

## Original Article

# Biopsychosocial Factors and Perceived Disability in Saleswomen with Concurrent Low Back Pain

Praneet PENSRI<sup>1</sup>, Prawit JANWANTANAKUL<sup>1</sup>,  
Puangsoi WORAKUL<sup>2</sup> and Thanesh SINSONGSOOK<sup>3</sup><sup>1</sup>Department of Physical Therapy, Faculty of Allied Health Sciences, Chulalongkorn University<sup>2</sup>Department of Psychiatry, Faculty of Medicine, Chulalongkorn University<sup>3</sup>Wellness Center, Samitivej Hospital, Bangkok, Thailand

**Objectives:** To quantify disability level in salespeople with concurrent low back pain (LBP) and to determine the relative associations between demographic, occupational, psychosocial and clinical factors and back disability. LBP is the most common cause of work-related disability in people under 45 years of age and the most expensive cause of work-related disability, in terms of workers' compensation and medical expenses. Evidence suggests high prevalence of LBP in salespeople.

**Methods:** A cross-sectional survey was conducted in which 184 saleswomen with a current episode of self-reported LBP working in a large up-scale department store filled out a battery of 6 self-administered questionnaires and received a standardised physical examination.

**Results:** Saleswomen with concurrent LBP had low disability levels. Factors significantly associated with disability were pain intensity, measured by a visual analogue scale, in the past week ( $p < 0.001$ ), physical and mental health status ( $p < 0.001$ ,  $p = 0.003$ , respectively), fear avoidance scores for both work and physical activities ( $p = 0.031$ ,  $p = 0.014$ , respectively), past history of LBP ( $p = 0.019$ ), and self-reported frequency of pushing or pulling objects placed in high positions during work ( $p = 0.047$ ). A significant level (45%) of the variance in disability status was explained by these variables.

**Conclusion:** In clinical management of LBP workers who required prolonged standing, such as salespeople, clinicians should look for modifiable risk factors associated with disability. Specific measures need to be taken to prevent disability due to LBP among salespeople.

**Key Words:** Occupational diseases, Risk factors, Functional status, Musculoskeletal disorders

## Introduction

One of Thailand's major tourist attractions is shopping. As a result, there are a considerable number of department stores in Thailand, particularly in Bangkok. A large number of sales-

people are employed by these department stores. The main responsibility of a salesperson is to service clients by providing information and recommendations about goods, finding items requested by clients, and proceeding with the purchase. Their job also involves ensuring that there is no shortage of goods on display and that the display of goods is well organized at any given time. They are often designated to oversee a small and particular shopping area in a department store. Due to job characteristics, salespeople are required to perform various physical activities including prolonged standing and manual handling tasks, such as lifting, carrying, pushing, and pull-

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**Correspondence to:** Prawit JANWANTANAKUL

Department of Physical Therapy, Faculty of Allied Health Sciences  
Chulalongkorn University, Bangkok 10330, Thailand

**Tel:** +66-2-218-3767, **Fax:** +66-2-218-3766

**E-mail:** prawit.j@chula.ac.th

ing. Because working as a salesperson in a department store requires no specific skill, most salespersons graduate below the Bachelor degree level. Salespersons usually receive low to moderate incomes, depending on the number of working hours and their sales performance. Salespersons' work conditions usually receive minimal attention with there being no specific measures or policies for preventing work-related injuries in place in Thailand.

A recent survey revealed that 34% of salespeople reported having low back pain (LBP) in the preceding 12 months [1]. LBP is the most common cause of work-related disability in people under 45 years of age and the most expensive cause of work-related disability in terms of workers' compensation and medical expense [2]. Despite the high prevalence, the level of disability in salespeople is unknown. It is important to identify the factors associated with disability, which may differ from those associated with the incidence or reporting of LBP. It has been reported that high disability scores on the Roland-Morris Disability Questionnaire (RDQ) are a prognostic indicator of poor long-term recovery from LBP, recurrence of LBP, and future sickness absence related to LBP [3,4]. Disability prevention has been suggested as a key objective in any program regarding LBP [5]. A standardized tool widely used to measure disability level associated with LBP is the original version of the RDQ [6]. Due to its validity, reliability, and responsiveness, the RDQ has been recommended for measuring disability in LBP research [7]. The specific aims of the study were to determine disability level and predictors of disability in saleswomen with concurrent LBP who were currently working.

## Materials and Methods

A cross-sectional study was conducted in convenience samples of salespeople worked in a large up-scale department store located in Bangkok. Saleswomen with a current episode of LBP were included in the study. The area of LBP was defined according to the standardized Nordic questionnaire [8]. Subjects were excluded if they had had < 1 year working experience in the current position or had had spinal surgery. Subjects with specific LBP (accidents, cancer, kidney disease, spinal infection, spinal fracture, inflammatory arthritis or had leg length discrepancy of > 2 cm) were also excluded. The study was approved by the University Human Ethics Committee.

To quantify disability level in salespeople with concurrent LBP and to determine the relative contributions of demographic, occupational, psychosocial, and clinical factors to back disability, subjects were asked to fill out a battery of 6 self-administered questionnaires and underwent a physical examination

conducted by physical therapists according to a standardized protocol. The questionnaires included:

1. A general questionnaire which gathered data on demographics, working conditions, and LBP characteristics. Demographic data included age, height, body weight, educational level, and frequency of weekly exercise sessions. Work condition data included average daily working hours and weekly working days as well as years of working experience. Participants were asked about average daily hours standing or walking with and without rest breaks, frequency of performing various physical activities during the work day, and height of shoes' heel worn during work. The questionnaire also asked participants to self-rate the work environment (including light intensity, noise level, temperature, size of work space, and air circulation). LBP characteristic data included pain intensity at the present and in the past week, evaluated by a visual analogue scale of pain intensity (VAS-I), symptom duration and frequency, work absenteeism, and past history of LBP.
2. Depression Screening Test. The test consisted of 15 yes/no questions assessing mood, cognitive behavior, and somatic components. Subjects are asked whether the statements apply to them during the preceding 2 weeks. The total score of the test ranges from 0 to 15. The higher the score is, the more a person should seek medical consultation [9].
3. Modified Work Adaptability, Partnership, Growth, Affection, Resolve (APGAR). The questionnaire consisted of 7 questions assessing social support by fellow workers and relationships with fellow workers. Each question was rated by the subject according to three categories (1 = almost always, 2 = some of the time, 3 = hardly ever) [10]. The Modified Work APGAR scores have a range of 0 to 10. Higher scores indicate lower social support and job satisfaction in the workplace [11].
4. Fear-Avoidance Beliefs Questionnaire (FABQ). The FABQ is a 16-item instrument containing two subscales: 7 items on fear avoidance beliefs about work and 4 items on fear avoidance beliefs about physical activity. Items are scored on a 7-point Likert scale with item responses ranging from 0 (completely disagree) to 6 (completely agree). The total score of the FABQ work scale ranges from 0 to 42 and the total score of the FABQ physical activities scale ranges from 0 to 24. In both subscales, higher scores represent more fear [12].
5. 12-item Short Form Health Survey (SF-12). The scores from the SF-12 yield two summary measures of health status: a physical component summary (PCS) and a mental component summary (MCS). The PCS and MCS scores

have a range of 0 to 100 and higher scores indicate a better status [13].

6. Roland-Morris Disability Questionnaire (RDQ-24). The RDQ-24 contains 24 yes/no items. Patients are asked whether the statements apply to them that day (the last 24 hours). The RDQ-24 score is calculated by adding up the number of “yes” items, ranging from 0 to 24, with higher scores indicating more severe disability [6].

The physical examination, which is commonly used by clinicians in LBP patients, included:

1. Straight leg raising test. The test is commonly used to examine the neurological tissue around the lumbar spine. With a subject in the supine position, an examiner passively flexed a subject’s hip with the knee extended until a subject felt pain, tingling, or strong stretching in the posterior aspect of the leg. The examiner then recorded the hip angle [14], which was then used in the data analysis.
2. Lumbar stability test. The test is used to assess the isometric contraction of abdominal and back muscles, which provide lumbar stability. A pressure sensor (Chattanooga, USA.) was placed between the L1 and S2 with a subject in the supine lying position to detect motion. A series of 7 exercises, which required increasing levels of muscular control of the lumbar spine for stability, was performed by each subject. The subject received a pass or fail for each exercise level based on the pressure gauge readings and the absence of movement compensations. The examiner recorded the highest exercise level that the subject attained [15], which was then used in the data analysis.
3. Spinal scoliosis. A subject was asked to flex forward, an examiner observed the spine from the “skyline” view. The examiner looked for a hump on one side and a hollow on the other, indicating spinal scoliosis [16] and, in the data analysis, the outcome was scaled into two groups (1 = Yes, 2 = No).
4. Spinal curve measurement using a flexicurve. While a subject stood relaxed, a flexicurve was pressed against a subject’s back so that the upper end of the flexicurve was set at the C7 spinous process and the lower end was placed at the lumbosacral joint level. The spinal curve from the flexicurve was then traced on paper and the indexes of thoracic and lumbar curvature were calculated according to Milne and Lauder [17]. Both kyphosis and lordosis indexes were then used in the data analysis.
5. Backache index (BAI). The test consisted of five active motions of the trunk in a standing position. An examiner made his assessment by means of a scoring system that in-

cludes pain factors obtained by asking the subject and combined with the stiffness estimation at the end of different lumbar motions. Each movement was scored on the 4-point scale. The sum of the five outcomes yields the BAI with a maximum of 15 points. A higher score indicates more restrictive spinal movement [18]. The BAI index was then used in the data analysis.

6. McKenzie extension test. A subject stood relaxed and was asked to concentrate on her current symptoms. The subject was then asked to extend her back as far as she could and return to the starting position. After the movement, the subject was asked to compare her symptoms during movement and at the baseline. The three possible responses were 1) the symptoms were worsened, 2) no change, and 3) improved [19]. In the data analysis, the outcome was scaled into three groups (1 = symptoms worsen, 2 = No change, 3 = symptoms improved).
7. Foot type and peak plantar pressure. The footscan<sup>®</sup> gait (RSscan INTERNATIONAL, Olen, Belgium), which is a pressure distribution measuring device, was used to assess foot type and peak plantar pressure during gait. A subject was asked to walk straight over the footscan<sup>®</sup> gait at her own pace. The foot was classified into one of seven types: heavy high arch foot, high arch foot, light high arch foot, normal foot, light flat foot, flat foot, and heavy flat foot [20]. Also, peak plantar pressure of the forefoot and rearfoot were recorded and the ratio of peak plantar pressure of rearfoot to forefoot was calculated [21,22]. These outcomes were then used in the data analysis.

Before data collection, the repeatability of physical examination outcomes was assessed on 21-31 saleswomen by testing each subject twice by two physical therapists. The intraclass correlation coefficient (ICC [1,1]) and Kappa coefficient were calculated for continuous and nominal/ordinal data, respectively. The results showed moderate (0.57) to very good (1.00) repeatability of the outcomes.

### Statistical analyses

First, a univariate analysis of all continuous variables was conducted to examine the relationships between each variable and disability level. For dichotomous variables, dummy variables were constructed before performing a univariate analysis. Second, stepwise multiple linear regression models were employed to define the combinations of variables that might be associated with disability. All dichotomous variables and any continuous variables with a p-value < 0.05 in the univariate analysis were entered in Step 1. The assumption of co-linearity was assessed

by inspection of tolerance values. However, no evidence of collinearity breach was found. The independent variables were correlated with all  $r < 0.4$ . To assess how well the linear combination of variables in the multiple regression analysis predict disability, a multiple correlation ( $R$ ), a squared multiple correlation ( $R^2$ ), and an adjusted squared multiple correlation ( $R^2_{adj}$ ) for all regression models were reported in conjunction with  $F$  and the corresponding significance level. Unstandardised regression coefficients, standardized regression coefficients,  $t$ ,  $p$ -value, and partial correlation were also reported for each model to demonstrate the relative importance of individual predictors. All statistical analyses were performed using the SPSS statistical software, version 17.0 (SPSS Inc, Chicago, IL, USA).

## Results

A total of 184 saleswomen participated in the study. Table 1 presents the general characteristics of the study population. A small number of saleswomen reported frequent sitting (17%), leaning forward (22%), pushing or pulling objects placed in high positions (24%), turning a body in a narrow space (29%), lifting heavy objects (21%), and climbing stairs (14%) during the work day. Sixty-five per cent of participants frequently performed repetitive tasks during work. Table 2 displays LBP characteristics and disability level of participating saleswomen.

**Table 1.** Characteristics of study population

Characteristics	n (%)	Mean (SD)
Age (years)	184	28.8 (6.0)
Body mass index (kg/m <sup>2</sup> )	184	22.2 (4.0)
Education	183	
Primary school	8 (4)	
Secondary school	97 (53)	
College	27 (15)	
Bachelor's degree	39 (21)	
Others	12 (7)	
Year of work experience (years)	173	4.9 (4.0)
Weekly working days (days per week)	167	6.1 (0.3)
Daily working hours (hours per day)	171	9.6 (2.6)
Daily hours required to stand or walk with rest breaks (hours per day)	174	9.0 (3.0)
Daily hours required to stand or walk without rest breaks (hours per day)	172	6.0 (3.1)

SD: standard deviation.

Table 3 gives the number and mean/per cent of participants in each of the risk factors.

In the univariate analysis, nine continuous variables were significantly associated with disability level, including years of work experience ( $p = 0.044$ ), pain intensity at the present ( $p < 0.001$ ) and in the past week ( $p < 0.001$ ), depression score ( $p = 0.001$ ), FABQ score ( $p < 0.001$  for both work and physical activities), SF-12 score ( $p < 0.001$  for PCS and  $p = 0.007$  for MCS), straight leg raising ( $p = 0.027$  for right side and  $p = 0.024$  for left side), thoracic kyphotic curve ( $p = 0.015$ ), and backache index ( $p < 0.001$ ).

In the stepwise linear regression model, the variables significantly associated with greater disability were pain intensity in the past week, SF-12 score (both PCS and MCS), FABQ score (both work and physical activity), past history of LBP, and frequency of pushing or pulling objects placed in high positions (Final Model,  $R = 0.67$ ,  $R^2 = 0.45$ ,  $R^2_{adj} = 0.43$ ,  $F = 20.46$ ,  $df = 7$ ,  $p < 0.001$ ) (Table 4).

**Table 2.** Low back pain characteristics and disability level of participating salespeople

Measure	n (%)	Mean (SD)
Characteristics of low back pain		
Current pain intensity (VAS-I)	184	3.4 (2.4)
Pain intensity in the past week (VAS-I)	184	4.0 (2.4)
Duration of low back pain	166	
≤ 6 weeks	67 (40)	
> 6 weeks to ≤ 3 months	39 (24)	
> 3 months	60 (36)	
Constant/Intermittent symptoms	171	
Constant	19 (10)	
Intermittent	152 (90)	
Work absenteeism	180	
Yes	24 (13)	
No	156 (87)	
Past history of LBP	184	
Yes	119 (65)	
No	65 (35)	
Disability level		
RDQ-24 score	184	4.5 (3.9)

SD: standard deviation, VAS-I: visual analogue scale of pain intensity, LBP: low back pain, RDQ-24: roland-morris disability questionnaire.

**Table 3.** The number and mean/per cent of participants in each of the risk factors

Measure	n (%)	Mean (SD)
Depression score	184	7.2 (3.8)
APGAR score	184	4.3 (2.7)
FABQ work score	184	24.7 (12.3)
FABQ physical activity score	184	17.5 (6.4)
SF-12 score		
Physical component summary	184	43.7 (6.3)
Mental component summary	184	44.1 (8.4)
Perception of work environment - Agree with the following sentences	180	
Light intensity in the workplace is good	136 (76)	
Noise level in the workplace is not too loud	28 (16)	
Temperature in the workplace is appropriate	74 (41)	
Air circulation in the workplace is good	76 (42)	
Size of work space is appropriate	86 (48)	
SLR (degrees)		
Right	184	69.0 (14.9)
Left	184	69.2 (14.6)
Lumbar stability test	184	
Level 0	15 (8)	
Level 1	82 (45)	
Level 2	66 (36)	
Level 3	20 (10)	
Level 4	1 (1)	
Level 5	0 (0)	
Level 6	0 (0)	
Thoracic or lumbar scoliosis	184	
Yes	89 (48)	
No	95 (52)	
Spinal curve measurement (cm)		
Kyphosis index	184	6.7 (2.7)
Lordosis index	184	15.3 (3.1)
Backache Index	184	4.0 (3.3)

**Table 3.** Continued

Measure	n (%)	Mean (SD)
McKenzie extension test	184	
Symptoms worsen	111 (60)	
No change	68 (37)	
Symptoms improved	5 (3)	
Heel height shoes worn during work	180	
< 2.5 cm	114 (63)	
2.5-5 cm	53 (30)	
> 5 cm	13 (7)	
Foot type classification - Right side	182	
Heavy high arch foot	3 (2)	
High arch foot	3 (2)	
Light high arch foot	70 (38)	
Normal foot	97 (53)	
Light flat foot	9 (5)	
Flat foot	0 (0)	
Heavy flat foot	0 (0)	
Foot type classification - Left side	184	
Heavy high arch foot	8 (4)	
High arch foot	23 (12)	
Light high arch foot	1 (1)	
Normal foot	115 (63)	
Light flat foot	37 (20)	
Flat foot	0 (0)	
Heavy flat foot	0 (0)	
Peak plantar pressure - Right side (N/cm <sup>2</sup> )		
FPPP	184	14.1 (9.2)
RPPP	184	14.8 (8.8)
RPPP : FPPP ratio	184	1.1 (0.7)
Peak plantar pressure - Left side (N/cm <sup>2</sup> )		
FPPP	184	10.1 (9.9)
RPPP	184	15.1 (9.2)
RPPP : FPPP ratio	184	1.6 (0.8)

SD: standard deviation, APGAR: modified work adaptability, partnership, growth, affection, resolve, FABQ: fear-avoidance beliefs questionnaire, SF-12: 12-item short form health survey, SLR: straight leg raising, FPPP: forefoot peak plantar pressure, RPPP: rearfoot peak plantar pressure.

**Table 4.** Results of stepwise multiple linear regression model for the association between variables and disability attributed to low back pain in saleswomen (n = 180)

Independent variables	B	SE	$\beta$	t	p-value	Partial correlation
(Constant)	9.50	2.66	-	3.58	< 0.001	-
Pain intensity in the past week	0.46	0.10	0.30	4.75	< 0.001	0.34
SF-12 score (PCS)	-0.16	0.04	-0.26	-4.15	< 0.001	-0.30
SF-12 score (MCS)	-0.08	0.03	-0.18	-2.99	0.003	-0.22
FABQ score (physical activity)	0.08	0.04	0.14	2.17	0.031	0.16
FABQ score (work)	0.05	0.02	0.16	2.47	0.014	0.19
Having past history of LBP	1.10	0.46	0.14	2.37	0.019	0.18
Frequency of pushing/pulling objects placed in high positions during work	1.06	0.53	0.12	2.00	0.047	0.15

B: unstandardized coefficient, SE: standard error,  $\beta$ : standardized coefficient, PCS: physical component summary, MCS: mental component summary, LBP: low back pain.

## Discussion

This is the first study investigating disability level and the relative associations between biopsychosocial factors and back disability in workers who required prolonged standing, such as salespeople, with concurrent LBP. In the present study, several clinical risk factors were also taken into consideration for their contribution to back disability. The majority of saleswomen who participated (60%) had either sub-acute or chronic LBP. The present study revealed that saleswomen who participated in this study had only low levels of disability, and a significant 45% of the variance in disability status was explained by pain intensity in the past week, physical and mental health status, fear avoidance beliefs, past history of LBP, and frequency of pushing or pulling objects placed in high positions during work.

In Thailand, a greater number of saleswomen work in department stores compared to their male counterparts, which has also been reported in department stores in other countries [23,24]. Saleswomen in the present study were relatively younger than those in the previous study [24]. Because their income is partly dependent on the number of working hours, salespersons in our study were willing to work longer hours to earn more. As a result, saleswomen in Thailand worked on average 58.5 hours per week while salespersons in the U.K. reportedly worked an average of 38-40 hours per week [24].

Disability level among saleswomen in this study is in contrast with that of Turner et al. [25] who reported moderate levels of disability (the mean RDQ score = 12.7/24) for those workers submitting work compensation claims for work-related

back pain. The discrepancy may be due to the difference in subject characteristics. In the previous study, the sample was comprised of workers who ceased working because of their LBP condition while in the present study saleswomen still continued their work. Workers who keep working should have low disability levels because it would be difficult for them to remain productive with high disability levels [26], particularly in physically demanding jobs.

Risk factors associated with disability differed from those associated with the prevalence of LBP. Factors associated with the prevalence of LBP mainly were work-related physical factors, such as daily hours standing or walking without rest breaks and frequency of working in static postures [27]. Waddell [28] proposed that pain and disability are different entities but inextricably linked. Several factors influence pain and disability, and each should be separately assessed. Our findings confirm this notion that the presence of LBP is mainly associated with work-related physical factors, which are theoretically able to cause tissue injury. While the ability to perform physical activities after having LBP is not necessarily associated with work-related physical factors. The results indicate that a set of individual (pain intensity in the past week, past history of LBP, and perceived physical health status), work-related (frequency of pushing or pulling objects placed in high positions during work), and psychosocial factors (fear avoidance beliefs and mental health status) is responsible for disability in salespeople with LBP.

Those who experienced greater disability had high pain intensity in the past week. Turner et al. [29], in their systematic review, found that greater pain intensity was one of the most

frequently identified predictors of chronic work disability. It is reasonable to expect that saleswomen, whose jobs are physically demanding, with high level of pain intensity would experience more limitation in performing activity of daily living and work.

A significant relationship between a past history of LBP and score on the RDQ is in accordance with previous studies [30]. McGill et al. [31] found abnormal motor control, particularly the control of spinal stability, in workers with a past history of LBP. Burdorf and Jansen [32] indicated that persons with a past history of LBP were more likely to withstand less physical loads than their counterparts with no past history of LBP. Waddell and Burton [33] reported that previous history of LBP was highly predictive of persistent symptoms. One hypothesis explaining the findings is that movement impairment due to LBP and persistent symptoms lead to disability.

Those who frequently performed pushing or pulling objects placed in high positions during work had higher RDQ scores than those who occasionally and seldom did so. Such activities demand extensive contraction of trunk muscles and, consequently, leads to considerable compression on intervertebral discs [34]. In addition, contraction of the abdominal muscles to prepare the body for the expected disturbance to postural equilibrium and spinal stability provoked by the reactive forces resulting from movement is required before shoulder movement [35]. Therefore, repetitive performing of pushing or pulling objects placed in high positions would cause substantial muscle fatigue. Evidence shows that workers who frequently perform such activities are susceptible to recurrent or chronic LBP [36]. Having pain may lead to the limited ability to perform physical activity.

Perceived disability was significantly predicted by fear-avoidance beliefs, which is in line with previous studies [5,37]. Turner et al. [25] found that workers with high work fear-avoidance had 4.6 times higher odds of being on work disability at 6 months than those with very low fear-avoidance. Educational interventions aimed at reducing negative attitudes and beliefs that mediate avoidance behaviour have been found to reduce LBP-related absence from work [38].

Physical and mental health status was significantly related to disability level. Studies investigating the influence of health status on disability level in LBP are in accordance with the current study [39,40]. LBP may deteriorate physical and mental health, consequently leading to disability. On the other hand, it is possible that poor physical and mental health status is a result of disability. Persons with disability may perceive their physical health to be poorer than healthy persons. As time passes and disability remains, persons may lose hope for a 'cure' and

become bitter, angry, and less forgiving of self and others [41], consequently worsening their mental health status.

The fact that the clinical factors evaluated in this study are only minimally responsible for variance in disability status is not a surprising finding. It is possible that the accuracy of the several physical examination tests employed may not have been sensitive enough to detect subtle differences, although moderate to very good reliability has been reported. Also, we only examined a select group of clinical factors. Other important clinical factors may be identified in future work.

The major strength of this study is the evaluation of several clinical factors for their contribution to back disability. The information regarding the relative associations between demographic, occupational, psychosocial, and clinical factors and back disability would be useful for clinicians in decision making regarding minimizing disability due to LBP in their patients. However, the current study has several weak points. First, a small number of salespeople participated in this study. Nevertheless, their characteristics were very similar to a larger sample of salespeople ( $n = 1,189$ ) who participated in our previous study [2]. For example, years of work experience (4.9 vs 5.4 years), weekly working day (6.1 vs 6.0 days per week), daily working hours (9.6 vs 10.2 hours per day), and daily hours standing or walking without rest breaks (6.0 vs 5.4 hours per day) are similar between the studies. Second, the use of a non-standardized translation method of the FABQ may have led to potential bias. The degree to which the data are inaccurate because of reporting error is unknown. A future study should attempt to re-examine the effect of fear-avoidance beliefs on disability level in salespeople using a standardized tool. Third, this study may be susceptible to the "healthy worker effect". Salespeople suffering from musculoskeletal injury due to work may move on to other jobs and therefore would have been missed during the sampling process in the present study. On the other hand, those workers remaining may be those who experience only mild to moderate levels of disability, which are not enough to warrant leaving or changing the job. Considering the low mean RDQ score in the sample of this study, this is certainly a possibility. Lastly, the cross-sectional study design only allows the association between exposure and outcome to be examined. It is not possible to establish a causal relationship between exposure and outcome. Therefore, a prospective study design is required to validate the findings of this study.

## Conclusions

The current study found that salespeople who continue working appear to have low disability levels and several biopsychosocial

social factors are significantly related to perceived disability due to LBP. These factors included pain intensity in the past week, physical and mental health status, fear avoidance beliefs, past history of LBP, and frequency of pushing or pulling objects placed in high positions during work. The results indicate that a set of individual, work-related, and psychosocial factors, rather than solely psychosocial factor, is responsible for disability due to LBP in those with physically demanding job. Despite the limitations of this study, it is recommended that, in clinical management of LBP workers who required prolonged standing, such as salespeople, clinicians should look for risk factors identified in the current study in their patients. Presence of such factors should prompt efforts from clinicians to correct them in order to minimize disability due to LBP. Because most factors are potentially modifiable, they offer promising targets for prevention measures. One specific measure or policy to prevent disability due to LBP is an education program on how to properly deal with an episode of LBP with an emphasis on a reduction of negative attitudes and beliefs. The introduction of an assistive device to help salespeople in pushing or pulling objects placed in high positions may prove to be useful. Further research on the effectiveness of measures to minimize disability due to LBP among salespersons in department stores should be conducted.

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## Competing Interests

No commercial party with a direct financial interest in the results of the research supporting this article has or will confer a benefit upon the author(s) or upon any organization with which the author(s) is/are associated.

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