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DETERMINATION OF CHEMICAL AND PHYSICAL RISK FACTORS IN LEATHER INDUSTRY IN TERMS OF OCCUPATIONAL HEALTH AND SAFETY

ABSTRACT

Occupational health and safety in work life has still alarming statistics around the world. Despite the fact that leather business seems being affected by mechanization, human power has important role for it. Workers in tanning processes frequently encounter physical and chemical risks. Therefore, the determination of employee consciousness and the arrangement of trainings for it are important for this sector which is included in the category 'Very risky work'. In our study, the population has been determined as active firms in Uşak Mixed-Organized Leather Industry, the awareness level of physical and chemical risks of 220 employees in 10 firms that accepted to take part in the survey has been examined and observed. Frequency, percentage and factor analysis and correlation tests were applied on the data in SPSS 22.0 programme. The Cronbach alpha values of the dimensions were found to be 0.681 in the physical risk dimension and 0.822 in the chemical risk dimension. According to the research of it can be said that the reliability of chemical risk factors is high and that the physical risk factors are medium reliability. The physical risk and chemical risk perceptions of workers in the survey are moderate/high. It has been observed that most of the services that are made compulsory by the state sanctions have been provided by the state sanctions, but it has been determined that there are still some deficiencies in some parts due to the situation such as the education level of the employees.

Keywords: Leather Operations, Physical Risks, Chemical Risk, Factor Analysis, Kruskal Wallis Test

1. INTRODUCTIONS

The technological developments in the world have positive reflections in working life. Besides, the labor productivity of the workers has become important as a result of the increasing number of machines, increasing production speed, competitive structure and rapid market changes. It has become a necessity for workers to work in healthy and safe environments. At this point, occupational health and safety gains importance cause it’s a field of corcerning human health and job safety. It contains some measures and methods against occupational risks. If the society doesn’t give importance on occupational health and safety, it costs human suffering, fatal disaster and economic results [1 and 2]. In Turkey, employers give more importance on workers’ health and job safety. Also the government puts into action some laws and rules. In accordance with the Law on Occupational Health and Safety No. 6331 [3], which took place in the working life with the European Union harmonization process and entered

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into force on June 20, 2012, occupational health and safety principles are effectively implemented. The risks that exist in the working life are generally caused by four main factors. They are expressed as Man, Machine, Media, and Management. Occupational accidents are in the form of human creation, physical and psychological structure, unsafe behaviors and environments, probability and outcome [4]. Annual statistics are published by the Social Security Institution in the working life. According to the figures of Social Security Institution the number of deadly work accidets is 1405, the insured employees having work accidet mostly at the age of 31-45 years, frequent accidents were observed in Coal and Lignite extraction operations (Mining), Building construction operations. Work accidents are more prevalent in those who have more percentage of working life than people and industrialists. Statistics of occupational accidents in Usak province between 2012 and 2016 are given in Table 1 [5].

Table 1. 2012 to 2016 years work accident statistics of Uşak province

Years	2012	2013	2014	2015	2016
Number of Employees Having Work Accident	646	476	489	499	543

Another health risk in working life is occupational diseases. Occupational disease is temporary/permanent physical and mental illness due to work or working conditions of workers [6]. Work health checkups, periodic health screenings, and occupational health services should be monitored. According to statistics of occupational diseases in our country in 2016, the number of men having occupational diseases is 568 and the number of women is 299 in total, which is 597. In Uşak province, 2 people had occupational diseases to statistics. Risk is defined as the probability of occurrence of a specific and undesired event in a certain time period [7]. In terms of occupational health and safety, some preventive measures are recommended to reduce or eliminate risks in the workplace. The Conservation Policies (2014) [8] for consciousness in schools are described by the Ministry of National Education in terms of occupational health and safety, as well as the terms, aims and measures of occupational health and safety [9]. Types of protection have two main groups: Bulk (Non-hazardous replacement, Marking, Insulation, Protection, Ventilation etc.) and Person based (Personnel selection, training and supervision, Health examinations, Personal protective equipment). At work places, collective protection practices should be kept on the front line. If there is risk continuity, person-based protection should be started. The skin is known as the first dress that takes on the task of protecting the human being against the external factors during the period from the past to the present day. The animal skin is so important for textile sector. The leather industry is a field covering all the operations carried out until raw materials extracted from animals are made into products by means of human power, machines, and processes [10]. By starting to use chromium salts in tanning processes, thin, smooth products with long service life have been started to be obtained. Although the industry revolution in the sector seems to have taken place in small leather workshops, enterprises with sophisticated processes, in many parts of the world still primitive methods are used and human power is needed intensively.When we refer to the leather industry in our country, our primary provinces that come to mind are Istanbul-Tuzla, İzmir-Menemen, Tekirdağ-Corlu, Balıkesir-Gönen, Bolu-Gerede, Manisa-Kula, Bursa, Usak, Isparta and Hatay.In addition, leather ready-wear industry companies are concentrated in Istanbul and Izmir due to their ease of transportation.The shoe subsidiary industries are located in Istanbul,

Izmir, Konya, Gaziantep, Bursa [10]. The operations and explanations made until they are made in leather enterprises are given in Table 2 in general [11 and 12].

Table 2. Leather processing steps

Semi-finished Leather Products	Soaking	The soaking process cleans the excess material on the skin and recovers the soft natural and swollen structure.
	Dehairing Liming	The layers like hair, hair are removed from the inside. During this process, sodium sulphide, sodium hydrosulfide and lime are used.
	Deliming	The excess lime is purified and the ineffective proteins on the skin are solved with the aid of various enzymes.
	Degreasing	The surplus overhead is the removal of oil. In this section, solvent is generally preferred.
	Pickling	For better tanning, it is the process of increasing the degree of deep acidity. It is called a pickle.
Wet-Blue Half Made	Tanning	It is a transformation process against the deep deterioration and stinking which is made pure with the help of the processes made. It can be used in different ways here. (Chrome, vegetable, synthetic, etc.)
Crust Half Made	Retanning	It is known as the second tanning process. It is made to make the skin tighter, more durable and plump.
	Dyeing	It is a coloring process. In general, water-based acidic paints are preferred.
Made	Finishing	Finished leather is obtained. Here the abrasive powders, dyed waste is obtained from the surplus excess.

Besides, the intermediate processes known during tanning are as follows [11 and 13]. When all operations are taken into consideration, bovine animal, small cattle, peltry etc. although there are minor changes in the interclass process, the raw order of raw leather in a leather operation in general is shown in Figure 1 as the repport of the Project for Strengthening the Vocational Education and Training System Leather Structure (2007) [9].

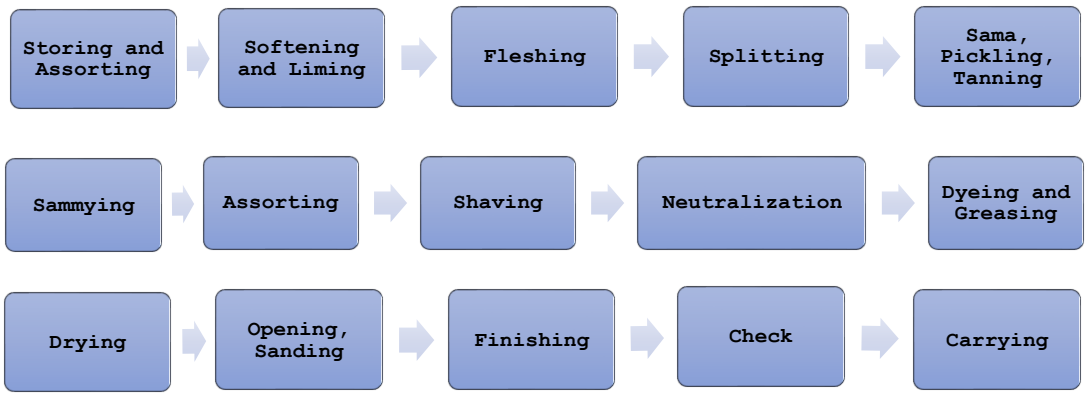

Figure 1. Leather manufacturing process

Leather Manufacturing Processes;

- **Assortment:** Leather is classified according to its quality.

- **Sammying and setting out:** The process of opening the leather surface and removing excess water.
- **Splitting:** The part to be used is separated from the skin section. The surplus is accumulated.
- **Fixation:** making chemicals active binding on the leather.
- **Shaving:** The process of setting the ending thickness is.
- **Toggling:** It is a process of gaining more space by stretching.
- **Tempering:** By adjusting the moisture of leather, it is possible to output with less damage than mechanical processes.
- **Neutralization:** The process of reducing the acidity of leather.

Chemical Risks: The use of chemical provides many benefits to the business life, and it causes harmful effects on the organism due to misuse. Chemical substances are explosive, flammable, irritating, corrosive, poisonous, oxidizing and dangerous to the environment [14]. In addition, if not used carefully, this effect can be increased by entering into the air or reacting with another chemical. Human life, the environment, a statement that should not be overlooked for businesses. Separate storages must be set up for businesses for chemicals and except for staff entrants must be restricted here. In these areas, attention must be paid to the exactness of the warning signs, the material data sheets should be well recognized and trained for each chemical. If the effects of the chemicals are determined in advance and necessary precautions are taken, it is expected that the health and safety risk is at the lowest level. In leather enterprises, processes are under intense chemical influence. This effect is especially great for the personnel handling chemical handling, mixing and weighing processes, especially in storage. Since the working conditions of the wet processing steps are also watery, evaporation heat is due to high concentrations of chemicals and powders in the drying process steps, especially in finishing applications due to liquid chemicals with low evaporation temperature and airborne liquid particles as a result of pressure sprays. For this, the risk and safety codes on chemicals must be known. Finally, the chemistry and process steps that are often preferred during tanning are generally given in Figure 2 [11].

Storage, Soaking, Softening, Dehairing liming	Deliming, Sama, Tanning	Retanning and Last Processes
Salt, Biocides, Sodium Hydroxide, Sodium Hypochlorite, Formic Acid, Sodium Hydrogen Sulphide, Thioalcohols, Sodium Sulphide, Enzymes	Sulfuric Acid, Formic Acid, Hydrochloric Acid, Boric Acid Acetic Acid, Lactic Acid Organic Solvents Ammonium Chloride, Ammonium Sulphate, Carbon Dioxide, Enzymes, Sodium Chloride, Sodium Sulphide, Chromium Oxide, Zirconium Chloride, Titanium, Aluminum Oxide, Aluminum Sulphate, Salts, Synthetic Tanning Salts, Aldehyde Tanning Salts, Sodium Carbonate, Base Agents, Magnesium Oxide, Mushroom	Zirconium Chloride, Titanium, Aluminum Oxide, Aluminum Sulphate, Vegetable Tanning Salts, Aldehyde Tanning Salts, Aldehyde Tanning Salts, Sodium Carbonate, Sodium Carbonate, Organic Solvents, Anionic Pigments, Basic Paints, Azoic Materials, Acetic Acid, Formic Acid, Hydrochloric Acid. Bisulfate, Ammonium Bicarbonate, Sodium Meta Bisulphite, Sodium Thio Sulphite, Sodium Formate Sodium Acetate, Oxalic Acid, Biocides, Chlorofluoroplasts, Chromium Oxide, Paint Materials

Figure 2. Chemicals used in tanning processes

Physical Risks: In enterprises, risks arising from environmental factors that work environments have been known as physical risk factors. The risks to be seen among the business may vary, and the

most common physical risks in leather enterprises are noise, heat, vibration, lighting, humidity, ventilation and dust.

- **Noise:** It is caused by mechanical equipment in enterprises. Acoustic trauma, transient hearing loss and permanent hearing loss in hearing loss occur as a result of exposure to high voice for a long time [15]. To avoid these, people close to the source of noise need to use ear protectors.
- **Lighting:** Everyone in the business should be able to see every point comfortably. Lamps placed near the machine must not disturb the employee's eyes.
- **Heat:** It is a risk that the values of in-house temperature do not change or reach the values that prevent the employee from working comfortably. In working environments temperature should be (19°C) work done sitting, (17°C) work done standing, (12°C) heavy physical works, (20°C) bureaus, (18°C) laboratories, (19°C) shopping centers, (20-23°C) mental works done sitting, (19°C) light duty done sitting, (18°C) light duty done standing, (17°C) heavy duty done standing, (15-16°C) heavy duty [15]. In addition, situations such as the lack of adequate cleaning operations in enterprises, the use of wooden pallet stands, and the intersection of bacterial growth temperature values transforms physical risk to a biological risk.
- **Moisture:** Leather operations are areas where abundant water is used in stages such as leather cleaning, hair removal, removal of used chemicals. For this reason, attention must be paid to the formation of in-house moisture, excess water gutter, channel, etc. should not be kept in operation with constructions. For this reason, attention must be paid to the formation of in-house moisture and excess water gutter, channel, etc. constructions should not be held in the enterprise.
- **Ventilation:** Tanneries have smelly working environmetsIt is unlikely to provide odorless environments in these enterprises due to its nature. Sufficient ventilation should be provided in terms of employee health and healthy working conditions. There are two types of industrial ventilation system in the industry as general ventilation and local exhaust ventilation system [16].
- **Powder:** Chemical dusts are most often seen during splitting. Such risks jeopardize human health. In order to prevent future occupational diseases, it is necessary to use protective masks especially for these kinds of works.
- **Vibration:** Generally, there are risks machine-induced that can lead to tingling, jolting, and disk drift. In leather enterprises, especially for those using pat pat machines, the risk is greater. Gloves with damping capability should be used. In addition, non-slip soles, head protectors, insulated gloves against electric accidents, work clothes for the protection of the whole bodyShould be worn and according to the work aprons, cuffs, face shields etc. should be added [11].

2. RESEARCH SIGNIFICANCE

6331 on Occupational Health and Safety Law 2, 4., all workplaces must effectively implement the necessary occupational health and safety practices without regard to the number of employees and the sector [3]. Existing laws and regulations, changes should be monitored in employees, employers and workplaces. The business line is located in the dangerous class of 'Leather and fur leather production (tanning, currying, dyeing, polishing and processing)' as specified in

the Communiqué on Occupational Health and Safety Hazard Classification published in the Official Newspaper No. 28602. In addition, "Leather and fur production" (tanning and finishing of fur and leather, tanning, dyeing, polishing and processing) specified in Communiqué on the Amendment of the Communiqué on Workplace Hazard Classes Concerning Occupational Health and Safety published in the Official Newspaper dated 27 February 2017 numbered 29992 except for ironing and drying only on the barrel without operations') took place in a very dangerous class [17]. This class change reveals the level of risk in the sector. However, in order to prevent situations such as occupational accidents and occupational diseases that may be experienced in the sector, it is necessary to first understand the attitudes and attitudes of workers and employers to the issues, in addition, the size and number of employees in the sector in Turkey is very high. Investigation of the level of knowledge about physical and chemical risk factors of workers in leather enterprises, presentation of the current situation, future work, and training will be beneficial [18].

3. MATERIALS AND METHODS

A literature survey on occupational health and safety was conducted for this research, the related laws, regulations and the recommendations of the Ministry of Labor leather management control were examined and a questionnaire was applied to this subject. The study universe of the research was determined as the enterprises actively working in Usak Leather Mixed Organized Industrial Zone. In August 2017, a total of 300 questionnaires were released to 10 companies that agreed to participate in the work after the negotiations. 220 questionnaires were used in the creation of the research data and missing data were not included in the study. The evaluation of the data obtained from the questionnaires used was made with the help of SPSS 22.0 program [19]. The questionnaire consists of two main parts; In the first part, general questions were asked about the employees such as gender, age, level of education, working time, and demographic information about the company such as organizational structure, personnel distribution, duration of activity, position distribution. In the second part, there are likert scale questions aiming to measure the levels of knowledge and awareness under the headings of physical and chemical risk factors, taking into account some of the risks seen in leather enterprises. All of the scales used in the study are in the form of 5 likert. In this context, the scoring process has been performed as "Absolutely Not Participating=1", "Not Participating=2", "Undecided=3", "Participating=4" and "Absolutely Participating=5". Chi-square and ratio tests (Binom) are used to compare the ratios obtained in frequency distributions. In the evaluation of the scales, reliability analysis and factor analysis were applied. Factor analysis is based on the principal component method and varimax rotation. In the factor analysis, it was noted that the KMO value was greater than 0.70 and the Bartlett’s sphericity test was statistically significant. As a result of factor analysis, chemical and physical risk factors were factorized as two factors. Mann Withney U and Krsukall Wallis tests were used to determine whether there is a difference in the risk factors among the sub-categories of demographic characteristics. However, descriptive statistics for each demographic characteristic are given as mean standard deviation, median, minimum and maximum value. Correlations between risk factors were obtained with Pearson correlation coefficient. Investigated hypotheses according to demographic characteristics for risk factors are following:

- H_0: There is no difference between female and male employees' perception of risk factors.
- H_0: There is no difference between employees' perception of risk factors in terms of age groups.
- H_0: There is no difference between employees' perception of risk factors and their level of education.
- H_0: There is no difference between the perception of risk factors and the perception of firms in terms of their duration of operation.
- H_0: There is no difference between the risk factor perceptions in terms of company staff numbers.
- H_0: There is no difference between the risk factors and the perception of institutional structures.
- H_0: There is no difference between employees' perception of risk factors in terms of their working time at the firm.
- H_0: There is no difference between employees' perceptions of risk factors in terms of job positions in the firm.

4. RESULTS AND DISCUSSIONS

4.1. Frequency Analysis

Table 3 gives the frequencies and percent distributions obtained for demographic characteristics of workers and firms in leather enterprises.88.6% of the employees are male and 11.4% are females. It is seen that the age interval is concentrated in the range of 26-45 (88.2%). At the level of education, there was no level of literated postgraduated. The majority of employees are primary school graduated (44.1%). It has been observed that employees are generally composed of people with sector experience. In addition, there was no intensity for long periods of time for different reasons (business change, business name change, company change, job, etc.).

Table 3. Employee demographic characteristics

	Statement	Groups	n	%
Statistics for EmployeeS	Gender	Female	25	11.4
		Male	195	88.6
	Age	Age 25 and Below	12	5.5
		26-35	69	31.4
		36-45	125	56.8
		46-55	12	5.5
		Age 56 and Over	-	-
	Education Level	Have never Attended School	-	-
		Primary School	58	26.4
		Secondary School	97	44.1
		High School	34	15.5
		Associate Degree	13	5.9
		Bachelor's Degree	14	6.4
		Postgraduated	-	-
	Your term of Employement	0-1 Year	42	19.1
		2-4 Years	128	58.2
		5-7 Years	31	14.1
		8-10 Years	6	2.7
		11 Years and Over	13	5.9

Table 4 shows the demographic characteristics of the firms. Firms are mostly family businesses (89.1%), far from institutional structure. There are enterprises that have been active since 11 years and more (55.5%). It can be said that the numbers of the personnel start from 10 and changes in some periods according to work intensity. It is seen that the distribution of the personnel in the working

departments is mostly concentrated in the sections of wet work and mechanical works (57.7%).

Table 4. Company demographic characteristics

		Statement	Groups	n
Industrial Structuresfadeler	Corporate Structure	Family Company	196	89.1
		Corporate Company	24	10.9
	Operation Period	1 Year and Below	29	13.1
		2-5 Years	69	31.4
		6-10 Years	-	-
		11-15 Years	97	44.1
		16 Years and Over	25	11.4
	Number of Personnel	2-9	16	7.3
		10-24	63	28.6
		25-49	69	31.4
		50-99	72	32.7
		100 and Over	-	-
	Position Distribution	Wetness	75	34.1
		Mechanical Processes	52	23.6
		Finishing	46	20.9
		Quality Control	9	4.1
		Other	38	17.3

3.2. Factor Analysis

After some items were removed of the scale, Cronbach alpha was computed to be 0.753. This scale included two dimensions, physical and chemical risks. 2 and 5th items in the pyhsical dimension, and 8, 9, 15, and 16th items in the chemical dimension were removed given in table 5. After removing these items, the Cronbach alpha values of the dimensions were found to be 0.681 in the physical risk dimension and 0.822 in the chemical risk dimension. According to the research of it can be said that the reliability of chemical risk factors is high and that the physical risk factors are medium reliability [18]. The scale explains 51.80% of the total variance. In the factor analysis, KMO (Kaiser-Meyer-Olkin) value was found as 0.812 and Bartlett's sphericity test was found statistically significant ($p<0.001$).

Table 5. Risk factor scale factor analysis

No	Factors	
Items	F1: Chemical Risks	F2: Physical Risks
12	0.805	
14	0.791	
11	0.790	
13	0.720	
10	0.709	
4		0.716
6		0.663
7		0.656
3		0.656
1		0.641

The descriptive statistics of the dimensions obtained as a result of factor analysis are given in Table 6.

Table 6. Descriptive statistics for factors

Factors	n	Mean	Std.Dev.	Median	Quarter Interval (IQR)	Min.	Max.
Chemical	220	4.10	0.54	4.17	0.67	2.00	5.00
Physical	220	3.86	0.55	4.00	0.60	1.20	5.00

In factor analysis, factors derived from risk factors are expressed as scale dimensions, and the hypotheses listed above for each of these dimensions are tested. Non-parametric statistical

methods have been used for hypotehes testing since the assumption of normal distribution is not provided in all of the obtained dimensions. For the obtained dimensions, Mann Withney was used when the comparison category was 2, and Kruskal Wallis test when the category number was more than 2. Statistical significance level was determined as 0.05 and raw p values calculated in tables were given. There was statistically no significant difference between genders in terms of chemical factors ($p>0.05$), while there was a significant difference between genders in terms of physical risk factors ($p<0.05$). Table 7 presents descriptive statistics and Mann Withney U test results. Physical risk factor perception was found to be statistically higher in males than females. However, both physical and chemical risk factor perception was found to be above 3 in both sexes.

Table 7. Descriptive statistics and Mann Withney U test results on gender and risk factors

		Descriptive statistics						Mann Withney U	
Factors	Gender	n	Median	Mean	Std.Dev.	Min.	Max.	Z	p Value
Physical	Male	195	4.00	3.88	0.56	1.2	5	-2.1012	0.0356
	Female	25	3.60	3.67	0.49	3	4.6		
Chemical	Male	195	4.20	4.13	0.57	2	5	0.7147	0.4748
	Female	25	4.20	4.18	0.49	2.8	4.8		

Table 8. Descriptive statistics and Kruskal Wallis test results for education levels

		Descriptive Statistics						Kruskal Wallis	
Factors	Education Level	n	Median	Mean	Std. Dev.	Min.	Max.	Chi Square	p Value
Physical	Primary School	58	3.80	3.70	0.56	2.2	4.8	7.762	0.100
	Secondary School	97	4.00	3.95	0.47	2.4	5		
	High School	34	4.00	3.92	0.57	2.8	5		
	Associate Degree	13	3.80	3.69	0.59	2.8	4.6		
	Bachelor's Degree	14	4.20	3.86	0.88	1.2	4.8		
Chemical	Primary School	58	4.00^{C}	4.00	0.60	2	5	9.584	0.048
	Secondary School	97	4.20^{B}	4.17	0.50	2	5		
	High School	34	4.20^{B}	4.19	0.61	2	5		
	Associate Degree	13	4.40^{A}	4.26	0.48	2.8	4.6		
	Bachelor's Degree	14	4.40^{A}	4.19	0.74	2	5		

In Table 8, education levels were compared in risk faktors. No statistically significant difference was found in terms of education level for physical risk factors ($p>0.05$). However, a statistically significant difference was found between educational levels in terms of chemical risk factors ($p<0.05$). For multiple comparisons, Mann Whitney U test was used with bonferroni correction. The highest level of perception was found at associate degree and bachelor's degree, while the lowest level was determined at primary school level. The perception averages for both risk factors at all educational levels were over three.

No significant difference was found between age groups in terms of physical and chemical risk factors ($p>0.05$). Table 9 shows descriptive statistics and Kruskal Wallis test results.

Table 9. Descriptive statistics and Kruskal Wallis test results for age groups and risk factors

		Descriptive Statistics						Kruskal Wallis	
Factors	Age	n	Median	Mean	Sandard Deviation	Min.	Max.	Chi Square	p Value
Physical	25 and Below	12	3.70	3.75	0.48	3	4.6	0.9599	0.8110
	26-35	69	4.00	3.85	0.65	1.2	5		
	36-45	125	4.00	3.87	0.53	2.4	5		
	46-55	12	4.00	3.92	0.28	3.6	4.4		
Chemical	25 and Below	12	4.10	4.18	0.29	3.8	4.6	2.4501	0.4844
	26-35	69	4.20	4.14	0.61	2	5		
	36-45	125	4.20	4.10	0.56	2	5		
	46-55	12	4.30	4.40	0.46	3.8	5		

In terms of structures of firms there was significant difference in the chemical risk factors ($p<0.05$) while there was no statiscially significant difference in physical risk factors ($p>0.05$). Table 10 presents descriptive statistics and Mann Withney U test results. Chemical risk perception in family companies was lower than corporate companies.

Table 10. Descriptive statistics and Mann Withney U test results for institutional structure and risk faors

		Descriptive Statistics						Mann Withney U	
Factors	Corporate Structure	n	Median	Mean	Standard Deviation	Min.	Max	Z	p Value
Physical	Family Company	196	4.00	3.86	0.57	1.2	5	-0.7674	0.4429
	Corporate Company	24	4.00	3.79	0.42	3	4.4		
Chemical	Family Company	196	4.20	4.11	0.58	2	5	2.2944	0.0218
	Corporate Company	24	4.40	4.35	0.23	4	4.8		

There were found statistically significant difference between the number of personnel of companies in terms of physical and chemical risk factors was found in all risk factors ($p<0.05$). In Table 11, descriptive statistics and Kruskal Wallis test results were given.

There was a statistically significant difference between the working periods of the personnel in the firms with respect to the physical risk factors ($p<0.05$) and no significant difference in the chemical risk factors ($p>0.05$). In Table 12, descriptive statistics and Kruskal Wallis test results are given. In terms of physical risk factors, risk factor perception increased as the duration of the working increased.

Table 11. Descriptive statistics and Kruskal Wallis test results on the number of personnel and risk factors

		Descriptive Statistics						Kruskal Wallis	
Factors	Number of Personnel	n	Median	Mean	Standard Deviation	Min.	Max.	Chi Square	p Value
Physical	2-9	16	4.40^{A}	4.33	0.64	2.8	5	51.8135	0.0001
	10-24	63	3.40^{D}	3.48	0.61	1.2	4.8		
	25-49	69	3.80^{C}	3.85	0.40	2.8	4.6		
	50-99	72	4.00^{B}	4.08	0.39	3	5		
Chemical	2-9	16	4.40^{A}	4.56	0.36	4.2	5	26.0916	0.0001
	10-24	63	4.00^{B}	3.93	0.68	2	5		
	25-49	69	4.20^{B}	4.08	0.41	2.8	4.6		
	50-99	72	4.40^{A}	4.26	0.52	2	5		

Table 12. Descriptive statistics and Kruskal Wallis test results for working duration and risk factors

		Descriptive Statistics						Kruskal Wallis	
Factors	Working Duration	n	Median	Mean	Standard Deviation	Min.	Max.	Chi Square	p value
Physical	0-1 Year	42	3.50^{C}	3.47	0.73	1.2	4.8	21.7861	0.0002
	2-4 Years	128	4.00^{B}	3.90	0.47	2.8	5		
	5-7 Years	31	4.00^{B}	4.00	0.31	3.4	4.6		
	8-10 Years	6	3.90^{B}	3.83	0.20	3.6	4		
	11 Years and Above	13	4.20^{A}	4.29	0.65	3	5		
Chemical	0-1 Year	42	4.10	4.02	0.73	2	5	5.1393	0.2733
	2-4 Years	128	4.20	4.12	0.54	2	5		
	5-7 Years	31	4.20	4.17	0.40	3	5		
	8-10 Years	6	4.10	4.23	0.43	3.8	5		
	11 Years and Above	13	4.40	4.46	0.44	3.6	5		

There was no statistically significant difference between the task positions of the employees in terms of physical risk factors ($p>0.05$) and there was a significant difference in chemical risk factors ($p<0.05$). In Table 13, descriptive statistics and Kruskal Wallis test results are given. Chemical risk factor perception was found to be higher in mechanical processes, finishing and other positions than in quality control and wetness positions.

In addition, relationships between physical risk factors and chemical risk factors perceptions were examined by Pearson correlation test. All of the correlation coefficients between the risk factors are positive. In additionally, the correlation between the physical risk factors and the chemical risk factors (23.65%) was statistically significant given in Table 14 ($p<0.01$).

Table 13. Descriptive statistics and Kruskal Wallis test results for task positions and risk factors

		Descriptive Statistics						Kruskal Wallis	
Factors	Position	n	Median	Mean	Standard Deviation	Min.	Max.	Chi Square	p Value
Physical	Wetness	75	4.00	3.86	0.54	2.4	5	3.1271	0.5368
	Mechanical Processes	52	4.00	3.94	0.55	2.2	5		
	Finishing	46	4.00	3.83	0.45	2.4	4.6		
	Quality Control	9	3.80	3.93	0.45	3.4	5		
	Other	38	3.80	3.74	0.72	1.2	5		
Chemical	Wetness	75	4.00[B]	3.98	0.62	2	5	14.032	0.0072
	Mechanical Processes	52	4.40[A]	4.22	0.55	2	5		
	Finishing	46	4.20[A]	4.25	0.40	3.4	5		
	Quality Control	9	4.00[B]	3.98	0.47	3.4	5		
	Other	38	4.40[A]	4.21	0.58	2	5		

Table 14. Pearson correlation test results

		PRF	CRF
PRF	Correlation	1	0.23659
	p Value		0.0004
CRF	Correlation	0.23659	1
	p Value	0.0004	

It is expected that the perception of chemical risk factors of individuals whose physical risk factors are perceived to be elevated is also high.

5. CONCLUSION AND RECOMMENDATIONS

There are 50 people and six participants in the majority of the companies in the research which is carried out in leather enterprises located in Uşak Mixed Organized Industrial Zone. Due to the fact that it is a sector that requires intensive labor and labor force, the gender of the majority of participants is male. Employees are mostly middle-aged and their level of education is at primary and secondary level. It has been observed that the enterprises are experienced firms in the sector. However, due to some problems experienced, the working periods of the firms were found to be low. The number of employees in the firms is variable, and the existence of daily employees is a matter of workload. Most of the firms are family firms. It can be said that the working periods of the employees in the firms are mostly 4 years or less. It is grouped under headings of wet and dry processes in the task distributions of the staff. It has been observed that the number of employees is higher because of the fact that wetness and mechanical work are require intensive labor. In addition, there was another finding that was obtained during the research that female employees were engaged in the dry processes. Among the firms participating in the study, well-trained workers are working in best places such as laboratories for increasing the quality of finished leather and testing of chemical mixtures. It has been observed that some of the firms have made one or two of the working sections according to the firm size. Qualified personnel required by the leather sector cannot be provided in new recruitment.

Tannery areas have smelly working environment due to the use of raw materials and chemicals. Participants stated that ventilation was

sufficient. In addition, it was observed that firms preferred natural ventilation (ventilation, window, etc.) rather than industrial ventilation. They stated that the majority of the workers participating in the survey were not exposed to dust, that there was sufficient lighting in the work areas, and that measures were taken for noise in the firms. In addition, firms are working in one shift (daytime) and have been observed to use auxiliary lighting for the use of machinery and equipment in areas where in-house daylight is insufficient. Also, for exposures such as dust and noise, the provision of personal equipments prevented exposure. Participants have stated in their offices that the machines used by the employees are safe, the temperature of the working environment is adequate, and the dampproof measures taken. It has been observed that the machines have pedal systems fitted with protective equipment and there are switches on the cabinet doors. The fact that the plates have a watery working environment causes the damp rising. For this, it seems that firms try to prevent this risk by evacuating the waters in the environment.

It has often been observed that participants were trained on chemical substances, material information and safety forms, and that they were conscious of the identification, use and storage of chemicals. It is stated that most of the chemicals used in the operation are in separate rooms, floors or enclosed areas in the working areas, no entry into these areas except for responsible personnel, or only those who are trained can work there. At the same time, at least two employees should be employed in these parts. It is a pleasing development to indicate that there is no exposure to the skin despite the fact that the number of participants who work with chemicals during the day is considerably high.

In terms of risk factors, gender differences were found only in terms of physical risk factors. Physical risk factor perception was higher in males than females. However, median scores for risk perception were higher than 3.5 in both genders. In terms of chemical risk factors, the median was 4.20.

While the physical risk perceptions of the employees in terms of education levels vary significantly, they are 3.80 and above. However, the perception of chemical risk increased as the level of education increased significantly. This situation can be considered as an indicator that the awareness of chemical hazards increases with education.

No significant difference was found between age groups in terms of risk factors. However, as age increases, the perception of risk factors increases. This situation can be explained by the increase of experience and knowledge of the employees depending on age.

There were no differences in the types of firms and the perception of physical risk factors. However, in terms of chemical risk factor, perception was lower in family companies. In corporate firms, working discipline and adherence to rules can be more flexible in family businesses. The difference in the number of employees in the firms caused significant differences in the perception of risk factors. In terms of both risk factors, the risk perception of firms with less than 10 employees and above 50 was found to be significantly higher than the others. This situation can be explained by the fact that the small number of employees in the enterprise is a facilitating factor in terms of education and information. If the number of employees is too high, the firm may be able to inform the employees due to some legal requirements and the interaction of individuals with each other.

There was a significant difference in terms of physical risk factor in terms of working duration of workers. The resulst of working

duration is parallel with the findings of age findings. As the duration of work increases, the perception of risk factor of individuals increases. This is the result of an increase in knowledge and experience related to individual experience and risk factors.

There was no significant difference in perceptions of physical risk factors in terms of job positions. In terms of chemical risk factor, it is interesting to note that the highest level of perception of the employees in mechanical operations and other tasks is higher than the ones working in the age group. However, although there was a significant difference between them, the median was found to be above all four in terms of chemical risk factors and values very close to each other.

Although there is a statistically significant correlation between risk factors, this correlation is a low correlation.

6. LIMITATIONS

Limitation of the research to the Usak province, Workers' being unwilling to participate in the survey, time, cost etc., the number of dayworkers is very high, the companies do not lean towards the survey, the differences between companies are not visible to the resultant homogeneous participant numbers, Sector based problems.

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