of awareness or indifference to health problems may expose microscope users to many occupational hazards (Jain and Shetty, 2014). The World Health Organization (WHO) suggests that various factors contribute to musculoskeletal disorders, stemming from professionals' exposure to a range of occupational risk factors (Oladeinde, Omoregie, Osakue et al., 2012).

a) Physical factors related to ergonomics encompass extended or improper body positions, repeating identical motions, exerting force, exposure to hand-arm vibrations, whole-body vibrations, mechanical pressure, and cold conditions (David, 2005; Vandergrift, Gold, Hanlon, et al., 2012).

b) Psychosocial factors related to work stress involve elements such as the pace of work, level of autonomy, monotony, the balance between work and rest, task requirements, support from colleagues and management, and uncertainty about the job (Labriola, Lund and Burr, 2006).

c) Factors pertaining to individuals encompass aspects such as age, gender, occupational skills and activities, physical fitness related to work, domestic responsibilities, leisure activities, and the use of alcohol or tobacco (Oladeinde, Omoregie, Osakue et al., 2012).

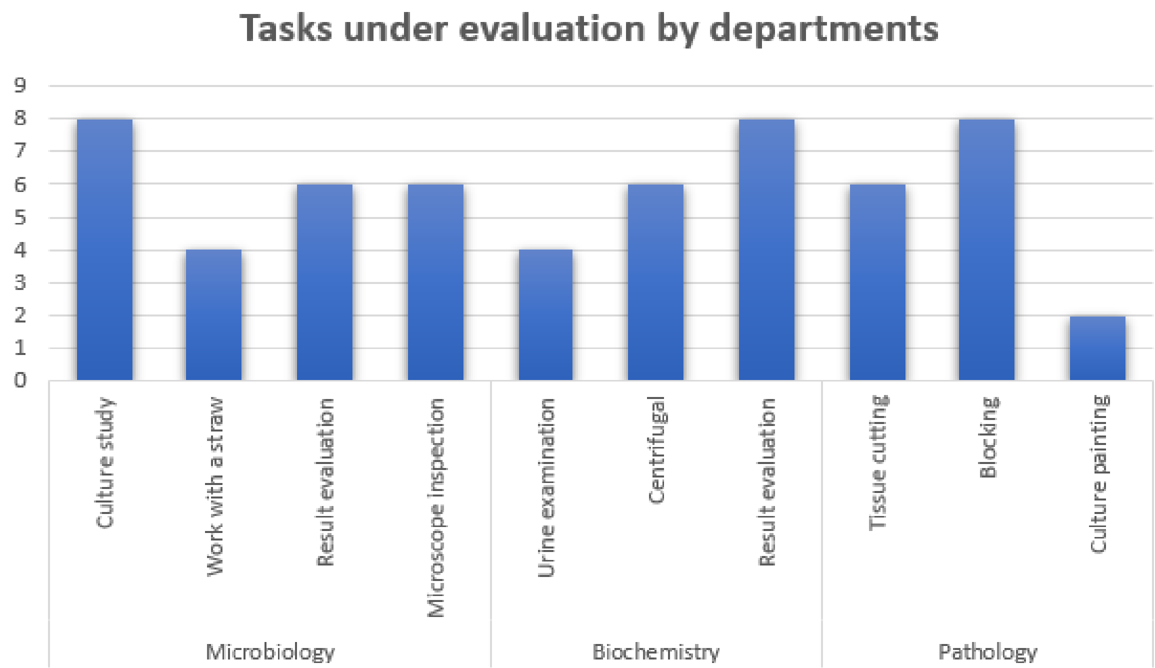
The frequent occurrence of musculoskeletal disorders in laboratory professional has increased the work called laboratory ergonomics (Muthad et al., 2018). With the advisory guide publications issued by many organizations from the USA and the European Union, laboratory professionals have been tried to be informed about ergonomics. Thus, it was thought to prevent job losses and to provide a more comfortable working environment (Günay, Alayunt and Çakmak, 2017). In microbiology laboratories, there are some basic task routines that cause ergonomic load and need to be examined. A close examination of these plays an important role in determining ergonomic solutions.

Performing tasks with a pipette in the microbiology laboratory is among the most demanding activities. It involves ergonomically challenging conditions that can lead to musculoskeletal disorders. These include repetitive motions, prolonged periods in uncomfortable positions, twisting the wrist while handling the pipette, and straining the thumb. Conditions such as wrist and elbow pain, inflammation (tendinitis) due to repetitive wrist motions during pipette manipulation, gripping the pipette tightly, exerting force with the thumb to remove tips, and DeQuervain's tenosynovitis resulting from repetitive movements are potential ailments associated with this procedure. In addition, rotation and stretching of the wrist during pipetting and discharging; may cause carpal tunnel syndrome (Boynton et al., 2020). Studies examining the work ergonomics of microbiologists emphasize that risk factors are high (Mukhtad et al., 2018; Patrao, Pais, Mohandas, and Shah, 2022). However, these studies generally only examine physical risk factors. In this study, it is planned to examine ergonomic risk factors among laboratory professionals in detail from physical, psychological and individual perspectives.

MATERIAL AND METHODS

After a comprehensive research invitation was prepared, it was shared with microbiologists and laboratory staff through associations and social media. In addition, those working in the Kütahya Health Sciences Application and Research laboratory were also included in the study. Demographic form, Occupational Balance Questionnaire, in which personal factors were examined for individuals who agreed to be included in the research; In the study, the REBA (Rapid Entire Body Assessment) method was employed to assess physical risk factors, while the RULA (Rapid Upper Limb Assessment) was utilized to assess risk factors specifically linked to the upper extremities. These assessments were conducted by an occupational therapist who observed the participants' natural work postures. Participants details were collected, and each participant was assigned a unique code for identification purposes. To evaluate psychosocial risk factors, online forms created through Google Forms were utilized to administer the Occupational Balance Questionnaire Work Stress Scale, and Beck Depression Scale. ErgoFellow 3.0 program was used in the evaluation of REBA and RULA risk scores in terms of ergonomics. In addition, in each laboratory where the evauluation was made, noise levels were recorded with a decibel meter and the average values of the meaurements were taken.

Figure 1. Tasks of the participants during the evaluation of risk analyzes



Note: In this graph, the tasks that the laboratory professionals evaluate according to their occupational groups are visualized with the graph.

Participants

Within the scope of the study, 80 individuals were evaluated. 24 microbiology, 18 biochemistry, 18 pathology laboratory employees were included in the study. Inclusion criteria for research group:

1. Working in a microbiology lab
2. To be over 18 years old
3. To voluntarily approve the acquisition of audio and video during the study.
4. Working actively in the laboratory.

Inclusion criteria for control groups:

1. Being a laboratory professional in a different field other than the field of microbiology
2. Volunteer to approve the acquisition of audio and video during the study.
3. Working actively in the laboratory.

Those who did not voluntarily approve of video and audio recording (n=3), who were diagnosed with a serious neurological or orthopedic disease that may affect the completion of the study (MS, Parkinson's, Disc Herniation, Fracture, etc.) (n=3) and did not complete the evaluation forms (n= 14) were not included in the study. The study was completed with 60 participants. In the power analysis based on G power, the sample size was calculated to carry out the study with 80 percent power and 5% (α = 0.05) margin of error. Descriptive data of the participants are given in Table 1.

Instruments

Examination of Demographic Form and İndividual Factors

Individuals: age, gender, marital status, working year, occupation, etc. features as well as work routines, habits, life roles, etc. individual characteristics were evaluated.

Work Stress Scale

The test consisting of 10 questions, developed by Suzanne Haynes and its Turkish adaptation and reliability application was made by Aktaş (2001), was used to measure work stress. Work stress scale; "I tend to lose control when I'm under pressure at my job. How true is this statement for you?", "Are you usually able to finish everything you need to do before you quit your job?" etc. The answers of the participants were evaluated in the form of points such as "I usually finish a large part (3)", "I leave very little (4)". As the score rises on the scale, job stress increases, despite the fact that the minimum achievable score is 20 and the maximum is 50. As the scores obtained from the job stress scale increase, it is measured that the job stress experienced by the employees also increases (Aktaş, 2001).

Beck Depression Inventory

The test developed by Beck et al. in 1978, measures the motivational, cognitive, emotional and vegetative symptoms seen during depression. Beck Depression Inventory is a 21-item self-assessment scale. Assigning scores ranging from 0 to 3 for each item, the maximum achievable score on the scale was computed as 63, while the minimum was set at 0. A higher score on the scale signifies elevated severity or a higher level of depression. Beck Depression Inventory (Beck, Epstein, Brown et al., 1988) translated by Hisli (1989), into Turkish language. As a result of the reliability analysis of the scale applied by Hisli, the reliability coefficient of the two half-tests conducted with 259 university students was found to be 0.74. Hisli, also examined the cut-off points of the Beck Depression Inventory within the scope of the reliability and validity analysis he conducted with outpatients, and concluded that a score of 17 and above obtained after the measurement was able to distinguish the depression that would require treatment with 90% accuracy. Within the scope of the current study, the Cronbach's Alpha value of the scale was calculated as 0.83 for the study group and 0.82 for the control group Hisli (1989).

Occupational Balance Questionnaire

The scale aims to assess an individual's satisfaction based on the quantity and diversity of daily occupations aiming to define occupational balance through the obtained results. Turkish validity and reliability studies were carried out for the most recent 11-item version of the test, revealing a test-retest coefficient of 0.922 and a Cronbach's alpha of 0.785 (Günal, Pekçetin, Demirtürk et al., 2020; Wagman and Håkansson, 2014). The scale utilized a 4-point Likert scale to score each item, with higher scores reflecting a greater level of occupational balance.

REBA (Rapid Entire Body Assessment)

The methodology devised by Hignett and McAtamney (2000) for posture analysis, known as the Rapid Entire Body Assessment (REBA) method, proves valuable in assessing risks associated with manual handling and lifting operations. This approach is instrumental in evaluating both dynamic movements and stationary postures. The REBA method, relying on observational analysis, scrutinizes an employee's posture across various bodily activities. Its application enables the identification of working styles that may contribute to occupational musculoskeletal disorders, facilitating the implementation of preventive measures. The REBA method allows for the numerical expression of the overall risk associated with the posture or movement under analysis. This numerical representation aids in precisely identifying and categorizing the distinct risks and hazardous situations posed by specific movements and postures within the analyzed scenario. Each designated movement or posture is segmented into angles for both the upper and lower body. The cumulative score is determined by amalgamating the positions of the neck, trunk, and upper and lower extremities.

Additional factors considered in the REBA method include the ease of the load to be lifted, the type of grip employed on the load, the frequency of the movement, whether the body remains stationary during the action, and whether there is concurrent rotation or twisting while in motion. (Kocabaş, 2009).

RULA Employee Assessment Worksheet

The ergonomic risk analysis method developed by Corlett and McAtamney is designed to assess working postures specifically in the upper extremities of the body. This method empowers the analyst to assign scores for each of the following body parts: lower arm, upper arm, wrist, neck, trunk, and legs (Widiyawati, Lukodono, Lustyana et al., 2020). The RULA method is a three-stage process. In the initial stage, a model for analyzing working postures is established, categorizing the human body into two groups: Group A, which includes the lower arm, upper arm, and wrist, and Group B, which involves parts such as the neck, trunk, and legs. The postures of these body parts are assessed, and the RULA score is assigned based on predetermined risk levels.

During the second stage of the RULA method, a methodology is established to combine the scores of body segments (Group A and Group B). Following the grading of scores for postures of body parts in Group A and Group B, Score A and Score B values are derived. Score A represents the cumulative score resulting from the combination of scores for working postures formed by body parts in Group A. In the third and concluding stage, a method is developed to analyze the final (main) score and determine the level of action. The RULA score is determined by the intersection of scores C and D on the main score table. The final score falls within the range of 1-7, and within the method's framework, it is segmented into four distinct action levels between the scores of 1-7 (McAtamney and Corlett, 2004).

Data Analysis

The Shapiro-Wilk goodness-of-fit test was applied to assess whether the distributions of numerical variables conformed to normal distributions. Descriptive statistics, including the mean and standard deviation, were provided for numerical variables exhibiting normal distributions. For categorical variables, percentage values and frequency tables were presented. Statistical analyses were conducted using the SPSS software (23.0, SPSS). Participants were divided into three groups as microbiology, pathology and biochemistry laboratory professionals. In the analysis of the distribution of variances, it was observed that the variances were homogeneously distributed, since the p value was greater than 0.05. One-way ANOVA test was used to evaluate whether there was a difference in ergonomic risk factors among laboratory staff, and post hoc analysis was performed for pairwise comparisons between microbiology laboratory staff and other staff. Tukey test was used as a complementary post-hoc analysis to determine the differences after the ANOVA test. Laboratory professionals were observed by the occupational therapy professional during the study, photographs and video recordings were taken for goniometric measurements. The Video Camera was fixed from the same distances with the help of a tripod to ensure standardization while the individuals were working, and recordings were taken. Later, the video recordings were watched repeatedly and the risky positions were screenshotted by the occupational therapist and angular values were calculated with the "Goniometer" program. These images were analyzed to fill in the scores in RULA and REBA. The Rapid Upper Extremity Assessment (RULA), the Rapid Entire Body Assessment (REBA) are used to assess the ergonomic risk of a job or task. Evaluations were made during different tasks to determine which group of laboratory professionals was in which risk category (see Fig 1).

RESULTS

In the study in which 60 laboratory professionals participated, the mean age was 35.4±3.32 years. 39 (65%) of the participants were female and 21 (35%) were male. 39 (65%) of the participants stated that they had work-related problems and 30% of these participants stated that these problems became more apparent after the study. 70% of the participants stated that they experienced work-related pain. Microbiologists reported experiencing the highest rates of back pain (60%) and wrist pain (50%); biochemists reported the highest rates of back pain (60%) and neck pain (50%); while pathologists indicated experiencing the highest rate of neck pain (72%). When the average noise levels in the laboratories were examined, it was 86 dB in microbiology laboratories, 76 dB in pathology laboratories, and 123 dB in biochemistry laboratories. When the daily and weekly average working hours were examined, they were mostly working in the microbiology, biochemistry and pathology laboratories, respectively. (Table 1)

When the ergonomic risk factors were compared, a statistically significant difference was found between REBA, RULA, OBQ and WSS scores ($p<0.05$). In post hoc analysis, a statistically significant difference was found between the whole group in the post hoc comparisons of REBA, RULA, OBQ and WSS evaluations made between different laboratory professionals ($p<0.05$). When Beck depression scores were examined, microbiology and pathology professionals showed moderate depression symptoms, while biochemistry professionals showed mild depression symptoms. There was no statistically significant difference between Beck depression scores ($p>0.05$). (Table 2)

The risk category and suggested changes of different laboratory professionals according to REBA and RULA are summarized in Table 3. Musculoskeletal system and anthropometric studies that push the limits of working conditions increase risk scores.

Accordingly, Microbiology laboratory professionals are in a high-risk group, especially in terms of upper extremities, as the body is exposed to movements that deviate from the natural during work. Pathology laboratory professionals are in the highest risk group in terms of both whole-body score and upper extremity. Biochemistry laboratory professionals, on the other hand, are in the category of moderately severe risk, especially since they are in a standing position for a long-time during device use.

Table 1. Participant characteristics (N=60)

	M (SD)		Range
Age	35.4±3.32		23-52
	Frequency (%)		
	Microbiology	Pathology	Biochemistry
Gender			
Female	16 (66%)	12(67%)	11(61%)
Male	8 (34%)	6(33%)	7(39%)
Do you have work related problems?			
Yes	14(58%)	13(72%)	12(66%)
No	10(42%)	5(28%)	6(34%)
If you have work-related problems, when do these problems start?			
Before starting work	2(14%)	3(23%)	2(16%)
While working	3(21%)	7(54%)	8(68%)
After work	8(58%)	2(15%)	2(16%)
Always	1(7%)	1(8%)	
Do you have pain related to work?			
Yes	20(83%)	11(61%)	10(55%)
No	4(17%)	7(39%)	8(45%)
If you have pain due to work, in which part of your body does this pain occur the most?			
Waist	12(60%)	7(63%)	6(60%)
Wrist	10(50%)	7(63%)	1(10%)
Shoulder	2(10%)	7(63%)	4(40%)
Neck	6(30%)	8(72%)	5(50%)
	Mean		
Noise level of the working environment (dB)	86	76	123
How many years of active work in the laboratory	12	14	8
Average working hours per day	12	8	9
Average working hours per week	60	48	52

Table 2. Comparison results of risk factors (N=60)

		M±SD	F	p		p’
REBA	*Microbiology*	8.3±1.21	4.206	0.006*	1-2	0.036*
	Pathology	11.4±0.36			1-3	0.045*
	Biochemistry	6.6±2.13			2-3	0.002*
RULA	*Microbiology*	5.6±0.9	6.667	0.01*	1-2	0.047*
	Pathology	6.7±0.23			1-3	0.023*
	Biochemistry	4.3±1.7			2-3	0.003*
OBQ	*Microbiology*	18.9±4.15	4.073	0.008**	1-2	0.032*
	Pathology	14.4±2.46			1-3	0.008*
	Biochemistry	20.3±1.16			2-3	0.023*
BECK	*Microbiology*	18.6±2.43	2.338	0.07		
	Pathology	18.9±4.48				
	Biochemistry	16.3±1.28				
WSS	*Microbiology*	43.56±3.13	2.895	0.009*	1-2	0.006*
	Pathology	47.44±2.47			1-3	0.003*
	Biochemistry	38.49±2.13			2-3	0.004*

Note: Microbiology:1; Pathology:2; Biochemistry:3; p: One Way ANOVA; p’:Tukey post hoc; M: Mean; SD: Standart Deviation; OBQ:Occupational Balance Questionnaire; Beck: Beck Depression Inventory; WSS: Work Stress Scale

Table 3. Risk decision table of REBA and RULA assessments

RULA					REBA	
	Action Required	**Action level (Risk level)**	**Risk Levels of Participants**		**Corrective Measure**	**Risk Levels of Participants**
1-2	Acceptable	0 (Negligible)		1	None necessary	
3-4	Change may be necessary	1 (Low)		2-3	May be necessary	
5-6	Change necessary soon	2 (Medium)	Biochemistry	4-7	Necessary	Biochemistry
7	Change immediately	3 (High)	Microbiology Pathology	8-10	Necessary soon	Microbiology
		4 (Very High)		11-15	Necessary NOW	Pathology

Finally, when the physical conditions were examined, the physical conditions that were not suitable for the anthropometric measurements of the employees were determined. In particular, the table, unsupported chairs, the position and height of the microscopes forced the antiergonomic body postures of the professionals. (Fig 2 and Fig 3)

Figure 2. Biosafety cabinet and chair for the microbiology laboratory

Note: In this image, the chair and cabin used in biosafety cabins are visualized. When the figure is examined, it can be said that the chair used is not suitable and is unsupported.

Figure 3. *Working example on lab table*

Note: The figure shows the desk work of an expert working in the biochemistry laboratory. When the figure is examined, it can be said that the table and chair, which are not suitable for the anthropometric measurements of the employee, are physically challenging the employee.

DISCUSSION

The main finding of this study is that there are statistically significant differences in ergonomic risk factors among different laboratory professionals. Haile et al. summarized the tasks of clinical laboratory professionals that cause ergonomic difficulties as follows: sitting and standing times, laboratory chairs, working with a microscope, working with a pipette, working at a computer (Haile, Taye and Hussen, 2012). Ergonomics has multiple components. These include a number of components related to person, work and environment (Rowan and Wright, 1994).

In this study, when the individual components are examined, increased head and neck flexion of the individuals, increased deviation of the hand and wrist, increased shoulder abduction and protraction reveal anthropometric compelling movements of the body. Particularly, the studies carried out by microbiologists with pipettes have caused pain and complaints in the hand and wrist together with repetitive thumb movements. In a study conducted with laboratory professionals in Egypt, Carpal tunnel syndrome was reported to occur due to ergonomic strains (El-Helaly, Balkhy and Vallenius, 2017). When the RULA scores were examined, it was seen that especially the microbiology and pathology laboratory professionals were at risk in terms of upper extremity.

When the work-related components are examined, it can be said that all three laboratories contain ergonomically risky tasks. Pathology and microbiology laboratories are risky environments both physically and chemically. Biochemistry laboratories, especially due to the simultaneous operation of devices within the laboratory, expose specialists to high decibel levels of noise. According to international standards, the noise level that damages the hearing system is 100-10,000 Mhz and 85 dB. The limit where the person has difficulty in understanding daily conversations from a distance of 1.5 meters is accepted as the noise level. The size of the noise exposure depends on the duration of exposure to the noise, the frequency of the noise, its intensity, whether it is intermittent or continuous, and personal characteristics. While sound levels above 65 dB may cause physiological problems, prolonged exposure to sounds above 120 dB may cause permanent hearing loss (Cheţa, Marcu and Borz, 2018).

When psychosocial factors were examined, it was determined that especially pathology and microbiology laboratory professionals were in the higher risk group in terms of work stress and depression. The presence of psychosocial risk factors has been reported in laboratory professionals (Ozdemir, Gul and Celik, 2017). In addition, when the occupational balances of the employees were examined, it was determined that their work-life balance was at a low level. Occupational balance supports well-being by balancing the variety and amount of daily activities of individuals (Güney Yılmaz, Avcı and Akı, 2023). Disruption of this balance may cause decreases in terms of psychosocial and job performance. In addition, situations such as long working hours, shift-duty work cycle, and anxiety about getting test results quickly may have increased work-related stress levels.

The static postures required to use the eyepieces of the microscope can cause the head to lean forward and overload the neck, shoulders, and upper extremities. The position of the control knobs too high above the main platform can leave the arms unsupported. The non-adjustable platforms the microscope relies on can force (Andersen, 2004). Working in a laboratory can require fine manipulation of tubes, forceps, lids, and similar equipment. Tools such as forceps can cause contact pressure on the fingers and require prolonged or repetitive finger movements. In addition, a lack of support is inherent with the use of different laboratory instruments. When the physical conditions are examined, especially the positioning of the tools used in the laboratories, the unsupported and unstable chairs, the inability to position the microscopes according to their personal characteristics have led to anthropometric difficulties for the employees. Working for a long time in microbiology laboratories, especially in biosafety cabinets, forces the body to work in positions outside the normal range of motion. The tools used during blocking and cutting processes in pathology laboratories cause repetitive and compelling movements.

In a study comparing risk factors in Hematology and Microbiology laboratories, it was emphasized that both laboratories had high risks (AlShammari, Alhussain and Rizk, 2021). When the data of this study were examined, physical, work-related and psychological differences were detected in all three laboratories. Each laboratory had different and common risk areas.

Ergonomics consists of not only physical components. In this study, microbiology laboratory professionals were compared with those working in different laboratories in terms of physical, individual, environmental, psychosocial and work ergonomics. When the study findings are examined, it can be said that the microbiology laboratory employees work under high ergonomic risk. Similarly, pathology and biochemistry laboratory professionals are also in risk groups in terms of various risk factors. In future studies, researches such as ergonomic arrangements, relaxation training, work-task analysis can be carried out in these laboratories. An ergonomics assessment conducted by occupational therapists among laboratory professional can be a valuable method to improve working conditions, mitigate risks, and safeguard the health of employees.

There were some limitations of this study. The long evaluation processes of the study caused some participants to withdraw from the study. Some studies, which are trying to fulfill the tasks due to the crowded working environments, did not volunteer to participate in the research. The presence of multitasking jobs in each laboratory made analysis of risk factors difficult.

Ethical Approval

The study was approved by the local institutional ethical board (X University Non-Interventional Clinical Research Ethics Committee, (registration number 2022/12-02) and conducted in consideration of Helsinki’s Declaration principles.

Authors’ Contribution

The authors confirm contribution to the paper as follows: study conception and design: GGY, EA, DPR; data collection: GGY, EA; analysis and interpretation of results: GGY, EA; draft manuscript preparation: GGY, EA, DPR; revising the manuscript critically: DPR. All authors reviewed the results and approved the final version of the manuscript.

Conflicts of Interest Statement

The authors confirm that there is no conflict of interest.

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