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Abstract

Background: Personality traits, due to having a relative stability, are important factors for predicting employees' safety behavior. Consideration of Future Safety Consequence (CFSC) is a personality trait that was recently introduced to predict the safety behaviors. The purpose of this study was to translate and assess the psychometric properties of the Persian version of the CFSC scale.

Methods: In the first stage of this cross-sectional study, the instrument was prepared by the forward-backward-forward translation technique and evaluated by 487 employees of a gas refinery. The validity of the scale was evaluated through face, concurrent, validity, and construct validity. The safety performance questionnaire was used to examine the concurrent validity. The reliability of the questionnaire was evaluated using internal consistency (Cronbach's alpha coefficient) and test-retest.

Results: Content validity index was 0.885. The results of exploratory and confirmatory factor analysis indicated that the CFSC scale had a single factor. Also, Pearson correlation showed a positive correlation between the safety performance and the Persian version of CFSC (R=0.401). Test-retest reliability and internal consistency were calculated as 0.86 and 0.82, respectively.

Conclusion: It is concluded that the psychometric properties of the Persian version of CFSC scale are desirable and can be used in future studies.

Introduction

Occupational accidents are always considered as one of the factors threatening the workers' health and socio-economic statuses.[1] In addition to direct and indirect economic disadvantages, these accidents have irreparable human and social impacts on individuals, families, colleagues, and communities.[2] The International Labor Organization (ILO) has estimated that 350,000 people worldwide die from occupational accidents annually.[3] The statistics show that in Iran 1,657 workers *died* from occupational accidents in 2016 and 2017.[4] Despite the advancement of technology and increased workplace monitoring, numerous occupational accidents occur in workplaces.[5]

Unsafe behaviors are the cause of about 90% of occupational accidents.[1] Therefore, it is crucial to identify the predictors of safety behavior in workplaces.[5, 6] Many factors lead to unsafe behaviors in the workplace. These factors can be divided into two general categories, including organizational and individual factors. Although organizational factors play a very important role in providing workplace safety, it is also important to consider the individual

differences of employees that may predict the safety behaviors. Although early studies focused on variables such as gender, education, and accident proneness, further studies have shown that the effectiveness of these variables in predicting employee safety behavior is low. Among individual factors, personality traits being the most important and most common predictors of safety behavior due to their relative stability over time.[7-10]. Assessing these traits can be used as an effective indicator to identify unsafe behaviors.[1]

Most previous studies used big five personality traits (conscientiousness, extraversion, agreeableness, openness, and neuroticism) to predict the workers' safety performance. Further studies showed that the validity of these personality traits for predicting behaviors with a specific domain, such as safety behavior, was low. For this reason, subsequent studies focused on facet-level personality traits.[7] The Consideration of Future Consequence (CFC) is one of the facet-level personality traits applied to predict behavior in recent years.[11-14] CFC is defined as "the extent to which individuals consider the potential long-term outcomes of their current behaviors".[15] Individuals with high CFC scores tend to pay more attention to the future consequences of their actions than the current consequences. They also tend to forgo immediate benefits if those results are more likely to benefit them in the future. Conversely, individuals with low CFC pay more attention to the immediate tangible consequences of their actions than to the long-term consequences. In recent years, the Consideration of Future Safety Consequence (CFSC) has been defined as CFC in relation to safety aspects in the workplace. It was then introduced as a personality trait for predicting employees' safety performance in the workplace.[5] The CFSC scale is one of the newest tools available to predict the employees' safety behavior in the workplace.[5] Several studies have confirmed the capability of CFSC to predict the employees' safety behavior (safety performance).[5, 7, 16-18] The 6-item CFSC scale was developed by Probst et al. and can be used in all workplaces due to its generality and small number of items.[5]

Our survey showed, however, that previous studies have been conducted on the relationship between personality traits and occupational safety. However, in our country, these studies are focused on non-industrial occupations (such as drivers and healthcare worker), and industrial occupations, in which the frequency rate and severity of accidents are higher, have received less attention. On the other hand, most studies have been done on big personality traits, and personality traits in facet level have been less studied. While the scope of application of big personality traits is wide, it is not sensitive enough to predict safety behaviors in the workplace. So far, no study has been conducted on CFSC personality trait

in Iran. Therefore, the psychometric properties of the Persian version of this scale have not been investigated yet. Given the importance of an index for predicting the employees' safety performance and the need to consider cultural differences affecting validity and reliability of the scale, this study aimed to translate and assess the psychometric properties of a Persian version of CFSC scale.

Methods

Study Sample

This cross-sectional study was performed in a gas refinery in Southern Iran. 487 out of a total of 860 male operational employees participated in the study. Exclusion criteria included being employed in non-operational work, having less than one year of work experience, having an experience of severe occupational accidents, being unwilling to participate, and obtaining confusing and incomplete answers. Before completing the questionnaire, the purpose of the study and the researcher's moral obligations were explained to the participants. A written consent was also provided for the study group. All questionnaires were anonymous, and their final analysis was carried out in a general way. This study was approved by the Ethics Committees of Shiraz University of Medical Sciences using Ethics Code 1396-01-04-15792.

CFSC Scale

This scale which was adapted by Probst et al. has six items; the first three questions measure and evaluate the consideration of long-term consequences of safety behaviors.[5] The second three questions measure and evaluate the consideration of immediate consequences of safety behaviors. Items are scored on a 4-point Likert scale (1 to 4).

Translating the Scale

In the forward translation stage, the English version of the scale was first translated into Persian by two independent professional translators familiar with the English language (Table 1). Then, a single copy of the scale was prepared in simultaneous presence of the two translators and researchers. In the backward stage, the provisional Persian version was retranslated into English by another two translators who were unaware of the original version. Finally, at a joint meeting, the translators and the research team compared the Persian version with the original version. After implementing the required corrections and cultural adaptations, the final Persian version of the scale was prepared.

Scale Validity Assessment
Face Validity and Content Validity

To evaluate the face validity, we used the opinions

Table 1: Items of consideration of future safety consequences (CFSC) questionnaire

	Item	Forward translation
1	Even though reporting accidents can take a lot of time and effort, it helps other workers in the future.	هرچند گزارش حوادث نیاز به وقت و تلاش زیادی دارد، اما در آینده به کارکنان دیگر در پیش-گیری از حوادث کمک میکند.
2	Failure to immediately report a workplace injury might result in serious problems later.	کوتاهی در گزارش فوری حوادث جزئی ممکن است در آینده منجر به حوادث جدیتر شود.
3	Even though it sometimes takes longer, it is better in the long run to follow appropriate safety procedures.	اگرچه پیروی از روشهای اجرایی و دستورالعملهای ایمنی وقتگیر است، اما این کار ضروری است.
4	Safety practices aren't worth time or effort when the risk of injury is low.	انجام اقدامات ایمنی زمانی که ریسک آسیب پایین است، ارزش وقتگذاشتن و تلاش کردن ندارد.
5	Pre-job inspections take too much time away from getting the job done.	بازرسیهای ایمنی قبل از شروع کار وقت زیادی میگیرد و بهکار لطمه میزند.
6	I sometimes need to compromise safety in order to meet production demands.	خیلی وقتها بهدلیل نیاز به تولید بیشتر، الزامات ایمنی را نادیده میگیرم.

of 20 occupational safety experts and industrial psychologists to provide input on grammar, wording, item allocation, and any other suggestions. Moreover, 15 employees of the company were asked to comment on any ambiguities and understanding of the items. A Content Validity Index (CVI) tool was used for the assessment. To this end, 11 safety, ergonomics, and industrial psychology *experts* were requested to separately rate *each item* based on relevancy, clarity, and simplicity. According to the instructions, a CVI value higher than 0.79 was considered acceptable; a CVI value of 0.7-0.79 *required* modification and revision; and a CVI value below 0.7 was unacceptable and rejected.[19, 20] The selection of employees and experts was done based on random and purposive sampling method, respectively.

Construct Validity

The Exploratory Factor Analysis (EFA) by the Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA) using the least weighted squares were applied to assess the construct validity. The total data (N=487) were randomly divided into two groups using SPSS software. An independent sample t-test and Chi-square test showed that there were no significant differences between the two samples. It is noteworthy that the adequate sample size for factor analysis is 4 to 10 times the number of variables and at least 100.[19] Before exploratory factor analysis, the adequacy of *sampling* was *tested* through the KMO (Kaiser–Meyer–Olkin) model. Bartlett's test was applied to ensure inter-*correlations*. Then, EFA was performed on the first random sample (N=244). Three main indices including (1) the eigenvalues,(2) ratio of the variance explained by each factor, and (3) Scree *plot* showing eigenvalues after *rotation* were used to determine how many significant factors have saturated the scale (the set of items). On the Scree plot, *eigenvalues* higher than 1 showed the number of scale factors.[21] The items with factor loadings more than 0.32 were considered to be acceptable.[22]

The second random sample was used for confirmatory factor analysis (CFA). For assessing model fit, multiple tools were used, such as root mean square, Root Mean Square Error of Approximation (RMSEA), Root Mean Square Residuals (RMR), Comparative Fit Index (CFI), Adjusted Goodness-of-Fit Index (AGFI), Goodness-of-Fit Index (GFI), and Chi-square/degrees of freedom ratio. CFI value of 0.95 or higher, RMSEA<0.08, RMR value close to zero, GFI and AGFI values of 0.9 or higher, and χ^2/df<3 indicated good model fit.[23, 24]

Concurrent Validity

To test the concurrent validity, a safety performance questionnaire and a CFSC scale were simultaneously completed by the participants. The safety performance questionnaire has two dimensions: safety participation and safety compliance, with 4 questions related to each dimension. Several previous studies have shown the association between safety performance and CFSC.[5, 16-18] The individuals who obtain higher degrees of this personality trait have better safety performance. The safety performance questionnaire developed by Neal and Griffin[25] was translated into Persian and validated by Kalteh et al.[26] The Pearson correlation coefficient was used to determine the association between CFSC and safety performance.

Reliability
Internal Consistency

Cronbach's alpha coefficient was used to evaluate the internal consistency of the questionnaires. The coefficient values of more than 0.7 were considered as acceptable.

Test-Retest Reliability

The interval between test-retest is recommended between 15 and 30 days and should be not less than 15 days. In this study, a sample of 30 employees completed the CFSC scale twice in 3 weeks. The correlation between the results of the first and second stages was analyzed using the Pearson correlation coefficient.

Table 2: Demographic characteristics of the participants (n=487)

Variable	Status	Number (%)
Marital status	Single	92 (18.9)
	Married	395 (81.1)
Education	Under the diploma	109 (22.4)
	Diploma	176 (36.1)
	Associate and higher	202 (415)
Shiftwork status	Rotational	48 (9.86)
	Fixed	439 (90.14)

Table 3: Mean (SD) and Inter-item correlations for the Persian translation elements using consideration of future safety consequences (CFSC) scale

Item	Mean (SD)	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6	Total score
Q1	3.50 (0.57)	1	0.540	0.502	0.348	0.357	0.332	0.707
Q2	3.53 (0.589)		1	0.530	0.357	0.319	0.380	0.720
Q_3	3.52 (0.56)			1	0.434	0.350	0.460	0.750
Q_4	3.43 (0.58)				1	0.519	0.553	0.736
Q_5	3.4 (0.561)					1	0.540	0.704
Q_6	3.54 (0.565)						1	0.746
Total Score	20.94 (2.50)							1

Statistical Analyses

All statistical *analyses* were performed using IBM SPSS 21 and AMOS 22 software.

Results

The mean age of the participants was 36.04±5.82 years with a range of 21-59 years. The mean job tenure was 7.67±3.9 years, with a range of 1-15 years. The participants' socio-demographic features are presented in Table 2. The results of mean score and standard deviation, inter-correlations of the CFSC scale items, and its total score are shown in Table 3.

Validity

Based on the results obtained for the content validity, the total CVI was computed to be 0.865. The CVI values for each of the items were in the range of 0.82-1.

The concurrent validity assessment showed a significant association between CFSC and safety performance. This association was 0.401 (P<0.001) for safety performance and 0.372 (P<0.001) and 0.329 (P<0.001) for safety compliance and safety participation, respectively.

The KMO value was 0.827. Therefore, the adequacy of sampling for factor analysis was confirmed. The acceptable value of this index is greater than 0.5.[19] Also, the results of Bartlett's test were significant (P<0.001), confirming the correlation between the items for factor analysis. The results of EFA using PCA showed the unidimensional nature of CFSC. In other words, there was only one factor with eigenvalue higher than 1 (Figure 1) on the Scree
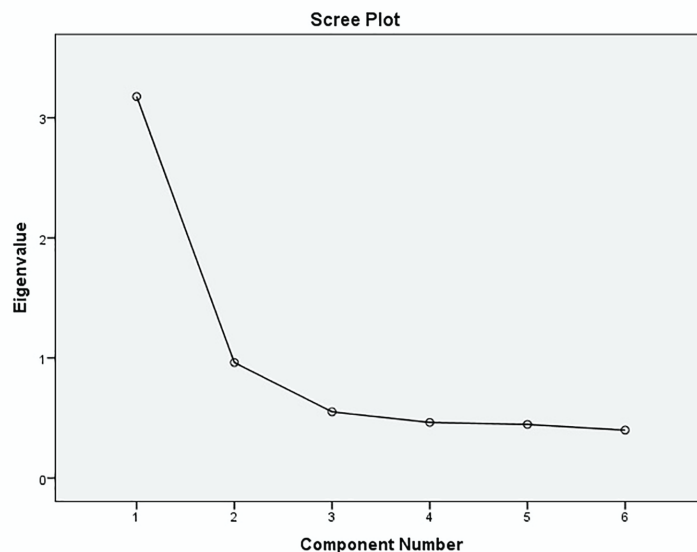

Figure 1: The scree plot for Persian version Consideration of Future Safety Consequences (CFSC) scale

plot. The calculated Factor Loadings for all items were greater than 0.4, with a range of 0.700- 0.755. Also, corrected item-total correlations were in the range of 0.559-0.621 and commonalities for the items were calculated in the range of 0.490-0.576. The details of EFA are presented in Table 4.

The results of the CFA demonstrated excellent goodness-of-fit of the single factor of the scale. The calculated value of model fit indices and their acceptable thresholds are displayed in Table 5. As can be seen, all fit indices for the single factor solution are within acceptable ranges. The standardized factor loadings of 4 items were strong (0.60<) with those of 2 items in the acceptable range (0.4-0.6) (Figure 2).

Reliability

The results of the scale reliability assessment using the test-retest method showed that the Pearson correlation coefficient was 0.86 (P<0.001) between the first and second stages. The results of internal consistency assessment of the scale showed that Cronbach's alpha for the whole scale was 0.82 and corrected item-total correlations for all items were within the range of 0.559-0.621 (P<0.001), which suggests that the reliability of the scale was adequate.

Discussion

The aim of this study was to evaluate the psychometric properties of the Persian version of CFSC and provide a reliable tool for predicting safety performance among Iranian employees. In this study, different psychometric properties of the scale including face validity, content validity, concurrent validity, structural validity and reliability (internal consistency of the instrument and

Table 4: Results of Exploratory Factor Analysis (EFA) for Persian version of consideration of future safety consequences (CFSC) from Principal Component Analysis (PCA) method

Items	Corrected item–total correlations	Cronbach's alpha if item deleted	Communalities	Factor loading
Q1	0.559	0.799	0.490	0.70
Q2	0.573	0.797	0.509	0.713
Q3	0.621	0.786	0.570	0.755
Q4	0.598	0.791	0.546	0.739
Q5	0.559	0.799	0.495	0.704
Q6	0.615	0.788	0.576	0.753

Table 5: Confirmatory Factor Analysis (CFA) Fit indices for Persian version of Consideration of Future Safety Consequences (CFSC) scale

| Model fit index	Computed index	Acceptable range[23, 24]
Chi-Square/Degrees Of Freedom Ratio (X²/Df)	1.77	<3
Goodness-Of-Fit Index (GFI)	0.988	>0.9
Adjusted Goodness-Of-Fit Index (AGFI)	0.959	>0.9
Non-Normed Fit Index (NNFI)	0.940	>0.9
Comparative Fit Index (CFI)	0.992	>0.95
Incremental Fit Index	0.992	>0.9
Standardized Root Mean Square Residuals (SRMR)	0.008	<0.5
Mean Square Error of Approximation (RMSEA)	0.050	<0.080
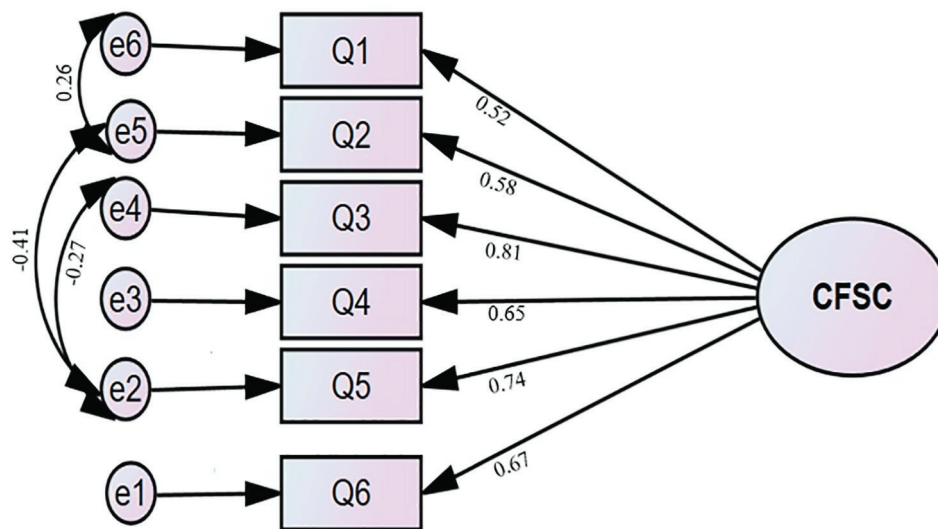
Figure 2: The one factor model of Confirmatory Factor Analysis (CFA) (N=243)

its repeatability) were confirmed in the statistical population including the operational staff of the gas refinery company. The assessment instrument was found to be appropriate to the targeted construct through the use of the face validity assessment. In this study, the opinions of occupational safety and health experts, industrial psychologists, and experienced staff working in the gas refinery company were used to assess the face validity of the scale. Necessary corrections were made to obtain face validity. The content validity index was used for assessment. The values of this index were 0.87 and 0.82 for the whole scale and for each item, respectively. CVI equal to 0.78 or higher is considered acceptable;[20] therefore, the content validity of the whole scale and its items was confirmed.

The results of concurrent validity assessment showed a positive relationship between CFSC and both dimensions of safety performance, so that people with a higher CFSC score had better safety performances. Several previous studies have also reported the relationship between CFSC and safety performance.[5, 16-18] This correlation is important because CFSC can be used as a preventive index to predict the employees' safety behavior in the workplace and select personnel with increased safety aptitude. A positive correlation between CFSC and safety performance was expected. Although safety rules are designed to protect the employees in the short and long term, employees may break safety rules for the immediate benefit of not following them (such as doing work quickly or more production). Some employees may choose to follow the rules, considering the long-term consequences. Therefore, employees are divided into two different groups in terms of facing safety rules and choosing one of the two short-term and long-term consequence. On the other hand, people with higher CFSC are generally more motivated to increase their level of safety knowledge, and this improves their safety performance.[7]

Exploratory and confirmatory factor analyses showed that CFSC had a single factor, which has a very excellent goodness of fit. This is contrary to the findings of CFSC developers. According to the original CFSC version, the two-factor solution demonstrated a better fit compared to the single factor. In that study, model fit indices for the 2-factor solution were $x^2/df=2.27$, GFI=0.97, NNFI=0.92, and SRMR=0.05; model fit indices for single factor solutions were poorer than those for the two-factor solution. It was concluded that CFSC had two dimensions.[5] In the present study, fit indices for the one-factor solution were calculated $x^2/df=1.77$, GFI=0.988, NNFI=.940, and SRMR=0.008, which was better than the calculated ones in the original version of the scale. Researchers have expressed different opinions about the number of CFC dimensions, as CFC scale developers argued that

it was a single-factor dimension.[15] Since then, some researchers confirmed their opinion.[14, 27, 28] However, several studies have suggested that CFC consists of CFC-Immediate (CFC-I) and CFC-Future (CFC-F);[29-32] some other researchers believe that the reason for reporting CFC with a two-factor structure by some studies is an artifact of the item wording.[5, 27, 28]

The factor loadings for the scale items were within the range of 0.52-0.81. The factor loadings of items 3, 4, 5, and 6 were very strong, and those of items 1 and 2 were within the acceptable range. In factor analysis, the items with factor loadings less than 0.32 (in some studies 0.4) are considered poor; the items with factor loadings of 0.32- 0.6 are acceptable, and the ones with factor loadings higher than 0.6 are considered as strong.[21, 22] The CFSC developers calculated the factor loadings of its items within the range of 0.52- 0.76, and among the items, only item 6 had a correlation of less than 0.6. This deviation can be due to cultural differences.

Reliability assessment of the scale using retest after 3 weeks showed that the Pearson correlation coefficient between the two stages was 0.87. Also, the results of internal consistency assessment using Cronbach's alpha showed that the whole scale was 0.82 and the corrected item–total correlations were within the range of 0.559-0.621. In the original version of the scale, the Cronbach's alpha was 0.71 and the corrected item–total correlations were within the range of 0.33-0.55.[5] In another study conducted by Mashia et al. at a hospital in Nigeria which used the translated version of this tool, the Cronbach's alpha of the entire scale was calculated to be 0.88.[18] Therefore, it can be concluded that the reliability of the scale is improved in its Persian version. Moreover, the *item-scale correlation* has increased in the Persian version.

Strengths, Limitations, and Suggestions for Future Research

The present study was conducted for the first time to measure the psychometric properties of the Persian version of the CFSC scale. However, our study was not without limitation. One of the most important limitations of this study was lack of occupation diversity since the participants were chosen from a particular industry. Therefore, validation of the scale in other workplaces is recommended. Also, the present study is a cross-sectional one, so it cannot validate sensitivity to changes over time. This validation requires a longitudinal study.

Conclusion

The results of this study indicated that the face validity, content validity, concurrent validity, structural validity, and reliability (internal consistency of the instrument and its repeatability) of the Persian version of CFSC

scale is acceptable. Therefore, this scale can be used as a useful tool for predicting safety performance in the selection and recruitment process of Iranian employees. Additionally, it can be applied conveniently to all workplaces, especially to high-risk industries due to the generality and small number of items.

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Conflict of Interest: None declared.

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