Fisker et al., *Cogent Medicine* (2018), 5: 1534536
https://doi.org/10.1080/2331205X.2018.1534536

cogent medicine

PHYSIOLOGY & REHABILITATION | RESEARCH ARTICLE

The association between psychosocial distress, pain and disability in patients with persistent low back pain —A cross-sectional study

Annette Fisker[1,2,3], Tom Petersen[2], Henning Langberg[1] and Ole Steen Mortensen[3,4]*

Received: 05 July 2018
Accepted: 25 September 2018
First Published: 11 October 2018

*Corresponding author: Ole Steen Mortensen, Section of Social Medicine, Department of Public Health, University of Copenhagen, Øster Farimagsgade 5, DK-1014 Copenhagen K, Denmark
E-mail: osm@regionsjaelland.dk

Reviewing editor:
Niall MacFarlane, School of Life Sciences, University of Glasgow, USA

Additional information is available at the end of the article

Abstract: Background: Psychological factors as depression and somatization are considered along with a high level of disability as risk factors for developing persistent low back pain (LBP). Furthermore, LBP and psychosocial distress are two of the most frequent reasons for seeking health care and sickness absence. However, it is not clear how these factors are intercorrelated. The aim of this study was to analyze how pain, fear-avoidance beliefs, depression and somatization were associated with disability in persistent LBP patients.
Methods: In a cross-sectional design, 765 LBP patients filled in Roland Morris Disability Questionnaire, LBP Rating Scale, Fear-Avoidance Beliefs Questionnaire (physical activity/work) and Symptoms Checklist 90 (psychological distress).
Results: In a multivariate regression analysis, disability was found to be significantly associated with pain, depression, fear-avoidance beliefs (physical activity), age and body mass index (BMI). Pain was significantly associated with disability, depression, somatization, sex and BMI. Disability, pain and the psychosocial variables were mutually correlated.

ABOUT THE AUTHOR

The authors do all work in the field of rehabilitation, especially vocational rehabilitation. This article report results from a large RCT study on patients with low back pain. The results shows that not only pain but also many associated psychosocial factors, such as somatization, depression and fear avoidance for physical activities, contribute to the consequences of low back pain. This has highlighted the fact that a multidisciplinary approach including physiotherapists, physicians and psychologist taking a broader bio-psychosocial perspective that previous is necessary to provide the best opportunities for the rehabilitation of the low back pain patients. The results from the study do also highlight the importance of a better understanding of functional ability. The results have been an inspiration for an ongoing study implementing and validating an ICF-based measure of workability. Treatment and rehabilitation should be carried out in a broad bio-psychosocial perspective to diminish the disability consequences not only of low back pain but also in other diseases.

PUBLIC INTEREST STATEMENT

This article report results from a large study on patients with low back pain (LBP). LBP is a very common disease affecting many aspects of life and function.

The results show that not only pain but also many associated psychosocial factors, such as somatization, depression and fear avoidance for physical activities, contribute to the consequences of LBP. It is important to consider these factors in the treatment and rehabilitation of patients with LBP. Treatment and rehabilitation should be carried out in a broad bio-psychosocial perspective to diminish the disability consequences of LBP.

Conclusion: The results of this study support earlier suggestions of an association between disability, pain and the psychosocial factors somatization, depression and fear-avoidance beliefs. The results support the importance of recognizing the mental health of LBP patients in the clinical setting.

Subjects: Allied Health; Public Health Policy and Practice; Occupational Health & Safety

Keywords: low back pain; rehabilitation; mental health; occupational health; disability; depression; somatization; fear-avoidance beliefs; pain management

1. Introduction

It is a logical assumption that pain and disability to some extend are linked and that pain intensity might determine disability level (Gronblad et al., 1996; Haugen et al., 2011; Turner, Fulton-Kehoe, Franklin, Wickizer, & Wu, 2003). Within health care, the predominant interpretation historically has been that low back pain (LBP) mainly was understood from a biomedical perspective, and therefore, examination, treatment and rehabilitation have traditionally been targeted at pathophysiological components (Waddell, 1998). Even though the bio-psychosocial approach to LBP has become generally accepted, at least among LBP specialists, pain is still often explained as mainly a biological factor, rather than influenced by psychological and social factors.

However, over the last two decades, there has been increasing evidence for psychosocial and psychological facets being crucial in the understanding of pain perception and subsequent disability (Chou & Shekelle, 2010; Pincus, Ak, Vogel, & Ap, 2002). Pincus et al. (2002) found depression to be the strongest single predictor of long-term disability in LBP, and psychological factors such as depression, catastrophizing, kinesiophobia and passive coping strategies have been found to be associated with a high level of disability and thus of great importance for the development of persistent LBP (Nicholas, Linton, Watson, & Main, 2011). It is furthermore suggested that psychological factors, that is, emotions, beliefs and avoidant behaviors, are linked to poor outcome of the rehabilitation process in LBP patients (Pincus & McCracken, 2013).

Some cross-sectional studies found only small or no associations between disability, pain and different psychological factors such as depression, catastrophizing and somatization (Kovacs et al., 2004; Meyer, Tschopp, Sprott, & Mannion, 2009; Preuper et al., 2011). However, a German pilot study suggested an association between pain, disability, depression and fear-avoidance beliefs in chronic LBP patients (Scholich, Hallner, Wittenberg, Hasenbring, & Rusu, 2012). Similarly, Licciadone (2012) found an association between depression, somatization and LBP in an American population. Meyer et al. (2009) found a weak association between catastrophizing, depression, pain, disability and fear-avoidance beliefs about work in chronic LBP patients. Two Dutch studies by Preuper and colleagues found weak associations between disability and psychological distress measured by, respectively, Roland Morris Disability Questionnaire (RMQ) and Symptom Checklist-90-Revised (SCL-90-R; Preuper et al., 2011; Schiphorst Preuper et al., 2007).

With the increasing incidence of LBP in the western world and the high percentage of these LBP symptoms becoming chronic despite of new rehabilitation regimes (Pincus et al., 2013), there is a need for supplementary studies to explore the potential relationship between the psychosocial and psychological factors, pain and their influence on disability. Previous studies investigating the correlations between psychological factors and degree of pain and disability have not been very clarifying and could not draw convincing conclusions. We wish to contribute to this research field by testing the hypothesis that the previous results might be confirmed in a study with a larger sample size. The aim of this study is to analyze whether pain, duration of pain, fear-avoidance beliefs, depression or somatization are associated with disability in a large group of patients with persistent nonspecific LBP.

2. Materials and methods

This study is a cross-sectional study based on baseline data from 765 patients with persistent LBP enrolled in a large clinical randomized controlled trial (RCT) from 2009 to 2013 (Fisker, Langberg, Petersen, & Mortensen, 2013). The study is registered at Clinical Trials (ClinicalTrials.gov: NCT01690234) and is approved by the Danish Regional Ethics Committee (J.no: H-C-2008-112). The results from the RCT are currently under review for publication. In the present cross-sectional study, the data were obtained before randomization; the patients and the data are handled as one big group. Only baseline data are used for post hoc analysis without the knowledge of which group the patients were allocated to in the RCT.

2.1. Patients

Data from 765 consecutive LBP patients referred to a public rehabilitation center in the Municipality of Copenhagen from their general practitioner are used in this study. The patients were enrolled in a RCT study based on the following criteria:

2.1.1. Criteria for inclusion

Working age adults (18–65 years) with LBP for more than 2 weeks. Both participants who were employed and unemployed and sick listed or at risk of being sick listed were included.

2.1.2. Criteria for exclusion

Red flags or comorbidity (i.e. cancer, fracture, osteoporosis, cardiopulmonary diseases), psychiatric diseases (i.e. psychosis), pregnancy, difficulties in reading and writing Danish or application for early retirement or "occupational rehabilitation" (reassignment to another type of occupation economic subsidized, a unique Danish constellation). Students and retired persons were not included.

A total of 1,320 consecutive referrals were screened for participation in this study. Of these, 245 did not meet the inclusion criteria, and out of 1,075 eligible participants, 305 were excluded (the reasons for exclusion are listed in Figure 1). Finally, 765 patients participated in this cross-sectional study.

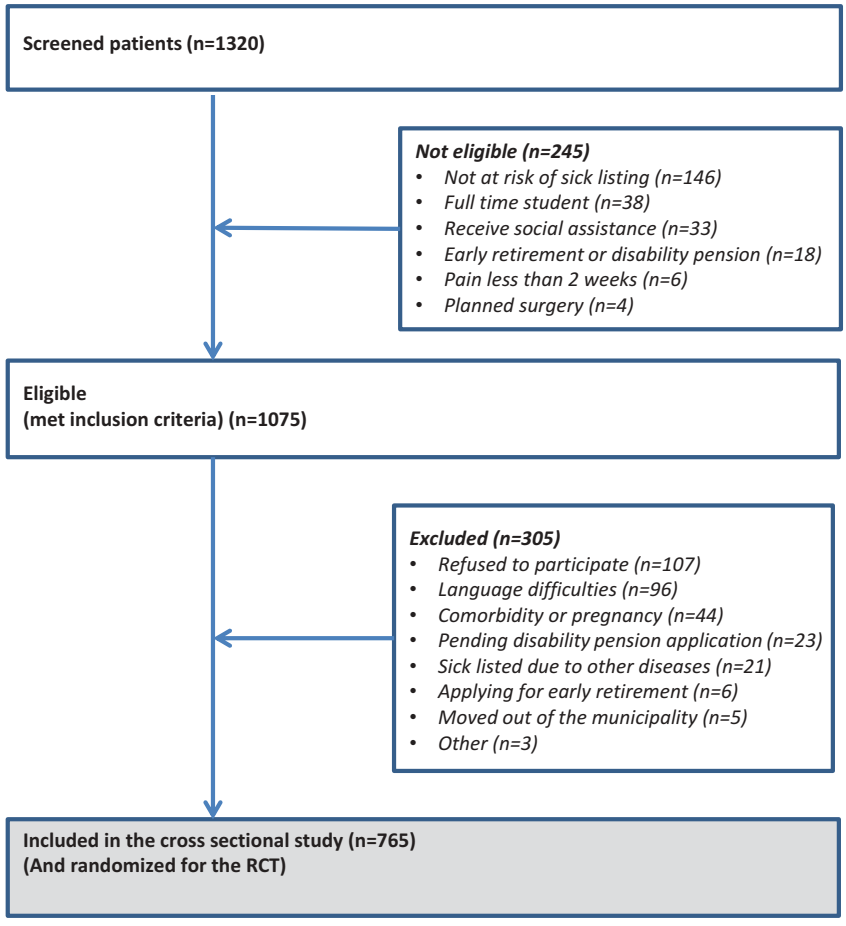
2.2. General procedure

Prior to participating in the study, the patients met the principal investigator (Annette Fisker (AF)) for a personal interview and information about the study at the rehabilitation center. At this initial visit, clinical examination was not performed, but the possible participants underwent a thorough clinical examination at their second visit (Fisker et al., 2013). After having received written and oral information, the patients signed an informed consent form. Prior to randomization for the RCT, the patients filled in a questionnaire covering demographic and personal data (age, sex, marital status, body mass index (BMI), educational level, occupation, possible sick listing, duration and economic relief), work-related factors (job satisfaction, working hours, self-assessed workability and beliefs on working future) and lifestyle factors (physical activity, smoking and alcohol consumption). Details of the design and methods in the RCT are reported in an earlier article (Fisker et al., 2013). The reporting of this cross-sectional study is conducted and reported according to the STROBE Statement (Vandenbroucke, von EE, Gotzsche, Mulrow, & Pocock et al., 2007).

2.3. Ethics committee statement

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 (Pincus et al., 2002). Informed consent was obtained from all patients for being included in the study. The study is approved by the Regional Ethics Committee, The Capital Region, Denmark (J.no: H-C-2008-112) and registered and approved at the Danish Data Protection Agency (J.no: 2009-41-3321).

Figure 1. Recruitment and patient flow



2.4. Measurements

2.4.1. Disability

The modified 23-item version of the RMQ (Albert, Jensen, Dahl, & Rasmussen, 2003; Patrick et al., 1995) was used in this study to explore self-reported back-specific disability. The Danish language version of RMQ is validated (Albert et al., 2003) and measures 23 activity limitations where each item is qualified by the phrase: "because of my back- or leg pain" (Patrick et al., 1995). All items have dichotomy outcomes and are answered as "yes" or "no." The RMQ is scored on a 0- to 23-point scale, where 0 is no disability and 23 is the highest possible disability. The RMQ is recommended as a tool for back-specific function by an international board of LBP researchers (Bombardier, 2000; Deyo, 1998). Since we intended to look for potential associations in a rehabilitation mind-set, disability is the most clinically relevant outcome. In order to increase the power of the analysis and because no cutoff value currently exists, we used the RMQ as a continuous variable in the analyses.

2.5. Pain

Measuring pain in LBP can be difficult as the dominant pain in some patients is related to the lower back and in others to the lower limb(s) (Bombardier, 2000). To determine pain intensity, we used the LBP Rating Scale, a back-specific version of the Numerical Rating Scale (NRS; Manniche et al., 1994). The scale has six 11-point subscales (range: 0–10): actual pain, worst pain in the previous 2 weeks and average pain in the previous 2 weeks for LBP and leg pain, respectively: 0 indicates no pain and 10 indicates worst imaginable pain. The LBP Rating Scale has a total pain score, a pooled score of the six subscales (range: 0–60). We used the total pain scale in the analyses as recommended by Manniche

et al. (1994), inasmuch as it covers both low back and leg pain and actual, worst and average pain. Furthermore, the participants reported the duration of their present pain in weeks.

2.6. Psychological distress

The Danish language version of the SCL-90-R was used to measure psychological distress (Olsen, Mortensen, & Bech, 2004). The SCL-90-R is a screening tool of general psychiatric symptomatology at a certain point in time, and it is not intended as a diagnostic tool of mental illness. The questionnaire consists of 90 items, divided in 10 symptom scales measuring somatization, obsessive-compulsive, depression, anxiety, phobic anxiety, hostility, interpersonal sensitivity, paranoid ideation, psychoticism and an additional scale concerning sleep and appetite (Derogatis, Lipman, & Covi, 1973). The 90 items scored on a 5-point Likert scale indicate the degree to which the person has been distressed by the symptom in the past week. The SCL-90 has a summary score, the Global Severity Index, (GSI), which is often used as a uniform measure of psychosocial status or mental health. However, a recent study using a Rasch model of the psychometric properties of the full GSI showed that the SCL-90 should not be used as a summary score (GSI); instead, the different symptom scales should be used individually (Olsen et al., 2004; Williams, Urban, Keefe, Shutty, & France, 1995). In this study, we were interested in the symptom scales of depression and somatization, since these two scales represent the most central aspects of the chronic/persistent pain patients' psychological distress (Williams et al., 1995). The factorial and discriminative validity of the individual symptom scales of the SCL-90 have earlier been examined, and they showed a high degree of intercorrelation (Rief & Fichter, 1992). The somatization symptom scale represents any bodily discomfort related to both psychological reactions and other autonomic as the experience of pain. The depression symptom scale reflects both cognitive and somatic aspects of a depressive behavior (Williams et al., 1995).

2.7. Fear-avoidance beliefs

Fear-avoidance behavior is defined as the behavior individuals develop to avoid activities that might cause pain. We used the Fear-Avoidance Beliefs Questionnaire (FABQ) to identify LBP patients at risk of developing fear-avoidance behavior. The FABQ assesses patients' beliefs about how both physical activity and work will affect their LBP. The questionnaire is divided into two subscales covering fear-avoidance beliefs related to physical activity (FABQ-PA) with four questions (maximum score = 24) and work (FABQ-W) with seven questions (maximum score = 42; Hoegh, Jacobsen, Mogensen, & Petersen, 2010; Waddell, Newton, Henderson, Somerville, & Main, 1993). The questions are answered on a 7-point Likert scale. The psychometric properties of the two subscales are better established than the total FABQ. This instrument was found to have acceptable factor structure, internal consistency, test–retest reliability and construct validity (Grotle, Brox, & Vollestad, 2006; Williamson, 2006).

2.8. Age, sex, BMI and duration of pain

In this study, we regarded the variables age, sex, BMI and duration of pain as possible confounders and included them in the multivariate regression analyses.

2.9. Data analysis

Two independent research assistants consecutively entered all data in a database, and the dataset used in this study was cleaned and validated by AF.

2.10. Missing values

Missing items in the RMQ were according to the scoring manual (Albert et al., 2003; Roland & Fairbank, 2000) scored as "no." There is no consensus on how to handle missing values in SCL-90, and two different approaches are commonly used. We used the most conservative method, where a missing item was replaced with a computed value as the mean of the remaining items in a subscale. In 2.3% of cases, missing values were replaced. For each individual, at least five items should be completed for each missing in one symptom scale,

otherwise the symptom scale was removed from the analysis (Hardt, Gerbershagen, & Franke, 2000). In the FABQ, we found no missing values.

2.11. Analyses

Initially, an analysis of simple correlation was performed to see whether there was any relationship between the variables. Pearson's correlation coefficients were calculated, and the strength of the correlation was interpreted as recommended by Altman (1991): no correlation: 0, negligible correlation: .0–±.3, low correlation: ±.3–±.5, moderate correlation: ±.5–±.7, high correlation: ±.7–±.9, very high correlation: .9–1.0 and complete correlation: ±1 (Hinkle & Applied, 2003).

Subsequently, linear regression analysis for each variable was carried out, and all variables that were significantly associated with disability were included in the final multiple regression models. A *p*-value below .10 is conventionally considered appropriate as threshold for including variables in a multivariate regression model. Due to our large sample size, where even trivial coefficients become significant, we considered a *p*-value below .01 as an appropriate threshold though. The multiple regression analyses were performed using stepwise backward elimination to determine which of the variables had the most significant influence on A: disability and B: pain (dependent variables). Finally, a collinearity analysis was performed to test for multicollinearity.

All analyses were carried out using the SAS Institute 9.4 statistical software (SAS Institute, Inc., 2013).

3. Results

A total of 765 LBP patients participated in the study, 400 men and 365 women. Baseline demographics, pain, disability, fear-avoidance beliefs about physical activity and work (FABQ-W and FABQ-PA) and the SCL-90 subscales of depression and somatization are all presented in Table 1.

The mean disability score on the RMQ was 14.2. Percentage of patients relative to cutoff scores is also presented in Table 1. Measured at the LBP Rating Scale (0–60), the participants showed a mean score of total pain at 27.2 in men and 30.7 in women. We tested the association between the six pain subscales of LBP Rating Scale, the total pain LBP Rating Scale and disability RMQ and found that "total pain", "actual leg pain" and "worst LBP during the previous two weeks" were significantly associated with disability (data not shown). Consequently, we chose to use "total pain" as the only pain measure in the further analyses, since it reflects both back and leg pain.

Correlation coefficients between the variables were calculated in order to explore whether there were any associations between the various variables in pairs. Correlation matrix and Pearson's correlation coefficients are presented in Table 2. All variables were statistically significantly correlated with both disability and pain (*p*-values < .01), except for duration of pain and sex (in relation to pain). Most correlations were very low (<.30), but a number of the correlations were low in relation to RMQ: depression (r = .34), somatization (r = .35) and FAB-PA (r = .31) and total pain was moderate (r = .48). In relation to pain, only somatization showed a low correlation (r = .35). The highest correlation was found between depression and somatization (r = .70; Table 2).

To explore whether the variables total pain, sex, age, duration of pain, FABQ-W, FABQ-PA, depression and somatization had any isolated influence on disability and pain, respectively, they were individually tested in a simple linear regression analysis. Except for duration of pain and sex in relation to disability, they all showed a significant positive linear association with disability and pain (Table 3).

Using multiple regression analysis with disability as outcome variable, we found that pain, age, BMI, depression, and FABQ-PA had significant association with disability (Table 4). In the

Table 1. Demographic characteristics and patient's scores on the questionnaires

Baseline characteristics	*n*	Mean (SD) or %
Age	765	39.16 (10.29)
Sex		
• Male	400	52
• Female	365	48
Duration of pain (months)		23.05 (46)
BMI		25.67 (4.62)
Marital status (%)		
• Married/cohabitant	478	63.06
• Single	76	10.03
• Divorced/widowed	168	22.15
• Other	36	4.75
Sick listed (%)	389	51.46
Work status (%) (5 missing)		
• Employed total	595	77.78
• Employed full-time[a]	466	78.32
• Employed part-time	58	9.75
• Self-employed	55	9.24
• Other[b]	16	2.69
• Unemployed	165	21.44
Educational level (%)		
• None	170	22.70
• Short/middle-long	504	67.29
• Long	40	5.34
• Other	35	4.67
Roland Morris[c]	765	14.2 (4.9)
Roland Morris score ≥ 15	396	51.7
Pain		
• Average LBP[d]		5.6 (2.0)
• Average leg pain[d]		3.6 (2.7)
• Total pain[e]		28.8 (11.0)
• Pain below knee (%)	313	45.10
Fear-avoidance beliefs–physical activity (FABQ-PA)[f]		15.52 (5.26)
Fear-avoidance beliefs–work (FABQ-W)[g]		23.37 (11.25)
Depression[h]		1.07 (0.81)

(*Continued*)

Table 1. (*Continued*)

Baseline characteristics	*n*	Mean (SD) or %
Depression score ≥ 1.5	196	53.7
Somatization[i]		1.15 (0.58)
Somatization score ≥ 1.5	196	53.7

[a]Percentage of total employed.
[b]Including housewife/husband.
[c]Roland Morris Disability Questionnaire (0–23).
[d]NRS (0–10).
[e]Low Back Pain Rating Scale (NRS; 0–60).
[f]Fear-Avoidance Beliefs Questionnaire–Physical Activity (0–42).
[g]Fear-Avoidance Beliefs Questionnaire–Work (0–24).
[h]SCL-90 depression symptom scale (0–5).
[i]SCL-90 somatization symptom scale (0–5).
SD: standard deviation; BMI: body mass index; LBP: low back pain; NRS: Numerical Rating Scale; SCL-90: Symptom Checklist-90.

multivariate analysis with total pain as outcome variable, only disability, sex BMI, depression, and somatization were significantly associated with pain (Table 4). In this analysis, depression presented with a negative value. FABQ-W had no statistically significant influence on either disability or total pain.

The amount of total explained variance, R^2, was .34 for disability and .29 for total pain. Meaning that the model explained 34% of the total variance in disability (RMQ) with significant contribution of pain, age, BMI, depression and fear-avoidance about physical activity. In addition, 29% of the total variance in total pain was explained with significant contribution of disability, sex, BMI, depression and somatization.

We tested the two models for multicollinearity, and the variance inflation factors (VIF) for Model A were between 1.01 and 2.19 (tolerance (1/VIF): .45–.95) and the VIFs for Model B between 1.07 and 2.07 (the tolerance: .48–.94) indicating that multicollinearity did not bias either of the two models. As a rule of thumb, the VIF should not be larger than 10 and the tolerance not lower than .1.

4. Discussion

The main finding in this cross-sectional study was a significant association between depression, somatization and disability. Fear-avoidance beliefs about physical activity, age and BMI were also found to have a smaller influence on disability. Another important finding was that the somatization subscale of the SCL-90 was significantly associated with total pain. In the multivariate analysis with pain as outcome, depression came out negative even though it had a significant positive influence in the simple linear regression. However, the influence from depression on total pain is quite small (R^2 = .03). It is not possible to explain it further from our data, but it is possible that the depressed patients take antidepressant drugs that also have analgesic effect. Unfortunately, we do not have this information. In both multivariate analyses, fear avoidance concerning work had no statistically significant influence on either disability or pain and was, therefore, excluded in the backward selection process. Furthermore, we found that most of the psychosocial variables were mutually correlated. Moderate correlations were found between disability and depression, somatization, total pain and fear-avoidance concerning physical activity, respectively. The strongest correlation was found between depression and somatization.

Our results support previous findings, indicating that LBP patients experience a high degree of psychological distress in combination with pain and disability (Licciadone, 2012; Meyer et al., 2009; Preuper et al., 2011; Scholich et al., 2012). To our knowledge, the two Dutch studies by Preuper et al. are the only other studies using the same measurement tools, SCL-90 and RMQ, in an LBP

Table 2. Correlations between disability, pain and the psychosocial variables

Correlation, Pearson's correlation coefficients

	Age	BMI[a]	Duration of pain[b]	Depression[c]	Somatization[d]	FABQ-W	FABQ-PA	Total pain[e]	RMQ
Sex	.02	−.13**	−.05	.16**	.22**	−.09	−.02	.16**	.08
Age		.18**	.07	−.08	−.03	−.03	.04	.12**	.12**
BMI			.06	.02	.07	.05	.04	.17**	.17**
Duration of pain				.04	.05	.05	.002	.007	−.08
Depression					.70**	.25**	.12**	.17**	.34**
Somatization						.24**	.12*	.35**	.35**
FABQ-W							.33**	.14**	.22**
FABQ-PA								.16**	.31**
Total pain									.48**

RMQ: Roland Morris Disability Questionnaire (0–23); total pain: Low Back Pain Rating Scale (NRS; 0–60); FABQ-PA: Fear-Avoidance Beliefs Questionnaire–Physical Activity (0–42); FABQ-W: Fear-Avoidance Beliefs Questionnaire–Work (0–24); Depression: SCL-90 depression symptom scale (0–5); Somatization: SCL-90 somatization symptom scale (0–5); BMI: body mass index; NRS: Numerical Rating Scale; SCL-90: Symptom Checklist-90.

[a]BMI: 19 missing.

[b]Duration of pain: 33 missing.

[c]Depression: 20 missing.

[d]Somatization: 22 missing.

[e]Total pain: 12 missing.

*Significance $p \leq .01$; **significance $p \leq 0.001$.

cogent medicine

Table 3. Simple linear regression analysis with disability (A) and pain (B) as dependent variables

Variable	Estimate (SD)	*p*-value	R^2
A: dependent variable: disability (RMQ)			
Total pain	0.21 (0.01)	<.0001	.23
Age	0.06 (0.02)	.001	.01
BMI	0.18 (0.04)	<.0001	.03
FABQ-PA	0.29 (0.03)	<.0001	.10
FABQ-W	0.10 (0.02)	<.0001	.05
Depression	2.01 (0.21)	<.0001	.11
Somatization	2.92 (0.29)	<.0001	.12
B: dependent variable: total pain (NRS)			
Disability (RMQ)	1.08 (0.07)	<.0001	.23
Sex	3.50 (0.79)	<.0001	.03
Age	0.13 (0.04)	.0006	.02
BMI	0.40 (0.09)	<.0001	.03
FABQ-PA	0.33 (0.08)	<.0001	.03
FABQ-W	0.14 (0.04)	<.0001	.02
Depression	2.25 (0.49)	<.0001	.03
Somatization	6.57 (0.65)	<.0001	.12

RMQ: Roland Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire–Physical Activity; FABQ-W: Fear-Avoidance Beliefs Questionnaire–Work; BMI: body mass index; NRS: Numerical Rating Scale; SD: standard deviation.

Table 4. Multivariate regression models with disability (A) and pain (B) as dependent variables

Variable	Parameter estimate	SD	*t*	*p*-value	R^2
A: dependent variable: disability (RMQ)					
Pain	0.16	0.01	127.67	<.0001	
Age	0.04	0.02	15.91	.01	
BMI	0.09	0.03	7.99	.005	
Depression	1.50	0.19	63.50	<.0001	
FABQ-PA	0.19	0.03	44.03	<.0001	
Somatization	1.16	0.38	0.17	.68	
FABQ-W	0.01	0.01	0.87	.35	
Age	0.04	0.02	15.91	.01	
Model					.34
B: dependent variable: total pain (NRS)					
RMQ	0.89	0.08	130.11	<.0001	
Sex	2.17	0.72	9.08	.003	
BMI	0.24	0.08	9.92	.002	
Depression	−2.80	0.60	21.47	<.0001	
Somatization	6.23	0.86	51.89	<.0001	
FABQ-W	0.04	0.03	1.35	.25	
FABQ–PA	0.03	0.07	0.20	.66	
Age	0.04	0.04	1.56	.21	
Model					.29

RMQ: Roland Morris Disability Questionnaire; FABQ-PA: Fear-Avoidance Beliefs Questionnaire–Physical Activity; FABQ-W: Fear-Avoidance Beliefs Questionnaire–Work; BMI: body mass index; NRS: Numerical Rating Scale; SD: standard deviation.

study population as we did. Accordingly, our studies are to some extent comparable. The observed association was significant in both studies. The sample sizes in the Dutch studies were smaller (n = 152 and n = 293), but the two study populations seem somewhat comparable concerning duration of pain, intensity of pain and the only it looks like our population scored higher on the RMQ, indicating that our patients were a little more affected by disability. Since we were interested in the two specific psychological dimensions depression and somatization and not in the general psychological profile, we used the depression and the somatization subscales and not the GSI of the SCL-90. The somatization subscale was earlier found to be elevated in both acute and chronic LBP (Bernstein, Jaremko, & Hinkley, 1994) and is separable from the GSI, whereas the depression subscale is closely associated with the GSI.

The significant association between somatization and total pain is not surprising in this group of LBP patients, since one of the questions in the somatization subscale of SCL was "Do you have pain in your lower back?" and the presence of LBP was a requirement to be enrolled in this study. However, the high influence of the somatization subscale cannot be explained by this single question.

It is not possible to explain any causal or temporal relationship based on the results from the present cross-sectional study. In a longitudinal study, Hurwitz, Morgenstern and Yu (2003) tried to investigate the temporal causality between pain and psychological distress. They found that these two factors were cause and consequence of each other: The level of pain predicted subsequent psychological distress, and psychological distress influenced subsequently the level of LBP and disability (Hurwitz et al., 2003).

In this study, we focused mainly on disability as outcome; the rehabilitation and functional ability is interpreted as at "the participation level" of the International Classification of Functioning, Disability and Health (ICF) model (Stucki, Cieza, & Melvin, 2007). It is debatable whether the RMQ captures all aspects of disability for LBP patients. It might be too biomechanically orientated and thereby overlooks some of the psychosocial aspects of having LBP. Another concern is whether the RMQ measures pain rather than disability, inasmuch as all the questions are qualified by the phrase "because of my back- or leg pain." We recognize the uncertainty as to whether RMQ is predominantly measuring pain or disability. The causality of pain leading to disability is indisputable, but the link is likely influenced by other psychosocial factors as well.

This study has some limitations; information bias might have influenced the data collection, where all information about mental health was collected as self-administered questionnaires. Although the participants were instructed thoroughly before filling in the questionnaires, there is a tendency to give socially acceptable answers to questions concerning behavior and mental health (King & Social Desirability, 2000). This influence might have led to an underreporting of the impact of the psychosocial variables.

Cultural issues might limit the generalizability of this study, inasmuch as there are some cross-cultural differences in scoring patterns of psychological parameters and generic health. In a study by Olsen, Mortensen and Bech (2006), Danes were found to generally score higher on the SCL-90 than Americans. Furthermore, the participants in this study had LBP for almost 2 years on average and were either sick listed or at risk of being sick listed; therefore, our results should only be applied with caution to patients with acute LBP or patients who are not on the edge of sick listing.

Further research should focus on how to address the impact of psychosocial strain in treatment strategies for this group of patients and identify predictors for the identification of patients for whom the more psychological approach will be relevant. Meaning that there might be subgroups of pain patients, for whom the recognizing of psychosocial strain is of especially high relevance. Understanding the relationship between psychological and physical components will help us target the treatment to the dominant problem in patients with complex pain conditions.

The diversity in measurement tools for psychosocial distress makes it a challenge to compare results from different research groups as well as the inherent possible overlap between, for example, somatization and depression in the different measurement methodologies. Finding the most appropriate way to assess psychosocial distress in combination with chronic diseases, LBP will be of great interest in future research.

5. Conclusion

The psychosocial factors somatization, depression and fear-avoidance about physical activity all have a statistically significant association with disability and pain in a group of patients with persistent LBP. The updated present knowledge in this field is that a close association between several psychosocial factors and disability exists and that the psychosocial variables related to bodily function and depression are of particular importance in LBP patients. This emphasizes the clinical implication of approaching LBP patients in the bio-psychosocial scope.

Funding
This work was supported by The Danish National Prevention Fund [j-nr. 2-2-009 20080051039].

Competing interests
The authors declare no competing interests.

Author details
Annette Fisker[1,2,3]
E-mail: fiskerannette@gmail.com
ORCID ID: http://orcid.org/0000-0002-0064-4047
Tom Petersen[2]
E-mail: tompete@mail.tele.dk
ORCID ID: http://orcid.org/0000-0002-6852-2919
Henning Langberg[1]
E-mail: henninglangberg@gmail.com
ORCID ID: http://orcid.org/0000-0001-8454-6534
Ole Steen Mortensen[3,4]
E-mail: osm@regionsjaelland.dk
ORCID ID: http://orcid.org/0000-0002-4655-8048
[1] Section of Social Medicine, Department of Public Health, University of Copenhagen, Øster Farimagsgade 5, DK-1014 Copenhagen K, Denmark.
[2] Back- and Rehabilitation Centre Copenhagen, Mimersgade 41, DK-2200 Copenhagen N, Denmark.
[3] Department of Occupational Health, Copenhagen University Hospital Holbæk, Smedelundsgade 60, 4300 Holbæk, Denmark.
[4] Section of Social Medicine, Department of Public Health, University of Copenhagen, Øster Farimagsgade 5, DK-1014 Copenhagen K, Denmark.

Conflicts of interest
Annette Fisker, Tom Petersen, Ole Steen Mortensen and Henning Langberg declare that they have no financial or ethical conflicts of interest.

Citation information
Cite this article as: The association between psychosocial distress, pain and disability in patients with persistent low back pain —A cross-sectional study, Annette Fisker, Tom Petersen, Henning Langberg & Ole Steen Mortensen, *Cogent Medicine* (2018), 5: 1534536.

References

Albert, H. B., Jensen, A. M., Dahl, D., & Rasmussen, M. N. (2003). [Criteria validation of the Roland Morris questionnaire. A Danish translation of the international scale for the assessment of functional level in patients with low back pain and sciatica]. *UgeskrLaeger*, *165*, 1875–1880.

Altman, D. G. (1991). *Practical statistics for medical research*. London: Chapman and Hall.

Bernstein, I. H., Jaremko, M. E., & Hinkley, B. S. (1994). On the utility of the SCL-90-R with low-back pain patients. *Spine* (Phila Pa1976), *19*, 42–48.

Bombardier, C. (2000). Outcome assessments in the evaluation of treatment of spinal disorders: Summary and general recommendations. *Spine*, *25*, 3100–3103.

Chou, R., & Shekelle, P. (2010). Will this patient develop persistent disabling low back pain? *JAMA*, *303*, 1295–1302. doi:10.1001/jama.2010.344

Derogatis, L. R., Lipman, R. S., & Covi, L. (1973). SCL-90: An outpatient psychiatric rating scale–Preliminary report. *Psychopharmacology Bulletin*, *9*, 13–28.

Deyo, R. A. (1998). Outcome measures for low back pain research: A proposal for standardized use. *Spine*, *23*, 2003–2013.

Fisker, A., Langberg, H., Petersen, T., & Mortensen, O. S. (2013). Early coordinated multidisciplinary intervention to prevent sickness absence and labour market exclusion in patients with low back pain: Study protocol of a randomized controlled trial. *BMC Musculoskeletal Disorders*, *14*, 93. doi:10.1186/1471-2474-14-93

Gronblad, M., Jarvinen, E., Airaksinen, O., Ruuskanen, M., Hamalainen, H., & Kouri, J. P. (1996). Relationship of subjective disability with pain intensity, pain duration, pain location, and work-related factors in non-operated patients with chronic low back pain. *The Clinical Journal of Pain*, *12*, 194–200.

Grotle, M., Brox, J. I., & Vollestad, N. K. (2006). Reliability, validity and responsiveness of the fear-avoidance beliefs questionnaire: Methodological aspects of the Norwegian version. *Journal of Rehabilitation Medicine*, *38*, 346–353. doi:10.1080/16501970600722403

Hardt, J., Gerbershagen, H. U., & Franke, P. (2000). The symptom check-list, SCL-90-R: Its use and characteristics in chronic pain patients. *European Journal of Pain*, *4*, 137–148. doi:10.1053/eujp.2000.0162

Haugen, A. J., Grovle, L., Brox, J. I., Natvig, B., Keller, A., Soldal, D., & Grotle, M. (2011). Estimates of success in patients with sciatica due to lumbar disc herniation depend upon outcome measure. *European Spine Journal : Official Publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society*, *20*, 1669–1675. doi:10.1007/s00586-011-1809-3

Hinkle, D. E. W. W. J., & Applied, S. G. (2003). *Statistics for the behavioral sciences* (5th ed.). Boston: Houghton Mifflin.

Hoegh, M., Jacobsen, J., Mogensen, K., & Petersen, T. (2010). Fear avoidance beliefs questionnaire, Danish version 2010 [updated 2010]. Retrieved from: http://fysio.dk/fafo/Nyheder/Fear-Avoidance-Beliefs-Questionnaire/.

Hurwitz, E. L., Morgenstern, H., & Yu, F. (2003). Cross-sectional and longitudinal associations of low-back pain and related disability with psychological distress

among patients enrolled in the UCLA low-back pain study. *JClinEpidemiol*, *56*, 463–471.

King, M. F. B., & Social desirability, G. C. (2000). Bias: A neglected aspect of validity testing. *Psychology & Marketing*, *17*, 79–103. doi:10.1002/(SICI)1520-6793(200002)17:2<79::AID-MAR2>3.0.CO;2-0

Kovacs, F. M., Abraira, V., Zamora, J., Teresa Gil Del Real, M., Llobera, J., & Fernández, C. (2004). Correlation between pain, disability, and quality of life in patients with common low back pain. *Spine*, *29*, 206–210. doi:10.1097/01.BRS.0000107235.47465.08

Licciadone, J. C. (2012). Depression, somatization, and somatic dysfunction in patients with nonspecific chronic low back pain: Results from the osteopathic trial. *JAOA - the Journal of the American Osteopathic Association*, *112*, 783–791.

Manniche, C., Asmussen, K., Lauritsen, B., Vinterberg, H., Kreiner, S., & Jordan, A. (1994). Low back pain rating scale: Validation of a tool for assessment of low back pain. *Pain*, *57*, 317–326.

Meyer, K., Tschopp, A., Sprott, H., & Mannion, A. F. (2009). Association between catastrophizing and self-rated pain and disability in patients with chronic low back pain. *Journal of Rehabilitation Medicine: Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine*, *41*, 620–625. doi:10.2340/16501977-0395

Nicholas, M. K., Linton, S. J., Watson, P. J., & Main, C. J. (2011). Decade of the flags" Working G. Early identification and management of psychological risk factors ("yellow flags") in patients with low back pain: A reappraisal. *Physical Therapy*, *91*, 737–753. doi:10.2522/ptj.20100224

Olsen, L. R., Mortensen, E. L., & Bech, P. (2004). The SCL-90 and SCL-90R versions validated by item response models in a Danish community sample. *Acta Psychiatrica Scandinavica*, *110*, 225–229. doi:10.1111/j.1600-0447.2004.00399.x

Olsen, L. R., Mortensen, E. L., & Bech, P. (2006). Mental distress in the Danish general population. *Acta Psychiatrica Scandinavica*, *113*, 477–484. doi:10.1111/j.1600-0447.2005.00743.x

Patrick, D. L., Deyo, R. A., Atlas, S. J., Singer, D. E., Chapin, A., & Keller, R. B. (1995). Assessing health-related quality of life in patients with sciatica. *Spine* (Phila Pa 1976), *20*, 1899–1908.

Pincus, T., Ak, B., Vogel, S., & Ap, F. (2002). A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. *Spine*, *27*, E109–E120.

Pincus, T., Kent, P., Bronfort, G., Loisel, P., Pransky, G., & Hartvigsen, J. (2013). Twenty-five years with the biopsychosocial model of low back pain-is it time to celebrate? A report from the twelfth international forum for primary care research on low back pain. *Spine* (Phila Pa 1976), *38*, 2118–2123.

Pincus, T., & McCracken, L. M. (2013). Psychological factors and treatment opportunities in low back pain. *Best Practice & Research Clinical Rheumatology*, *27*, 625–635.

Preuper, H. R. S., Boonstra, A. M., Wever, D., Heuts, P. H. T. G., Dekker, J. H. M., Smeets, R. J. E. M., (2011). Differences in the relationship between psychosocial distress and self-reported disability in patients with chronic low back pain in six pain rehabilitation centers in the Netherlands. *Spine*, *36*, 969–976. doi:10.1097/BRS.0b013e3181e8af83

Rief, W., & Fichter, M. (1992). The Symptom Check List SCL-90-R and its ability to discriminate between dysthymia, anxiety disorders, and anorexia nervosa. *Psychopathology*, *25*, 128–138. doi:10.1159/000284763

Roland, M., & Fairbank, J. (2000). The Roland-Morris disability questionnaire and the oswestry disability questionnaire. *Spine*, *25*, 3115–3124.

Schiphorst Preuper, H. R., Reneman, M. F., Boonstra, A. M., Dijkstra, P. U., Versteegen, G. J., & Geertzen, J. H. (2007). The relationship between psychosocial distress and disability assessed by the Symptom Checklist-90-Revised and Roland Morris disability questionnaire in patients with chronic low back pain. *The Spine Journal : Official Journal of the North American Spine Society*, *7*, 525–530. doi:10.1016/j.spinee.2006.08.016

Scholich, S. L., Hallner, D., Wittenberg, R. H., Hasenbring, M. I., & Rusu, A. C. (2012). The relationship between pain, disability, quality of life and cognitive-behavioural factors in chronic back pain. *Disability and Rehabilitation*, *34*, 1993–2000. doi:10.3109/09638288.2012.667187

Stucki, G., Cieza, A., & Melvin, J. (2007). The International Classification of Functioning, Disability and Health (ICF): A unifying model for the conceptual description of the rehabilitation strategy. *Journal of Rehabilitation Medicine: Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine*, *39*, 279–285. doi:10.2340/16501977-0041

Turner, J. A., Fulton-Kehoe, D., Franklin, G., Wickizer, T. M., & Wu, R., 2003, Comparison of the Roland-Morris disability questionnaire and generic health status measures: A population-based study of workers' compensation back injury claimants, *Spine* (Phila Pa 1976), *28*:1061–1067. (Phila Pa 1976). doi: 10.1097/01.BRS.0000062007.95197.08.

Vandenbroucke, J. P., von EE, A. D. G., Gotzsche, P. C., Mulrow, C. D., Pocock, S. J.. . ., & Reneman, M. F. (2007). Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): Explanation and elaboration. *Annals of Internal Medicine*, *147*, W163–W194.

Waddell, G. (1998). *The back pain revolution* (1st ed.). Edinburgh: Churchill Livingstone.

Waddell, G., Newton, M., Henderson, I., Somerville, D., & Main, C. J. (1993). A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain*, *52*, 157–168.

Williams, D., Urban, B., Keefe, F. J., Shutty, M. S., & France, R. (1995). Cluster analyses of pain patients' responses to the SCL-90R. *Pain*, *61*, 81–91.

Williamson, E. (2006). Fear Avoidance Beliefs Questionnaire (FABQ). *The Australian Journal of Physiotherapy*, *52*, 149. doi:10.1016/S0004-9514(06)70052-6

Cogent Medicine **(ISSN: 2331-205X) is published by Cogent OA, part of Taylor & Francis Group.**

Publishing with Cogent OA ensures:

- Immediate, universal access to your article on publication
- High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
- Download and citation statistics for your article
- Rapid online publication
- Input from, and dialog with, expert editors and editorial boards
- Retention of full copyright of your article
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

Submit your manuscript to a Cogent OA journal at www.CogentOA.com