



EFFECTIVENESS OF JOINT HEALTH AND SAFETY UNITS IN OCCUPATIONAL SAFETY AND HEALTH SERVICES: A FIELD STUDY AND A SCALE

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ABSTRACT

Background: To protect employees against the hazards they may be exposed to during work, employers must provide preventive occupational safety and health (OSH) in international and national legislation. Employers can provide these services by their firm or by third parties. Structures created outside the workplace, within the scope of the private sector, are called joint health and safety units (JHSUs). The number of studies examining the effectiveness and adequacy of JHSUs is limited. **Material and Methods:** This study experimentally and hypothetically reveals the effectiveness level of JHSUs in providing OSH by conducting an extensive field study with a survey of 381 health and safety professionals and developing an *Occupational Safety and Health Services Effectiveness Scale*. Moreover, it compares those who receive the service from JHSUs and those who receive the service from the workplace, and the effectiveness level of JHSUs is evaluated. **Results:** The fit index as a result of confirmatory factor analysis with the scale is at an acceptable level with $\chi^2/df = 3.18$, RMSEA = 0.076, TLI = 0.89, and CFI = 0.91. Cronbach's α values of the factors are at a high level of reliability with PMCE = 0.949, OSHA = 0.927, OSHCM = 0.875, OSHEC = 0.869, OSHSQ = 0.877, OSHSE = 0.852. **Conclusions:** The effectiveness of JHSUs in OSH services differs from the effectiveness achieved by internally assigning an occupational safety expert. The Student's t-test accepts all hypotheses H1–H6 regarding the developed scale and that there is a significant difference between the external and internal groups in all factors. *Med Pr Work Health Saf.* 2025;76(1)

Key words: occupational health, health services, healthcare providers, health workforce, health infrastructure, health planning

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INTRODUCTION

Joint health and safety units (JHSUs) appear as structures where the private sector provides occupational safety and health (OSH) within the legislation of the Ministry of Labor. Turkey's national occupational health and safety legislation was created based on international sources, mainly the European Union (EU) and the International Labor Organization. Although the methods mentioned in these sources are basic, flexibilities are also specific to each country's conditions [1]. In countries based on international legislation or countries that harmonize international legislation with their past legislation, OSH organizations are established under these, and efforts are made to develop and disseminate OSH services, thus protecting all employees [2].

According to the Turkish legislation, there are 2 ways to provide OSH services externally. One is the Joint Health and Safety Unit (JHSU), and the other is the Community

Health Center Unit (CHCU). Within the scope of this study, JHSUs, which are the most controversial and have the most impact on the development of OSH within the market conditions and are widespread, are discussed.

Various obligations have been imposed on employers by legislation to ensure the health and safety of employees and to implement protective and preventive policies. The most important of these is that the employer takes every precaution to ensure the health and safety of the employee [3]. It is stated in national and international legislation that employers can/should receive guidance and consultancy regarding their OSH. In international legislation, the employer needs to provide OSH services internally. However, providing externally is also a method when the service cannot be provided internally or when additional support is required.

Occupational safety and health culture is defined as all shared values, common awareness, and employee behavior toward OSH. If a group of employees names

an incident an occupational risk or a department holds a meeting and solves a particular safety issue in their meeting minutes, a scale can be defined from low to high to measure the rate at which this culture exists. Hypotheses 3, 4, and 6 refer to this aspect and compare internal and external provisions of OSH experts in firms. Effectiveness refers to the success rate of precautions and measurements taken by OSH experts and everyone in the workplace to address OSH issues. Any tool or technique developed in that sense can provide before-after analysis and its effectiveness can be measured. Hypotheses 1, 2, and 5 refer to this aspect and together constitute the effectiveness of internal and external provisions of OSH experts in the firm.

The research aims to reveal whether there is a significant difference in the level of effectiveness of OSH services depending on whether OSH services are carried out internally or externally on a statistical basis. In this respect, the study reveals the effectiveness of JHSUs and the extent to which success can be achieved in OSH with private-sector structures. For these purposes, the groups receiving service externally from JHSUs and internally from workplaces were compared in service effectiveness using the *Occupational Safety and Health Services Effectiveness Scale* (OSHSES) in 6 hypotheses:

- hypothesis 1 (H1): the effectiveness of OSH services is lower in workplaces that employ JHSU than in workplaces that assign an occupational safety expert (OSE) within their organization,
- hypothesis 2 (H2): the effectiveness of periodic maintenance and control of work equipment is lower in workplaces that appoint an OSE from JHSU compared to workplaces that assign an OSE within their organization,
- hypothesis 3 (H3): workplace managers' OSH culture is lower in workplaces that assign an OSE from JHSU than in workplaces that assign an OSE within their organization,
- hypothesis 4 (H4): workplace OSH culture of employees is lower in workplaces that appoint an OSE from JHSU than in workplaces that assign an OSE within their organization,
- hypothesis 5 (H5): the quality of OSH services in the workplace is lower in workplaces that appoint an OSE from JHSU than in workplaces that assign an OSE within their organization,
- hypothesis 6 (H6): OSH awareness in the workplace is lower in workplaces that appoint an OSE from JHSU than in workplaces that assign an OSE within their organization.

The most prominent workforce components that can be directly active in OSH and may even impact other resources are OSH professionals, namely OSEs and workplace physicians. Therefore, by revealing the effectiveness level of JHSUs in this study, it will also be revealed how effectively OSH professionals can be used.

Many factors can be used as measurement dimensions in OSH services. Analytical Hierarchy Process (AHP) is used to propose a Key Performance Indicators-based measurement of OSH services with 109 different proactive performance indicators [4]. The factor analysis method can be used on scales with high reliability [5]. Analysis can be done using the average values of questions/statements on the Likert scale [6].

Informational symmetries and costs are the main reasons firms outsource OSH activities [7]. Safety plays a secondary role. Internal and external factors are necessary to successfully perform OSH services in small and medium-sized enterprises [8]. Health and environmental factors such as worker injury due to imperfections in a walking surface area or poor air quality or humidity causing a lung disease like pneumonia in case workers are exposed to it for a long time significantly affect worker performance in the long run and cause poor performance. However, setting up health and safety management systems to address all these issues can provide solutions quickly as the problems are directly solved, and they are, therefore, more effective in the short run [9].

Occupational safety and health provider ownership should extend to the human resources (HR) department of the client firm for successful service provision, and there is a strong relationship between ownership and success in providing OSH services [10]. The European Agency for Safety and Health at Work's report analyzes the EU practices on OSH services. The agency provides good practices and examples for sustainable and effective OSH services while providing guidance on utilizing these services internally from the enterprise or externally from third parties [11]. Optimal regulatory strategies to be urged by the government for the quality of OSH services and a framework for proper punishment and support standards are also defined [12].

The perceptions of employees and employers are also important for the success of OSH services. Many studies try to measure these perceptions to evaluate the current status of the enterprise in creating an OSH framework. A correlation analysis and hierarchical regression analysis are used to analyze the relationship between the

perceived workload of workers, supervisors' leadership, and the organization's safety climate [13].

Occupational safety and health services are evaluated using the SERVPERF (Service Performance) method and are compared using SERVPERF, AHP and fuzzy AHP (FAHP) [14]. The weights are calculated in SERVPERF also using AHP and FAHP. Assurance and empathy dimensions are more adequate while work environment needs significant improvement.

Studies about safety climate and employee individual performance show that employee behavior is strongly affected by their perception of safety and OSH services [15]. A paired Student's t-test and response surface analysis find the gap between leaders' and members' perceptions of safety climate. If the gap between leaders and workers is high, cynicism and turnover intentions are high [16]. If leaders and members are both strict regarding safety measures, then there is a more positive environment and low conflict. For more studies about safety performance and safety perception of managers and employees, the reader may refer to Quansah and his team's study [17] and Cao and his team's work [18].

Understanding OSH services and raising awareness on this issue is also important for a company's innovation success [19]. Based on this awareness and skilled labor force, OSH services can be provided more efficiently and reach their purpose. This skilled labor force is used in prevention services as well [20]. Within this context, the roles of OSH specialists and physicians are essential; they should be defined well and criteria should be clear to ensure professional conduct [21].

MATERIAL AND METHODS

A comprehensive field research in all regions of Turkey was conducted with a structured survey to test the produced hypotheses. A total of 315 workplaces have been contacted. The OSHSES comprises 6 factors and 31 statements. T-test statistics were applied to test the primary hypothesis and to reveal whether there is a significant difference between the groups receiving service from JHSU and the groups that carry out the service internally using the OSHSES.

Hypothesis tests overlapping each factor were applied using IBM SPSS Faculty Pack (IBM, Armonk, New York, USA). Here, the grouping regarding whether the service is received from JHSU or not is made according to the way the OSH specialist is assigned, which is the primary source of difference in practice. Within the

scope of the study, the groups are denoted with the letters E (external) for workplaces that assign OSH specialists from JHSU and I (internal) for those that appoint them from within their organization.

Participant data

Companies and survey candidates were determined based on website and contact information availability. Local municipalities and Chamber of Commerce offices in every region were contacted to find candidate firms whose labor force will most likely include ≥ 1 OSH expert or OSH physician. They also directed the survey to further companies if they were already in an industry area. Accordingly, the survey was sent to >500 official and sometimes personal emails.

Survey participants were identified based on 3 main factors. The first factor is the firm scale, which allows for finding ≥ 1 OSH expert or someone who is responsible for OSH activities in the firm. The second factor is the experience. If the current employee did not conduct any work in OSH, or the current employee did not spend ≥ 3 years in OSH-related work, either the survey was not conducted at all or the participant's response data were not considered. The last factor is the response quality. If some questions were skipped, unsatisfying, or incomplete answers were found, the survey data was discarded completely. As a result, a data of 381 people from approx. 250 different companies and institutions was considered in the survey. In the company where 186 of the participants work, OSH services are provided from JHSU, 190 from internal sources and 5 from the CHCU. Participants are employers and their representatives, HR, administrative and technical managers, employee representatives, OSH board members who are knowledgeable about OSH in the workplace; in addition, quality officers, infection nurses, OSEs, workplace physicians, other health personnel, JHSU employees, responsible managers, and OSH coordinators joined the survey.

Data collection methods

Data were collected by online survey method. The first part includes questions about the participants' professions and the workplace they are assigned to, along with demographic information. The other section provides scale questions and expressions. The first survey created contained a total of 42 questions covering 7 main factors and sub-factors of each main factor. However, as a result of the factor analysis optimization, it was determined that a scale consisting of 6 main factors and a total of 31 ques-

Sample question*	Answers for the questions (to be filled by the participant)				
	responsible manager	OSH expert	workplace physician	other health personnel	other (specify)
19. Your role					
	absolutely disagree	disagree	indecisive	agree	absolutely agree
28. Considering the size of the workplace, risk situation and number of employees, the OSH studies carried out are sufficient					
	1	2	3	4	5
78. Benefits for the work of an occupational safety specialist					
78.1. Keeping the documents required by the legislation ready					
78.2. Fulfilling the obligation imposed on the employer by the legislation					
78.3. Making determinations and recommendations for the health and safety of employees					
78.4. Importance in showing employees that they are valued					

OSH – occupational safety and health, 1 – being the least/lowest, 5 – being the most/highest.

* In order to show a sample from question types, 3 different questions (1 with demographic data-job roles, 1 with agree/disagree and 1 with 1–5 Likert scale) are randomly chosen and given.

Figure 1. Sample questions from the survey conducted with 381 participants from all regions of Turkey in 2022

tions was the most appropriate scale. Some questions from the survey are provided in Figure 1. The developed scale OSHSES and factor values are provided in Table 1. The survey prepared in Google Forms was sent to the emails of people with extensive knowledge and experience in the subject, especially OSH professionals, randomly obtained from different channels. Participant profile was stated to the surveyed people, who were then asked to forward the survey to participants with similar knowledge and experience. The scale is a 5-point Likert-type measurement tool ranging from 1 – “strongly disagree” to 5 – “strongly agree.”

RESULTS

Participant demographics

Participants’ occupational distribution is given in Figure 2. The naval industry has the largest percentage with 26.1%. Experience data is provided in Figure 3a; 270 of the participants has sufficient knowledge about JHSU and used it before. Sectoral data is provided in Figure 3b. Overwhelmingly, participants work in private sector. Job roles are given in Figure 3c. The “other” category relates to employees who do not hold a OSH title but still conduct OSH activities as additional responsibilities in their jobs.

Factor analysis

According to the factor analysis outputs, the most optimal scale that can be used as the effectiveness scale of OSH services consists of 6 factors and 31 questions (Table 1). These factors are as follows:

- factor 1: effectiveness in work equipment periodic maintenance and control activities (PMCE) – technical effectiveness; corresponding to H2,
- factor 2: awareness in occupational safety and health (OSHA) – motivational effectiveness; corresponding to H6,
- factor 3: occupational safety and health culture of workplace managers (OSHCM) – managerial effectiveness; corresponding to H3,
- factor 4: workplace occupational safety and health culture of employees (OSHEC) – educational-cultural effectiveness; corresponding to H4,
- factor 5: the quality of occupational safety and health services in the workplace (OSHSQ) – organizational effectiveness; corresponding to H5,
- factor 6: the effectiveness of occupational safety and health services (OSHSE) – total effectiveness; corresponding to H1.

The total variance explained due to exploratory factor analysis of the 6-factor structure of the scale is 65.43%. As a result of confirmatory factor analysis (CFA),

Table 1. The efficiency scale *Occupational Safety and Health Services Effectiveness Scale* – factor scores

Factor and statement	Score
Factor 1: Effectiveness in work equipment periodic maintenance and control activities (PMCE)	
1. Periodic checks of work equipment began to be carried out more regularly after the occupational safety specialist took office.	0.831
2. Periodic checks of work equipment began to be carried out only by authorized personnel after the occupational safety specialist took office.	0.832
3. Periodic checks of work equipment began to be carried out within the annual plan after the occupational safety specialist took office.	0.872
4. Periodic maintenance of work equipment began to be carried out only by authorized personnel after the occupational safety specialist took office.	0.892
5. Periodic maintenance of work equipment began to be carried out within the annual plan after the occupational safety specialist took office.	0.908
6. Periodic maintenance of work equipment began to be carried out more regularly after the occupational safety specialist took office.	0.885
Factor 2: Awareness in occupational safety and health (OSHA)	
1. After OSH training, employees become more willing to comply with OSH rules.	0.932
2. After OSH training, employees become more willing to contribute to OSH.	0.905
3. After OSH training, employees become more willing to join other training sessions.	0.855
4. Employees are willing to follow OSH rules.	0.802
5. Decisions taken at board meetings are considered.	0.723
6. Exercise results are taken into account by the management.	0.678
Factor 3: OSH culture of workplace managers (OSHCM)	
1. There is a work permit form for renovation, maintenance, working on high locations, and similar operations.	0.861
2. Permission to leave policies are applied under OSH.	0.866
3. A work permit form is used for renovation, maintenance, working on high locations, and similar operations.	0.733
4. There is an internal directive for OSH in the workplace.	0.619
5. There is a separate department for OSH in the workplace.	0.582
6. No operation begins unless there is approval on the work permit form.	0.693
7. Risk assessment is performed in the workplace.	0.542
8. Employee roles and responsibilities regarding OSH are defined in their job descriptions.	0.615
Factor 4: Workplace OSH culture of employees (OSHEC)	
1. Durations of training programs are sufficient.	0.853
2. Contents of training programs are sufficient.	0.867
3. OSH training programs are conducted regularly.	0.833
Factor 5: The quality of OSH services in the workplace (OSHSQ)	
1. After employing an OSH specialist, awareness is increased.	0.853
2. Since the OSH specialist started working, OSH activities in the workplace have been put in order.	0.880
3. Employees report nonconformities regarding OSH.	0.768
4. Work accidents are reported to official institutions regularly.	0.704
Factor 6: The effectiveness of OSH services (OSHSE)	
1. At the workplace, the findings and recommendations of the OSH expert and workplace physician are considered.	0.862
2. The perception of the benefits of an OSH specialist in the workplace is positive.	0.928
3. Work accidents have decreased since OSH services started in the workplace.	0.665
4. Considering firm size, risk assessment, and number of workers, OSH exercises are enough for the firm.	0.647

OSH – occupational safety and health.

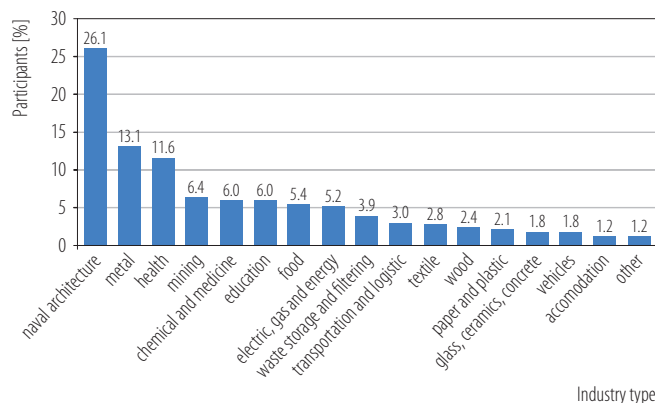


Figure 2. Participants (N = 381) industrial distribution, Turkey, 2022

the number of items (statements) included in the 6 factors are 6, 6, 8, 4, 4 and 3, respectively. The standardized factor values of these items vary 0.93–0.54, as seen in Table 1.

The fit index as a result of CFA with the scale is at an acceptable level with $\chi^2/df = 3.18$, root mean square error of approximation (RMSEA) = 0.076, Tucker-Lewis index (TLI) = 0.89, and comparative fit index (CFI) = 0.91. Cronbach’s α values of the factors are at a high level of reliability with PMCE = 0.949, OSHA = 0.927, OSHCM = 0.875, OSHEC = 0.869, OSHSQ = 0.877, OSHSE = 0.852.

It was observed that the factors had high reliability scores. Based on this, hypothesis tests were made in the next stage by taking the average of the Likert-type questions/expressions used in the survey together with the other questions/expressions in the factor values. No factor rotation was employed in factor analysis stage.

Hypothesis tests

In the research, the answers given by the participants to the 5-point Likert scale questions in the OSHSES scale, which are further developed to measure the OSHSE, were used as input for the t-test. In addition to developing a scale, the other aim of the research was to examine whether there is a difference in the effectiveness of OSH activities between companies that supply OSH services internally (I) or externally (E).

T-test is a parametric analysis method used to test whether the averages of observed values of 2 independent groups are significantly different from each other. The 2 independent groups required for the t-test are those who perform OSH services I and those who provide services E. The prerequisite for performing this test is that the data has a normal distribution. For testing the hypotheses and proving if there is a significant difference between E and I groups, factors are tested for normality first, and it was seen that they were normally distributed, with all values of skewness and kurtosis being between -1 and 1. Then, t-tests were applied for the factors, and all had a probability value <0.05 significance level. These results are provided in Table 2.

Based on the t-test results, there is a difference between the E and I ratios at the 0.05 significance level in all factors. To reveal which group, which factors, and to what extent the observed difference between the groups originates, the calculation of the averages was used as it will enable the study to make a meaningful comparison, as given in Table 2.

As a results of t-test analysis, the effectiveness of JHSUs in OSH services is lower from the effective-

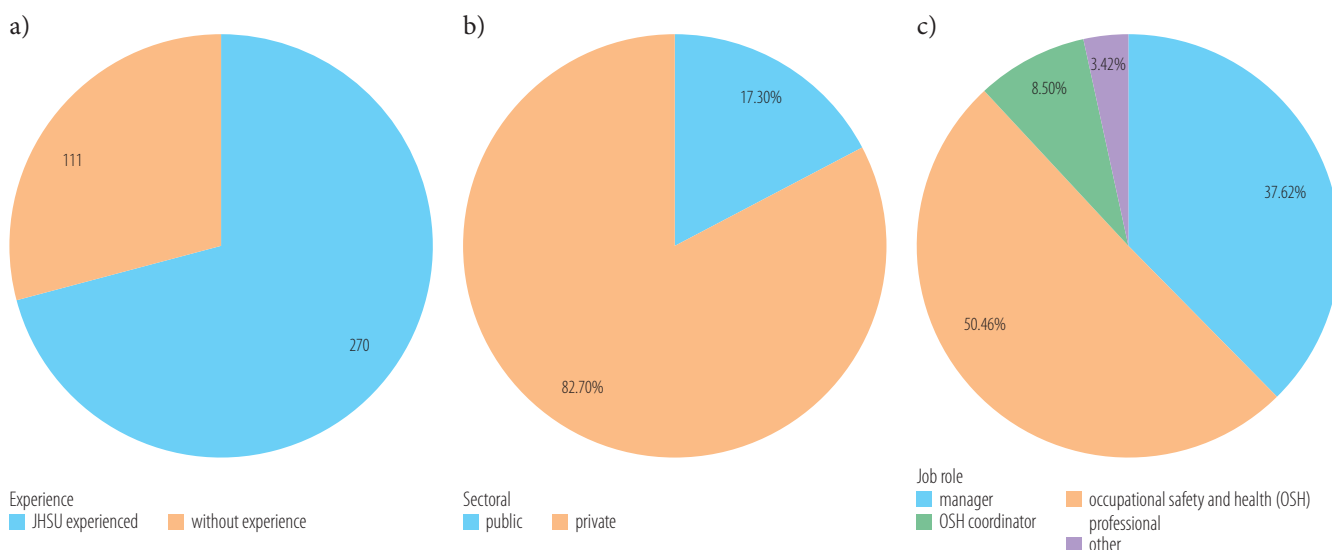


Figure 3. Participants’ (N = 381), Turkey, 2022 a) joint health and safety units (JHSU) experience, b) sectoral data, and c) job roles

ness achieved by the internal use of OSEs (OSHSE – factor 6). Thus, H1 hypothesis is accepted. According to the results of the t-test conducted on the scale, all of the initial hypotheses H1 through H6 regarding the scale and each of the relevant factors were accepted. In addition, it was understood that there was a significant difference between the E and I groups in all factors.

The average of the factors belonging to the E group, which represents workplaces where OSEs are assigned from the JHSU, is different compared to the I group, which represents the assignment from the workplace itself. Table 2 shows that all means of all factors in group I are higher than group E. It is seen that the biggest difference between groups I and E is in the factors of the OSHSQ (factor 5) with an average of 0.48. The factor with the least difference is the PMCE (factor 1) – 0.31. In workplaces where external assignment is made, the factor with the highest average score is the OSHSQ (factor 5) with 3.59, and this factor is with the highest score in internal assignment with 4.07, and it is the factor with the biggest difference between I and E.

In E assignment, the lowest score factor is OSHA (factor 2) with 3.05, and this factor is also the least scored factor in I assignment. This factor is also 1 of the 3 factors with the largest difference between I and E. It is also seen that the highest scores averages (factor 1, 3.56 and factor 5, 3.59) in E are at lower levels than almost all of the participation averages in I. In other words, the averages are generally significantly better for internal assignments as also approved by t-tests.

DISCUSSION

Occupational safety and health services are performed in 2 branches: an occupational safety specialist and an occupational physician. Although many workforce components play an indirect role in OSH, the most prominent workforce components that can be directly effective and even have an impact on other resources are OSH professionals, namely OSEs and workplace physicians [22]. Therefore, by revealing the effectiveness level of JHSUs in this study, it is also revealed how effectively the workforce consisting of OSH professionals can be used.

When OSH services effectiveness is mentioned, activities in which OSEs are predominantly involved in the field come to mind. In other words, the difference in the effectiveness of OSH services is related to the activities of OSH specialists. The activities are chemical, biological, mechanical, electrical, ergonomic, and so on, so it is a multi-dimensional process. Regarding OSH services,

Table 2. Group averages on the factors and Student's t-test (t) results, N = 381, Turkey, 2022

Factor and group	Score (M)	Δ	t	Skewness	Kurtosis
1. PMCE		0.31	0.003	-0.821	0.145
I	3.87				
E	3.56				
2. OSHA		0.43	0.000	-0.389	-0.372
I	3.48				
E	3.05				
3. OSHCM		0.35	0.000	-0.418	-0.453
I	3.61				
E	3.26				
4. OSHEC		0.43	0.000	-0.660	0.077
I	3.80				
E	3.37				
5. OSHSQ		0.48	0.000	-0.987	0.808
I	4.07				
E	3.59				
6. OSHSE		0.38	0.000	-0.698	0.295
I	3.67				
E	3.29				

E – external group, I – internal group.

OSHA – awareness in occupational safety and health, OSHCM – OSH culture

of workplace managers, OSHEC – workplace OSH culture of employees,

OSHSE – the effectiveness of OSH services, OSHSQ – the quality of OSH services in

the workplace, PMCE – effectiveness in work equipment periodic maintenance and

control activities

occupational safety expertise is more effective in the technical sense of the field [23]. Accordingly, in the legislation, the mandatory appointment periods for OSH specialists and workplace physicians vary by 2–3 times.

It will be more difficult for the workplace employees to adopt an OSE who is not part of the workplace and is assigned to commercial relations and to create an OSH culture in the workplace. This will inevitably affect other factors on the scale in a chain manner. Because unless a general safety culture is established in the workplace, it is difficult to fulfill the issues specified in the content of other factors.

It is also known that external service opportunities were introduced to facilitate the provision of OSH services, especially for small-scale enterprises. Of course, the purposes of using external service opportunities when support is required for internal services or providing convenience to weak, limited-capacity businesses cannot be ignored. In this case, it is essential that reg-

ulations regarding employers' opportunities to provide OSH services be made in line with ethical elements. The open-ended use of the opportunity to provide OSH services externally by all employers should be prevented, and the legislation should be regulated accordingly [24].

Under current conditions and based on the study results, it seems infeasible to carry out OSH services through JHSUs. However, there may be an improvement with new regulations. For example, first of all, employers should be prevented from receiving services directly from JHSU if they can provide the services internally. In this way, the main purpose of providing this opportunity to employers can be achieved as also proposed by international legislation. This main purpose is the allowance of external OSH services to be procured where the service provided by the workplace itself is not sufficient.

It is clearly understandable that in a structure where written notifications have legal and criminal consequences for the employer, OSEs cannot be expected to effectively carry out OSH inspections, report deficiencies, and make determinations and suggestions in the workplace of the employer, under whose command and authority they are indirectly financially dependent. This is why it is essential to ensure the independence of OSEs in ensuring effectiveness in OSH services. In order to ensure this independence, e.g., OSEs can be ensured to receive their salaries through a funding system. However, the most important point here is that it is necessary to establish a structure where OSEs can both carry out their work effectively and where their rights under labor law are not taken away, directly or indirectly.

One of the ways to achieve the expected progress in OSH is to receive external support while each workplace has its OSH specialist and to have the OSH activities in the workplace inspected from time to time by an external, independent third eye. The primary condition for this audit to be beneficial and useful in solving the problem will be for the audit mechanism to carry out its audits through a structure that ensures its independence from the employer.

CONCLUSIONS

Joint health and safety units will continue to play crucial roles in providing OSH services. This study evaluated the effectiveness level of JHSUs in providing OSH experimentally and hypothetically by 6 hypotheses. At the end, all 6 hypotheses were accepted and JHSUs have been proven to work less efficiently. There is a significant difference between the 2 groups, the group taking

the service by JHSUs and the group assigning an employee from within the firm.

The study produced at the same time a guideline for workplaces that plan to provide OSH services by using JHSUs, and hypothetically showcased the efficiency of JHSUs by collected data.

Furthermore, an original OSHSES is developed. Workplaces that receive OSH from JHSUs and those that internally manage OSH activities are compared in effectiveness. This scale is adjustable for many authorities that plan to provide safety and healthcare to workplaces and can be further tailored for measuring effectiveness of JHSUs.

By revealing the effectiveness level of JHSUs in this study, it is also revealed how effectively the workforce consisting of OSH professionals can be used.

AUTHOR CONTRIBUTIONS

Research concept: Sule Sezgin, Suleyman Ozdemir, Fatih Yilmaz

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Collecting material: Sule Sezgin, Fatih Yilmaz

Statistical analysis: Sule Sezgin, Murat Cal, Fatih Yilmaz

Interpretation of results: Murat Cal, Fatih Yilmaz

References: Murat Cal

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