

# Development and validation of the Occupational Back Pain Prevention Behaviors Questionnaire in nursing personnel

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## Research article

**Keywords:** Occupational Back Pain, Prevention behaviors, Psychometric evaluation, PRECEDE-PROCEED model, Nurse

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# Abstract

**Background:** Occupational back pain is the most prevalent health problem among nurses that needs to be assessed by a valid and multi-factorial questionnaire. The purpose of the present study was to design and develop an instrument for assessing job-related back pain prevention behaviors among nursing professionals. **Methods:** First an item pool of 49 items was generated. Then, content and face validity was carried out. Consequently, a cross-sectional study was conducted in Mazandaran, Iran. The questionnaire was distributed among a sample of nurses working in hospitals affiliated to Mazandaran University of Medical Sciences. Exploratory factor analysis was used to determine the factor structure of the questionnaire. Item-scale correlation matrix employed to examine the construct validity. The Cronbach's alpha was estimated to assess the reliability and the intraclass correlation coefficient was calculated to examine stability. **Results:** In all 155 nurses participated in the study. The mean age of respondents was 34.1 (SD = 7.66) years, and 83.2% were female. Six factors with 30 items emerged from the exploratory factor analysis: knowledge, attitude, self-efficacy, reinforcing factors, enabling factors and behavior that jointly accounted for %66.5 of variance observed. Item-scale correlation matrix showed satisfactory results lending support to construct validity of the questionnaire. The Cronbach's alpha coefficient showed excellent internal consistency ( $\alpha=0.92$ ). The intraclass correlation coefficient with 2-weeks interval also indicated that the questionnaire has satisfactory stability (ICC = 0.97). **Conclusions:** The findings showed that the Occupational Back Pain Prevention Behavior Questionnaire is a reliable and valid instrument for measuring occupational back pain prevention behaviors among nurses. **Keywords:** Occupational Back Pain, Prevention behaviors, Psychometric evaluation, PRECEDE-PROCEED model, Nurse

## Background

Low back pain is considered a major health problem worldwide. It leads to disability, absenteeism and considerable annual health costs (1). One major risk factor of low back pain is what people do as their professional job. Among professional jobs, nursing professions are experiencing higher risk of low back pain compared to other jobs, and it accounts for 60% of the reported occupational injuries among this population (2-4). Thus any interventions to promote preventive low back pain behaviors among nurses are worthwhile. In addition, any attempts to understand and measure preventive behaviors among nurses could be of prime importance.

There are a number of questionnaires that designed to understand how much low back pain affects one's ability to manage routine activities. For instance, the Quebec Back Pain Disability Scale, the Roland-Morris Disability Questionnaire, the Oswestry Low Back Pain Questionnaire, and the Short-Form McGill Pain Questionnaire-2 that are just to name a few (5-8). However, these questionnaires do not examine the cause of pain and behaviors, which leads to back pain. Thus, for development of any intervention to tackle job-related back pain among different professions we need to understand main causes of low back pain in the first place, and secondly, since the pain usually originates from behaviors during work-related activities it should be, to some extent, within a realm of educational planning models.

The PRECEDE-PROCEED model is the most popular and commonly used framework for health education planning programs. This model identifies behavioral, environmental, educational and ecological factors that are contributing to a problem (9). It is believed that a behavior can be influenced by *predisposing*, *reinforcing*, and *enabling* factors and thus a program based on the PRECEDE-PROCEED model seeks to identify these three factors. The predisposing factors include knowledge, attitudes, beliefs, values, and self-efficacy. The reinforcing factors include attitudes and behaviors among those who are involved, and enabling factors include access to resources, availability of health services, policies, legislation, and existing regulations, and behavioral skills that are affecting the adoption of a health behavior (9). Thus, as part of a study to develop an intervention for reducing low back pain in nursing personnel, the purpose of this study was to design an instrument based on the PRECEDE-PROCEED model.

## Methods

### *Item generation*

The initial questionnaire was developed through semi-structured interviews with nursing professionals. Participants were asked to explain about job-related low back pain and indicate the ways that could prevent low back pain in nursing personnel. The interviews were carried out by one of us (SSK) individually in the office of participants or the nursing office and in a quiet environment. Interviews continued until data saturation was achieved. As such 18 nurses, head nurses, educational supervisors, nursing managers, hospital managers, hospital affairs experts, quality improvement experts, and development and support managers were interviewed. For further certainty, two more interviews were conducted, but no new data was obtained. Accordingly, based on the interviews and literature review, the preliminary questionnaire containing 49 items was developed. Then the research team assessed the questionnaire and 9 items were deleted to ensure the clarity, objectivity and the ease of comprehension of the terms employed. Thus at this stage in all 38 items was remained.

### *Developing a preliminary questionnaire*

At this stage, we assessed content and face validity. To determine the content validity, qualitative and quantitative methods were used (10). For qualitative content validity 10 experts in health education, physiotherapy, educational management, and nursing were asked to check the quality of the questionnaire based on grammar, use of proper words, item allocation and scaling. Then the content validity ratio (CVR) and content validity index (CVI) was used to evaluate quantitative content validity. To determine the content validity ratio, the questionnaire was sent to 10 experts with different specialty (including health education, physiotherapy, nursing, education management) and was asked to respond where the items are essential, useful but not essential and no essential. Then responses were calculated based on the formula and matched to the Lawshe's table (11). The same experts were asked to indicate whether items are simple, relevant and clear in order to calculate content validity index (12, 13). The CVR for the questionnaire was 0.84, which was well above the recommended value. The CVI for the questionnaire was 0.98. However, at this stage, 7 items were removed and the number of items was

reduced to 31. Similarly, for face validity, qualitative and quantitative methods were used. The qualitative face validity determined by asking 10 nurses (the potential user of the questionnaire) to complete the questionnaire and to indicate whether any items were difficult, ambiguous or irrelevant. In the next step, Item Impact Score was calculated in order to assess the importance of each item by the same nurses. For each item, a 5-point Likert response category was considered: strongly important, quite a lot important, moderately important, slightly important and not at all. The analysis showed that the impact score for all items was above 1.5 (the actual mean impact score was 3.73). There were no additional changes at this stage and thus the provisional version of the questionnaire with 31 items was subjected to psychometric evaluation.

### *Psychometric evaluation*

A cross-sectional study was conducted to examine the psychometric properties of the questionnaire. The questionnaire was administered to a sample of nursing personnel recruited from teaching hospitals affiliated to Mazandaran University of Medical Sciences, Sari, Iran. Indeed, first we provided a list of all hospitals and three hospitals were randomly selected. Then in each hospital, individuals randomly selected based on a simple random number table and staff identification (ID).

### *Statistical analysis*

To assess construct validity, the exploratory factor analysis and item-scale correlation matrix were employed. Indeed, the Kaiser-Meyer-Olkin (KMO) Index and Bartlett's Test of sphericity were used to assess sampling adequacy (14). The factor structure of the questionnaire was extracted using Varimax rotation. The presence of an item in a factor was determined as approximately 0.4 as recommended (15). For item-scale correlation matrix, the Pearson correlation coefficient was used and coefficient values of 0.4 or above were considered acceptable (15). The reliability of the questionnaire was assessed using internal consistency and stability. To compute the internal consistency, the Cronbach's alpha coefficient was estimated. To demonstrate the stability of the questionnaire the Intraclass Correlation Coefficient (ICC) was calculated. For this purpose, a subsample of 20 nurses completed the questionnaire twice with a two-week interval.

## **Results**

### *The sample characteristics*

In all, 155 nurses aged 24 to 55 years participated in the study. The mean age of respondents was 34.1 (SD = 7.66) years, and 83.2% were female. Participants were nurse, head nurse and educational supervisors from different units. The mean work experience of participants was 9.81 (SD = 7.0) years. The characteristics of participants are shown in Table 1.

### *Factor structure*

After confirming the adequacy of the sampling based on the KMO and Bartlett's Test of Sphericity (KMO = 0.854 and  $\chi^2 = 2426.236$ ,  $p < 0.0001$ ), exploratory factor analysis performed and 8 factors emerged with eigenvalues of greater than 1, which accounted for 67.91% of the variance observed. Due to the low loading of some factors, and in accordance with the dimensions of the PRECEDE-PROCEED model, the number of factors was limited to 6, with a minimum factor loading of 0.4. Finally, 30 items were loaded in 6 factors representing the following dimensions: knowledge (4 items), attitude (5 items), self-efficacy (6 items), reinforcing factors (5 items), enabling factors (7 items), and behavior (3 items). The results are shown in Table 2. The final questionnaire and scoring manual are provided in additional files (Additional file 1, and 2, 3).

#### *Item-scale correlation matrix*

The correlation between items and their own subscales are presented in Table 3. As expected items belonging to a given factor showed a significantly higher correlation with its own subscale compared to other subscales.

#### *Reliability*

The Cronbach's (alpha) coefficient for the entire scale was 0.92 and ranged from 0.49 to 0.87 for various domains. The intraclass correlation coefficient (ICC = 0.97) also indicated that the questionnaire has satisfactory stability (Table 4).

## **Discussion**

The purpose of this study was to design and psychometrically appraise an instrument to measure occupational low back pain preventive behaviors among nurses. The initial items were originated and developed based on data from a qualitative study and review of the literature on studies of job-related low back pain in nursing personnel (16-19). In generating the statements we also considered the biopsychosocial characteristics for low back pain among the nursing professionals. It is argued that individuals, who experienced a problem, are the best ones to provide input on factors, which might be effective in imitation of a condition (20). In fact we have tried to ask nurses about factors, which might affect their low back pain in the framework of the PRECEDE-PROCEED model. Interestingly most participants completed the questionnaire without any hardness since they received it user-friendly.

There are two concepts of enabling factors and administrative policy diagnosis in the PRECEDE-PROCEED model. They refer to characteristics of the environment that assist the action and any skills or resources require to achieve specific behavior. Also, this could hamper or facilitate the development of a health program (9, 21). In the present study, both concepts were grouped into one category and named 'enabling factors'. Green and Kreuter believe these are important items and can lead to a behavior change (9).

The findings indicated that this questionnaire has appropriate validity and reliability and one of the features of this questionnaire is the fact that in addition to assessing knowledge it encompasses other dimensions including attitude and self-efficacy. Indeed, this questionnaire could measure knowledge, attitude, self-efficacy, reinforcing factors, enabling factors, and behaviors that all are theory-driven constructs.

In general there are three categories of risk factors for low back pain: personal, psychological and occupational factors (22). Thus the intricate nature and causes of low back pain necessitate using a multidimensional instrument when assessing low back pain. Indeed, the Occupational Back Pain Prevention Behaviors Questionnaire is a multidimensional instrument containing a set of constructs that collectively could indicate reasons for doing or not doing preventive behaviors as relates to occupational low back pain. These reasons are very important in improving health among different occupational groups, especially nursing personnel. Without understanding such reasons development of educational interventions almost is impossible.

Although this study had several strengths, there were some limitations. The most important limitation was the fact that nurses responded to the questionnaire at their worksite, so this might have affected their answers. Despite this limitation, the instrument had the optimal statistical properties regarding predictors for low back pain among the Iranian nursing staff.

## **Conclusion**

The Occupational Back Pain Prevention Behaviors Questionnaire is a valid and reliable instrument and now may be used for future studies.

## **List Of Abbreviations**

PRECEDE: Predisposing, Reinforcing, and Enabling Constructs in Educational/ Environmental Diagnosis and Evaluation.

PROCEED: Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development.

CVR: Content Validity Ratio

CVI: Content Validity Index

KMO: Kaiser-Meyer-Olkin

ICC: Intraclass Correlation Coefficient

## **Declarations**

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## **Ethics approval and consent to participate**

The Ethics Committee of Tarbiat Modares University approved the study. Informed consent was obtained from all participants.

## **Consent to publish**

Not applicable.

## **Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the corresponding authors on reasonable request.

## **Competing interests**

The authors declare that they have no competing interests.

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## **Authors' Contributions**

SSK was the main investigator, collected and analyzed the data, and wrote the first draft. SST supervised the study and contributed to writing process. AH helped in design and contributed to writing process. AM was the study advisor, contributed to analysis and interpretation, and provided the final draft. All authors read and approved the final manuscript.

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## Tables

**Table 1:** The characteristics of participants (n = 155)

<b>Gender</b> No (%)	
Female	129 (83.2)
Male	26 (16.8)
<b>Marital status.</b> No (%)	
Single	42 (27.1)
Married	113 (72.9)
<b>BMI.</b> No (%)	
Underweight (<18.5)	6 (3.9)
Normal weight (18.5–24.9)	77 (49.7)
Overweight (25–29.9)	60 (38.7)
Obese ( $\geq 30$ )	12 (7.7)
<b>Age.</b> Mean (5)	34.33 (7.42)
<b>Work experience.</b> Mean (SD)	9.81 (7.02)
<b>Work hours.</b> Mean (5)	47.42 (9.33)

**Table 2:** The result obtained from exploratory factor analysis with varimax rotation (n = 155)

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
1. What is low back pain?	-.199	<b>-.761</b>	-.157	-.008	-.012	-.020
2. Which item can increase low back pain?	.056	<b>.717</b>	.080	.108	.270	.073
3. What causes spinal damage?	.316	<b>-.405</b>	.179	.119	.125	-.236
4. What is the treatment for occupational low back pain?	.099	<b>-.584</b>	-.094	-.290	.021	.197
5. If I follow the back pain prevention practices during work, I can do my job in ease without delay.	.034	.008	.248	.288	-.091	<b>.735</b>
6. Establishing a respectful relationship with colleagues in the workplace helps to reduce stress and prevent low back pain.	.240	.124	.101	-.041	.170	<b>.591</b>
7. Training on low back pain prevention behaviors in nurses is a necessity.	-.091	.501	.097	.010	.155	<b>.483</b>
8. Performing low back pain prevention behaviors is one of my priorities.	.115	-.060	.253	.215	.059	<b>.736</b>
9. Lower back pain leads to a reduction in absenteeism.	-.060	.094	.203	.066	.204	<b>.616</b>
10. I can do the prevention behavior of low back pain in my workplace.	.167	.011	<b>.779</b>	.191	.122	.189
11. I can change the position in different situations to prevent low back pain (from standing to sitting and vice versa).	.089	-.090	<b>.716</b>	.295	.088	.316
12. I have the skill of doing low back pain prevention behaviors.	.215	.139	<b>.714</b>	-.020	.042	.228
13. I can manage stressful conditions in the workplace by working out a respectful relationship.	.164	.498	<b>.541</b>	-.145	.208	.105
14. With many works, I can devote some times for doing low back pain prevention behaviors.	.325	.033	<b>.638</b>	.344	.070	.208
15. Despite the restricted regulations, I can do the prevention of low back pain.	.185	.074	<b>.601</b>	.368	.169	.141
16. My colleagues encourage me to keep my spine healthy at work.	.141	-.168	.475	.338	<b>.318</b>	-.054
17. Providing a low-cost or discounted pool ticket and existence of bodybuilding at the workplace are encouraging factors in the prevention of low back pain.	.053	.039	.111	.497	<b>.596</b>	.090
18. Attractive educational programs for doing low back pain prevention in the workplace encourage me to do these behaviors.	.148	-.047	.119	.112	<b>.820</b>	.074
19. Getting a certificate and receiving rewards due to participation in a training program to prevent low back pain in the workplace encourages me to do these behaviors.	.104	.037	-.003	.100	<b>.819</b>	.090
20. Feeling good after having low back pain prevention behaviors will keep me from risky behaviors.	.292	.069	.313	-.056	<b>.690</b>	.130
21. The volume of my work is such	<b>.422</b>	.005	.420	.334	.088	.176

that I have the opportunity to undertake the prevention of low back pain.						
22. The rules and regulations at my workplace support the prevention of low back pain.	<b>.569</b>	.241	.438	-.040	-.020	.045
23. At my workplace, the presence of a sports hall helps to prevent back pain.	<b>.522</b>	-.249	.152	.271	.157	.093
24. In my workplace, equipment such as a chair for sitting between activities and a footstool next to the bed of the operating room helps prevent back pain.	<b>.627</b>	-.032	.131	.222	.137	.196
25. At my workplace, the educational needs of the nursing staff are planned and implemented in the executive management committee.	<b>.827</b>	.021	.105	.155	.100	-.023
26. At my workplace, in-person training on the prevention of low back pain treatment is applicable.	<b>.714</b>	-.032	.260	.258	.149	.070
27. At my workplace, training via social media on low back pain prevention behaviors is feasible.	<b>.827</b>	.079	.187	.055	.187	.030
28. During my work, I maintain the correct position of the spine, such as moving legs in a standing position and lifting heavy objects with the help of leg muscles.	.319	.286	.256	<b>.617</b>	.210	.175
29. I carry out special exercises for strengthening the muscles of the waist, abdomen, and thighs.	.237	-.054	.295	<b>.724</b>	.131	.239
30. By deep breathing and relaxing, I manage stress in my workplace.	.310	.212	.190	<b>.692</b>	.055	.122
<i>Eigenvalue</i>	9.68	3.38	2.46	1.94	1.48	1.40
<i>Variance observed (%)</i>	32.27	11.31	8.19	6.48	4.95	4.67

**Table 3:** Item-scale correlation matrix for the Occupational Back Pain Prevention Behaviors Questionnaire

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Knowledge 1	-0.32	<b>0.58**</b>	-0.26	-0.16	-0.22	-0.13
Knowledge 2	0.28	<b>0.48**</b>	0.24	0.24	0.33	0.18
Knowledge 3	0.32	<b>0.59**</b>	0.16	0.20	0.23	-0.07
Knowledge 4	-0.04	<b>0.57**</b>	-0.09	-0.15	-0.02	-0.04
Attitude 5	0.28	-0.02	0.45	0.41	0.17	<b>0.80**</b>
Attitude 6	0.24	-0.03	0.30	0.22	0.22	<b>0.62**</b>
Attitude 7	0.08	-0.16	0.30	0.21	0.20	<b>0.58**</b>
Attitude 8	0.34	0.05	0.47	0.41	0.28	<b>0.79**</b>
Attitude 9	0.16	0.05	0.37	0.30	0.29	<b>0.70**</b>
Self-Efficacy 10	0.50	0.06	<b>0.85**</b>	0.47	0.43	0.43
Self-Efficacy 11	0.45	0.07	<b>0.82**</b>	0.49	0.41	0.51
Self-Efficacy 12	0.44	0.05	<b>0.75**</b>	0.41	0.27	0.42
Self-Efficacy 13	0.32	-0.11	<b>0.61**</b>	0.30	0.31	0.33
Self-Efficacy 14	0.57	0.09	<b>0.81**</b>	0.59	0.38	0.43
Self-Efficacy 15	0.46	.071	<b>0.76**</b>	0.54	0.43	0.40
Reinforcing Factors 16	0.41	0.13	0.50	0.44	<b>0.63**</b>	0.21
Reinforcing Factors 17	0.31	-.019	0.35	0.46	<b>0.74**</b>	0.27
Reinforcing Factors 18	0.36	0.23	0.32	0.31	<b>0.83**</b>	0.22
Reinforcing Factors 19	0.29	0.19	0.22	0.29	<b>0.78**</b>	0.22
Reinforcing Factors 20	0.42	0.19	0.44	0.30	<b>0.72**</b>	0.29
Enabling Factors 21	<b>0.70**</b>	0.19	0.57	0.52	0.38	0.39
Enabling Factors 22	<b>0.72**</b>	0.11	0.53	0.37	0.24	0.27
Enabling Factors 23	<b>0.74**</b>	0.20	0.39	0.44	0.41	0.22
Enabling Factors 24	<b>0.73**</b>	0.09	0.40	0.45	0.34	0.28
Enabling Factors 25	<b>0.77**</b>	0.11	0.35	0.43	0.31	0.12
Enabling Factors 26	<b>0.80**</b>	0.07	0.49	0.51	0.42	0.26
Enabling Factors 27	<b>0.80**</b>	0.14	0.43	0.39	0.40	0.20
Behavior 28	0.55	-0.01	0.56	<b>0.84**</b>	0.50	0.41
Behavior 29	0.49	0.10	0.55	<b>0.89**</b>	0.43	0.43
Behavior 30	0.50	0.15	0.49	<b>0.87**</b>	0.34	0.34

\* Correlation is significant at 0.05 level.

\*\* Correlation is significant at 0.01 level.

**Table 4:** Cronbach's  $\alpha$  coefficient and ICC for the Occupational Back Pain Prevention Behaviors Questionnaire

	Number of items	Cronbach's $\alpha$ coefficient (n = 155)	ICC <sup>a</sup> (n = 20)
Knowledge	4	0.49	0.68
Attitude	5	0.75	0.98
Self-Efficacy	6	0.86	0.99
Reinforcing Factors	5	0.79	0.97
Enabling Factors	7	0.87	1
Behavior	3	0.84	0.96
Total scale	30	0.92	0.97

a. ICC: Intraclass correlation coefficient

## Additional Files

**Additional file 1:** The Occupational Back Pain Prevention Behaviors in English (doc)

**Additional file 2:** The Occupational Back Pain Prevention Behaviors in Persian (doc)

**Additional file 3:** Scoring manual for the questionnaire (doc)

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

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