Safety and Health at Work 7 (2016) 326–330

Contents lists available at ScienceDirect

Safety and Health at Work

journal homepage: www.e-shaw.org

Original Article

Validity Assessment of the Persian Version of the Nordic Safety Climate Questionnaire (NOSACQ-50): A Case Study in a Steel Company

Yadolah Yousefi [1], Mehdi Jahangiri [2,*], Alireza Choobineh [3], Hamidreza Tabatabaei [4], Sareh Keshavarzi [4], Ali Shams [5], Younes Mohammadi [6]

[1] School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
[2] Research Center for Health Science, Department of Occupational Health, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
[3] Research Center for Health Science, Department of Ergonomics, Shiraz University of Medical Sciences, Shiraz, Iran
[4] Department of Epidemiology, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
[5] Health and Safety Department, Parsarman Company, Qazvin, Iran
[6] Department of Epidemiology, School of Health, Hamadan University of Medical Sciences, Hamadan, Iran

A R T I C L E I N F O

Article history:
Received 9 September 2014
Received in revised form
20 March 2016
Accepted 22 March 2016
Available online 7 April 2016

Keywords:
exploratory factor analysis
Nordic Safety Climate Questionnaire-50
safety climate
validity

A B S T R A C T

Background: The Nordic Safety Climate Questionnaire-50 (NOSACQ-50) was developed by a team of Nordic occupational safety researchers based on safety climate and psychological theories. The aim of this study was to develop and validate the Persian version of NOSACQ-50 and assess the score of safety climate on a group of workers in a steel company in Iran.
Methods: The Persian version of NOSACQ-50 was distributed among 661 employees of a steel company in Qazvin Province (Iran). Exploratory factor analysis (EFA) and confirmatory factor analysis were used to determine the dimensions of the questionnaire. The reliability of the questionnaire was assessed using Cronbach α coefficient. Pearson correlation test was applied to investigate the correlation between different dimensions.
Results: The results of EFA showed that the Persian version of NOSACQ-50 consisted of six dimensions. The Cronbach α coefficient of the questionnaire was 0.94. The mean score of safety climate in all dimensions was 2.89 (standard deviation 0.60).
Conclusion: The Persian version of NOSACQ-50 had a satisfactory validity for measuring safety climate in the studied Iranian population.

1. Introduction

Safety climate is the employees' shared perceptions of safety policies, procedures, practices, and overall importance and priority of safety at work [1]. It is a part of organizational climate that shows the state of safety in an organization and can be used for measuring safety performance [2,3].

Safety climate is a multidimensional factor and could be considered as an important antecedent of safety in workplaces [4]. Measuring safety climate provides a snapshot of the organization's state of safety at a discrete point of time [5].

The Nordic Safety Climate Questionnaire-50 (NOSACQ-50) is a reliable and valid tool for predicting safety motivation, perceived safety level, and self-rated safety behavior. It has been used to identify the differences in safety climate within and between different companies, industries, and countries [3]. This questionnaire has been translated into different languages and is used to determine the level of safety climate among managers and workers in organizations [6].

The questionnaire has 50 items, divided into the following seven dimensions: (1) Management safety priority, commitment, and competence, (2) Management safety empowerment, (3) Management safety justice, (4) Workers' safety commitment, (5) Workers' safety priority and risk nonacceptance, (6) Safety communication, learning, and trust in co-workers' safety competence, and (7) Trust in the efficacy of safety systems. Among these dimensions, the first three are related to the perceptions of safety management in the organization and the other four dimensions are related to

* Corresponding author. Research Center for Health Science, Department of Occupational Health, School of Health, Shiraz University of Medical Sciences, P.O. Box 71645-111, Shiraz, Iran.
E-mail address: jahangiri_m@sums.ac.ir (M. Jahangiri).

http://dx.doi.org/10.1016/j.shaw.2016.03.003

employees. Answers to questions are given on a four-point scale: “strongly disagree,” “disagree,” “agree,” and “strongly agree.” Respondents are thus compelled to take a particular position with respect to each question. A high scale score is indicative of a positive response. In addition to climate items, a few demographic questions are asked in the questionnaire including age, sex, and whether the respondent holds a (senior) management position [3,6].

Any questionnaire translated into another language must again be subjected to further analysis and pilot studies to confirm its validity because of difference in cultural context and meaning and intention of the word in the second language [7]. For this purpose, factor analysis is used because its scales are distinct and nominated based on the items contained in the questionnaire [8–10]. Factor analysis is a generic term given to a class of statistical methods whose primary purpose is to define the underlying structure of a data set. The main aim of this type of analysis is to form coherent subgroups of items that are relatively independent from other groups of items. In factor analysis, variables with the strongest relationship or the highest intercorrelations are grouped together. The subgroups of items are then named based on the general theme of the items that have been grouped together. By identifying the theme of each group of items, the researcher identifies the underlying factors of the topic of interest or construct. In this way, much information can be condensed into a few manageable factors to measure a complex construct [11].

Although there is a plethora of safety climate questionnaires around the world, very few have been proven to be able to present a factor structure in which organizational and safety climate theories have been considered [3]. The NOSACQ-50 is a decent tool involving these aspects and it has been translated and validated in over 25 languages [6]. Because there is a limited number of standard safety climate tools in Persian language and considering the aforementioned advantages of NOSACQ-50, this study was conducted to develop and validate the Persian version of NOSACQ-50 and assess the level of safety climate on a group of workers in a steel company in Iran.

2. Materials and methods

After signing the agreement for using NOSACQ-50 [12], forward translation was performed by a bilingual translator. For backward translation, the translated version was rendered into English by another bilingual translator. Then, the English version of the Persian questionnaire was sent to the designer and after some minor edits, the questionnaire was finalized.

Face validity evaluates the appearance of the questionnaire in terms of feasibility, readability, consistency of style and formatting, and the clarity of the language used [13,14]. To determine the face validity of the Persian version of NOSACQ-50, during a pilot study, 30 workers were randomly selected from the Iranian steel company studied to perform face validity. In the validity form, respondents assessed each question in terms of layout and style and clarity of the wording. Moreover, 10 safety experts evaluated the relevance and appropriateness of each item and words used in the questionnaire.

In the next stage, in a cross-sectional study in April 2013, the prepared questioners were distributed among 661 employees of a steel company in Qazvin province (Iran). According to the NOSACQ-50 guideline, each item had a four-point scale ranging from 1 (strongly disagree), 2 (disagree), 3 (agree) to 4 (strongly agree). Reversed scaling were as follows: 4 (strongly disagree), 3 (disagree), 2 (agree), and 1 (strongly agree).

All the participants agreed to participate in the study by signing a written informed consent on the first page of the questionnaire. The questionnaires were completed anonymously to keep the data confidential. Time allowed for answering the questions was approximately 50 minutes for each participant.

2.1. Data screening

In this stage, questions that had not been completed carefully and questions with stereotyped answers were excluded from further analysis. Respondents who did not answer more than 50% of the items in each dimension were excluded from the study.

2.2. Statistical analysis

The statistical data analysis was conducted using SPSS statistics (IBM, Armonk, NY, USA). Exploratory factor analysis (EFA) was then used to extract the factor structure of the questionnaire. To minimize the number of variables with high loadings, EFA was used by principal component analysis and Varimax rotation method was performed to facilitate interpretation of factors. Gerbing and Hamilton [15,17] suggested the use of EFA techniques as a decent measure for performing confirmatory analysis. Items with negative eigenvalue were reversed and tested again to obtain a positive eigenvalue. Based on Kim and Muller (1978) [16] and Hair et al (1978) [18], items with factor loadings of 0.4 or more were removed. Finally, each dimension was named based on the content of items and experts' points of view. Then, confirmatory factor analysis (CFA) was performed to confirm the identified dimensional structure of the scale. To perform a satisfactory factor analysis, sampling adequacy was detected by Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity in accordance with the requirements for factor analysis [19].

The reliability of the questionnaire was examined using Cronbach α coefficient. Finally, the correlation between dimensions of safety climate was tested using Pearson correlation. The mean scores of safety climate were calculated in all dimensions and compared using Friedman test.

3. Results

Of the total 661 collected samples, 257 respondents (38.8%) did not answer more than 50% of questions in each dimension and were thus excluded from the study analysis. Finally, 404 samples were considered acceptable for analysis.

Some of the participants' demographic characteristics are presented in Table 1. The mean age and work experience of respondents in this study were 29.97 years [standard deviation (SD) 5.53 years] and 17.27 years (SD 15.40 years), respectively; 33% of the respondents were single and most (71%) had a high-school diploma.

The result of face validity showed that 92% of participants in the pilot study understood the questions and found them easy to answer; 90% indicated that the appearance and layout would be acceptable to the intended target audience. Item 29 (“We who work here regard

Table 1
Demographic characteristics of the respondents ($N = 404$)

Age (y), mean (SD)	29.97 (5.53)
Work experience (y), mean (SD)	17.27 (15.40)
Marital status, *n* (%)	
Single	134 (33.16)
Married	270 (66.8)
Education, *n* (%)	
Under diploma	106 (28.9)
Diploma	164 (40.5)
Higher diploma	134 (30.6)
Shift schedule, *n* (%)	
Day	163 (41)
Evening	3 (0.5)
Rotation	338 (58.5)

SD, standard deviation.

risks as unavoidable") was removed from the questionnaire as it was not understandable by both studied workers and experts.

The results of factor analysis are presented in Table 2. Items with factor loadings lower than 0.4 (Items 40 and 42) were eliminated from the questionnaire [17–19]. The questionnaire was classified into the following six dimensions: (1) Management safety commitment and empowerment, (2) Workers' safety commitment, (3) Workers' attitude toward safety, (4) Workers' safety priority, (5) Workers' safety participation and communication, and (6) Workers' risk nonacceptance. Correlations of items are also presented in

Table 2
Items' eigenvalues and factor loading of different dimensions of the Persian version of the Nordic Safety Climate Questionnaire

Items	Factor loading	Correlation coefficients of items with scales	Extracted dimensions' loading eigenvalue (%)
1. Management encourages employees here to work in accordance with safety rules	0.628	0.742	29.77*
2. Management ensures that everyone receives the necessary information on safety	0.665	0.723	
3. Management looks the other way when someone is careless with safety	0.623	0.682	
4. Management places safety before production	0.701	0.708	
5. Management accepts employees here take risks when the work schedule is tight	0.656	0.705	
6. We who work here have confidence in the management's ability to handle safety	0.740	0.760	
7. Management ensures that safety problems discovered during safety rounds are corrected immediately	0.649	0.611	
8. When a risk is detected, management ignores it without action	0.557	0.607	
9. Management lacks the ability to handle safety properly	0.563	0.588	
10. Management strives to design safety routines that are meaningful and actually work	0.744	0.774	
11. Management makes sure that each and every one can influence safety in their work	0.767	0.785	
12. Management encourages employees here to participate in decisions which affect their safety	0.703	0.731	
13. Management never considers employees' suggestions regarding safety	0.597	0.718	
14. Management strives for everybody at the worksite to have high competence concerning safety and risks	0.620	0.617	
15. Management never asks employees for their opinions before making decisions regarding safety	0.589	0.685	
16. Management involves employees' indecisions regarding safety	0.675	0.671	
17. Management collects accurate information in accident investigations	0.628	0.679	
18. Fear of sanctions from management discourages employees here from reporting near-miss accidents	0.477	0.567	
19. Management listens carefully to all who have been involved in an accident event	0.677	0.703	
20. Management looks for causes, not guilty persons, when an accident occurs	0.508	0.526	
21. Management always blames employees for accidents	0.433	0.519	
22. Management treats employees involved in an accident fairly	0.629	0.697	
23. We who work here try hard together to achieve a high level of safety	0.583	0.761	7.28†
24. We who work here take joint responsibility to ensure that the workplace is always kept tidy	0.460	0.677	
27. We who work here help each other to work safely	0.514	0.682	
36. We who work here try to find a solution if someone points out a safety problem	0.447	0.628	
37. We who work here feel safe when working together	0.681	0.765	
38. We who work here have great trust in each other's ability to ensure safety	0.604	0.667	
44. We who work here consider that a good safety representative plays an important role in preventing accidents	0.662	0.766	3.90‡
46. We who work here consider that safety training is good for preventing accidents	0.723	0.809	
48. We who work here consider that safety rounds/evaluations help find serious hazards	0.563	0.696	
50. We who work here consider that it is important that there are clear-cut goals for safety	0.725	0.796	
30. We who work here consider minor accidents as a normal part of our daily work	0.445	0.705	3.43§
34. We who work here consider that our work is unsuitable for cowards	0.722	0.640	
45. We who work here consider that safety rounds/evaluations have no effect on safety	0.510	0.378	
25. We who work here do not care about each other's safety	0.417	0.646	3.17‖
26. We who work here avoid tackling risks that are discovered	0.597	0.574	
28. We who work here take no responsibility for each other's safety	0.624	0.707	
41. We who work here seldom talk about safety	0.409	0.591	
43. We who work here can talk freely and openly about safety	0.413	0.548	
47. We who work here consider early planning for safety as meaningless	0.657	0.736	
49. We who work here consider that safety training is meaningless	0.544	0.657	
31. We who work here accept dangerous behavior as long as there are no accidents	0.555	0.753	3.038¶
32. We who work here break safety rules in order to complete work on time	0.552	0.778	
33. We who work here never accept risk taking even if the work schedule is tight	0.611	0.684	
35. We who work here accept risk taking at work	0.685	0.663	

* Management safety commitment and empowerment.
† Workers' safety commitment.
‡ Workers' attitude toward safety.
§ Workers' safety priority.
‖ Workers' safety participation and communication.
¶ Workers' risk nonacceptance.

Table 3
Cronbach α values for different dimensions of the Persian version of the Nordic Safety Climate Questionnaire

Dimensions	Number of items	Cronbach α
Management safety commitment and empowerment	22	0.940
Workers' safety commitment	7	0.826
Workers' attitude toward safety	4	0.796
Workers' safety priority	4	0.585
Workers' safety participation and communication	7	0.785
Workers' risk nonacceptance	4	0.716
Total	48	0.942

Table 4
Fit indices of the confirmatory factor analysis model of the Persian version of the Nordic Safety Climate Questionnaire

Model fit index	Computed index	Acceptable criterion [14]
Chi-square (df)	1.9 (2,059/1,059)	< 2.00
Comparative fit index	0.93	> 0.90
Incremental fit index	0.92	> 0.90
Standardized root-mean-square residual	0.51	≤ 0.5
Non-normed fit index	0.89	No absolute criterion
Root-mean-square error of approximation	0.047	≤ 0.05

df, degrees of freedom.

Table 2. As shown, all items have sufficient correlation with dimensions.

The value of the KMO measure of sampling adequacy for this set of variables was 0.94, which would be labeled as marvelous for factor analysis, based on Kines' recommendations [12]. However, Bartlett's test of sphericity was significant at the 5% level of significance ($p < 0.001$), thus rejecting the null hypothesis that the correlation matrix is an identity matrix.

The Cronbach α values for all dimensions are presented in Table 3. As shown, the total Cronbach α value of 0.94 was obtained for NOSACQ-50. However, in some scales such as workers' safety learning factor ($\alpha = 0.398$), the value of Cronbach α was much less than the acceptable level ($\alpha \geq 0.6$), and therefore, it was eliminated. As the result, items were divided into six scales.

To provide further evidence of construct validity of safety climate scales, CFA was performed. The results of CFA (Table 4) show that all model-fit indices are acceptable [17].

Table 5 shows the total variance of the extraction and rotation sums of squared loading for each dimension of the questionnaire. Rotation sums of squared loading show that the primary correlation is more accurate than the extraction sums of squared loading [20,21]. Table 5 also shows that the amount of variance explained by all the dimensions was 50%.

Table 6
Mean, standard deviation, and minimum and maximum of safety climate scores among studied employees

Dimensions	Mean (SD)	Min–Max
Management safety commitment and empowerment	2.78 (0.53)	1.63–40
Workers' safety commitment	3.03 (0.57)	1.6–40
Workers' attitude toward safety	3.15 (0.66)	1.57–4.75
Workers' safety priority	2.74 (0.45)	1.75–40
Workers' safety participation and communication	2.79 (0.56)	1.5–5.50
Workers' risk nonacceptance	2.87 (0.72)	2–3.70
Total	2.89 (0.61)	1.72–4.2

SD, standard deviation.

The mean scores of safety climate in different dimensions are provided in Table 6. As shown, the mean score of safety climate in all dimensions was 2.89 (SD 0.61). The results of Friedman test showed that there was no statistical difference between various dimensions of the safety climate questionnaire.

4. Discussion

The main purpose of this study was to validate the Persian version of NOSACQ-50 using EFA among a group of employees in a steel company in Iran. First, the content validity was conducted by experts based on the fact that the qualitative evaluation of safety climate scales by a group of experts is a common approach to assess the content validity of scales [22].

The EFA was performed to organize the items into the relevant dimensions; therefore, items were distributed in six dimensions, which are different from the seven dimensions in the original version of NOSACQ-50 [3]. In this way, 53.4% of variance is explained, which is relatively acceptable to determine the optimal number of factors to extract in EFA [11,14,23]. The number of dimensions in this study was not the same as in the original article [3] and distributions of items were completely different. Therefore, dimensions were nominated according to both content of items and the original version. We only considered items with loading factors greater than 0.4 [17]; therefore, Items 40 and 42 were overlooked.

In the original version of NOSACQ-50, management issues of safety climate were distributed in three dimensions including "Management safety priority and ability," "Management safety empowerment," and "Management safety justice," whereas in the EFA results, all management issues were distributed under one factor as "Management safety commitment and empowerment." Instead, workers' safety climate issues were distributed under five dimensions compared with four in the original version of the questionnaire [3]. However, the distribution of items under various dimensions and their correlation were different. This variation could be due to the difference in safety perception among Iranian workers.

Table 5
Total variance of extraction and rotation sums of squared loading for different dimensions of the Persian version of the Nordic Safety Climate Questionnaire

Dimension	Extractions sums of squared loading		Rotation sums of squared loading	
	Variance percentage	Cumulative percentage	Variance percentage	Cumulative percentage
Management safety commitment and empowerment	29.773	29.773	19.816	19.816
Workers' safety commitment	7.285	37.058	7.058	26.874
Workers' attitude toward safety	3.908	40.966	6.635	33.509
Workers' safety priority	3.439	44.405	6.103	39.612
Workers' safety participation and communication	3.173	47.578	6.072	45.684
Workers' risk nonacceptance	3.038	50.616	4.347	50.031

Item correlation is also a criterion in some literature to develop unidimensional scales [17,18], and scales with correlation less than 0.5 are usually eliminated [18]. The results of correlation test revealed that all items were good.

The questionnaire's reliability obtained by Cronbach α was acceptable in this study ($\alpha = 0.942$) and this was in accordance with what authors found among workers in the ceramic industry [14]. In Dimension 1 (Management safety commitment and empowerment), 22 items were loaded, which showed the highest value of alpha coefficient ($\alpha = 0.940$) and these had considerable effects on the total reliability of the questionnaire. The lowest value of Cronbach α coefficient was obtained for "Workers' safety learning" ($\alpha = 0.398$), indicating that workers did not have the same opinions or did not express their real opinions about safety in their workplace. Therefore, this dimension was removed.

The value of Cronbach α for the "Workers' safety priority" dimension was marginal and very close to 0.6 ($\alpha = 0.585$). Therefore, we decided to keep this dimension as its exclusion could decrease the number of items in the questionnaire and affect the total value of Cronbach α [24], particularly when the number of items is below seven [25,26]. Furthermore, some studies have shown that Cronbach α values between 0.5 and 0.7 represent an acceptable level of internal consistency [27,28].

In this study, we used the Chi-square test [19], comparative fit index, non-normed fit index, root-mean-square error of approximation, incremental fit index, and standardized root-mean-square residual [22,28] as criteria for acceptability of factor analysis. The findings of these indices in CFA support the application of a six-dimension model of the Persian version of the safety climate questionnaire. The assessment of fit indices revealed that the dimensional structure of safety climate scales was good enough. The sample size was 404 participants and was acceptable for conducting factor analysis. Some studies argue that the numbers of applicants between 50 and 300 are satisfactory for conducting EFA [13,22]. Moreover, KMO results revealed that the sample size for CFA was appropriate.

As Table 6 shows, in this study, the mean score of safety climate was 2.89 (SD 0.61), which is acceptable according to the instruction of NOSACQ-50 [12]. However, safety climate scores in this study were lower as compared with those in Bergh et al's study [29], who conducted a study among workers in chemical industries in Sweden (safety climate score 3.01–3.58). This discrepancy may be due to the difference in occupational groups (chemical vs. steel industries) and management safety systems.

The major limitation of this study was that the participants were from a certain occupational setting (i.e., steel workers) and the study population did not include a variety of occupations. Therefore, NOSACQ-50 should be studied in other occupations in future studies. In general, these findings suggest that NOSACQ-50 has a satisfactory validity and reliability and can be applied for assessing safety climate among Iranian workers.

Conflicts of interest

The authors declare no conflict of interest.

Acknowledgments

This article was extracted from the thesis written by Yadolah Yousefi, MSc, Student of Occupational Health Engineering, and was financially supported by Shiraz University of Medical Sciences (Grant No. 92-6499). The authors wish to thank Dr Pete Kines for allowing us to use the original version of the questionnaire. The authors also appreciate Professor Nasrin ShokriPour for her assistance and worthwhile guidance in translating the questionnaire. The authors are also grateful to Mr Mohsen Varzande for improving the English of this manuscript.

References

[1] Griffin MA, Neal A. Perceptions of safety at work: a framework for linking safety climate to safety performance, knowledge, and motivation. J Occup Health Psychol 2000;5:347–58.
[2] Kennedy R, Kirwan B. Development of a hazard and operability-based method for identifying safety management vulnerabilities in high risk systems. Saf Sci 1998;30:249–74.
[3] Kines P, Lappalainen J, Mikkelsen KL, Olsen E, Pousette A, Tharaldsen J, Tómassonf K, Törner M. Nordic Safety Climate Questionnaire (NOSACQ-50): a new tool for diagnosing occupational safety climate. Int J Ind Ergon 2011;41:634–46.
[4] Vinodkumar MN, Bhasi M. Safety climate factors and its relationship with accidents and personal attributes in the chemical industry. Saf Sci 2009;47:659–67.
[5] Huang YH, Chen JC, DeArmond S, Cigularov K, Chen PY. Role of safety climate and shift work on perceived injury risk: a multi-level analysis. Accid Anal Prev 2007;39:1088–96.
[6] Guldenmund F, Cleal B, Mearns K. An exploratory study of migrant workers and safety in three European countries. Saf Sci 2013;52:92–9.
[7] Griffee DT. Questionnaire translation and questionnaire validation: are they the same? Presented at the Annual Meeting of the American Association for Applied Linguistics. St. Louis (MO); 2001. Available from: http://eric.ed.gov/?id=ED458800.
[8] Zeidi IM, Farmanbar R, Hoseyni MS. Assessment of psychometric properties (validity and reliability) of Safety Climate Questionnaire: factor analysis application. J Guilan Univ Med Sci 2011;81:12–21 [in Persian].
[9] Vosoughi S, Oostakhan M. An empirical investigation of safety climate in emergency medical technicians in Iran. Int J Occup Hyg 2011;3:70–5.
[10] Nouri Parkestani H, Alimohammadi I, Arghami S, Ghohari MR, Farshad AA. Assessment of reliability and validity of a new safety culture questionnaire. Iran Occup Health J 2010;7:18–25 [in Persian].
[11] Australian Transport Safety Bureau (ATSB). ATSB aviation safety survey—safety climate factors. Aviation Research Paper B2003/0122. Civic Square (Australian Capital Territory): ATSB; 2004.
[12] Kines P. Interpreting NOSACQ-50 results [Internet]. København (Denmark): Det Nationale Forskningscenter for Arbejdsmiljø; 2013 [cited 2014 Jan 9]. Available from: http://www.arbejdsmiljoforskning.dk/da/publikationer/spoergeskemaer/nosacq-50/how-to-use-nosacq-50/interpreting-nosacq-50-results.
[13] Furr M. Scale construction and psychometrics for social and personality psychology. London (UK): Sage Publications; 2011.
[14] Yousefi Y, Jahanghiri M, Choobineh A, Tabatabaee SH, Nowrozi A. Validity and reliability of Persian (Farsi) version of Nordic Safety Climate Questionnaire-50: a study among ceramic tile industry employees. J Health Syst Res 2013;9:812–8 [in Persian].
[15] Gerbing DW, Hamilton JG. Validity of exploratory factor analysis as a precursor to confirmatory factor analysis. Struct. Equ. Modeling 1996;3:62–72.
[16] Kim JO, Muller CW. Introduction to factor analysis: what it is and how to do itIn Series: Quantitative Applications in the Social Sciences; 1978. Sage University Paper 9.
[17] Seo D-C, Torabi MR, Blair EH, Ellis NT. A cross-validation of safety climate scale using confirmatory factor analytic approach. J Saf Res 2004;35:427–45.
[18] Lu C-S, Shang K-C. An empirical investigation of safety climate in container terminal operators. J Saf Res 2005;36:297–308.
[19] Sexton J, Helmreich R, Neilands T, Rowan K, Vella K, Boyden J, Roberts PR, Thomas EJ. The Safety Attitudes Questionnaire: psychometric properties, benchmarking data, and emerging research. BMC Health Serv Res 2006;6:44.
[20] Kudo Y, Satoh T, Kido S, Watanabe M, Miki T, Miyajima E, Saegusa Y, Tsunoda M, Aizawa Y. A pilot study testing the dimensions of safety climate among Japanese nurses. Ind Health 2008;46:158–65.
[21] Alimohamadi I, Hashemi HJ, Farshad A, Amini M, Haghi B, Alibeikkandi SN, Momeni Zadeh A. Assessment of reliability of a safety culture questionnaire in the cleanser and washer industries. JHSW 2012;2:33–42 [in Persian].
[22] Ghahramani A, Khalkhali HR. Development and validation of a safety climate scale for manufacturing industry. Saf Health Work 2015;6:97–103.
[23] Beavers AS, Lounsbury, Richards JW, Huck JK, Skolits GJ, Esquivel LS. Practical considerations for using exploratory factor analysis in educational research. Pract Assess Res Eval 2013;18:1–13.
[24] Cortina JM. What is coefficient alpha? An examination of theory and applications. J Appl Psychol 1993;78:98–104.
[25] Swailes S, McIntyre-Bhatty T. The "Belbin" team role inventory: reinterpreting reliability estimates. J Manage Psychol 2002;17:529–36.
[26] Nunally JC. Psychometric theory. 2nd ed. New York (NY): McGraw Hill; 1978.
[27] Streiner LD, Norman GR. Health measurement scales: a practical guide to their development and use. 4th ed. New York (NY): Oxford University Press; 2008.
[28] Tharaldsen JE, Olsen E, Rundmo T. A longitudinal study of safety climate on the Norwegian continental shelf. Saf Sci 2008;46:427–39.
[29] Bergh M, Shahriari M, Kines P. Occupational safety climate and shift work. Chem Eng Trans 2013;31:403–8.