

## A Study of The Relationship Between The Components of The Five-Factor Model of Personality and The Occurrence of Occupational Accidents in Industry Workers

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### ABSTRACT

Accidents are among the most important problems of both the developed and the developing countries. Individual factors and personality traits are the primary causes of human errors and contribute to accidents. The present study aims to investigate the relationship between the components of the five-factor model of personality and the occurrence of occupational accidents in industrial workers.

The independent T-test indicated that there is a meaningful relationship between the personality traits and accident proneness. In the two groups of industry workers injured in occupational accidents and industry workers without any occupational accidents, there is a significant relationship between personality traits, neuroticism ( $p \leq 0.001$ ), openness to experience ( $p \leq 0.001$ ), extraversion ( $p \leq 0.024$ ) and conscientiousness ( $p \leq 0.021$ ). Nonetheless, concerning the personality trait of agreeableness ( $p \leq 0.09$ ), the group of workers with accidents did not differ significantly from the workers without any accidents.

The results showed that there is a direct and significant relationship between accident proneness and the personality traits of neuroticism and openness to experience. Furthermore, there is a meaningful but inverse correlation between accident proneness and the personality traits of extraversion and conscientiousness, while there was no relationship between accident proneness and the personality trait of agreeableness.

**Keywords:** Personality Traits, Safety, Occupational Accidents

### INTRODUCTION

The increase in the variety and severity of occupational accidents and work-related diseases is an undesirable consequence, resulted from the expansion of industries and modern technologies, which threaten the life of humans specifically the workers [1]. Work-related accidents and injuries are the most serious social and public health problems in all communities. This is to the extent that, compared to different types of cancers, cardiovascular diseases, Alzheimer's and AIDS, the financial burden of injuries and occupational diseases is the highest [2]. As a result of the quality and the method of provision of healthcare and also difference in recording systems of occupational accidents, there is no accurate estimate of the rate of deaths from occupational accidents in different parts of the world [3]. According to an estimate by the International Labor Organization (ILO) about 50 million work-related injuries occur annually, which equals 16,000

accidents per day [4]. Statistics provided by the same organization reveal that about 350 thousand workers lose their lives due to accidents at work each year [5]. World Health Organization (WHO) reports also confirm that nearly one hundred million people are victims of occupational accidents and 200,000 of them die each year [6]. In Iran, according to available statistics, the rate of occupational accidents has increased from 15552 incidents in 2000 to 16745 incidents in 2003, which indicates a 7.67 percent growth rates in these years [7].

The figures and statistics show that in most countries, the distribution of accidents among those individuals at risk is not uniform, and in fact three-quarters of the accidents happen for a quarter of those at risk [8]. Hence, the human factor can be considered as the most important factor in the incidence of occupational accidents [9]. Individuals' behaviors are influenced by two factors: internal tendencies towards making a mistake and the conditions which

induce making mistakes. The individual's inclinations towards making mistakes are in fact intrinsic properties which are formed as a result of the different physical and physiological characteristics. On the other hand a series of external factors, entitled as performance-shaping factors, such as experience, training, fatigue, physical environment, together with the intrinsic properties, could shape the individual's behavior [9]. In other words, unsafe behavior is formed by the personal characteristics and the socio-occupational environment [10].

Research suggests that there is a relationship between a wide range of personality traits and accident causing behaviors. Conscientiousness is one of the personality traits which are defined by Barrick and Mount as being reliable, responsible, hard-working and accurate. Summarizing several researches in the previous years. Barrick and Mount have concluded that conscientiousness and emotional stability is correlated with job performance in a variety of jobs [10]. In addition to predicting job performance, conscientiousness is correlated with safety and accidents [11]. Arthur and Graziano, in a study, reported a significant inverse correlation between the injuries and conscientiousness [11]. In another similar study, there was a significant inverse correlation between the rate of work-related accidents and conscientiousness, and this is even true for those accidents in which the workers did not cause the accidents and therefore were not blameworthy [12]. In another study, three personality aspects of conscientiousness, excitement-seeking and aggression have been reported to have a negative, positive and positive correlation respectively, with different aspects of risky driving behaviors [13]. Moreover, in a research conducted by Wallis and Vodanovich among workers in manufacturing occupations, it was concluded that there is a significant inverse correlation between conscientiousness and unsafe work behaviors and the consequent occupational accidents [14]. Clark and Robertson, in a meta-analysis, showed that the personality traits of agreeableness and neuroticism with modified coefficients of 0.44 and 0.30 are effective predictors of occupational accidents [15]. Overall, the researches on extraversion and being injured in accidents indicate three relations (positive correlation, negative correlation and no correlation). Some studies have reported a positive correlation between extraversion and being injured in accidents [16-18]. However, other studies have found no correlation between these two variables [19], or the correlation found between these two was the opposite of the expected result [20].

As regards the fact that each individual's personality traits can be considered as predictors of their predisposition towards causing accidents, the aim of this study was to investigate the relationship between personality traits of the workers and the likelihood of occupational accidents. The findings of this study can be very useful and also applicable in the examinations and interviews prior to employment of an individual and also in determining whether the worker is well-qualified for the specific occupation in order to prevent the employment of those with predisposition and a high probability of causing accidents in sensitive positions in different occupations.

## **MATERIALS AND METHODS**

This descriptive and cross-sectional study was conducted in 19 industries in Esfahan. The research population included all workers employed by Isfahan industries, those involved and those not involved in accidents. In fact, the research population of those workers involved in occupational accidents comprised of the ones who visited a health center, at least once in the last 6 months, for an injury treatment as the result of the accident; the ones for whom an incident report form had been provided and filled out. The workers not involved in accidents are those who had never visited any health centers in order to treat any injuries as a result of occupational accidents [21]. The sampling method was multi-stage. First, a list of industries which had accidents in the last 6 months was prepared through correspondence with health centers and the department of labor. After investigating and making phone calls with the abovementioned industries, 19 industries were selected. Individuals who had accidents within the last 6 months were identified and selected as members of this research population by first referring to the accident and injury statistics and also consulting with occupational health and safety officers of the specific industry. The participants of this research were fully briefed on how the research was going to be administered. They were assured that their information will remain confidential, and out of their own consent and volition they participated in the study. In addition to the aforementioned qualifications for the subjects to take part in this study there were some other inclusion criteria such as having at least diploma credentials, having no mental illness, not having had any traumatic experience such as the death of a close relative or a divorce in the family within the last 6 months. Afterwards, the NEO (Neuroticism-Extraversion-Openness) Five Factor Inventory short form (NEO-FFI), with confirmed the validity and reliability [22], was completed for 200 participants (100 injured workers and 100 workers

without any occupational accidents and injuries). Finally, the collected data were processed by SPSS20 software, and then it was analyzed with the statistical independent T-test.

### Research tools

In order to collect data, NEO Five Factor Inventory was used. NEO-FFI is a personality test, made on the basis of factor analysis. This 60 item questionnaire is used to assess personality. The long and complete form of this questionnaire included 240 items and it was introduced by McCrae and Costa as NEO Personality Inventory in 1985 [22]. Five personality traits include neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Each of them is briefly described in the following part.

**Neuroticism:** The most effective measure of personality is the contrast between compatibility or emotional stability and incompatibility or neuroticism. Clinical experts recognize a variety of emotional disorders, such as social phobia, depression and hostility in the individuals. Numerous studies have indicated that individuals who are susceptible to one of these emotional states, might also experience other states. General tendency to experience negative emotions such as fear, sadness, clumsiness, anger, guilt and hatred sets up the gamut of this factor [23].

**Extraversion:** Extroverts are sociable, but social ability is just one of the traits of the extensive gamut of extraversion. In addition to that, loving people, enthusiasm for participating in large groups and social gatherings, and being brave, active and also assertive are among an extrovert's traits. Such individuals are also happy, energetic and optimistic. Different parameters of this personality trait are significantly correlated to risk taking tendencies in businesses [24].

**Openness to experience:** As the main aspect of personality, openness to experience is less known compared to neuroticism and extraversion. Different factors of openness to experience such as active imagination, love of beauty, caring for inner feelings, love of variety, intellectual curiosity and independence in the judgments, have often played a role in theory and measures of personality, but their connection on a bigger scale and their integration into a creating factor have rarely been discussed. People who are open to experience are curious about both the inner world and the outer world and their life is rich in experience. Such people experience the positive and negative emotions and excitements more and more profoundly than people who are not open to experience.

**Agreeableness:** like extraversion, agreeableness is primarily an aspect of interpersonal tendencies. An

agreeable person is basically altruistic, is eager to help, feels sympathy towards others, and believes that others are mutually helpful. By contrast, an individual who is disagreeable and antagonistic, is egotistical and skeptic and rather competitive than cooperative.

**Accountability and conscientiousness:** Dutifulness and accountability (conscientiousness) confer the power to control the impulses, in such a way that the society considers eligible. Such traits act as facilitator of a task-oriented and goal-oriented behavior. Conscientiousness includes features such as thinking before acting, delaying gratification of desires, obeying the rules and norms, and also organizing and prioritizing the tasks.

## RESULTS

Participants in this study were all male workers from 19 industries in Isfahan. The average age of participants was 33.19 with a standard deviation of 7.39 years. 76.5 percent of them were under 40 years of age. 80.5 percent of them did not have or had a high school diploma and the rest of them had a university or a higher degree. 74.5 percent of them were married, 24 percent single and the rest were divorced. 80 percent of them were from 3 industries (steel and smelting industry, ceramics industry and sugar industry). Tables 1 and 2, illustrate the number of samples by the type of industry and occupation, respectively.

**Table 1:** Number of samples based on the type of the industry

Row	Type of Industry	Number of Industries	Number of samples (%)
1	Metal and smelting	7	96 (48%)
2	Sugar	1	34 (17%)
3	Ceramics	4	30 (15%)
4	Textile	2	14 (7%)
5	Construction	2	8 (4%)
6	Paper	1	8 (4%)
7	Stone Cutting	1	4 (2%)
8	Glass	1	6 (3%)
Total	8	19	200 (100%)

**Table 2:** Number of samples based on the type of occupation

Row	Occupation	Number of samples (%)
1	Device/ machine operator	42 (21%)
2	Turner	28 (14%)
3	Repairs and Installations	22 (11%)
4	Warehouse Keeper	20 (10%)
5	Welder	16 (8%)
6	Simple Worker	14 (7%)
7	Presser	12 (6%)
8	Electrician	10 (5%)
9	Assembly Worker	8 (4%)
10	Services	8 (4%)
11	Supervisor	6 (3%)
12	Other Occupations	14 (7%)

The results of the analysis of data obtained from NEO-FFI questionnaire on five personality traits of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness are presented in Table 3 below. The highest value is related to

personality trait of conscientiousness (49.47) and the lowest figure is related to the personality trait of openness to experience (30/61).

**Table 3:** Values of different personality traits in the study group

Index/ Variable	Neuroticism	Extraversion	Openness to Experience	Agreeableness	Conscientiousness
The Average	31.81	42.9	30.61	43.46	49.47
Standard Deviation	4.67	4.72	3.64	4.67	5.1
The Lowest	13	25	20	28	26
The Highest	55	56	41	50	60

The independent T test showed that in the two personality trait areas of neuroticism and openness to experience, the mean scores of the injured workers were significantly higher than of the workers without accidents. In the two personality dimensions of extraversion and conscientiousness, the mean scores of the injured workers were significantly less than

those without any accidents. Concerning the personality trait of agreeableness, the mean scores of workers without any accidents were higher than the mean scores for the injured workers, but there was not a significant difference between the mean scores of these two groups.

**Table 4.** Comparing the five dimensions of personality in the two groups of injured workers and workers without accident

Index Variable	Neuroticism		Extraversion		Openness to experience		Agreeableness		Conscientiousness and Accountability	
	Injured	Not injured	Injured	Not injured	Injured	Not injured	Injured	Not injured	Injured	Not injured
Mean scores	34.34	29.28	40.27	45.53	31.53	29.69	43.21	43.71	47.36	51.58
Standard deviation	5.82	6.36	4.69	5.00	5.07	3.53	4.3	5.00	4.99	5.45
P value	0.02		0.035		0.001		0.1		0.001	

## DISCUSSION

In this research, after studying the personality variables, T test showed that, as regards the personality trait of neuroticism, the mean score of the injured workers was significantly higher than those without any accidents and injuries. As a result of having characteristics such as high levels of aggression and anxiety, emotional instability, depression, anti-social behavior, impulsive behavior or psychological stress in the workplace, the level of caution, attention, accountability, conscientiousness and awareness of neurotic workers has decreased and the probability of human errors and accidents has increased. Distressed people are more likely to ignore the rights of others and violate the laws and also they have more dangerous and risky experiences [25]. Hansen was the first researcher to test the relationship between personality variables and some other variables in relation to occupational accidents with a path analysis model. In his research model, Hansen reported a positive correlation between

neuroticism and occupational accidents, and the results of his research are consistent with the findings of this study [26]. The findings of this current study are similar to results of the research by Mahmoudi *et al.* Results of the study by Mahmoudi *et al.* showed that the personality variable of neuroticism at the error level of less than 0.01 is directly and significantly correlated with unsafe and risky actions [27]. Furthermore, the findings of this study are similar to findings of the research conducted by Haghshenas et al and the one by Sommer et al in the field of unsafe behaviors of the drivers. The results of their studies show that there is a direct and significant correlation between the index of neuroticism and high-risk driving behaviors [27, 28]. Moreover, the findings of this study are consistent with the findings of Clark and Robertson. In a meta-analysis, Clark and Robertson showed that the personality trait of neuroticism with a corrected coefficient of 0.30 is an effective predictor of occupational accidents [29].

The mean score of the extraversion variable in injured workers was significantly less than the mean score in those without any injuries. In other words, in this study, there was a significant inverse relationship between the variable of extraversion and accident proneness. Individuals seeking excitement, search for emotion more; they tend to increase excitement, and they like involvement and experience [30]. It is highly probable that those individuals who are less active in interpersonal interactions will feel insecure and consequently avoid asking for help from others if they are forced to interact with others in special occupational situations; as a result, the possibility of an error or occupational accident increases [31]. The findings of this study were consistent with findings of Mahmoudi et al. Mahmoudi et al reported a significant and inverse correlation between extraversion and the rate of risky and unsafe behaviors [27]. The findings are also in line with research by Lajunen, Fernandez, Smith and Kirkham [32-34].

Comparing the scores of injured workers and the workers without any injury indicates that there is a significant and direct correlation between the openness to experience and the amount of accident proneness. As regards openness to experience, individuals with higher scores enjoy an active, diverse and fresh imagination, are attracted to music and they also have different avocations. It could be explained that, as a result of their interest in getting more new experiences, individuals with higher scores concerning the variable of openness to experience tend to take more risks, and consequently they are predisposed to having more unsafe behaviors which in turn increases the possibility of causing accidents. The results of this study are in line with the findings of the research by Mahmudi et al and also the research by Haghshenas *et al.* [27, 28]. Comparing the scores of the injured workers and the ones without any injury revealed that there is no significant relation between the variable of agreeableness and the rate of injuries. The personality trait of agreeableness is a combination of different features such as respect, care for people, mutual help and being nondefense and therefore, it is very normal that the aforementioned features have a positive effect on safe conducts. Although the variable of agreeableness can result in safety behavior, which is evident in this study, the relationship between this variable and its effect on rate of injuries was not significant. The findings of this study are consistent with Clark's study. In his meta-analysis, Clark reports that there is no relationship between agreeableness and rate of injuries in the workplace [25].

Conscientiousness is one of the personality traits which is defined by Barrick and Mount as being reliable, responsible, hard-working and thorough [17]. In this study, a significant and inverse correlation was observed between conscientiousness and the possibility of causing accidents. Individuals with high scores concerning the variable of conscientiousness and accountability seem to have more control over their desires and more control over their impulses and behaviors and as a result they are expected to have safer behaviors. The findings are consistent with results of the research by Arthur and Gryanu. Arthur and Gryanu, in a research similar to that of Soler, Nelson and York, reported a significant and inverse correlation between conscientiousness and work-related accidents, even those accidents in which the workers were not considered to be blameworthy [18]. Schwebel, Severson, Ball and Rizzo, in another study, found that conscientiousness, sensation seeking and hostile aggression have a negative, positive and positive correlation, respectively, with high-risk driving behaviors [35]. In the research among workers in manufacturing jobs, Wallace and Vodanovich reported that there is a significant and negative correlation between conscientiousness and unsafe occupational behaviors [36].

## CONCLUSION

Assessment of the personality traits can be a useful tool in the identification of people prone to accident. Therefore, by designing an appropriate questionnaire in the examinations and interviews prior to employment of an individual in industries, it is possible to screen the applicants and to prevent the employment of those with high probability of and a predisposition to causing accidents in sensitive positions in different occupations. This way the fit between a worker competences and the job demands, an important goal in the examinations and interviews prior to employment, is observed. One of the strengths of this study was the selection of samples, which was conducted in a way that the injured workers and those without any injury were completely equal and similar regarding their number, their workplace, organization, management style and the type of work they performed. Nonetheless, the weakness of this study was lack of any comparison between the individuals who were blameworthy for accident and those who were not faulty in the occurrence of the accidents. Therefore, in order to obtain more reliable results it is much better to conduct this study once by separating and comparing the workers who are known to be culpable for the accidents and those workers who are not blameworthy for the accidents [37-40].

## ETHICAL ISSUES

Ethical issues have been completely observed by the authors.

## CONFLICT OF INTERESTS

Authors have no conflict of interests.

## AUTHORS' CONTRIBUTIONS

All authors participated in design, conduct of the study, and have contributed in drafting, revising and approving of the manuscript.

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