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Fear-Avoidance Beliefs and Clinical Outcomes for Patients Seeking Outpatient Physical Therapy for Musculoskeletal Pain Conditions

The fear-avoidance model (FAM) of musculoskeletal pain describes a psychological process for the development of chronic pain syndromes.[21] The FAM suggests that, following musculoskeletal injury, there are 2 potential recovery pathways, depending on the presence of negative affect, threatening-illness information, pain catastrophizing, fear of pain, and pain anxiety.[21] When these psychological factors are not engaged by patients, a normal recovery is expected. However, when elevated, these psychological factors increase the potential for avoidance and escape behaviors that may lead to chronic musculoskeletal pain syndromes.[21]

STUDY DESIGN: Prospective cohort.

OBJECTIVE: To investigate fear-avoidance beliefs across different anatomical regions for patients with musculoskeletal pain.

BACKGROUND: Fear-avoidance beliefs were first widely studied in patients with low back pain. The early results of studies involving patients with cervical spine, knee, and shoulder disorders suggest that fear-avoidance beliefs have the potential to influence pain and function in different anatomical regions. However, very few prospective studies of fear-avoidance beliefs involve multiple anatomical regions.

METHODS: The sample of this study consisted of 313 patients (mean age, 45.5 years; 115 males, 198 females) seeking outpatient physical therapy for cervical spine (n = 63), upper extremity (n = 58), lumbar spine (n = 79), or lower extremity (n = 113) complaints. During the intake session, patients completed the Fear-Avoidance Beliefs Questionnaire physical activity scale (FABQ-PA), modified for the appropriate anatomical location. Patients also rated pain intensity and function on the Therapeutic Associates Outcomes System (TAOS) Functional Index at intake and discharge. The collection of treatment-related parameters included the number of visits, calendar days of physical therapy, and treatment received. FABQ-PA scores were compared across anatomical regions. Elevated FABQ-PA scores and anatomical regions were also investigated for association with intake pain and function, clinical outcomes, and treatment utility parameters.

RESULTS: Similar FABQ-PA levels were observed across the 4 anatomical regions ($P>.05$). Number of visits, calendar days of physical therapy, and treatment received did not differ between elevated and lower fear-avoidance belief levels ($P>.05$). Findings for pain intensity and function were similar for each anatomical region. Patients with elevated fear-avoidance beliefs had higher intake scores ($P<.05$), larger improvements ($P<.05$), but similar discharge scores ($P>.05$), compared to those with lower fear-avoidance beliefs.

CONCLUSION: These data suggest that, in patients with cervical, upper extremity, lumbar, or lower extremity complaints, fear-avoidance beliefs may have a similar influence on intake and change scores for pain intensity and function. General assessment of fear-avoidance beliefs using the FABQ-PA, especially to predict change scores, may be appropriate for use in patients with various musculoskeletal pain conditions. *J Orthop Sports Phys Ther 2011;41(4):249-259, Epub 18 February 2011. doi:10.2519/jospt.2011.3488*

KEY WORDS: cervical spine, chronic low back pain, pain intensity, upper extremity

Fear-avoidance beliefs are a clinical aspect of the FAM that has been previously studied in patients with low back pain.[8,11,13,14,33,35] In cross-sectional studies, patients with elevated fear-avoidance beliefs were more likely to have higher pain and disability scores, even in multivariate analyses that control for potential confounding factors.[14,35] In longitudinal studies, patients with elevated fear-avoidance beliefs were more likely to not return to work[8] and to experience poor treatment outcomes following physical therapy episodes.[11,13] Collectively, these studies support the clinical application of the FAM for patients with low back pain.

Recent studies of the FAM have considered other musculoskeletal pain conditions. In studies of cervical pain conditions, fear-avoidance beliefs were associated with pain and disability[5,12] and also predictive of 12-week disability outcomes.[20] In studies of upper extremity conditions, fear of pain and reinjury was associated with shoulder disability

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following induced delayed-onset muscle soreness[9] and in those seeking physical therapy treatment.[22] Fear of pain and reinjury was associated with function for patients in the return-to-sports phase of rehabilitation following anterior cruciate ligament reconstruction,[3] and also with self-report of disability in patients with foot and ankle pain.[23] In other studies for lower extremity conditions, fear-avoidance beliefs were associated with self-report of knee function in patients with knee osteoarthritis[32] and were predictive of pain and function outcomes in patients with patellofemoral pain.[29] Collectively, these studies suggest that the FAM is not specific to low back pain and may have clinical applications for a variety of musculoskeletal pain conditions.

There is consistent evidence to support the FAM's relevance for musculoskeletal conditions, but there are also some important, unresolved issues to consider. First, in anatomical locations other than the lumbar spine, most of the previously cited studies have been cross-sectional, thus have not assessed temporal relationships. Though available studies suggest the predictive ability of fear-avoidance beliefs for cervical and lower extremity regions,[20,29] more prospective studies are needed. Second, studies of other anatomical locations to date have not included different categories of musculoskeletal pain within the same cohort. For example, the association of fear-avoidance beliefs with disability appeared weaker in patients with cervical spine pain than in those with lumbar spine pain[5,12]; however, this conclusion was not based on direct comparison. Studies directly comparing patients in the same treatment setting are needed to make firmer conclusions about the role of fear-avoidance beliefs in patients with different musculoskeletal conditions.

The purpose of the current study was to address this need by examining the influence of fear-avoidance beliefs across 4 anatomical regions in patients seeking treatment for musculoskeletal pain at a single outpatient physical therapy setting. Our first aim was to determine if fear-avoidance beliefs scores, or rates of elevated fear-avoidance beliefs, differed across anatomical regions of musculoskeletal pain. Our second aim was to determine if fear-avoidance beliefs contributed to intake pain intensity and function levels for each anatomical region, both alone and in multivariate regression models. Our third aim was to determine the relative influence of fear-avoidance beliefs and anatomical region on the treatment parameters (calendar days in physical therapy, number of physical therapy visits, and specific treatment received), as well as on clinical outcomes (pain intensity and function). Our overall hypotheses were that (1) there would be similar fear-avoidance beliefs across the 4 anatomical regions and (2) elevated fear-avoidance beliefs would be associated with increased intake pain intensity, decreased intake function, increased treatment parameters, and poor clinical outcomes.

METHODS

Design Overview

This prospective study consisted of intake and discharge assessments of patients who sought treatment of musculoskeletal pain at an outpatient physical therapy clinic. The intake assessments took into account fear-avoidance beliefs for all anatomical regions, and elevated fear-avoidance level was then investigated as an influence on clinical outcomes and treatment parameters. Treating physical therapists were not blinded to intake fear-avoidance beliefs scores, and all discharge assessments were done by self-report. Due to the fact that all data were collected as part of a routine clinical practice and deidentified before analysis, this study was exempt from approval from The University of Florida Institutional Review Board, and patients were not required to provide informed consent.

Patients

Data were collected from February 1, 2009 to June 1, 2010, during the clinical visits of a consecutive sample of patients who sought physical therapy treatment at an outpatient clinic in Portland, OR. The criteria for patient data to be included in this analysis were that musculoskeletal pain had to be the primary reason for seeking treatment (as determined by patient report and verified by the treating physical therapist), the patient treatment episode had to be completed by June 1, 2010, thus provide discharge outcome data as well as intake data, and participants had to be able to read and speak English, so as to complete the self-report questionnaires. Patient data were excluded from the analysis if the patients were not seeking treatment for musculoskeletal pain, reported no pain at intake, or reported multiple sites of musculoskeletal pain.

Measures

Demographic data, including age and sex, were collected at intake. Also collected at intake were clinical data, including duration of symptoms (days from onset to physical therapy examination) and anatomical region (cervical, upper extremity, lumbar, or lower extremity), as determined by the primary musculoskeletal complaint that led the patient to seek physical therapy services. These data were taken during the initial examination, when the treating clinician verified the body part affiliated with the primary complaint that was to be the focus of physical therapy treatment.

Fear-Avoidance Beliefs All eligible patients completed the Fear-Avoidance Beliefs Questionnaire (FABQ) at intake. The wording of the original FABQ, which was designed for patients with low back pain,[35] was modified to address the respondent's specific musculoskeletal pain condition. For example, for a patient with a complaint of cervical pain, administrative staff modified the FABQ by replacing the word "back" with "neck." Though we did not assess the psychometric properties of these modifications, the validity of similar modifications to the FABQ has been reported in prior studies of musculoskeletal pain.[5,12,29,32] The FABQ contains 2 scales: a 7-item FABQ work scale (FABQ-W; range, 0 to 42) and a 4-item FABQ physical activity scale (FABQ-PA; range, 0 to 24). Patients indicate their responses on a 7-point Likert scale, ranging from "completely disagree" to "completely agree." Higher scores indicate higher levels of fear-avoidance beliefs for both FABQ scales. The FABQ-PA was the focus of the current study, because it has been the most commonly reported scale in studies of other anatomical regions.[5,12,29,32] Furthermore, in a recent psychometric analysis,[16] elevated FABQ-PA scores were found to be similar across different diagnostic categories. Examples of items from the FABQ-PA are "Physical activity makes my pain worse" and "I should not do physical activities which (might) make my pain worse." The score on the FABQ-PA was used 2 ways in this study: as a total score (continuous variable) and, when 15 or greater, as an operationally defined "elevated score" (categorical variable).[16]

Treatment Parameters The duration of treatment episode (number of calendar days between intake and discharge) and visits to rehabilitation (number of visits) were collected at discharge. Treatment received was collected from the Current Procedural Terminology (CPT) codes. Only the most commonly billed codes were included in this study: therapeutic exercise (97110), manual therapy (97140), and modality use (combined ultrasound [97035], and electrical stimulation [97014]). These codes were reported in total units billed for the physical therapy episode.

Outcomes Two clinical outcome measures were included in these analyses. A visual analog scale (VAS), an accepted outcome measure for pain intensity,[28,30] was used by patients to rate their pain intensity at intake and discharge. Patients were asked to indicate their current pain intensity on the VAS by marking a 10-cm line ranging from 0 ("no pain") to 10 ("worst pain imaginable"). The subsequent distance was then measured. Patients also provided a self-report of function at intake and discharge with the Therapeutic Associates Outcomes System (TAOS) Functional Index,[31] which measures function by combining 5 functional activities specific to anatomical location of pain with 5 functional activities appropriate for all anatomical locations. For example, a patient with cervical spine pain would rate function for concentration, headaches, reading, driving, and lifting, while a patient with upper extremity pain would rate function for carrying, dressing, reaching, driving, and lifting. In addition, both of these patients would rate function for walking, work, personal care, sleeping, and recreation activities. Each functional activity has a numeric rating from 0 to 5, with 0 representing the lowest level of function and 5 representing the highest level of function. The TAOS Functional Index is scored by summing these activities, and the score is typically reported as a percentage ranging from 0% (lowest possible function) to 100% (highest possible function).[31]

Clinical Environment

The physical therapy clinic where these data were collected specializes in orthopaedic manual physical therapy. All 4 physical therapists involved in this study were either fellowship trained in orthopaedic manual therapy (n = 1), currently enrolled in a fellowship program (n = 2), or performing coursework in preparation for entry into a fellowship program (n = 1). All physical therapists had received, or were currently receiving, training through the same fellowship program, which emphasizes differential diagnosis, regional interdependence, and specific biomechanical assessment and treatment. One therapist had received board certification in orthopaedics from the American Physical Therapy Association. At the start of their employment at this clinic, physical therapists receive a 40-hour orientation training that emphasizes quadrant scanning and development of a working hypothesis and preparation work on clinical reasoning.[6,19] New physical therapists are required to begin a manual therapy fellowship program in their first 2 years of employment and to receive 24 hours of supervised, one-on-one mentorship during their first year of employment. Furthermore, physical therapists in this environment are required to take a minimum of 30 hours of continuing education annually, either in orthopaedic manual physical therapy coursework or in treatment of chronic pain. Four physical therapists (1 male and 3 females), with an average of 5.8 years (range, 1-13 years) of clinical experience, were involved in the study. Three were DPT trained at entry level and 1 was MPT trained.

Treatment Procedures

The participating physical therapists who evaluated the patients were given the scored FABQ-PA and general information about the FAM. They were given further instruction on how to interpret the FABQ-PA scores, including confirmation of the score through the subjective examination, as well as potential treatment strategies to manage those with elevated fear-avoidance beliefs. For example, they were instructed to treat as usual but to keep in mind that those patients with higher fear-avoidance beliefs might benefit from more active approaches. In addition to these general guidelines, participating physical therapists used their own professional judgment and clinical reasoning to treat their patients. They were also provided with reference materials for describing pain physiology to patients and encouraged to use these materials.[2,25-27] However, a standardized approach to pain education was not utilized in the clinic.

In general, evaluation appointments for each new patient lasted for 1 hour. Once a physical therapist reviewed the intake paperwork, including the FABQ-PA, a patient history and physical examination were performed. Tailored to the specific complaints of the patient, these could include red flag screening, a quad-

TABLE 1 Intake Characteristics for Patients Seeking Outpatient Physical Therapy for Musculoskeletal Pain

Variable	Outcomes
Age, y*	45.5 ± 14.8
Sex	
Male, n (%)	115 (36.7)
Female, n (%)	198 (63.2)
Anatomical region	
Cervical spine, n (%)	63 (20.1)
Upper extremity, n (%)	58 (18.5)
Lumbar spine, n (%)	79 (25.2)
Lower extremity, n (%)	113 (36.1)
Symptom duration	
Median days, d (interquartile range)	64.0 (21.0-212.5)
Fear-avoidance beliefs	
FABQ-PA score on 0-24 scale*	13.1 ± 6.1
Elevated FABQ-PA score, n (%)†	134 (42.8)
Pain intensity	
Rating on 0-10 scale*	3.8 ± 2.4
Function	
Score on 0-100 scale*	72.0 ± 16.7

Abbreviation: FABQ-PA, Fear-Avoidance Beliefs Questionnaire physical activity scale.
**Values are mean ± SD.*
†Elevated FABQ-PA score defined as a score of 15 or higher.

rant examination, and a detailed biomechanical examination, as appropriate.[6,19] Physical therapists then worked directly with patients during each subsequent visit, which sessions lasted approximately 40 minutes. No standardized or protocol-driven treatments were provided, as all programs were patient centered and customized for each patient's specific needs, which included consideration of the patient's level of fear and anxiety. At each visit, patients were treated with therapeutic exercise, manual therapy, education, and/or modalities. Although not directly monitored as part of this study, among the common manual therapy techniques utilized were peripheral joint mobilization and manipulation, spinal joint mobilization and high-velocity low-amplitude thrust manipulation, deep transverse-friction massage, manual spinal traction, muscle energy techniques, contract-relax techniques, and positional release. Furthermore, patient education was customized based on injury, pain, and individual activity demands. Typical education topics included extensive ergonomic assessments and modifications, posture recommendations, sleeping postures, pain modulation strategies, graded home exercises, graded-exposure techniques, return-to-work strategies, breathing training, self-treatment, relaxation strategies, pacing, and pain physiology education. Education was incorporated into each visit and the overall goal was to empower patients to self-manage their condition by providing information about triggers for pain and the best ways to approach and control pain.[2,24,25,27] A secondary goal of this education was to reduce the threat value of pain and to embrace pain as a guide to healing and, ultimately, recovery.[2] At most visits, patients were issued written, illustrated instructions for their education and home exercise program. We have provided this treatment information for descriptive purposes. General treatment guidelines were followed, but no standard programs were used.

Data Analysis

All analyses were completed with SPSS Version 17.0 statistical software (SPSS Inc, Chicago, IL). The alpha level was set at .01, due to the number of planned analyses. Descriptive analyses were generated and reported in the appropriate metric for continuous and categorical data.

First Aim Mean FABQ-PA scores were compared by anatomical region using an analysis of variance (ANOVA). The percentage of patients with an elevated fear-avoidance score (an FABQ-PA score of 15 or greater) was compared by anatomical region with chi-square analysis.

Second Aim Differences in intake pain intensity and functional levels by elevated fear-avoidance and anatomical region were first investigated by ANOVA and Bonferroni post hoc testing, as appropriate. This was to determine if FABQ-PA score and anatomical region were main effects or had potential for interaction effects on the pain and function measures. An interaction effect was the primary focus of these analyses, because that would imply a differential effect of fear-avoidance beliefs based on anatomical location. The influence of FABQ-PA score on intake pain intensity and functional level was further investigated by hierarchical multiple regression. Consistent with the primary aim of this study, individual regression models were created by anatomical region, so that the contribution of fear-avoidance beliefs could be calculated separately. The first step of the regression model included demographic and clinical variables (age, sex, and duration of symptoms), and the second step included the FABQ-PA score. Separate regression models were created for each anatomical region, using the dependent variables of intake pain intensity and function.

Third Aim Differences in treatment parameters by elevated fear-avoidance and anatomical region were first investigated by ANOVA and Bonferroni post hoc testing, as appropriate. In these univariate analyses, duration of treatment episode (calendar days), number of visits, and type of treatment received were the dependent variables. The influence at discharge of fear-avoidance beliefs on pain intensity ratings and functional status scores was further investigated by repeated-measures ANOVA, with FABQ-PA score (elevated or not) and anatomical region (cervical, upper extremity, lumbar, and lower extremity) as the between-subject factors, and assessment (intake and discharge) as the within-subject factor. Separate repeated-measures ANOVA models were run for pain intensity and function, and Bonferroni post hoc testing was used as appropriate. Again, an interaction effect was the primary focus of these analyses, as that would imply a differential effect of fear-avoidance beliefs based on anatomical region.

RESULTS

A total of 672 patients with complaints of musculoskeletal pain sought treatment at the clinic from February 1, 2009 until June 1, 2010. For the current analysis, data from 10 patients were excluded due to report of multiple sites of musculoskeletal pain as the primary complaint and data from 128 were excluded for not having their treatment episodes completed by June 1, 2010. Of the remaining 534 potential patients, 313 (58.6%) provided complete intake and discharge data, and these data were included in the current analysis. The intake descriptive statistics for this cohort are reported in **TABLE 1**.

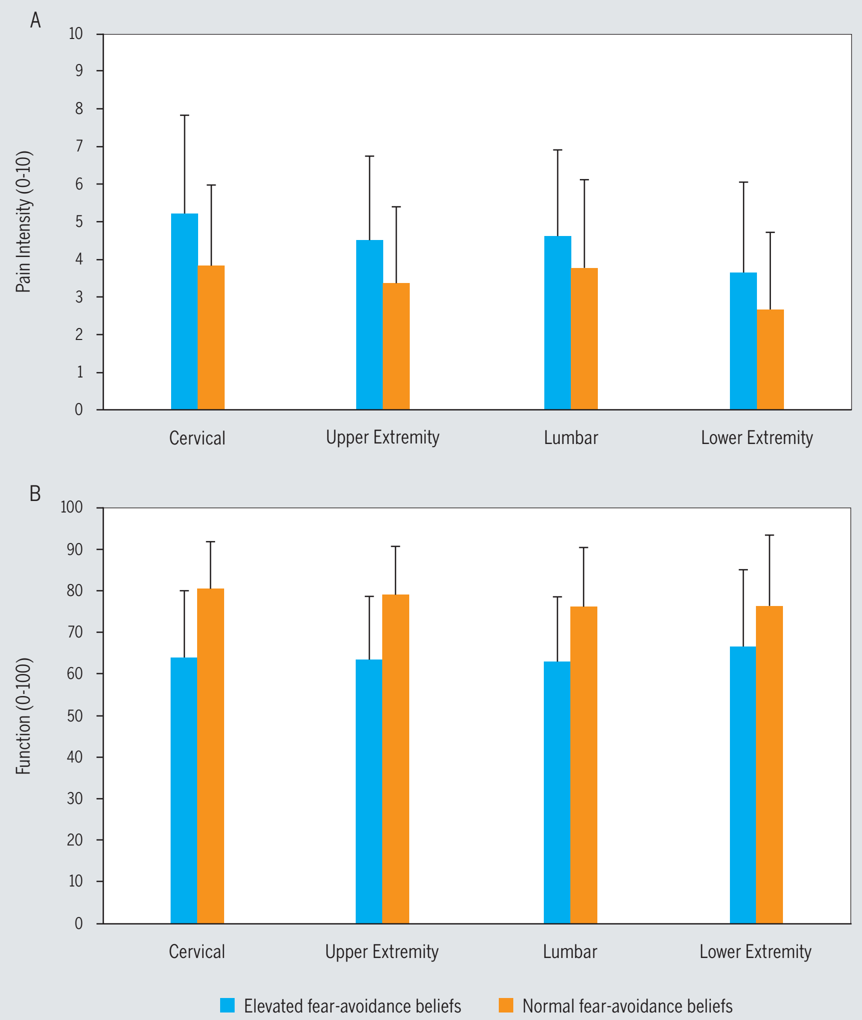

FIGURE 1. (A) Fear-avoidance beliefs and anatomical region: association with intake pain intensity. (B) Fear-avoidance beliefs and anatomical region: association with intake function. Elevated fear-avoidance beliefs (blue) are defined by a score of 15 or greater on the Fear-Avoidance Beliefs Questionnaire physical activity scale. Normal fear-avoidance beliefs (orange) are defined as a score of less than 15 on the Fear-Avoidance Beliefs Questionnaire physical activity scale. Higher scores on the visual analog scale for pain intensity indicate higher pain intensity. Higher scores on the Therapeutic Associates Outcome System (TAOS) Functional Index indicate higher functional levels. Error bars are 1 SD.

Aim 1

FABQ-PA scores for patients with cervical spine pain (mean ± SD, 12.8 ± 6.6), upper extremity pain (14.4 ± 5.5), lumbar spine pain (13.4 ± 5.9), and lower extremity pain (12.4 ± 6.1) were similar across the 4 anatomical regions of musculoskeletal pain (P>.01). Rates of elevated FABQ-PA scores (15 or greater) for patients with cervical spine pain (46.0%), upper extremity pain (48.3%), lumbar spine pain (41.8%), and lower extremity pain (38.9%) were also similar across the 4 anatomical regions of musculoskeletal pain (P>.01).

Aim 2

There was no interaction between elevated fear-avoidance beliefs and anatomical region for intake pain intensity and functional status. For pain intensity, there were main effects for elevated fear-avoidance beliefs and anatomical region (both, P<.01). These results are depicted in **FIGURE 1A**. Similar intake pain intensity scores were associated with the cervical (4.5), lumbar (4.1), and upper extremity (3.9) regions. The lower extremity location (3.1) had lower intake pain intensity ratings in comparison to the cervical and lumbar spine regions (P<.01). Independent of anatomical location, patients with elevated fear-avoidance beliefs had higher intake mean pain intensity ratings (4.4), when compared to those without elevated fear-avoidance beliefs (3.3). For function, there was a main effect for elevated fear-avoidance beliefs only (P<.01). These results are depicted in **FIGURE 1B**. Independent of anatomical region, those with elevated fear-avoidance beliefs were associated with lower intake mean function self-report (64.5), when compared to those without elevated fear-avoidance beliefs (77.6).

The final hierarchical regression models for intake pain intensity ratings are reported in **TABLE 2**. In the first step of these models, demographic and clinical variables contributed a variance in intake pain intensity scores of 1.1%, 4.1%, 10.6%, and 2.4% for the cervical, upper extremity, lumbar, and lower extremity categories, respectively. In the second step, the FABQ-PA score contributed an additional variance for intake pain intensity scores of 16.9%, 7.5%, 12.8%, and 7.7% for the cervical, upper extremity, lumbar, and lower extremity regions, respectively. In the final models for intake pain intensity, fear-avoidance beliefs were the strongest individual contributor, with the exception of upper extremity pain, of which the overall model was not statistically significant (**TABLE 2**).

TABLE 2 Fear-Avoidance Beliefs Contribution to Intake Pain Intensity Ratings and Functional Status Scores for All Anatomical Regions

Measure/Model	β	P Value
Pain intensity		
Final cervical model (R^2 = 0.18, P = .02)		
Age*	.04	.77
Sex†	.01	.96
Duration‡	–.05	.67
FABQ-PA§	.42	<.01
Final upper extremity model (R^2 = 0.12, P = .16)		
Age	.24	.08
Sex	.08	.52
Duration	.06	.67
FABQ-PA	.29	.04
Final lumbar model (R^2 = 0.23, P<.01)		
Age	.14	.18
Sex	.27	.01
Duration	–.16	.12
FABQ-PA	.37	<.01
Final lower extremity model (R^2 = 0.11, P = .01)		
Age	.03	.73
Sex	.14	.13
Duration	–.12	.21
FABQ-PA	.30	<.01

Table continues on page 255.

The final hierarchical regression models for intake function are also reported in **TABLE 2**. In the first step of these models, demographic and clinical variables contributed a variance in intake functional scores of 47.1%, 34.0%, 28.5%, and 16.4% for the cervical, upper extremity, lumbar, and lower extremity categories, respectively. In the second step, the FABQ-PA score contributed an additional variance in intake functional scores of 13.8%, 17.1%, 9.3%, and 7.7% for the cervical, upper extremity, lumbar, and lower extremity categories, respectively. Fear-avoidance beliefs were a statistically significant addition to all models for intake function scores, with a magnitude of contribution similar to that of intake pain intensity ratings (**TABLE 2**).

Aim 3

The mean ± SD duration of the treatment episode was 74.4 ± 58.7 days and number of visits was 11.1 ± 6.8. The variability in treatment parameters, based on fear-avoidance beliefs and anatomical region, is reported in **TABLE 3**. As these results were similar across anatomical region, general interpretation is possible. There were no interactions for fear-avoidance beliefs and anatomical region, and no main effects for fear-avoidance beliefs for any of the variables representing treatment parameters. This indicates that patients with elevated and normal levels of fear-avoidance beliefs had similar calendar days, number of visits, and types of treatment received while in physical therapy. Differences in anatomical location were not further considered, as these were not related to the aims of this study.

We found no 3-way interaction for fear-avoidance beliefs, anatomical location, and assessment time for pain intensity outcomes (P>.01). There was, however, a 2-way interaction for fear-avoidance beliefs and assessment time (P<.01), which showed that those who had elevated fear-avoidance beliefs had higher intake pain scores and greater improvement from intake to discharge, but similar discharge scores. These results, collapsed across all anatomical locations due to the lack of a 3-way interaction, are depicted in **FIGURE 2A**.

Similarly, no 3-way interaction was found for fear-avoidance beliefs, anatomical location, and assessment time for function outcomes (P>.01). A 2-way interaction was, however, found for fear-avoidance beliefs and assessment time (P<.01), showing that those who had elevated fear-avoidance beliefs had lower intake function and a larger improvement from intake to discharge, but similar discharge function scores. These results are depicted in **FIGURE 2B**, where they are col-

TABLE 2 FEAR-AVOIDANCE BELIEFS CONTRIBUTION TO INTAKE PAIN INTENSITY RATINGS AND FUNCTIONAL STATUS SCORES FOR ALL ANATOMICAL REGIONS (CONTINUED)

Measure/Model	β	P Value
Function‖		
Final cervical model (R^2 = 0.61, P<.01)		
Age	–.11	.22
Sex	.18	.11
Duration	.14	.66
FABQ-PA	–.42	<.01
Pain intensity¶	–.42	<.01
Final upper extremity model (R^2 = 0.51, P<.01)		
Age	–.02	.87
Sex	–.12	.23
Duration	–.15	.16
FABQ-PA	–.45	<.01
Pain intensity	–.39	<.01
Final lumbar model (R^2 = 0.38, P<.01)		
Age	–.02	.81
Sex	.01	.96
Duration	–.04	.66
FABQ-PA	–.34	<.01
Pain intensity	–.42	<.01
Final lower extremity model (R^2 = 0.24, P<.01)		
Age	–.19	.04
Sex	–.05	.58
Duration	.11	.22
FABQ-PA	–.30	<.01
Pain intensity	–.28	<.01

Abbreviation: FABQ-PA, Fear-Avoidance Beliefs Questionnaire physical activity scale.
**Age entered as continuous variable.*
†Sex coded as 0 for male, 1 for female.
‡Duration entered as continuous variable.
§FABQ-PA score entered as continuous variable.
‖Function was the Therapeutic Associates Outcome System (TAOS) Functional Index score.
¶Pain intensity was the numeric pain rating score entered as continuous variable.

lapsed across all anatomical locations due to the lack of a 3-way interaction.

DISCUSSION

THIS STUDY INVESTIGATED FEAR-avoidance beliefs and musculoskeletal pain across 4 anatomical regions. As hypothesized, we observed similar levels of fear-avoidance beliefs across these 4 anatomical regions. Furthermore, we found that elevated fear-avoidance beliefs were associated with higher intake pain intensity ratings for all anatomical regions except the upper extremity, and with lower function scores for all anatomical regions. In the multiple regression models that controlled for potential confounding factors (age, sex, and duration of symptoms), fear-avoidance beliefs were the strongest contributor to intake pain intensity ratings for each anatomical region. Fear-avoidance beliefs and pain intensity were the 2 strongest contributors to intake function scores for each region, indicating that fear-avoidance adversely impacts function, even after controlling for pain intensity. Collectively, these data indicate no obvious anatomical specificity for fear-avoidance beliefs. These data could be used to support a streamlined assessment of fear with the FABQ-PA for all anatomical regions, such as that reported in a large cross-sectional study for a 1-item fear screening tool.[16] Due to the limited prospective studies of fear-avoidance involving multiple anatomical regions, further research is required before stronger clinical recommendations can be made.

Fear-avoidance beliefs had a consistent association across anatomical regions for treatment parameters and clinical outcomes; however, they had an influence different from the one that we had hypothesized. In the current study, elevated fear-avoidance beliefs were not associated with higher treatment utilization or poorer clinical outcomes. In fact, patients with elevated fear-avoidance beliefs, compared to those with lower fear-avoidance beliefs, reported larger improvements in pain intensity and function from intake to discharge. These findings are in contrast to those of other studies in physical therapy settings, in which higher fear-avoidance scores predicted poorer outcomes.[8,11] These results are, however, similar to those of a cohort study which found that initial FABQ-PA score levels were not predictive of discharge pain or disability in patients with low back pain,[4] and to those of a randomized trial which reported better treatment outcomes for participants with elevated fear-avoidance beliefs who received graded exercise.[10] In the current study, the elevated fear-avoidance group was not put into a specific treatment group but received a patient-centered plan of care tailored towards their elevated fear-avoidance beliefs.

Though we did not determine the reasons for our findings, as this was beyond the scope of the current study's design, we can suggest several explanations. The larger improvements might reflect a statistical phenomenon similar to that of regression to the mean. Patients with elevated fear-avoidance beliefs had higher

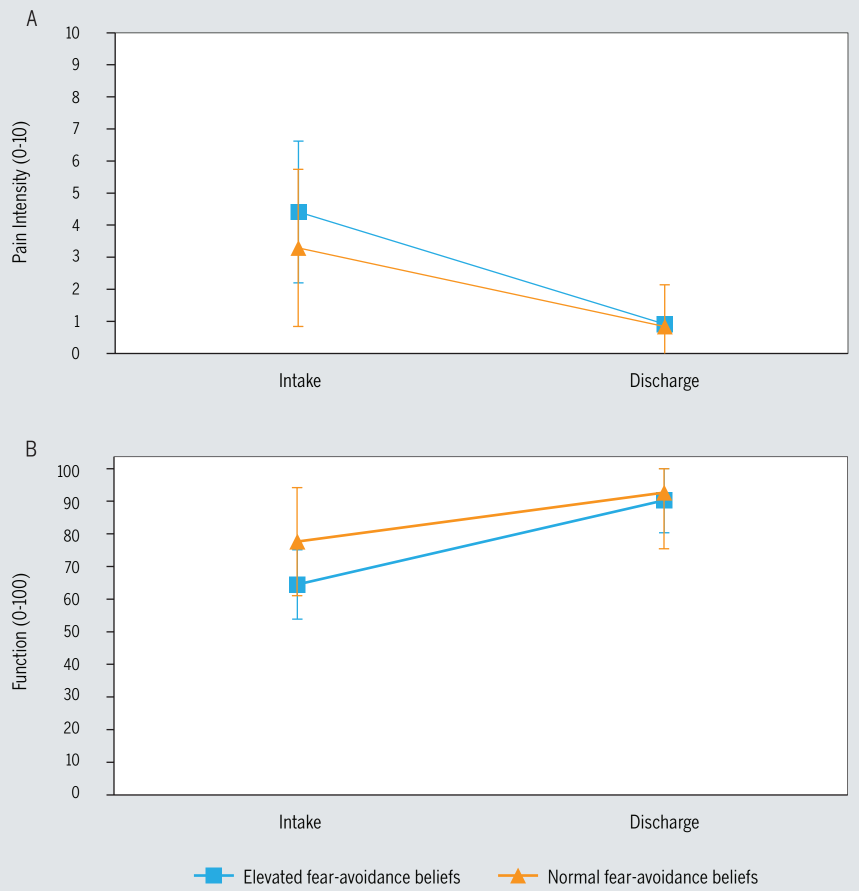

FIGURE 2. (A) The influence of fear-avoidance beliefs on pain intensity outcomes (collapsed across all anatomical regions). (B) The influence of fear-avoidance beliefs on function outcomes (collapsed across all anatomical regions). Elevated fear-avoidance beliefs (blue) were defined as a score of 15 or greater on Fear-Avoidance Beliefs Questionnaire physical activity scale. Normal fear-avoidance beliefs (orange) were defined as a score of less than 15 on the Fear-Avoidance Beliefs Questionnaire physical activity scale. Higher scores on the visual analog scale for pain intensity indicate higher pain intensity. Higher scores on the Therapeutic Associates Outcome System (TAOS) Functional Index indicate higher functional levels. Error bars are 1 SD.

intake scores and, subsequently, greater potential to improve during physical therapy. The previous studies in physical therapy settings that have found the FABQ to have predictive value were secondary analyses of randomized trials using standard treatment protocols.[8,11] The treatment approach used in these trials was different from that used in the current study, which used unstandardized treatment protocols, a practice typical of most clinical settings. Previous studies in physical therapy settings have indicated that the FABQ-W might have better predictive validity for outcomes than the FABQ-PA.[4,8,11] The current study focused on the FABQ-PA because, unlike the FABQ-W, it has been used across different anatomical areas.[5,12,29,32] Our data are, therefore, only applicable to the FABQ-PA, and should not be generalized to studies or clinical environments that used the FABQ-W.

Another potential explanation for these findings is that the treatments offered in this clinical environment provided a larger relative benefit for those with elevated fear-avoidance beliefs. While this result is not typical for those with elevated fear-avoidance beliefs, a physical therapy clinical trial[10] has produced similar evidence. In the current study, the treating physical therapists based their treatment approach on a biopsychosocial model.[34] They were encouraged to explicitly address fear when detected through patient self-report or history and discouraged negative stereotypes or attitudes about highly fearful patients. For example, the treating physical therapists in this study tailored questions for fearful patients by specifically addressing the fear before moving on to other components of the physical exam. Addressing fear in a methodical way, with knowledge, tasks, and reassurance, was a mainstay of the clinic philosophy. In addition to having their fear explicitly addressed, patients were empowered by having input on treatment decisions, progression, and goal setting. The last factor unique to this clinical setting, that might have contributed to the observed positive outcomes, was the requirement of mentorship, postprofessional training in orthopaedic manual therapy, and emphasis on clinical reasoning and differential diagnosis for each physical therapist involved in data collection. Education[1,26] and patient activation approaches[15,17,18] similar to those used in this clinical setting have been associated with positive outcomes. These explanations are, however, speculative, and it should not be assumed that this clinical environment was unique in its quality of care.

In an attempt to differentiate treatments based on fear-avoidance level, billing codes were collected as a proxy measure of treatment received, as in another study.[7] We found no differences in the number of billing units for therapeutic exercise, manual therapy, and modalities provided to patients with elevated versus normal fear-avoidance belief levels. It is quite possible that the approach for exercise or manual therapy differed for those with elevated fear-avoidance beliefs. It is also possible that the content differed, or more time was spent on education and self-care, for the elevated fear-avoidance group. However, the metrics used in the current study were not able to account for such differences.

Future effectiveness studies in clinical environments should include more thorough analysis of treatment, so that key differences in treatment may be included in the data analysis. Such methods may allow for the identification of optimal treatment parameters delivered within routine clinical settings for those with elevated fear-avoidance beliefs.

This prospective study is one of the few to directly compare the influence of fear-avoidance beliefs across different anatomical regions. There are, however, limitations to consider when interpreting the results of this study. The biggest of these appear to be that the treatment protocols were not standardized and specific treatment information was not provided. Our data are, therefore, best interpreted with respect to overall response to physical therapy and not to a specific response to particular treatment protocols or individual treatments. Another limitation is the study's focus on the FABQ-PA. We did not include the FABQ-W because of a lack of precedent in the literature for its use in other anatomical locations. Though other potential psychological factors, including pain catastrophizing, anxiety, and depression, may affect musculoskeletal pain outcomes, these factors were not included in the current study. Thus our psychological assessment should not be viewed as comprehensive. Lastly, we did not collect information on whether the musculoskeletal pain was work related, which is another important limitation to consider. Future studies using the FABQ-W for patients with work-related musculoskeletal injury could potentially add to the literature.

TABLE 3 Fear-Avoidance Beliefs Association With Treatment Parameters for All Anatomical Regions*

Dependent Variable/Anatomical Region	Normal Fear-Avoidance	Elevated Fear-Avoidance
Calendar days†		
Cervical	61.6 ± 45.4	76.3 ± 105.0
Upper extremity	78.9 ± 41.8	69.4 ± 42.2
Lumbar	74.9 ± 57.7	91.3 ± 56.3
Lower extremity	77.7 ± 62.4	64.5 ± 37.7
Visits‡		
Cervical	11.8 ± 9.3	10.3 ± 8.2
Upper extremity	12.1 ± 5.1	11.9 ± 7.3
Lumbar	10.6 ± 5.6	14.3 ± 6.1
Lower extremity	10.2 ± 6.0	9.8 ± 6.1
Therapeutic exercise§		
Cervical	10.9 ± 10.0	10.0 ± 6.2
Upper extremity	17.5 ± 12.3	19.0 ± 12.3
Lumbar	18.1 ± 10.7	27.1 ± 17.6
Lower extremity	20.5 ± 14.8	22.0 ± 18.7
Manual therapy‖		
Cervical	25.0 ± 22.6	18.2 ± 18.1
Upper extremity	20.2 ± 12.9	16.6 ± 16.3
Lumbar	14.4 ± 13.8	17.1 ± 10.6
Lower extremity	10.0 ± 10.6	8.0 ± 8.4
Modalities¶		
Cervical	0.3 ± 0.8	0.6 ± 1.5
Upper extremity	0.4 ± 1.0	1.2 ± 2.6
Lumbar	0.3 ± 0.9	0.6 ± 1.2
Lower extremity	1.2 ± 2.3	0.9 ± 2.0

**All data are mean ± SD, with therapeutic exercises, manual therapy, and modalities based on billing units. Primary analysis of interest is the interaction term, because it indicates differential treatment utilization parameters based on fear-avoidance belief level and anatomical location. Differences in anatomical region were not further considered, because they were not related to the aims of this study.*
†Interaction, P = .24; main effect for fear-avoidance, P = .77; main effect for anatomical location, P = .47.
‡Interaction, P = .09; main effect for fear-avoidance, P = .62; main effect for anatomical location, P = .07.
§Interaction, P = .13; main effect for fear-avoidance, P = .08; main effect for anatomical location, P<.01.
‖Interaction, P = .25; main effect for fear-avoidance, P = .15; main effect for anatomical location, P<.01.
¶Interaction, P = .16; main effect for fear-avoidance, P = .16; main effect for anatomical location, P = .04.

CONCLUSION

These data suggest that fear-avoidance beliefs had a similar influence on intake and change scores for pain intensity and function outcomes in patients with cervical, upper extremity, lumbar, and lower extremity complaints. Elevated fear-avoidance beliefs were associated with higher intake pain intensity ratings and lower function scores, even when potential confounding variables were included in multiple regression models. Elevated fear-avoidance beliefs were also associated with a larger change in pain intensity rating and function scores during treatment for each anatomical location. However, initial fear-avoidance belief levels were not associated with treatment utilization or discharge scores. Our data provide a preliminary indication that assessment of fear-avoidance beliefs may be appropriate for patients with musculoskeletal pain in different anatomical regions if there is an interest in predicting change scores in response to treatment approaches similar to those described in this study. Future study in this area should refine the clinical utility of the FABQ. For example, FABQ cut-off scores have been published for patients with lumbar pain but not for those with pain in other anatomical regions. Future studies should focus on the same treatment philosophy used in this study but capture more specifically what was done, to better inform future clinical practice. ◉

KEY POINTS

FINDINGS: Elevated fear-avoidance beliefs were associated with higher pain and lower function at intake, as well as larger improvements in pain and function following physical therapy. In contrast, discharge pain and function scores and treatment utilization parameters did not differ between the elevated and normal fear-avoidance beliefs groups.

IMPLICATIONS: The influence of fear-avoidance beliefs was not specific to those with low back pain in this outpatient physical therapy setting, so assessment of fear in outpatient physical therapy settings should include other anatomical regions. However, the assessment of fear may only be of clinical value for predicting change scores if patients are treated with approaches similar to the one described in this study.

CAUTION: The outcomes in this study were similar across anatomical region but not typical of what has been reported in the literature for those with elevated fear-avoidance beliefs. Also, the clinical environment for this study did not use standardized protocols, so specific treatment recommendations cannot be made.

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REFERENCES

1. Burton AK, Waddell G, Burtt R, Blair S. Patient educational material in the management of low back pain in primary care. *Bull Hosp Jt Dis*. 1996;55:138-141.
2. Butler D, Moseley L. *Explain Pain*. Adelaide, Australia: Noigroup Publications; 2003.
3. Chmielewski TL, Jones D, Day T, Tillman SM, Lentz TA, George SZ. The association of pain and fear of movement/reinjury with function during anterior cruciate ligament reconstruction rehabilitation. *J Orthop Sports Phys Ther*. 2008;38:746-753. http://dx.doi.org/10.2519/jospt.2008.2887
4. Cleland JA, Fritz JM, Brennan GP. Predictive validity of initial fear avoidance beliefs in patients with low back pain receiving physical therapy: is the FABQ a useful screening tool for identifying patients at risk for a poor recovery? *Eur Spine J*. 2008;17:70-79. http://dx.doi.org/10.1007/s00586-007-0511-y
5. Cleland JA, Fritz JM, Childs JD. Psychometric properties of the Fear-Avoidance Beliefs Questionnaire and Tampa Scale of Kinesiophobia in patients with neck pain. *Am J Phys Med Rehabil*. 2008;87:109-117. http://dx.doi.org/10.1097/PHM.0b013e31815b61f1
6. Cyriax J. *Textbook of Orthopedic Medicine*. 8th ed. London, UK: Baillère Tindall; 1982.
7. Fritz JM, Cleland JA, Brennan GP. Does adherence to the guideline recommendation for active treatments improve the quality of care for patients with acute low back pain delivered by physical therapists? *Med Care*. 2007;45:973-980. http://dx.doi.org/10.1097/MLR.0b013e318070c6cd
8. Fritz JM, George SZ. Identifying psychosocial variables in patients with acute work-related low back pain: the importance of fear-avoidance beliefs. *Phys Ther*. 2002;82:973-983.
9. George SZ, Dover GC, Fillingim RB. Fear of pain influences outcomes after exercise-induced delayed onset muscle soreness at the shoulder. *Clin J Pain*. 2007;23:76-84. http://dx.doi.org/10.1097/01.ajp.0000210949.19429.34
10. George SZ, Fritz JM, Bialosky JE, Donald DA. The effect of a fear-avoidance-based physical therapy intervention for patients with acute low back pain: results of a randomized clinical trial. *Spine (Phila Pa 1976)*. 2003;28:2551-2560. http://dx.doi.org/10.1097/01.BRS.0000096677.84605.A2
11. George SZ, Fritz JM, Childs JD. Investigation of elevated fear-avoidance beliefs for patients with low back pain: a secondary analysis involving patients enrolled in physical therapy clinical trials. *J Orthop Sports Phys Ther*. 2008;38:50-58. http://dx.doi.org/10.2519/jospt.2008.2647
12. George SZ, Fritz JM, Erhard RE. A comparison of fear-avoidance beliefs in patients with lumbar spine pain and cervical spine pain. *Spine (Phila Pa 1976)*. 2001;26:2139-2145.
13. George SZ, Fritz JM, McNeil DW. Fear-avoidance beliefs as measured by the fear-avoidance beliefs questionnaire: change in fear-avoidance beliefs questionnaire is predictive of change in self-report of disability and pain intensity for patients with acute low back pain. *Clin J Pain*. 2006;22:197-203.
14. George SZ, Valencia C, Beneciuk JM. A psychometric investigation of fear-avoidance model measures in patients with chronic low back pain. *J Orthop Sports Phys Ther*. 2010;40:197-205. http://dx.doi.org/10.2519/jospt.2010.3298
15. Hagen EM, Eriksen HR, Ursin H. Does early intervention with a light mobilization program reduce long-term sick leave for low back pain? *Spine (Phila Pa 1976)*. 2000;25:1973-1976.
16. Hart DL, Werneke MW, George SZ, et al. Screening for elevated levels of fear-avoidance beliefs regarding work or physical activities in people receiving outpatient therapy. *Phys Ther*. 2009;89:770-785. http://dx.doi.org/10.2522/ptj.20080227
17. Indahl A, Haldorsen EH, Holm S, Reikeras O, Ursin H. Five-year follow-up study of a controlled clinical trial using light mobilization and an informative approach to low back pain. *Spine (Phila Pa 1976)*. 1998;23:2625-2630.
18. Indahl A, Velund L, Reikeraas O. Good prognosis for low back pain when left untampered. A randomized clinical trial. *Spine (Phila Pa 1976)*. 1995;20:473-477.
19. Jones M, Rivett D. *Clinical Reasoning for Manual Therapists*. Burlington, MA: Butterworth-Heinemann; 2003.
20. Landers MR, Creger RV, Baker CV, Stutelberg KS. The use of fear-avoidance beliefs and nonorganic signs in predicting prolonged disability in patients with neck pain. *Man Ther*. 2008;13:239-248. http://dx.doi.org/10.1016/j.math.2007.01.010
21. Leeuw M, Goossens ME, Linton SJ, Crombez G, Boersma K, Vlaeyen JW. The fear-avoidance model of musculoskeletal pain: current state of scientific evidence. *J Behav Med*. 2007;30:77-94. http://dx.doi.org/10.1007/s10865-006-9085-0
22. Lentz TA, Barabas JA, Day T, Bishop MD, George SZ. The relationship of pain intensity, physical impairment, and pain-related fear to function in patients with shoulder pathology. *J Orthop Sports Phys Ther*. 2009;39:270-277. http://dx.doi.org/10.2519/jospt.2009.2879
23. Lentz TA, Sutton Z, Greenberg S, Bishop MD. Pain-related fear contributes to self-reported disability in patients with foot and ankle pathology. *Arch Phys Med Rehabil*. 91:557-561. http://dx.doi.org/10.1016/j.apmr.2009.12.010
24. Moseley GL. Evidence for a direct relationship between cognitive and physical change during an education intervention in people with chronic low back pain. *Eur J Pain*. 2004;8:39-45. http://dx.doi.org/10.1016/S1090-3801(03)00063-6
25. Moseley GL. Joining forces: combining cognition-targeted motor control training with group or individual pain physiology education: a successful treatment for chronic low back pain. *J Manip Man Ther*. 2003;11:88-94.
26. Moseley GL, Nicholas MK, Hodges PW. A randomized controlled trial of intensive neurophysiology education in chronic low back pain. *Clin J Pain*. 2004;20:324-330.
27. Moseley L. Combined physiotherapy and education is efficacious for chronic low back pain. *Aust J Physiother*. 2002;48:297-302.
28. Ostelo RW, Deyo RA, Stratford P, et al. Interpreting change scores for pain and functional status in low back pain: towards international consensus regarding minimal important change. *Spine (Phila Pa 1976)*. 2008;33:90-94. http://dx.doi.

org/10.1097/BRS.0b013e31815e3a10
29. Piva SR, Fitzgerald GK, Wisniewski S, Delitto A. Predictors of pain and function outcome after rehabilitation in patients with patellofemoral pain syndrome. *J Rehabil Med*. 2009;41:604-612. http://dx.doi.org/10.2340/16501977-0372
30. Price DD, McGrath PA, Rafii A, Buckingham B. The validation of visual analogue scales as ratio scale measures for chronic and experimental pain. *Pain*. 1983;17:45-56.
31. Schunk C, Rutt R. TAOS Functional index: orthopaedic rehabilitation outcomes tool. *J Rehabil Outcomes Meas*. 1998;2:55-61.
32. Scopaz KA, Piva SR, Wisniewski S, Fitzgerald GK. Relationships of fear, anxiety, and depression with physical function in patients with knee osteoarthritis. *Arch Phys Med Rehabil*. 2009;90:1866-1873. http://dx.doi.org/10.1016/j.apmr.2009.06.012
33. Staerkle R, Mannion AF, Elfering A, et al. Longitudinal validation of the fear-avoidance beliefs questionnaire (FABQ) in a Swiss-German sample of low back pain patients. *Eur Spine J*. 2004;13:332-340. http://dx.doi.org/10.1007/s00586-003-0663-3
34. Waddell G. 1987 Volvo award in clinical sciences. A new clinical model for the treatment of low-back pain. *Spine (Phila Pa 1976)*. 1987;12:632-644.
35. Waddell G, Newton M, Henderson I, Somerville D, Main CJ. A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain*. 1993;52:157-168.