

Original Research Article

THE EFFECT OF SAFETY CULTURE ON SAFETY PERFORMANCE: INTERMEDIARY ROLE OF JOB SATISFACTION

ABSTRACT

Aims: Development of safety culture at work environments which has emerged as an important solution in the field of occupational health and safety is important for minimizing the number of occupational accidents and diseases. The main purpose of this research is to determine the relationship between safety culture, safety performance and job satisfaction and propose a model showing how safety culture increases safety performance via the mediation of job satisfaction, and to determine whether occupational accidents are caused by unsafe practices or unsafe work environments.

Study design: The research was designed as a cross-sectional field study. Survey technic was used as the data collection method and the survey consists of 73 questions.

Place and Duration of Study: A mining enterprise operating in the city of Kutahya, Turkey in January 2014

Methodology: Convenience sampling method was used and the data was collected face to face from the employees who volunteered to participate in the research. The collected data was analyzed via SPSS Statistics 22 and AMOS 20 program was used in order to determine the relations between safety culture, safety performance and job satisfaction. The values for which $P=.05$ has been accepted as statistically significant.

Results: A total of 358 employees constitute the research sample. More than half (52%) of the employees perceive unsafe worker practices as the most common reason of occupational accidents. Also, significant relationships were found between safety culture, safety performance and job satisfaction. These results point out that human factor has the most important role in the prevention of occupational accidents. Accordingly, businesses and employers should establish and disseminate safety culture in their organizations.

Keywords: *safety culture, safety performance, job satisfaction, occupational health and safety*

1. INTRODUCTION

The concept of occupational health and safety, which is one of the most important issues for professional life, has become an important subject that attracts increasing attention in the recent years. In order to continue employees' professional lives, the primary purpose is to protect and maintain their health and safety. The sum of systematic studies in relation with this purpose is described as occupational health and safety. Occupational health and safety plays a major role in establishing a positive safety culture concept at a work environment. When statistics on occupational accidents and diseases are reviewed, the importance of this situation is better understood. According to International Labor Organization,[1] more than 2.3 million people die as a result of occupational accidents or work-related diseases per year and 317 million accidents occur on the job annually around the world. Moreover, according to Social Security Institution, 221,366 occupational accidents, 494 occupational diseases and 1,626 fatal occupational accidents were reported in Turkey in 2014. Also in 2014, there were nearly 400 workers dead because of fatal mining accidents. These numbers show that occupational health and safety is a very important issue for Turkey, especially in mining sector, which cannot be overlooked.

2. MATERIAL AND METHODS

In the prevention of occupational accidents and the dissemination of occupational safety practices by creating occupational health and safety management systems in enterprises, establishing occupational safety culture has become a major issue for businesses. The first studies in the field of safety culture began with the report published by the International Atomic Energy Agency after the Chernobyl accident.

In this report, lack of safety culture was pointed out as the cause of the accident [2, 3]. Safety climate and safety culture studies began first of all with the definition of Zohar in 1980 [4]. Zohar (1980) defined the concept of safety climate as “a summary of holistic perceptions on work environment shared by workers” [2, p.656]. Meanwhile, IAEA defines safety culture as “a product of the patterns of values, attitudes, competency and behaviors of individuals and groups which determine the adequacy, style and persistency of implementation of the organization’s health and safety programs” [5]. Because the organizations have more than one target as well as more than one means to achieve those targets they develop policies on issues such as high level customer management services, product quality and employee safety. For this reason safety climate is related with shared perceptions regarding safety policy, procedure and implementations [6, p.376].

The concepts of safety culture and safety climate are separate but most of the time they have also been used interchangeably [2, p.656; 3, p.423]. While authors like Mearns [7] distinguish between safety culture and safety climate, others like Guldenmund [8] accept that these concepts are derived from each other [9, p.201]. According to Guldenmund [10], safety climate is part of the culture and is affected by both the structure and the process [10, p.738]. Meanwhile, Cox and Flin (1998) treat the concept of safety climate as a reflection of the safety culture concept explaining employee attitude and behavior [11, p.642].

The key variables of the study have been determined as safety culture, safety performance and job satisfaction. Several studies [12-16] have revealed that significant and positive relationships have been found between safety culture and safety performance. Researchers who have utilized the concept of safety climate in order to measure the occupational safety perception of employees regarding work environment have found that there is a significant relationship between safety climate and safety performance [17-22]. Moreover, the existence of significant and positive relationships between safety culture and job satisfaction have been expressed in the field literature [23-25]. In accordance with this information, the main purpose of the study is to identify the occupational safety culture in organizations and to investigate the effects of safety culture on security performance and job satisfaction. The hypotheses of the research have been constructed as follows:

H1: There is a significant relationship between safety culture and safety performance.

H2: There is a significant relationship between safety culture and job satisfaction.

H3: There is a significant relationship between safety performance and job satisfaction.

H4: Job satisfaction functions as an intermediary in the relationship between safety culture and safety performance.

2.1 Methodology

The research has been designed as a cross-sectional field study. The main purpose of the research is to determine the relationship between safety culture, safety performance and job satisfaction and propose a model showing how safety culture increases safety performance via the intermediary of job satisfaction.

In the research “survey technique” has been used as a data collection method. The survey used in the research as a means of data collection consists of 73 questions. In the first section of the survey, there are a total of 18 questions and while nine are related to demographic characteristics and the other nine questions, which were developed by [26], are about the occupations of the participants. The second section consists of a total of 35 questions with 29 on safety culture [26] and 6 on safety performance [27,28]. In the third section there is the Minnesota Job Satisfaction scale which has been developed by Weiss et al. [29] and translated into Turkish by Baycan [30] and consists of 20 questions. While there are multiple-choice questions in the first section of the survey the second and third sections require participant evaluation of the questions according to a 5-point Likert scale. Accordingly the format of the scale is as follows “1: Totally disagree”, “2: Disagree”, “3: Somewhat agree”, “4: Agree”, “5: Totally agree”.

A pilot study was conducted with a group of 30 people and the survey design was finalized after questions and concepts which were difficult for the participants to understand were rephrased. Moreover, it was determined that it took about 30 minutes to complete a survey. Survey was conducted in a mining enterprise operating in the city of Kutahya and the research universe consists of 1452 personnel working at the mining enterprise. Convenience sampling method was used and the surveys were conducted with employees who volunteered to answer the questions. Data has been collected via face to face surveys. Due to the hazardous work environment and the intensity of workload, a total of 403 surveys were completed. Out of these 45 were left out of evaluation because they were not completed properly or fully and as a result 358 surveys were included in the analysis. Thus a total of 358 people constitute the research sample.

In the analysis of the collected data, frequency distribution, mean and standard deviation were used and SPSS for Windows 22.0 (Statistical Program for Social Sciences) has been utilized for these analyses and calculations. Moreover, Structural Equation Model has been used in the exploration of the relationships between factors and the investigation of the intermediary effect of job satisfaction. AMOS 20 program has been used for confirmatory factor analysis and the structural equation model analysis. The values for which $P=.05$ has been accepted as statistically significant.

Conducting the research in a mining enterprise which operates in the high-risk mining sector, the difficulty of working conditions and the critical issue of practices of occupational health and safety being the subject matter have been the main constraints of the research. In this sense, the contribution of this study to the field literature is important.

3. RESULTS AND DISCUSSION

A total of 358 employees of the mining enterprise participated in the research. It has been observed that while the majority of the participants (38%) are 45 years old and older, 53.7% are between 27 and 44 years. Almost half (49.7%) of them are high school and vocational high school graduates. Moreover, while only 6.7% of the employees are women, 85.8% are married.

Table 1. Classification of employees according to employment specifics

Position at Work	Number	Percentage
Manager	3	0.8
Engineer	36	10.1
Technician	40	11.2
Tech-artist	1	0.3
Operator/Mechanic	12	3.3
Supervisor	8	2.2
Foreman	2	0.6
Worker	207	57.8
Administrative personnel	41	11.5
Other	8	2.2
Employment period at this job		
0-5 years	152	42.4
6-10 years	85	23.7
11-15 years	25	6.9
16 years or more	96	26.8
Department working for		
Financial Affairs – Personnel – Administrative Social Affairs	116	32.4
Open Furnace – Study Project – Machine Servicing – Machine Operation	150	41.9
Underground production – Underground Control – Lab – OHS – R&D	92	25.7

Employment type		
Working in shifts	195	54.5
Working full-time	163	45.5
Job training		
Received	280	78.2
Not received	78	21.8
Sufficiency of received training		
Sufficient	208	58.1
Insufficient	150	41.9
Total	358	100

More than half of the participants (57.8%) are workers. In mining enterprises, the most risky group is workers in terms of occupational safety and health. Their contribution is valuable as they face most of the risks. While 41.9% of the participants work at departments such as open furnace, study projects, machine services, 25,7% of them work at underground production and control departments or laboratories. Nearly 40% of the employees have 0-5 years of experience at this work place and 27% have 16 years of experience or more. Also, while 54.5% of the participants are working in shift, 45,5% of them are working full time. Moreover 79% of the employees have stated that they have received training related to their job and almost 60% perceive this training to be sufficient.

3.1 PERCEIVING THE CAUSES OF OCCUPATIONAL ACCIDENTS

While 52% of the participants perceive the most common cause of occupational accidents to be unsafe worker practices, the remaining 48% see unsafe work environment as the most common cause of occupational accidents. Approximately 54% of the employees have experienced a close call. 14.2% of the participants stated that they have suffered an occupational accident at this work place and nearly 21% have had an occupational accident in their professional lives. In a study by Ayber et al. [31], 44.4% pointed to factors related to unsafe work environment and 55.6% pointed to unsafe worker practices as the most common cause of occupational accidents. According to an early work of Demirbilek [26] on the textile sector, it has been stated that from among 200 employees 61% perceived unsafe worker practices and 39% perceived unsafe work environment as the most common cause of occupational accidents.

Table 2. Perceptions of employees towards occupational accidents

	Number	Percentage
The most common cause of occupational accidents		
Unsafe worker practices	185	51.7
Unsafe work environment	173	48.3
Ever experienced a close call at work		
Yes	109	30.5
No	167	46.6
Partially	82	22.9
Ever experienced an occupational accident at this workplace		
Yes	51	14.2
No	307	85.8
Ever experienced an occupational accident in professional life		
Yes	74	20.7
No	284	79.3
Total	358	100

As a result of the independent sample t test, it is seen that there is a statistically significant difference between the levels of safety culture of those who have and those who have not experienced an

occupational accident. Accordingly, the safety culture level of those who have experienced an occupational accident is significantly lower than those who have not experienced an occupational accident ($t: -3.011$, $P=0.05$).

Table3. Investigation of the differences between those who have and those who have not experienced occupational accidents in terms of the level of safety culture

Variables	N	Mean	Std. Deviation	T	P
Have you ever experienced an occupational accident?	74	2.07	0.486	-3.011	.003
Yes	284	2.24	0.427		

Table 4. Investigation of the differences between employees who have diverging opinions on the causes of occupational accidents in terms of the level of safety culture

Variables	N	Mean	Std. Deviation	T	P
In your opinion, which is the most common cause of occupational accidents?	185	2.34	0.348	6.142	.000
Unsafe worker practices of work environment	173	2.06	0.492		

As a result of the independent sample t test it has been found that there is a statistically significant difference between the safety culture levels of those who have diverging opinions on the causes of occupational accidents. Accordingly, the safety culture level of those who perceive the cause of occupational accidents as unsafe worker practices is significantly higher than the safety culture level of those who perceive the cause of occupational accidents as unsafe work environments ($t: 6.142$, $P=.05$).

3.2 CONFIRMATORY FACTOR ANALYSIS

For the measurement model that consists of 27 items and 5 latent variables as determined as a result of the confirmatory factor analysis regarding the safety culture scale, first a primary level then a secondary level confirmatory factor analyses have been conducted. The dimensions which have been defined as latent variables are administrative commitment, safety priority, safety communication, safety training and safety participation. The secondary level factor analysis that recognized administrative commitment, safety priority, safety communication, safety training and safety participation, which were included in the measurement model as a result of the primary level factor analysis, as the sub-dimensions of the latent variable of safety culture is shown in Figure-1.

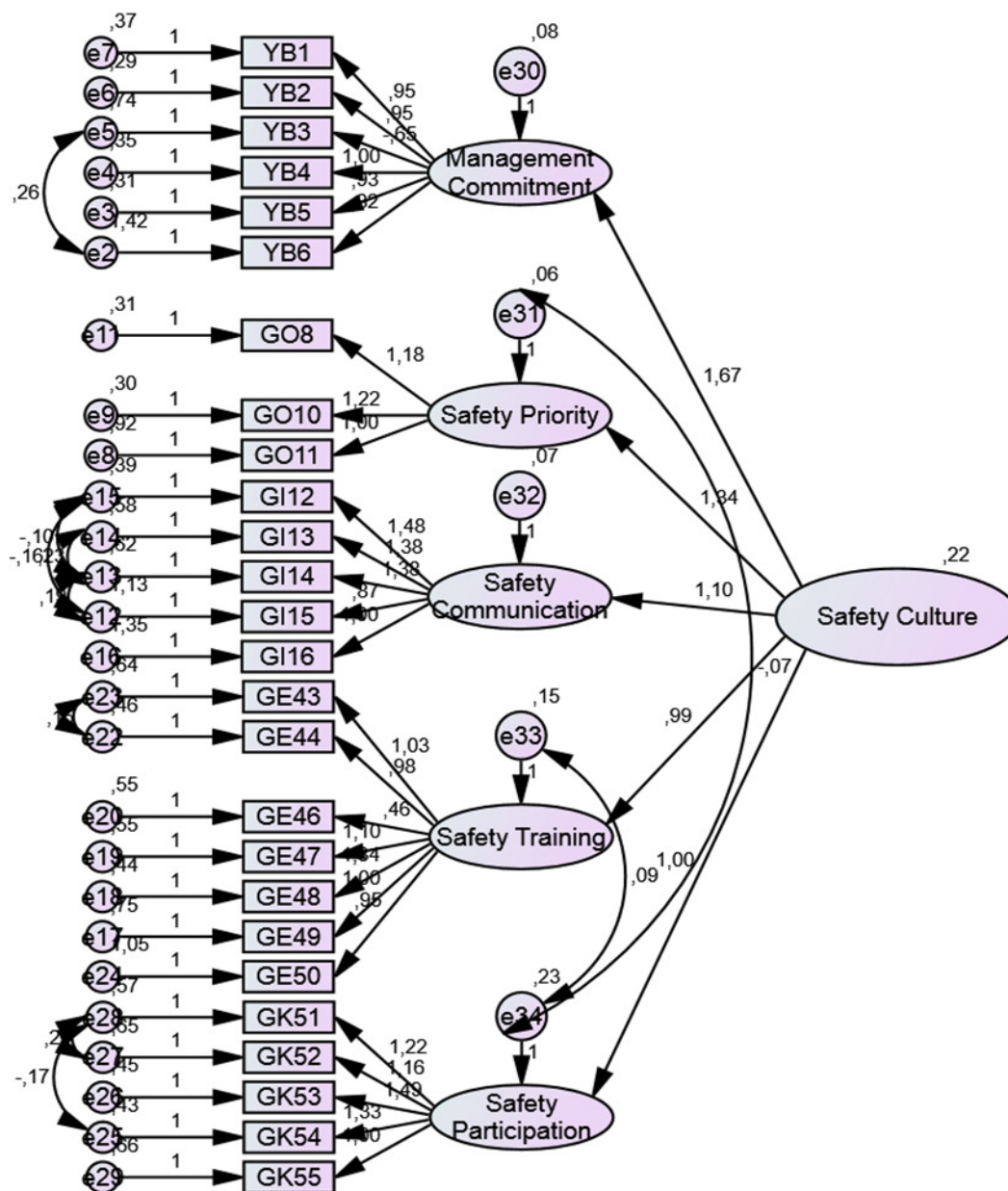


Figure 1. Confirmatory factor analysis.

In order to ensure that the measurement model remains within the acceptable range of adaptive values, one item from safety priority dimension and one item from safety training dimension were removed. As a result of the confirmatory factor analysis the following results have been found: $\chi^2/Sd = 1.753$; RMSEA=0.046; CFI=0.952 and GFI=0.904. According to these results it can be seen that the validity of the scale is ensured and that the model has adapted well to the data.

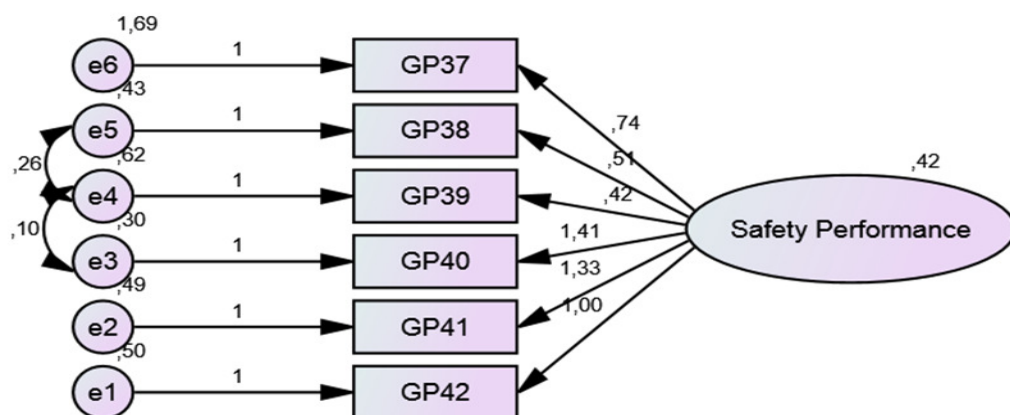


Figure 2. Confirmatory factor analysis for safety performance scale.

According to these results it can be argued that the safety performance dimension and the variables are related, that the model is appropriate and the confirmatory factor analysis is statistically significant. As a result of the confirmatory factor analysis performed for the Safety Performance Scale, the following results have been found: $\chi^2/Sd = 2.155$; RMSEA=0.057; CFI=0.987 and GFI=0.986. According to these results it can be seen that the validity of the scale is ensured and that the model has adapted well to the data.

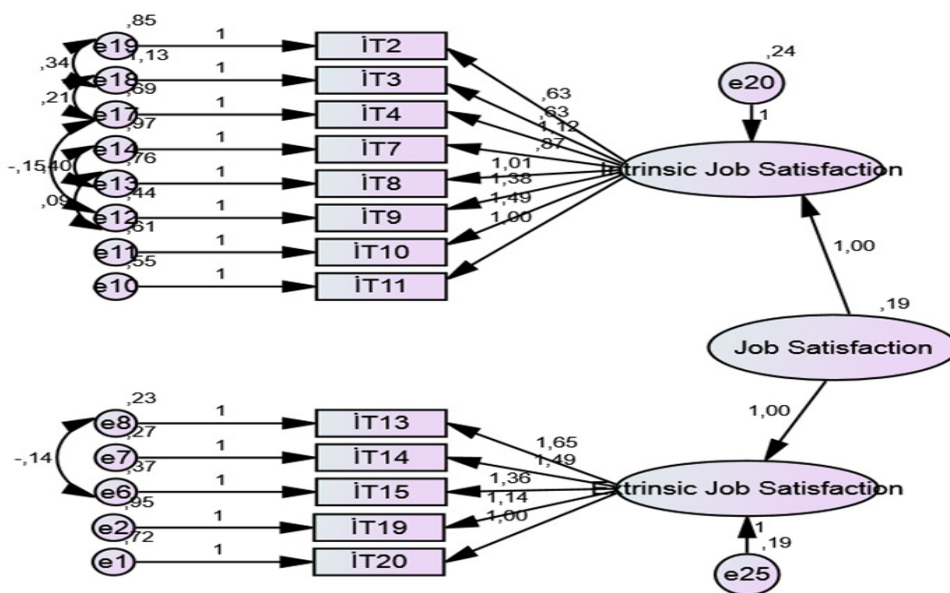


Figure 3. Confirmatory factor analysis for job satisfaction scale.

For the measurement model that consists of 13 items and 2 latent variables as determined as a result of the second level confirmatory factor analysis regarding job satisfaction, first a primary level then a secondary level confirmatory factor analyses have been conducted. The latent variables are intrinsic job satisfaction and extrinsic job satisfaction. Intrinsic and extrinsic job satisfaction, which were involved in the measurement model as a result of the primary level factor analysis, are defined as the sub-

dimensions of the latent variable of job satisfaction and the secondary level confirmatory factor analysis is shown in the above Figure-3. In order to ensure that the measurement model remains within the acceptable range of adaptive values, 5 items have been removed from the intrinsic job satisfaction dimension and 2 items from extrinsic job satisfaction dimension. As $\chi^2/Sd = 2.568$ it remains within the acceptable range of adaptive values. As a result of the confirmatory factor analysis performed for the job satisfaction scale the following results have been found: $\chi^2/Sd = 2.568$; RMSEA=0.066; CFI=0.955 and GFI=0.939. According to these results it can be seen that the validity of the scale is ensured and that the model has adapted well to the data.

As a result of the confirmatory factor analysis performed for the job satisfaction scale it has been seen that validity is ensured and the model has adapted well to the data. While work commendation (question 10) is considered as an extrinsic dimension, in this study it is subsumed under intrinsic dimension. In a study of Koroglu [32], the factors in the Minnesota job satisfaction scale short form have expressed variation. The "commendation" item which in the original Minnesota Job Satisfaction Scale Short Form is listed within the extrinsic satisfaction structure in this research it is included in the intrinsic satisfaction factor structure. Also, researchers have stated that the short form of Minnesota job satisfaction scale can include different factor structures [33-35].

3.3 THE EVALUATION PROCESS OF THE STRUCTURAL MODEL AND THE EVALUATION OF ADAPTATION

A model has been developed in order to primarily investigate the relationship between safety culture and safety performance with the purpose of evaluating the model in the study.

Table 5. Effect of safety culture on safety performance

			Beta	T	P
Safety Culture	→	Safety Performance	0.878	16.376	.000**

From the developed model it can be seen that safety culture has a positive and statistically significant effect on safety performance. Accordingly, a unit of increase in safety culture leads to a 0.878 units of increase in safety performance.

Table 6. Intermediary effect of job satisfaction on the relationship between safety culture and safety performance

			Beta	T	P
Safety Culture	→	Safety Performance	0.793	12.736	.000**
Safety Culture	→	Job satisfaction	0.400	11.551	.000**
Job satisfaction	→	Safety Performance	0.213	2.625	.009**

In the developed model to investigate the intermediary effect of job satisfaction, it has been determined that the effect of safety culture on safety performance is 0.793, the effect of safety culture on job satisfaction is 0.400 and the effect of job satisfaction on safety performance is 0.213. Moreover, the results of the model developed to investigate the intermediary role of job satisfaction are shown in Figure-4.

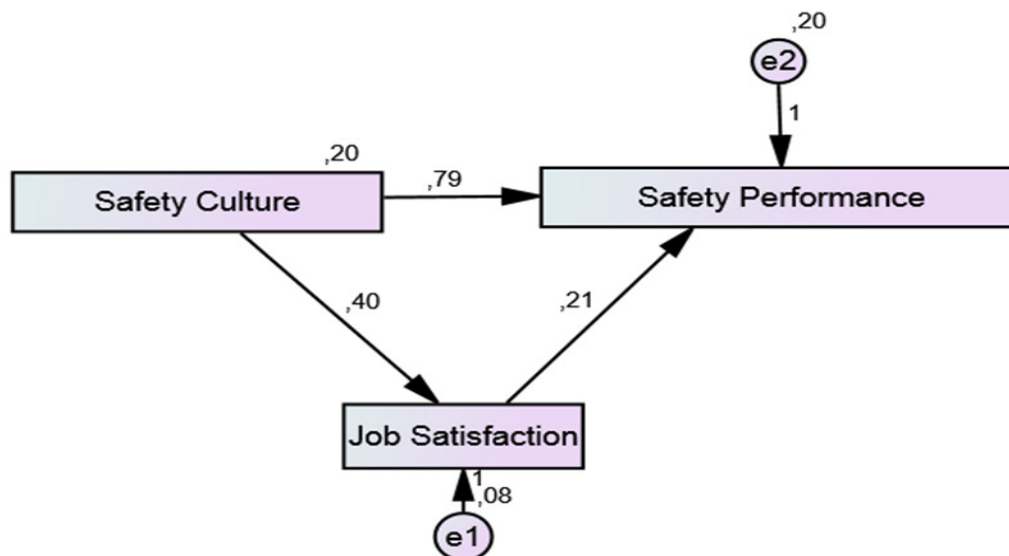


Figure 4. Path analysis of the research model

When the paths in the model are examined it is seen that all paths are significant. In order to examine the intermediary role of job satisfaction, the relationship between safety culture and safety performance must be investigated. It is seen that the coefficient which was 0.878 in the previous model has decreased to 0.793 when job satisfaction intervenes as model intermediary. Moreover, there are significant relationships between safety culture and job satisfaction, and between job satisfaction and safety performance. Accordingly, it is seen that job satisfaction has a partial intermediary effect on the relationship between safety culture and safety performance.

According to the results gathered at the end of the performed analyses H1, H2, H3 and H4 hypotheses have been accepted. Accordingly, we can say that there is a statistically significant relationship between job satisfaction, safety culture and safety performance and that job satisfaction has an intermediary role in the relationship between safety culture and safety performance.

4. CONCLUSION

As a result of the research, it has been found that the relationships between safety culture, safety performance and job satisfaction are significant and moreover that job satisfaction assumes a partial intermediary role in the relationship between safety culture and safety performance. In the light of these findings we can say that safety culture has a positive effect on safety performance and moreover that, job satisfaction partially intermediates in this relationship. While on its own safety culture accounts for 27.2% of a change in job satisfaction ($R^2=0.272$), safety culture together with job satisfaction can account for 44% of a change in safety performance ($R^2=0.440$).

Taking occupational health and safety precautions, making sure that these are implemented and supervising their applications are the responsibilities of the administration and they are related with its commitment to this system. The most important dimension in the studies on especially both safety climate and safety culture is administrative commitment. Therefore, in order for safety performance to reach the desired levels, administration has to spend energy towards increasing businesses' safety culture and job satisfaction levels and make an effort to increase employees' job satisfaction. Remuneration systems aimed at encouraging safe practices can make important contributions to decreasing the number of accidents. Moreover, as required by the recently accentuated issue of behavioral safety management, administration has to pay attention to psychological empowerment which increases employees' job satisfaction. One of the most important factors in the establishment of safety culture consciousness is employee participation. The representation of employees in occupational health and safety boards as well

265 as listening to the opinions of employees while making other decisions are practices both of which
266 increase job satisfaction.

267 It has been found that the safety culture and safety performance levels of employees who think that the
268 cause of occupational accidents is 'unsafe worker practices' are significantly higher relative to those who
269 think that the cause is 'unsafe work environment' ($p < 0.05$). This results from the fact that the employees
270 who have higher levels of safety performance perceive the most important factor in the cause of
271 occupational accidents as human error.

272 Moreover, it has been seen that the safety culture, safety performance and job satisfaction levels of those
273 who have received job training are significantly higher relative to those employees who have not received
274 such training ($P = .05$). It has been found that the safety culture, safety performance and job satisfaction
275 levels of those employees who think that the job training they received was sufficient are significantly
276 higher relative to those who do not think that the training was sufficient ($P = .05$). The importance of
277 training in behavioral change is irrefutable. Employers have a responsibility to train their employees
278 regarding both their rights as well as the risks specific to their sector. The main purpose of these trainings
279 is to inform employees about the risks relevant to the workplace and minimize the number of occupational
280 accidents and diseases. Therefore, rather than considering these trainings as a legal burden, they should
281 be held in an interactive manner with the genuinely active participation of employees. Furthermore,
282 exemplary cases of past accidents can be presented during trainings in order for employees to gain
283 experience.

284 In the instillation of safety culture, establishing a reporting system and conducting risk evaluations are
285 important. The purpose of risk evaluation is to take the necessary protective precautions to prevent
286 accidents with a proactive approach. Detecting, recording, reporting and sharing with employees the
287 accidents and close calls that take place in the enterprises which operate in the same sector are
288 important in reducing the number of accidents as a result of the gained experience.

289 In Turkey, one of the most serious deficiencies in the field of occupational health and safety is the lack of
290 standards at the sectoral level. The state, by meeting with all parties, has to provide solutions appropriate
291 to the problems in occupational health and safety and establish industry-specific regulations. Although the
292 most important responsibility lies with employers in establishing and implementing occupational health
293 and safety precautions the state must make sure through its inspections that sanctions are efficient.

294 Identifying levels of safety culture and investigating the intermediary role of job satisfaction for employees
295 from different sectors in the future studies will increase the generalizability of the study. Furthermore, it is
296 suggested that researchers conduct studies on the different dimensions of safety culture. Because the
297 number of variables was high some of the sub-dimensions of safety culture were not included in the
298 analysis of this study. In future research, other variables can be included in analysis. Moreover,
299 conducting research on larger universes will ensure the generalizability of the study.

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