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Research Paper:

Psychometric Properties of The Persian Version of Job Design and Work Context Questionnaires Among Employees of the Textile Industry in Qom City

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ABSTRACT

Background & Aims of the Study: Today, the process of humanizing jobs so that the characteristics and working conditions are compatible with the psychological characteristics of employees, has been considered. Content of work and job design is one of the significant concepts in ergonomics, which is one of the impacts of job science and its analysis. The present study was designed to evaluate the reliability and validity of job design questionnaires and work context and then analyze their relationship with musculoskeletal disorders among employees working in the textile industry in Qom in 2019.

Materials and Methods: This is a cross-sectional and analytical study. The target population included employees working in the textile industry of Qom, of whom 252 people were included in the study using stratified sampling. The tools used in this study included four questionnaires: demographic, job design, work context, and body map questionnaires. In order to analyze and test the simultaneous correlation of the variables in this study, the multivariate analysis modeling technique of structural equations was used, during which the fit of the measurement model and the reliability of the structures were confirmed by examining the factor loads, Cronbach's alpha coefficient, and the composite reliability, and its validity by calculating the Average Extracted Variance (AVE) of the convergence validity of the Fornell-Larcker models. This study used Smart PLS and SPSS software, v. 20 software for data analysis.

Results: The results of descriptive statistical tests showed that among 252 employees, 74.6% were male, and 25.4% were female. The main variables, i.e., work context and job design and their subscales, had acceptable conditions in terms of validity and reliability. The relationship between job design and musculoskeletal disorders was significant (P<0.05).

Conclusion: The result of this study showed that the two Persian versions of the questionnaire, namely the work context questionnaire and the job design questionnaire, have good validity and reliability and can be used to assess working conditions in job environments, especially in Iranian industries.

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Archives of Hygiene Sciences
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1. Introduction

Today, the process of humanizing jobs in such a way that the characteristics and working conditions are compatible with the psychological characteristics of employees has been considered [1]. The science of ergonomics in order to create a safe and efficient work environment can create a balance between employee characteristics and tasks [2, 3]. It can lead to labor productivity, increased safety, physical and mental well-being of the employee, and job satisfaction. Numerous studies have shown the positive effect of applying ergonomic principles in the design of the workplace, machines, and tools. On the other hand, the motivational design also leads to more employee efficiency and better customer service [1-3]. The most important goal of any organization is to achieve optimal productivity, one of the efficient factors in productivity is human resources. Employees' job performance is affected by several factors [4, 5]. Properly designed jobs will play an important role in attracting and retaining a motivated workforce that is capable of producing quality goods and services [1].

Job design is one of the significant concepts in ergonomics, one of the impacts of occupational studies and its analysis, and has received increasing attention in recent decades [6, 7]. The basis of job design thinking is the effect on employee motivation by creating a relationship between the job and its conditions with the characteristics of the individual and the environment [7]. The general concept of job design or redesign means that workers are motivated by job satisfaction to perform better. In other words, this approach is to adjust the duties and responsibilities in a job or a group of interdependent jobs to achieve maximum efficiency and lead to satisfaction, growth, progress, and ultimately improves employees' quality of work life. Therefore, it can be said that job design means job structuring to increase organizational efficiency and increase job satisfaction [7, 8].

Job design is the effective combination of the components of a job with the characteristics of the employees, in such a way that during the process of defining and reconstructing the duties, powers, responsibilities, way of doing work, job relations, and working environment conditions after job characteristics are adapted to employees' talents, and abilities should be directed towards meeting the goals and needs of the individual and the organization [7]. After designing jobs, people with the necessary skills and abilities to do the job should be considered, and jobs are analyzed or re-examined to find out to what extent the person has the required characteristics of the job [9]. There are many goals in job design, the most important of which is increasing employee motivation, increasing productivity and quality of work-life, allowing women to enter jobs that have traditionally been considered masculine, jobs for older men, people with disabilities, minorities, and indigenous peoples. Also, efficiency and finding a way to produce a product or provide services, more efficient use of human and material resources, identification of the workforce, increasing employee motivation, and fulfilling social responsibilities of organization for employees by improving working conditions are other job design goals. In general, it can be said that the purpose of job design is to create unity between job and employee [9-11].

Job redesign allows employees to grow and prosper and allows people to increase their sense of competence and personal worth [12]. For the organization to achieve its goals, jobs must be organized and designed to have the necessary efficiency in various ways [13]. Some of the disadvantages, apathy and mental fatigue, are related to the incompatibility of the job with the morale and needs of employees, as well as repetitive, simple, and low work context [7]. Job design is one of the factors affecting stress, mental health, and wellness [13]. Employee efficiency and satisfaction are the results of good job design. Jobs that are not well-designed can lead to inefficiency, absenteeism, complaints, vandalism, resignations, leaving work, stress, reduced motivation and performance, and other problems [14]. On the other hand, paying attention to work context also helps design the job better and is an essential factor [15]. In macro-ergonomic theory, much attention has been paid to work context in job design to predict and take into account the various characteristics of the environment in the job [16].

Job Diagnostic Survey (JDS) and Job Design Questionnaire (JDQ) are the two main tools for measuring job design that can be used in different job groups. The JDS questionnaire, which is based on the theory of job characteristics, can be called the most widely used tool in this regard [17]. However, this tool is based only on job motivation characteristics and has problems in terms of internal and structural consistency [18]. The JDQ created better conditions than the previous tool regarding the wide range of examined factors and their validity and reliability. Various sources have introduced this questionnaire as an acceptable and practical tool [17, 19-22]. This tool measures four factors [19]:

Motivational: job enrichment and expansion, intrinsic work motivation, and socio-technical systems

Mechanical: Arising from the scientific and engineering management of classical industries and the importance of specializing tasks, skill simplicity, and repetition

Biological: Biomechanics, work physiology, and ergonomics and focus on the physical requirements of the task, and environmental factors, such as light, temperature, and noise

Perceptual: Derived from human factor engineering, perceptual and cognitive skills, and information processing

This tool provides an integrated visualization of job design and provides reliable data to analysts and information on job requirements review [20]. Another advantage of this questionnaire is its applicability in different organizations, while some other questionnaires can only be used in the field of information technology [23]. It can also collect the necessary information on its own, while some questionnaires are used only as part of the study and to follow up on information previously obtained in other ways, such as interviews [24]. Regarding the work context questionnaire, it should be noted that this tool has nine factors, including working with others, management, time management, independence at work, spatial organization, operational requirements, job diversity, posture, and physical environment [25]. In addition, compared to the tools provided by other researchers, it has a broader scope and applicability in various industries and organizations; for example, Lee et al. used it in the health sector [26], Deutscher and Winther used it in the construction industry [27], and Lee et al. used it in gas transmission stations [28, 29]. Other questionnaires, such as the psychological well-being at work (IPWBW), which measures psychological well-being at work [30], and the EACT, which measures the three components of work organization, working conditions, and socio-occupational relationships [31], have structural limitations as opposed to Working Cognition Inventory (WCI).

Underlying and inherent occupational factors are involved in health and physical problems, including musculoskeletal injuries. Work-related musculoskeletal disorders have been one of the major challenges to ergonomics and occupational health in recent decades. In addition to reducing working time, job restrictions or changing jobs have detrimental effects on physical, mental, and quality work-life health and social costs [32]. In Iran, musculoskeletal disorders are the most common disease and work-related injuries. The World Health Organization has described these effects as a "silent epidemic" [33]. Musculoskeletal disorders are the second leading cause of absenteeism after respiratory problems; they also cause employee dysfunction in work environments and are one of the causes of occupational harm and disabilities in industrialized and developing countries [34, 35]. Various potential risk factors are involved in occupational diseases, including physical, mental, and organizational factors [34, 36].

The prevalence of musculoskeletal disorders reduces the power and quality of work and increases treatment costs, lost time, and premature disability [37]. Hence, work context and job design evaluation can also be effective in harm control. In the meantime, using the right tools will also help achieve a more reliable result. Morgeson and Campion's [21] job design questionnaires and Pignault and Houssemand's [25] work context questionnaires are the most common and valid tools used in this field, which due to the lack of standardization in Iran, there is a need to study their psychometric properties. Therefore, the present study was designed to evaluate the reliability and validity of job design and work context questionnaires and then analyze their relationship with musculoskeletal disorders among employees working in the textile industry in Qom in 2019.

2. Methods

This research is a cross-sectional and analytical study. The target population included employees working in the textile industry of Qom, of whom 252 people were included in the study using stratified sampling. The tools used in this study were four standard questionnaires. After explaining the purpose of the study, training, and necessary information about the content of the questionnaires how to complete and answer the relevant questions, the questionnaires were distributed among individuals, and the necessary data were collected. Inclusion criteria were having at least one year of work experience and not having a second job and chronic illness, and exclusion criterion was the unwillingness of individuals to continue participating in any stage of the study. The demographic questionnaire included demographic information about employees, including gender, age, marital status, work system, and occupation.

The second questionnaire was the Job Design Questionnaire, which was provided by Morgeson and Campion and measures four subscales of motivational, mechanical, biological, and perceptual. This questionnaire consists of 50 questions with five-choice answers of the Likert scale (strongly disagree (1) to strongly agree (5)). Thus, a person's score is in the range of 50 to 250 [21]. The work context questionnaire was the third questionnaire used in this study; this questionnaire is in the form

of 9 factors and 36 questions and was provided by Pignault and Houssemand. The answers come in five Likert-scale options (strongly disagree (1) to strongly agree (5)), and the subscales include working with others, management, time management, work independence, spatial organization, operational requirements, work diversity, posture, and physical environment. Thus, a person's score is in the range of 36 to 180 [25]. Also, to find out which musculoskeletal disorders are more concentrated in which organs of the body, we used the fourth questionnaire, called the Body Map Questionnaire (BM), which divides the human body into different anatomical areas [38]. In this questionnaire, the staff measures the severity of pain in areas of the body that have suffered from musculoskeletal problems by selecting numbers from 1 to 5, which indicate painless, low pain, moderate pain, severe pain, and maximum pain, respectively. They express themselves as a report [39].

The present study consisted of three stages. In the first stage, work context and job design questionnaires for intercultural compatibility were translated into Persian by relevant experts and an English expert. After obtaining a single translation based on consensus, a native English person fluent in Persian translated questionnaires back into English. Then, a Persian version of the questionnaires was prepared by comparing the translated version with the original version, examining its qualitative compliance, and confirming its uniformity. In the second stage, the validity and reliability characteristics of the questionnaires were examined so that after distributing and collecting the questionnaires among the sample members, structural validity with exploratory factor analysis among 60% of the sample members, which were randomly selected, reviewed, and then the Persian version of the questionnaires was confirmed using confirmatory factor analysis on 40% sample members who were not used in exploratory analysis. Also, the above data were examined to evaluate the reliability of the internal consistency of the questionnaire using Cronbach's alpha coefficient. In the third stage, a body map questionnaire was distributed among the employees to evaluate the musculoskeletal disorders variable, and after completion, the required data were collected.

To analyze and test the simultaneous correlation of the variables in this study, the Structural Equation Modeling (SEM) multivariate analysis technique was used, during which in order to evaluate the compatibility and appropriateness of the measurement model and the structural model with the sample data, the fit of the measurement model and the reliability of the structures (questions related to the questionnaires used in the research) the factor loads and Cronbach's alpha coefficient were assessed, and the model composite reliability and validity were also confirmed by calculating the average extracted variance (AVE) and the convergence validity of the Fornell and Larcker (1981) model. This study used Smart PLS and SPSS software, v. 20 for data analysis.

3. Results

The results of descriptive statistical tests showed that among 252 employees, 74.6% were male, and 25.4% were female. The highest percentage of marital status was related to married status with 68.3%. The level of education of people with master's degree and above, bachelor's degree, associate diploma, diploma and less than diploma was equal to 6, 81, 6, 6.3, and 0.4%, respectively, and 80.6% of employees had a shift work system and 18.7% had a working day system.

The mean scores of the subjects in the questionnaires used for the job design questionnaire were 153.3 (SD=22.3) and for the work context questionnaire was 113.4 (SD=19.2). The Mean±SD indices of the subjects' scores in terms of subscales related to each of the job design questionnaires and the job field questionnaire are also presented in Table 1.

The results of Cronbach's alpha coefficient to determine the internal consistency of the studied areas by each work context and job design questionnaires in all cases were close to 0.7 (Table 2). These results indicate acceptable reliability. In order to complete the structural reliability study, in addition to reporting Cronbach's alpha coefficients and composite reliability, the values of factor loads were also evaluated, during which questions with a factor load of less than 0.4, including questions 3 and 7 of the work context questionnaire and questions 1 2, 7, 9, 12, 14, 15, 16, 17, 18, 19, and 17 related to the job design questionnaire were removed and after the mentioned corrective action, all factor loads were obtained higher than 0.4, which indicates the appropriateness of this criterion (Figure 1).

AVE index was used to evaluate the convergence validity of the questionnaires, which shows the correlation of each structure with the obvious variables of the structure. The results showed that AVE values for all structures except the five areas of work context, job design, musculoskeletal disorders (MSDs), biological and motivational approach are higher than 0.4, which indicates that the convergent validity is relatively acceptable (Table 2).

Table 1. Mean and standard deviation of scores of subscales of work context and job design questionnaires

Variables	Subscales	Mean±SD	Range of Scores
Work context	TM	13.6984±3.26217	56-159
	WO	20.77±4.08	11-30
	M	9.55±2.6	3-15
	WM	13.34±2.96	4-20
	A	18.32±5.07	6-30
	SO	10.87±3.40	4-20
	PR	9.88±2.86	3-15
	PP	6.34±2.52	2-14
	PE	10.59±3.65	3-15
	Total	113.4±19.23	56-159
Job design	Mechanical approach	24.09±3.97	8-32
	Motivational approach	45.23±9.71	19-84
	Perceptual approach	35.44±7.34	11-76
	Biological approach	48.58±8.83	19-65
	Total	153.35±22.29	70-205

Archives of Hygiene Sciences
Qom University of Medical Sciences

TM: Time Management; WO: Working with Others; M: Management; WV: Work Variety; A: Autonomy; SO: Spatial Organization; PR: Performance Requirements; PP: Physical Posture; PE: Physical Environment.

The results of the values obtained from the cross-loading coefficients in connection with the validity of the divergence of the questionnaires showed that the correlation is higher in almost all questions in the relevant area than in other areas. R^2 index was used to determine the effect of the exogenous variable on an endogenous variable, and the results with high values of 0.33 and 0.67 except PR, PP, and PE areas for the work context variable (less than 0.19) shows the moderate and strong levels of the predictive power of this model and its proper fit (Figure 2).

In the present study, the values of the Z coefficient to determine the effect of exogenous variables of job design and work context on the endogenous variable of musculoskeletal disorders indicate the lack of significant effect of work context variable on PE area of a work context variable and musculos keletal disorders variable ($P> 0.05$). Also, regarding other exogenous variables on the endogenous variable, considering that the values were less than 1.96, the significance of their effect on each other was proved ($P<0.01$) (Table 3).

The results of the body map questionnaire to determine the location and severity of pain in 27 areas of the body showed that employees reported the highest amount of pain in the lower, middle and upper back with percentages of 33.3, 24.6, and 21.1, respectively, painful and very painful. The results for pain in other body areas are also presented in Table 4. Concerning the Q^2 standard values, since the values for all structures are greater than 0.1, it indicates a good model prediction regarding the structures (Table 5).

4. Discussion

This study aimed to investigate the Persian version of job design and work context questionnaires' psychometric properties and their relationship with musculoskeletal disorders among employees working in the textile industry in Qom. The analysis results showed that the main variables, i.e., work context and job design and their subscales, have acceptable conditions in terms of reliability [40]. Edwards et al. used the job design questionnaire, and in addition to confirming its original form with four

Table 2. Values of convergent reliability and validity indices of the questionnaires and studied areas

Variables	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
WC	0.906	0.915	0.263
PE	0.897	0.905	0.763
A	0.84	0.883	0.561
TM	0.813	0.889	0.727
PR	0.795	0.866	0.686
WO	0.777	0.848	0.531
M	0.735	0.853	0.664
PP	0.714	0.84	0.636
SO	0.692	0.813	0.521
WV	0.689	0.807	0.512
MSDs	0.894	0.857	0.121
Job Design	0.896	0.898	0.205
Perceptual approach	0.876	0.898	0.41
Motivational approach	0.806	0.839	0.345
Biological approach	0.801	0.844	0.355
Mechanistic approach	0.768	0.842	0.519

Archives of Hygiene Sciences
Qom University of Medical Sciences

factors, they also approved the 10-factor model using exploratory factor analysis. In addition, in this study, the reliability of the tool was also expressed as acceptable [22]. In their study on the work context survey questionnaire using exploratory factor analysis and the correlation of its subscales, Pignault and Houssemand confirmed the conditions of the tool [25].

In another study in Iran, evaluating the validity and reliability of the Persian version of the Organizational Diagnosis Questionnaire in small industries, methods, such as confirmatory factor analysis, internal reliability, and test-retest were used to analyze the validity and reliability of tools in the Persian version. The results showed that the Persian version of this questionnaire is suitable for assessing the internal conditions in Persian language organizations [41]. In this regard, Tabatabai et al. in their study on the validity and reliability of the work context questionnaire using Cronbach's alpha and factor analysis, which showed a structure similar to the original structure of the questionnaire, found that the Persian version of the tool has good conditions for use [42].

Chahardoli et al. investigated the relationship between job design, performance, and job satisfaction in employees of a bank in Hamadan. In this study, job design and job satisfaction questionnaires and bank performance index were used to collect data, and Spearman's correlation coefficient was used to determine the relationship between the two variables. The study results showed that the motivational approach, the least approach, and the mechanical approach were the dominant approach, and the majority of branches had a moderate position in terms of job satisfaction. There is also a significant positive correlation between job design (motivational approach and perceptual approach) and job satisfaction and also between job design (motivational approach) and job satisfaction with performance [2]. Shahbazi et al. conducted a descriptive correlational study to explain the relationship between job design and teachers' performance [14]. The study results showed a significant relationship between the three indicators of the existence of various tasks in the job and independence and feedback and organizational performance. There was no significant relationship between the two indicators of task and task identity significance and organizational performance

Table 3. The values of t and p-value of the effect of variables on each other

Variable	T Statistics	P Values
WC -> PE	0.367	0.714
WC -> PR	4.61	0
WC -> PP	7.549	0
WC -> WV	11.304	0
WC -> TM	12.939	0
WC -> SO	21.941	0
WC -> WO	32.228	0
WC -> M	34.561	0
WC -> A	47.388	0
WC -> MSDs	0.346	0.73
Job Design -> Mechanistic approach	19.005	0
Job Design -> Motivational approach	27.497	0
Job Design -> Biological approach	51.828	0
Job Design -> Perceptual approach	44.123	0
Job Design -> MSDs	2.808	0.005

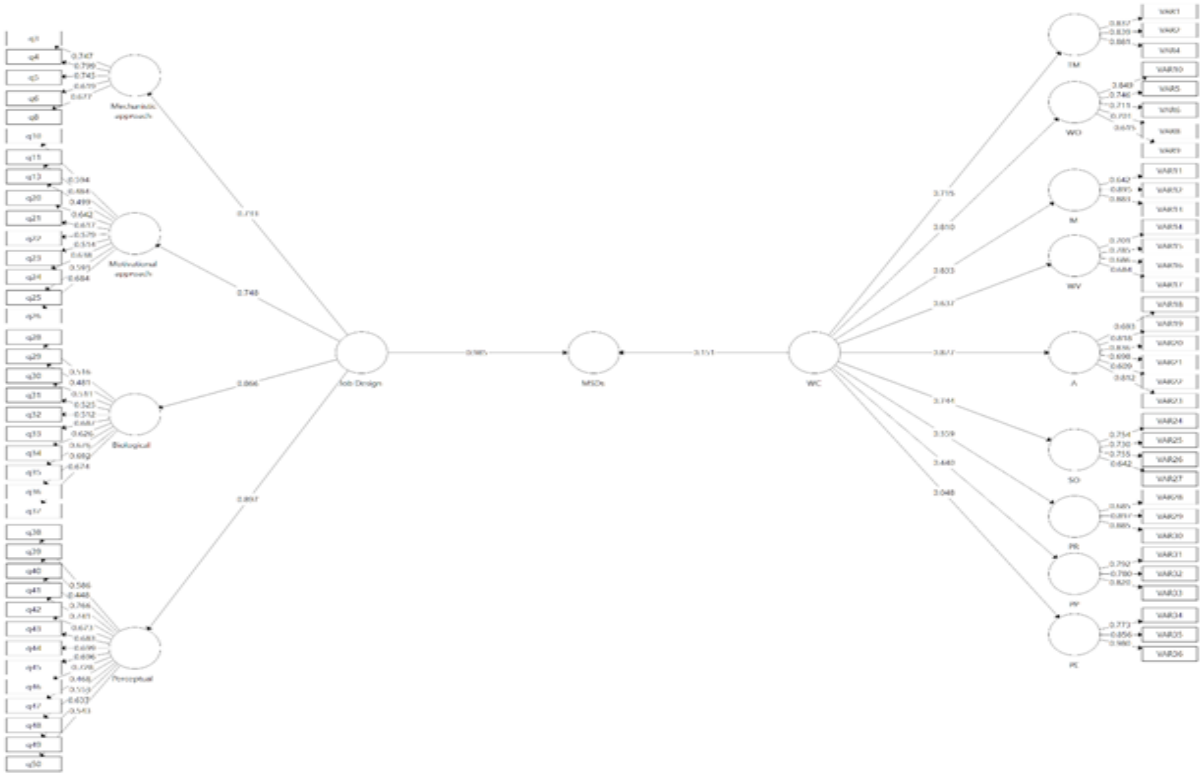

Figure 1. Performed model with factor load coefficients

Table 4. Frequency percentages in 27 areas of the body by pain

Row	Body part	Pain rate (%)			
		Painless	Moderate Pain	Painful	Very painful
0	Upper part of the neck	38.5	39.3	14.3	7.1
1	Uower part of the neck	42.5	36.5	12.7	7.9
2	Left shoulder	57.5	24.2	12.7	5.2
3	Right shoulder	60.7	24.6	11.1	3.6
4	Left arm	80.6	13.5	4.4	1.6
5	Upper back	54.4	24.2	16.3	4.8
6	Right arm	79.4	13.5	5.6	1.2
7	Middle part of the waist	46	28.8	18.3	6.3
8	Lower part of the waist	37.3	28.6	23	10.3
9	Hip	74.6	14.7	6.7	3.8
10	Left elbow	84.5	11.5	2.8	0.8
11	Right elbow	86.1	10.3	3.2	0
12	Left forearm	82.1	12.7	4	1.2
13	Right forearm	81	13.1	4.8	1.2
14	Left wrist	65.9	21.8	7.9	3.2
15	Right wrist	59.1	28.2	8.7	4
16	Palm or left fingers	77.8	14.3	6.3	1.6
17	Palm or right fingers	77.8	15.5	5.6	1.2
18	Left thigh	77.8	14.7	5.6	2
19	Right thigh	79	12.7	6	2.4
20	Left knee	51.2	26.6	15.5	6.7
21	Right knee	52	28.2	14.7	5.2
22	Left leg	61.5	19.8	13.9	4.8
23	Right leg	61.1	22.2	12.7	4
24	Left ankle	67.1	17.9	10.3	4.8
25	Right ankle	68.3	18.7	10.7	2.4
26	Sole or the toes of the left foot	57.5	23.4	13.5	5.6
27	Sole or the toes of the right foot	58.3	23.4	13.5	4.8

Archives of Hygiene Sciences
Qom University of Medical Sciences

Table 5. Q2 criteria values of the research model

Examined variables	Q^2
MSDs	0.11
Mechanistic approach	0.265
Motivational approach	0.155
Perceptual approach	0.321
Biological approach	0.252
PE	-0.011
A	0.423
PP	0.117
PR	0.067
M	0.449
SO	0.28
TM	0.362
WO	0.337
WV	0.186

[14] in a study conducted by Rezaei Kilidbari et al. on the role of job redesign in employee competence and organizational commitment of state-owned companies in Guilan province. The results showed a positive and significant relationship between job redesign and organizational commitment of employees, between job redesign and employee competence, and between employee competence and organizational commitment [43]. The study results showed that job diversity and nature among job characteristics, job feedback, and freedom of action at work had a significant relationship with job stress [44]. These job characteristics, which are a kind of work context, can cause or aggravate musculoskeletal disorders through the psychological factor of stress, which was also found in the present study and have a significant relationship with this type of disorder.

On the other hand, the prevalence of neck, shoulder, arm, and back pain among full-time nurses at the National Hospital of Japan was examined. The results showed that nurses' prevalence of musculoskeletal symptoms was maximum in the waist and minimum in the arm.

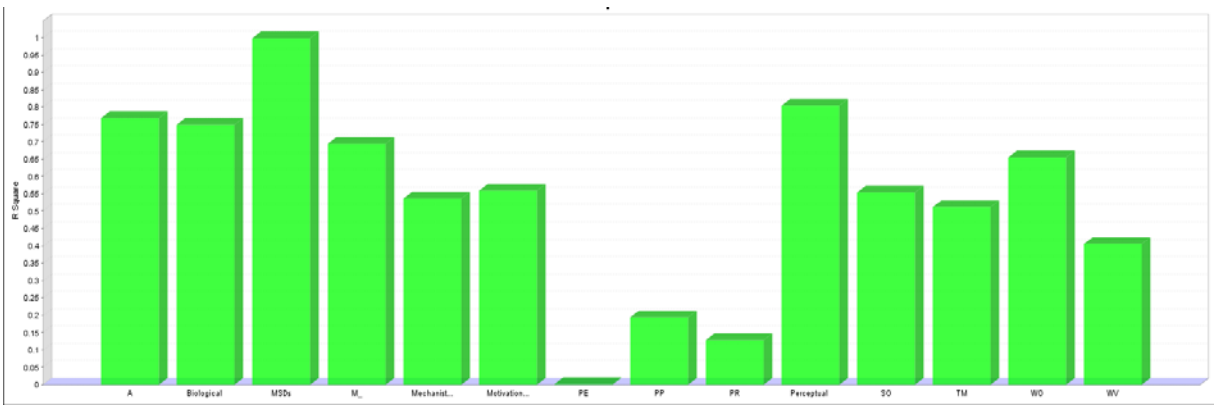

Figure 2. Graph of R^2 values for the studied variables

There is no significant relationship between musculoskeletal pain and work-related issues and demographic conditions in Cox's model. This study concluded that musculoskeletal pain in hospital nurses is probably related to the physical condition of the work and the work organization [45]. The purpose of Caruso's et al. research on musculoskeletal disorders was to evaluate studies that have examined musculoskeletal disorders; for example, in these studies, it has been found that shift work, forced overtime, work on holidays, or weekend work, which is the work context and job design, are influential in the development of musculoskeletal disorders [46].

5. Conclusion

The result of this study was to determine psychometric properties of the two Persian versions of the questionnaire, namely the work context questionnaire and the job design questionnaire, which had good validity and reliability and can be used to assess working conditions in job environments, especially in Iranian industries. On the other hand, it was found that job design can be effective on musculoskeletal disorders and increase their incidence and prevalence. As a result, managers can control these disorders in the workplace by considering different approaches in job design, such as motivation and biology.

Ethical Considerations

Compliance with ethical guidelines

The Vice-Chancellor for Research and Technology of Qom University of Medical Sciences approved and funded this study with the ethical code IR.MUQ.REC.1399.025.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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