



ORIGINAL ARTICLE

Study Perception of Hospital Safety Sign and Related Factors

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ABSTRACT

**Introduction:** The safety signs are used as one of the methods of notification and warning to the staff regarding the type and intensity of existing hazards in the workplace. This study aimed to investigate perception of the Hospital safety signs and comparison with International Organization for Standardization (ISO) and American National Standards Institute (ANSI) standard also survey relationship between variables such as age, gender, and work experience and education level with perception of the signs. **Materials and Methods:** This analytical-descriptive study was done in 2016. Tools include a standard questionnaire (ISO 9186-1) and criteria of safety signs (ANSI 535.3). The sample included 200 non-monochromatic employees working in two hospitals of Bushehr City. Stratified - Random sampling method was used, then, obtained data were analyzed using SPSS-16 software. **Results:** The overall mean of perception in the two studied hospitals was  $61.04\% \pm 25.74$ . The highest and lowest levels of perception were respectively related to the sign "no smoking"(97.5%) and "stretcher to carry injured" (11.5%). 11 and 5 of signs cannot be reached to limit of acceptable perception base on ISO and ANSI. also In 11 case (91%), the level of personnel perception was higher than clients. Result also showed which, in most cases, there was no significant relationship between perception and gender, age, education, experience and type of sample ( $p < 0.05$ ). **Conclusions:** The results showed that perception patterns of signs are different. Assessing perception of signs show a moderate level of perception in accordance with ISO and ANSI standard, with regard to less than the standard limit "Risk of biological substances" and "Stretcher to carry injured "safety signs, redesigning this sign is needed. The results showed that type of sample and gender was not an effective factor on safety signs perception.

INTRODUCTION

The safety signs are used as one of the methods of notification and warning to the staff regarding the type and intensity of existing hazards in the working environment (1). According to the standard International Organization for Standardization (ISO) 17724: 2003, safety sign is a sign that conveys a general safety message. When these signs are accompanied by colors, geometric shapes and graphic symbols can transmit a specific safety message (2). Nowadays, we see that some of these signs are not well understood and defects are seen more in adults than younger people (3, 4). In addition, sometimes these signs can have a different message or it may deliver exactly opposite of its original concept (4). In general, safety signs may represent a danger, dangerous conditions, or consequences of being exposed to dangers (5).

Also, some signs include cautions and safety recommendations for the individuals who execute unsafe and dangerous behaviors; and, at the same time, show the way to prevent such behaviors (6).

Safety signs must establish a good relationship with the user (7). So that the defect in the guidance of information and the incorrect perception of the signs in various countries and regions might cause irreparable injuries or even death (8, 9). For more effectiveness, these signs shall be so designed that can be reasonably understood (10). Attracting attention and charm, providing awareness and promoting compliance are considered as three main factors in the effectiveness of the safety signs (11). Studies conducted by Liu et al. showed that the signs of safety, before to be used, must be evaluated by the people in terms of the correct perception (12).

Due to the widespread and increasing use of hospital safety sign and the effects of application and perception of the signs in control and prevention of risk, this study aimed to assess the perception of the hospital signs among the staff and the people referred (client) of the two hospitals in Bushehr province and survey related factors to perception of hospital safety sign.

## MATERIALS AND METHODS

This descriptive-analytical cross-sectional study was conducted in 2016 in the two State-owned hospitals; Shohadaye-Khalij-e-Fars and Salman-e-Farsi hospitals of Bushehr city which provide services to the general public, and have the highest number of the people referred. ISO 9186-1:2014 specifies a method for testing the comprehensibility of graphical symbols. It provides a measure of the extent to which a variant of a graphical symbol communicates its intended message. The purpose is to ensure that graphical symbols and signs using graphical symbols are readily understood.

Since, according to ISO9186-1, number of participants in each test must be at least 50 members per population; so in this study, by random simple sampling method we selected 100 employees of both of the hospitals and 100 people referred to both of the aforementioned hospitals. Based on the criteria of the study, people, who were a native Persian speaker, had the adequate mental functioning and no color blindness disease, and were examined in the study. To ensure a lack of color blindness, all the subjects in this study were tested using the Ishihara Color Blindness Test among them

Data collection tool in this study is the ISO standard questionnaire ISO9186-1: 2014 (13). This questionnaire contains 4 parts; 1-instruction sheet 2-demographic data sheet 3- example sheet 4- test sheet of safety signs. Determination of the number and composition of signs is based on the number of the signs available in a particular workplace where the people are in contact with daily, Also In accordance with the clause of 4.2.6 of the standard, a number of signs in each test should not be more than 15 PCs (14). In accordance with the clause of 4.2.6 of the standard, a number of signs in each test should not be more than 15 PCs, as well as the size of signs according to clause of 6.2.3 standard,  $8 \times 8$  cm, and colored with the adhesive back for sticking to white A4 sheet.

12 colored signs designed according to standard ISO3864-1. After giving the questionnaires to each of the users, they were asked to, after visiting the signs, mention their perception of sign as well as do one thing after seeing the sign. Next, after completing the questionnaires, according to standard method ISO 9186-1: 2014, responses were divided into 5 groups: true, false, false and conversely, I do not know, and no response. Then they were analyzed (15).

And finally, responses of participants in the test of perception of the hospital safety signs were compared with an acceptable level of standards of ANSI Z535.5: 2011 (85%) and ISO3864-2: 2004 (67%) (16, 17).

Data analysis was performed using SPSS version 16, to investigate the relationship between variables such as age, work experience and education level with perception of the signs, the chi-square test was used and to comparison perception between male and female, also between personnel and referred people the mann-whitney test was used.

## RESULTS

In this study, 48.5% of the participants was male and 51.5 % were female. In terms of the age the 40% of people were in the age group of 15- 30 years, 56% between 31-50 years and 4% were in the age group of 51 years and above. In this study, 9.5% of the subjects had an education level less than

diploma, 25.5% had a diploma degree, 65% had university education graduate, and in terms of health status 98% of the subjects were the healthy and 2% were with disabilities in physical, as well.

## DISCUSSION

In this study, correct responses were considered as the criteria for perception of the hospital safety signs. According to standard method ISO 9186-1, responses were divided into 5 groups: true, false, false and conversely, I do not know, and no response. The number of people who responded correctly, were known as understanding that sign to an extent. Furthermore, in the evaluation of the extent of understanding, the average of correct answers on safety signs, according to the standard ISO9186-1, is 67%, which means that 67% of participants in the test can give a correct answer to the sign (18). The results of the study showed that the overall mean rate of perception in the two hospitals was  $61.04\% \pm 25.74$ , the lowest amount of perception was related to Stretcher to carry injured (11.5%), most wrong answers were also related to the same signs (51.5%). which is consistent with the study conducted by Davoudian. in four industries in Iran (19). Similarly, according to the study conducted by Annie et al., 67.54% of Chinese students, gave the correct answer to the tested signs (1). Chan et al. showed that the overall average perception of the safety signs in Hong Kong and Korea was 20.47% and 21.94%, respectively (20).

The relatively high standard deviation of the correct responses (25.74%) shows that the perception of these signs is different with each other and almost every signs have their own pattern of perception (21). also, in various countries, the rate of perception of safety signs is different. These differences are due to the differences in cultural background (22), style of display safety signs (23), as well as ways of thinking in different societies (20). According to ISO3864 and ANSI Z535.5, at least the percent of correct answers about safety signs should be 67% and 85% of the all people (17).

As table 1 show, in this study only the sign "smoking prohibited" reaches an acceptable level of perception according to ANSIZ5353. In order to assess the level compliance of safety signs with the standard ISO3864, in this study 58.33% of the signs reached an acceptable standard.

In a study by Liu and Hoelscher in the ICU, 50% of the signs tested in Germany and 25% of the signs tested in China reached the acceptable level of ISO standard and also 18.75% of the signs tested in both Germany and China reached the acceptable level ANSI standard (12). In the study by Chan and Annie, while the amount of perception of 50% of the signs in the American population was within acceptable range of the standard ISO, but the amount of perception of 8.3% of the signs in the Korean and Hong Kong population met the acceptable criteria of standard ISO (24). it seems that the differences in the rate of the correct perception of signs in different studies are resulting from factors such as cultural differences, characteristics of the studied population, the previous training and being commonly used sign in the studied place (21).

According to the study, the most amount of correct perception is related to the sign "no smoking" with 97.5% of the correct perception. Which is consistent with Zamanian et al. study, that represents being commonly used sign in the society and work environment, and familiarity with it. Studies suggest familiarity with various signs is a contributing factor on perception (25).

The least amount of perception was related to the sign "stretcher to carry injured" with 11.5%, and the percentage of incorrect answers to the meaning of this sign was significantly high so that 51.5% of the subjects gave the incorrect answer. In this study, 46% of the subjects did not know the meaning of the sign "risk of biological material" and it means that the scheme inserted on the sign, unlike other signs, was completely unfamiliar for subjects and it was an uncommon sign. In the current study, the relationship between personal factors and the perception of safety signs has also been studied. The results showed that there is a significant relationship, between age and correct perception of signs ( $p \leq 0.05$ ), but the descriptive findings of this study show that the most amount of perception of the signs is related to the age group of 30-50 years, and the age group over 50 years had the lowest correct perception compared to other age groups; moreover, as it has been expressed in the study of Reis et al., mental and behavioral abilities of individuals in the perception of the safety signs is reduced by aging (26) also studies by Lesch and Chan et al. have referred to the reduced perception of signs in older people than young's (3, 24).

In an assessment of the relationship between the signs and work experience, the findings of the study show that there is a significant relationship between the perception of signs with work experience that is consistent with the study by Davoudian et al., So that the amount of perception is increased in individuals with a higher work experience level, On the other hand, the drop in the amount of perception of signs in the groups with work experience more than 23 years could be the result of the process of the increased age and fatigue caused by the work and also the decreased level of cognitive skills (19).

In general, about the relationship between the amount of the perception of hospital safety signs with age and work experience it can be stated that, as studies show, one of the factors affecting the perception of the signs in general and work environment is the amount of familiarity with the signs (25) and familiarity means the number of times the person can be faced with the signs, so, the multiplicity of being exposed causes to create a better opportunity to learn the signs and return the information to the individual memory (27).

There was no significant difference between men and women in terms of correct perception of the tested signs, this result is consistent with studies by Chan et al. (24), and Davoudian et al. (19).

The study also showed that, there is a significant and strong correlation between the amount of perception and level of education that is consistent with the study by Hashemi Al-Madani et al. (28). So that people with university education had a better understanding and recognition compared

to other education groups. According to Chan, one of the reasons for the differences in perception of the safety signs is their way of thinking and attitude (29).

The results of an assessment of the relationship between previous training in the field of signs and the amount of the perception, showed that in 8% of cases there is a significant relationship between the amount of the perception of the signs and the prior training. This can be due to a poor educational approach or inappropriate educational content. In this study, a significant difference was seen between personnel and Clients (Table 3), but, In most cases, The descriptive findings shows the level of personnel perception was higher than that of the referrals (Table 2), So we can say that the personnel had a better perception of the signs than the Clients and due to the more familiarity and the multiplicity of times of personnel exposure, it can cause to create a better opportunity to learn the signs and return the data to the memory of the personnel.

In an survey of the amount of perception signs based on their categorization (Table 4) (warning, prohibitive, safe conditions, hospital-specific signs) the result shows, the highest mean score correct perception is related to the signs "prohibition, and the lowest mean score correct perception is related to the category of signs "safety condition". In other words, this sign was not able to completely introduce itself and had low self-explanation. In addition, the form of this sign was also quite unfamiliar to the study subjects. On the other hand, prohibitive sign perception have highest mean because this sign is quite common in both the society and the workplace. Overall, the signs which were more commonly used in the workplace had a higher perception level. This is in line with the results of other studies conducted on the issue (30, 31).

## CONCLUSION

This study showed that the amounts of the perception of the tested signs were different in comparison with each other and each sign has its own perception model. In this study, Due to low perception of some signs and that some the tested signs could not obtain the level accepted by the standards. Hence, the rational design of the new graphic form for signs that have a lower percentage of the perception and their interaction with the users seems to be necessary.

The results also showed that gender and previous training in this field are not effective factor on the perception of safety sign. But the age, work experience and type of sample due to the repetition of the contact and the level of familiarity with signs are factors affecting the perception of safety signs.

Study limitations include the lack of cooperation between the samples due to the time consuming completion of the questionnaire.

Recommended, In line with this study, other research in the field of judgment test to be done, which an effective process to engage workers in designing safety signs and is one of the basic principles in designing safety signs in accordance with the standard.

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#### AUTHOR CONTRIBUTIONS

MRA, conceived, designed and did data collection and manuscript writing

ADT statistical analysis & editing of manuscript also did review and final approval of manuscript

#### CONFLICT OF INTERESTS

The authors declare that they had no competing interests.

#### ETHICAL STANDARDS

All of the the subjects in this study gave voluntary informed consent to participate in this research. Researchers received introduction letters from the Islamic azad university Ahvaz branch, Ahvaz with ethics code IR.IAU.REC.1395. 5872.

**Table 1.** The people's perception safety signs tested in the two hospitals













Safety Signs	Meaning	Answers										
		Correct		Incorrect		I do not know		No responses		Incorrect and converse answer		
			Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
	Risk of toxic substances		146	73	44	22	7	3.5	3	1.5	3	1.5
	Risk of biological substances		51	25.5	45	22.5	92	46	12	6	0	0
	Danger electric shock risk		168	84	18	9	7	3.5	7	3.5	0	0
	Risk warning		147	73.5	23	11.5	21	10.5	8	4	1	0.5
	Radiation risk		137	68.5	26	13	27	13.5	10	5	0	0
	Smoking prohibited		195	97.5	4	2	1	0.5	0	0	0	0
	In case of fire, do not use elevators		91	45.5	72	36	32	16	4	2	1	0.5
	No entry		161	80.5	27	13.5	6	3	6	3	0	0
	Emergency exit		156	78	29	14.5	12	6	0	0	3	1.5
	Stretcher to carry injured		23	11.5	103	51.5	60	30	14	7	0	0
	Infectious disease ward		82	41	58	29	58	29	2	1	0	0
	Intensive care unit		108	54	35	17.5	42	21	15	7.5	0	0
All signs	Mean		122.1	61.04	40.3	20.8	30.4	15.4	6.8	3.2	0.4	0.2
	SD		51.5	25.74	29.9	13.9	27.9	14.6	5.2	2.7	0.9	0.5

Table 2. Different of Hospital safety sign perception between personnel and client

















Safety Signs	Sample	N	Correct	Wrong	Don't know	No responses	Incorrect and converse answer
	personnel	100	76%	18%	6%	0	0
	client	100	66%	24%	8%	0	0
	personnel	100	71%	22%	7%		0
	client	100	22%	12%	56%	0%	0
	personnel	100	30%	28%	40%	2%	0
	client	100	26%	20%	48%	6%	0
	personnel	100	86%	8%	2%	4%	0
	client	100	82%	12%	2%	4%	0
	personnel	100	84%	10%	2%	4%	0
	client	100	64%	10%	18%	6%	2%
	personnel	100	99%	1%	0	0	0
	client	100	96%	3%	1%	0	0
	personnel	100	43%	37%	17%	3%	0
	client	100	48%	35%	15%	1%	1%
	personnel	100	88%	8%	2%	2%	0
	client	100	73%	19%	4%	4%	0
	personnel	100	83%	12%	5%	0	0
	client	100	73%	17%	7%	0	3%
	personnel	100	14%	53%	26%	7%	0
	client	100	9%	50%	34%	7%	0
	personnel	100	51%	28%	21%	0S	0
	client	100	31%	30%	37%	2%	0
	personnel	100	68%	11%	13%	8%	0
	client	100	40%	24%	29%	7%	0

Table 3. Survey relationship between safety sign perception with demographic factors and training

Safety Signs	Age (Chi square)	experience (Chi square)	education (Chi square)	Type of sample (personnel and Clients) (mann-whitney)	sex (Chi square)	Previous training (mann-whitney)
	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value	<i>p</i> -value
	0.44	0.001	0.1	0.02	0.51	0.42
	0.83	0.01	0.5	0.86	0.87	0.29
	0.27	0.001	0.3	0.65	0.07	0.35
	0.57	0.62	0.005	0.34	0.26	0.39











	0.02	0.22	0.001	0.001	0.41	0.01
	0.001	0.81	0.001	0.36	0.62	0.47
	0.37	0.90	0.24	0.65	0.52	0.61
	0.45	0.04	0.12	0.06	0.88	0.93
	0.02	0.83	0.02	0.18	0.23	0.57
	0.53	0.10	0.8	0.52	0.83	0.52
	0.86	0.08	0.2	0.01	0.08	0.39
	0.78	0.09	0.15	0.001	0.6	0.88

Table 4. Distribution of signs perception score in different groups of signs

Categorization of signs	Number of signs	Percentage of answers									
		Correct		Incorrect		I do not know		No responses		Incorrect and converse answer	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Warning signs	5	64.8	22.74	15.6	6.23	15.3	17.65	4	1.69	0.3	0.65
Prohibitive signs	3	74.5	21.64	17.16	17.29	6.2	8.32	1.54	1.5	0.16	0.28
Signs of safe conditions	2	44.75	47.02	33	26.16	18	16.97	33.5	4.92	0.75	1.06
Hospital-specific signs	2	47.5	9.19	23.25	8.13	25	5.65	9.25	11.66	0	0

Abbreviation; SD: standard error

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