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Original Article

The Factorial Structure and Psychometric Properties of the Persian Effort-Reward Imbalance Questionnaire

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ABSTRACT

Background: With global changes in the current state of work and employment, the role of health-adverse psychosocial work environments has received increasing attention in developed as well as in rapidly developing countries. Thus, there is a need to apply valid measurement tools for monitoring and preventive purposes. This study aims to examine the factorial structure and psychometric properties of the Persian version of the effort-reward imbalance (ERI) questionnaire, assessing one of the internationally leading concepts of stressful work.

Methods: This descriptive cross-sectional study of a random sample of 202 white collar employees in an industrial company in Iran analyzes the ERI scales by exploratory and confirmatory factor analysis. Moreover, aspects of construct and criterion validity are tested. To this end, correlations of ERI scales with subscales of organizational injustice, a complementary work stress model, and also the correlations of ERI scales with a questionnaire assessing psychosomatic symptoms are performed.

Results: Internal consistency of the three ERI scales was satisfactory (Cronbach α effort: 0.76, reward: 0.79, overcommitment: 0.75). Fit indices of confirmatory factor analysis pointed to an adequate representation of the theoretical construct (e.g., adjusted goodness of fit index (AGFI): 0.73, goodness of fit index (GFI): 0.78). Negative correlations with subscales of organizational injustice supported the notion of construct validity of the ERI scales, and positive correlations of ERI scales with psychosomatic symptoms indicated preliminary criterion validity.

Conclusion: The Persian version of the ERI questionnaire has acceptable psychometric properties and can be used as a valid instrument in research on this topic.

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1. Introduction

In recent decades, the nature of work and employment has undergone significant changes in economically advanced societies. With the advent of new technologies and new social demands, employment sectors shifted from industrial mass and lean production towards service delivery and information/communication technology-driven jobs. While on the one hand, there is a significant decline in physically hazardous work, on the other hand, there is a growth of stressful psychosocial working conditions that can threaten the health of employed people, not least in the context of aggravated economic competition, work intensification, and growing job insecurity [1]. Alongside these developments, the composition of the workforce has also been changing, marked by an increase in the number of older workers, a rise in women's participation in the labor market, and also the growth of migration. In the context of economic globalization, nowadays, these trends are also increasingly affecting working people in rapidly developing countries [2]. It is therefore important to monitor potential health-adverse working conditions in these countries, and to provide respective information to stakeholders responsible for occupational health. To this end, psychometrically validated scales measuring theoretical models of stressful work have been developed, specifically scales assessing three internationally well-established models: demand-control [3,4], effort-reward imbalance (ERI) [5,6], and organizational injustice [7].

As Iran is considered to be a rapidly developing country, the assessment of health-adverse psychosocial working conditions can

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be a relevant task. This contribution sets out to test the psychometric properties of the Iranian version of the measurement of one of the three models mentioned, the original ERI questionnaire. To this end, the data was collected from a cross-sectional study of employees of an industrial company and then analyzed comparing the ERI scales with data on organizational injustice, a complementary model of stressful work, as well as with data on psychosomatic complaints. The first comparison was conducted in order to analyze construct validity, whereas the second one was performed to assess criterion validity within the constraints of a cross-sectional study design.

It is important to mention that the ERI model was selected due to its emphasis on the employment contract, the changes of which are at the core of current economic developments. More specifically, this model posits that employment arrangements defined by an imbalance between high efforts spent and low rewards received in turn are likely to elicit negative emotions and associated physiological stress reactions in working people, with adverse long-term effects on mental and physical health [5]. The powerful effects of this imbalance are due to the fact that it hurts evolutionary old feelings of reciprocity and justice of exchange. It is important to note that three reward dimensions are distinguished: salary or wage, promotion prospects including job security, and esteem or appreciation of accomplishments by significant others. Concerning effort, the model distinguished between its extrinsic aspects, the demands at work, and the working people's motivation to achieve. Concerning the latter, a personal pattern of coping with demands has been identified, termed overcommitment, which reflects a critical condition of recurrent excessive striving at work. In summary, three scales are defined to measure the ERI model: "effort", "reward", and "overcommitment". There is now a large empirical evidence base available that demonstrates increased relative risks of stress-related disorders among working people who score high on these scales [2].

2. Materials and methods

As mentioned, this contribution is a descriptive study testing psychometric properties of the ERI questionnaire. Ethical committee permission was received and all participants gave written informed consent. The study population consisted of all of the white collar employees in the Bidboland Gas Refinery in Behbahan, Iran who had at least 2 years of work experience in the refinery. Among the employees, 220 people were selected as the study sample, applying a simple random sampling method and using the Morgan and Kerjesy Table. Finally, 202 questionnaires were collected, with 186 male and 16 female participants. The mean age of the participants was 40.67 years (standard deviation: 9.44 years). The mean number of years of work experience of participants was 16.20 (standard deviation 9.54).

To carry out the current research, the questionnaire was first translated from English into Persian, and then it was back-translated from Persian into English, and the problems related to the translation of the items were reviewed and resolved. In a pilot study, the translated questionnaire was presented to a sample of 30 employees, and queries of inaccurate understanding were resolved by an improved language version.

The original ERI questionnaire consists of 23 Likert-scaled items, but since the existence of only one item on physical effort is not suitable for white collar employees, it was removed from the questionnaire, as recommended by the authors [6]. The first five items of the questionnaire define a scale measuring extrinsic effort to perform duties. Eleven items define the scale measuring rewards at work, and this scale is composed by the three subscales mentioned, as confirmed in several second-order factor analyses. The remaining six items measure the intrinsic component of overcommitment by the employees. Based on the first two scales, the construction of a ratio of effort and reward has been proposed by the authors to give an approximate quantitative estimate of the respective imbalance at individual level (for details see [6]).

To analyze one aspect of construct validity, a measure of organizational injustice [8], that has good psychometric properties in the Iranian sample, was additionally applied [9,10]. Furthermore, in order to assess criterion validity, a scale measuring psychosomatic symptoms that has good psychometric properties in the Iranian sample [11] was also added. Participants were asked to answer these scales in a standardized situation of data collection. The study was approved by the university's ethic committee. All statistical analyses were performed using software SPSS-22 and AMOS-21 (IBM, United States).

3. Results

Before the analyses were carried out, univariate and multivariate outliers were examined using Box Plot and Mahalanobis statistics and the results indicated that there was no outlier within this data set. The kurtosis and skewness of the data was calculated using SPSS software, and the results indicated that the kurtosis and skewness of none of the values were more than ± 1. The assumption of the normality of data distribution was evaluated using the Kolmogorov-Smirnov test, and the results showed that this assumption was met by the data. In addition, data independence was checked and confirmed using the Durbin Watson approach. Furthermore, multicollinearity was examined using tolerance and inflation variance statistics, and the results showed that none of the tolerance values were below the limit of 0.1. Therefore, based on two proposed indicators, colinearity was not observed in the data. Given these results of testing the underlying assumptions for statistical analysis, in the next step we performed exploratory factor analysis.

3.1. Exploratory factor analysis

To extract factors from our data set, principal component analysis was used. In this analysis, the Kaiser-Meyer-Olkin (KMO) value was equal to 0.78, and the Chi-square index of Bartlett test indicated a significant effect (1388.91, with $df = 231$; $p \leq 0.0001$). Thus, in addition to the adequacy of sampling, the implementation of a matrix-based factor analysis was justified. To determine the number of saturated factors of the ERI questionnaire, eigenvalues indices, the proportion of variance explained by each factor, and also Scree plot were taken into account. Accordingly, three factors with eigenvalues beyond 1.0 were extracted, and these factors explained 43.68% of the variance. Table 1 reports the factorial loadings of the items relevant to the questionnaire, the alpha coefficients after item removal, and the correlations with the total score.

As can be seen, the results of this exploratory factor analysis are in line with our assumptions. None of the items needed to be removed, factor loadings were beyond 0.50, all item-total correlations were satisfactory, and the three factors displayed Cronbach α values of 0.76, 0.79, and 0.75, respectively.

3.2. Confirmatory factor analysis

To test the fit between the data of the questionnaire and the underlying theoretical construct, a confirmatory factor analysis was performed with the three main factors, effort, reward, and overcommitment (see Fig. 1). Several fit indices were calculated, based on recommendations [12,13]. These indices are displayed in Table 2. As can be seen, some of these indices met the criteria for goodness of fit, such that an overall satisfactory model fit was achieved.

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