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The Relation Between Pain-Related Fear and Disability: A Meta-Analysis

Emily L. Zale,* Krista L. Lange,† Sherecce A. Fields,† and Joseph W. Ditre*

**Syracuse University, Syracuse, New York.*
†Texas A&M University, College Station, Texas.

Abstract: Within a biopsychosocial framework, psychological factors are thought to play an important role in the onset and progression of chronic pain. The cognitive-behavioral fear-avoidance model of chronic pain suggests that pain-related fear contributes to the development and maintenance of pain-related disability. However, investigations of the relation between pain-related fear and disability have demonstrated considerable between-study variation. The main goal of the current meta-analysis was to synthesize findings of studies investigating cross-sectional associations between pain-related fear and disability in order to estimate the magnitude of this relation. We also tested potential moderators, including type of measure used, demographic characteristics, and relevant pain characteristics. Searches in PubMed and PsycINFO yielded a total of 46 independent samples (N = 9,579) that reported correlations between pain-related fear and disability among persons experiencing acute or chronic pain. Effect size estimates were generated using a random-effects model and artifact distribution method. The positive relation between pain-related fear and disability was observed to be moderate to large in magnitude, and stable across demographic and pain characteristics. Although some variability was observed across pain-related fear measures, results were largely consistent with the fear-avoidance model of chronic pain.

***Perspective:** Results of this meta-analysis indicate a robust, positive association between pain-related fear and disability, which can be classified as moderate to large in magnitude. Consistent with the fear-avoidance model of chronic pain, these findings suggest that pain-related fear may be an important target for treatments intended to reduce pain-related disability.*

Key words: *Fear of pain, disability, meta-analysis, fear-avoidance, pain.*

Chronic pain is a critical public health problem that affects an estimated 37 to 41% of persons worldwide[72] and engenders a substantial economic burden on both individuals and systems.[55] Chronic pain has been associated with a variety of negative outcomes, including increased absence from work and unemployment,[4] reduced participation in social and recreational activities,[10] lower perceived social support,[6] increased rates of psychiatric disorders and suicidality,[32,84] and disability. Pain-related disability encompasses a variety of domains including deficits in physical, occupational, recreational, and social functioning. Given the substantial impact that chronic pain has on individuals and health care systems, factors that may contribute to the development of pain-related disability have received considerable empirical attention.

According to the biopsychosocial model of chronic pain, psychological factors (eg, pain-related fear) contribute to the onset and progression of both pain and disability.[23] In accord with a cognitive-behavioral perspective, the fear-avoidance model of chronic pain posits that pain-related fear activates avoidance mechanisms, resulting in the avoidance of movement and activity. This model was originally developed to explain the transition from acute to chronic low-back pain.[41,81-83,86] Although avoidance behaviors may be adaptive in the context of acute pain (eg, by allowing an acute injury to heal), long-term avoidance of physical activity is thought to impair daily functioning and result in greater physical disability. The fear-avoidance model further posits that pain-related

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Address reprints requests to Joseph W. Ditre, PhD, Department of Psychology, Syracuse University, Syracuse, NY 13244. E-mail: jwditre@syr.edu
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fear may be negatively reinforced by avoidance behaviors, leading to the maintenance and progression of disability.

A growing body of research supports the notion that pain-related fear may contribute to the development of chronic pain and pain-related disability. An initial qualitative review of the fear-avoidance model revealed that pain-related fear was associated with reduced physical performance, expectancies for greater pain, and greater self-reported disability.[83] However, these authors also noted considerable between-study variability, with effect size estimates of the relation between pain-related fear and disability ranging from small to large. Following an increase in primary studies, Leeuw et al completed a second qualitative review of the fear-avoidance model in chronic low-back pain.[40] These authors concluded that fear-avoidance behaviors likely contribute to the maintenance of chronic pain and that there is evidence to suggest that pain-related fear may serve as a risk factor for the development of chronic low-back pain.[40]

Although there is increasing evidence to support the fear-avoidance model of chronic pain, we are not aware of any studies that have attempted to estimate the magnitude of the relation between pain-related fear and disability. The variability observed across studies may suggest the presence of moderating factors, though little is known regarding the circumstances in which the strength of this relation may vary. Therefore, the main goal of the current study was to estimate the magnitude of the relation between pain-related fear and self-reported disability among persons reporting acute or chronic pain. First, we sought to estimate the average correlation after correcting for sampling error and artifacts (ie, reliability of predictor and criterion variables) across primary studies. We then sought to test the influence of potential moderating factors, including measurement variability, participant demographics, and pain characteristics. For example, subgroup analyses were conducted to estimate the average correlation between pain-related fear and disability within different pain conditions and for individual measures of pain-related fear and disability.

Method

Search Procedure and Study Selection

Relevant studies published prior to April 2012 were identified using PubMed and PsycINFO online databases. Searches were conducted using the terms *fear* and *pain* and *disability*, and returned reference lists were reviewed to identify additional relevant studies. Searches yielded a total of 787 unique citations. Studies were included if they met the following criteria: published in English, published in a peer-reviewed journal, included self-report measures of pain-related fear and disability (eg, occupational, social, or recreational), included only participants who reported current acute or chronic pain (ie, not healthy controls), and reported correlations between pain-related fear and disability. Studies that examined treatment efficacy were included if they reported correlations at baseline (ie, pretreatment). When multiple studies used the same sample, the publication that provided the most information (eg, reliability coefficients for measures of pain-related fear and disability) was selected for inclusion. For instances in which studies reported results for more than 1 sample (ie, distinct, nonoverlapping groups of participants), results were coded separately for each sample. Fig 1 depicts the stages in which studies were identified and the number of studies excluded at each stage. A total of 41 primary studies, with 46 unique samples, were identified for inclusion in the current meta-analysis.

Selection of Predictor Variables

Pain-related fear is typically measured via self-report instruments that assess fear of experiencing pain, fear of activities that may elicit pain (eg, work and physical activity), fear of movement/(re)injury, and pain-related anxiety. All studies that included at least 1 self-report measure of pain-related fear were eligible for inclusion in the current analyses. Table 1 presents a summary of each pain-related fear measure from which data were derived.

Selection of Criterion Variables

Pain-related disability has been identified as a core outcome measure that should be assessed in all trials involving patients with chronic pain.[18] Patient perceptions of disability can be reliably assessed via both general and condition-specific self-report measures that assess impaired functioning across a variety of domains, including self-care, physical activity, and social

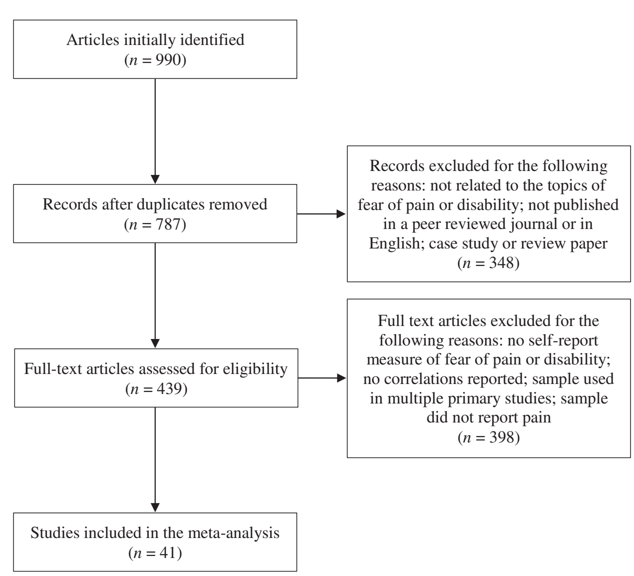

Figure 1. Study selection process.

Table 1. Self-Report Measures of Pain-Related Fear and Disability

Measure	Domains Assessed
Pain-related fear	
FABQ[87]	Belief that pain will be caused or made worse by work or physical activity, avoidance of work and physical activity
FOPQ[65]	Fear of experiencing pain, avoidance of activity
PASS[47]	Fear of experiencing pain and symptoms of anxiety, avoidance of activity
PFActS-C[75]	Fear of performing movements and activities that may be associated with neck pain
TSK[49]	Focus on somatic complaints, interpretations of pain as serious injury, fear of injury due to movement and physical activity
Disability	
BPI[8]	General measure; pain-related interference with work, social relations, physical activity, mood, sleep, and enjoyment of life
CALI[52]	General measure; difficulty performing physical, social, school-related, work-related, and recreational activities in children and adolescents
DASH[29]	Specific to arm, shoulder, and hand pain; difficulty performing physical activities, pain-related interference with sleep, work, social functioning and self-image, severity of physical symptoms (eg, pain, tingling, stiffness)
DRI[62]	Specific to neck, shoulder, and low-back pain; difficulty performing daily, work-related, and physical activities
FDI[88]	General measure; difficulty performing daily, physical, and social activities
NDI[80]	Specific to neck pain; pain intensity, pain-related interference with self-care, lifting, work, concentration, driving, reading, sleeping, headaches, recreation
ODI[19]	Specific to low-back pain; pain intensity, pain-related interference with self-care, lifting, walking, sitting, standing, sexual activity, social functioning, traveling
PDI[56]	General measure; interference with family/home responsibilities, recreation, social activities, occupation, sexual behavior, self-care, life-support activities
QBPDS[37]	Specific to back pain; pain-related interference with sleep, walking, lifting, self-care
RMDQ[59]	Specific to low-back pain; pain-related interference with self-care, work, physical activity/movement, mood
SPADI[57]	Specific to shoulder pain; difficulty performing self-care and daily activities

Abbreviations: FOPQ, Fear of Pain Questionnaire; PASS, Pain Anxiety Symptoms Scale; PFActS-C, Pictorial Fear of Activity Scale–Cervical; TSK, Tampa Scale for Kinesiophobia; BPI, Brief Pain Inventory; CALI, Child Activities Limitations Interview; DASH, Disability of the Arm, Shoulder, and Hand Questionnaire; DRI, Disability Rating Index; FDI, Functional Disability Inventory; NDI, Neck Disability Index; ODI, Oswestry Disability Index; PDI, Pain Disability Index; QBPDS, Quebec Back Pain Disability Scale; RMDQ, Rolland-Morris Disability Questionnaire; SPADI, Shoulder Pain and Disability Index.

and occupational functioning. All studies included in this meta-analysis incorporated at least 1 self-report measure of disability (see Table 1).

Selection of Moderator Variables

Type of Measure Used to Assess Predictor and Criterion Variables

Primary studies that tested associations between pain-related fear and disability have employed a variety of self-report measures to assess both constructs. With regard to predictor measures, although some directly assess fear of experiencing pain,[47,65] others assess beliefs that pain may be indicative of serious injury or that pain may be worsened by movement,[49,75,87] and only a few assess specific avoidance behaviors.[47,65,87] With regard to criterion disability measures, a relatively small proportion assesses how pain may interfere with factors such as mood,[8,59] sexual activity,[19,29,56] and sleep,[8,29,37,59,80] and researchers have expressed concern that some disability measures may be susceptible to floor and ceiling effects, possibly as a function of disability severity.[58] Given the observed variability in predictor and criterion measures, we sought to test whether the association between pain-related fear and disability may be moderated by the type of measure used across primary studies. We also sought to examine whether the magnitude of this association may vary across subscales within a single measure.

Demographic Characteristics

Among persons with chronic pain, age and gender differences have been observed with regard to pain reporting (eg, pain intensity), treatment outcomes, and health-related quality of life.[20,60,61] Therefore, we sought to test whether average age or gender composition of the sample moderated the relation between pain-related fear and disability.

Pain Characteristics

First, although pain intensity has not traditionally been included in the fear-avoidance model, it has been positively associated with greater disability.[25] Therefore, we tested average self-reported pain intensity (typically measured on a 0–10 scale) as a potential moderator of the relation between pain-related fear and disability. Second, given that treatment-seeking chronic pain patients may report more severe/enduring pain, we also tested treatment status (treatment-seeking vs non-treatment-seeking) as a potential moderator. Third, the extent to which pain duration may moderate the relationship between pain-related fear and disability remains unclear. For example, the fear avoidance model predicts that pain-related fear is a precursor to pain-related disability, so it may be that pain-related fear is more strongly related to disability at the onset of a chronic pain condition. Therefore, we tested chronic pain duration as a potential moderator. Finally, although the fear-avoidance model was originally developed with regard to chronic low-back pain, the relation between pain-related fear and disability has since been tested among persons with a variety of chronic pain conditions, and there is reason to believe that the model may apply across types of pain.[40] Therefore, we sought to test whether differences in the relation between pain-related fear and disability could be observed between studies that included samples with low-back pain, relative to other pain conditions.

Data Extraction

Data were coded by 2 independent reviewers. For each study, the sample size, demographic variables (ie, age, gender composition), and correlations (*r*) between pain-related fear and disability were recorded. With regard to measures of pain-related fear and disability, coders documented which measures had been utilized and the reliability coefficient (α) for each measure. For studies that utilized multiple pain-related fear or disability measures, intercorrelations between the measures were coded. Various pain characteristics were also coded for use in moderator analyses. The primary pain type was coded as low-back pain or "other" (eg, nonspecific pain, whiplash). Coders also documented whether the sample was recruited from a pain treatment program or whether participants were seeking pain treatment services at the time of study enrollment. Although no standard has been agreed upon, acute and chronic pain are typically distinguished by cut-offs within a range of 3 to 12 months.[74] Therefore, 2 dichotomous variables were created to represent pain duration: pain lasting longer than 3 months (yes/no) and pain lasting longer than 1 year (yes/no). Pain duration was coded only for primary studies that reported relevant inclusion criteria (ie, minimum pain duration). In instances in which minimum pain duration was not reported, pain duration was coded based on the reported measure of central tendency (eg, mean duration). Average pain intensity ratings (ie, numerical rating scale, 0–10 or 0–100) were also coded. Finally, gender composition of the sample was coded as the percentage of the total sample that was female.

Data Analytic Approach

Effect size estimates were derived using methods outlined by Hunter and Schmidt.[31] Two sets of meta-analytic calculations were conducted in order to estimate the magnitude of the relation between pain-related fear and disability before and after correction for reliability artifacts. First, a random-effects model that corrects for sampling error in primary studies was used to generate the average sample size–weighted correlation ($\bar{r}$) and to determine the amount of variance attributable to sampling error. Second, calculations were conducted using the artifact distribution method, which yields the average correlation ($\bar{\rho}$) corrected for artifacts in the primary studies.[31] These analyses employed corrections for reliability (α) of predictor (pain-related fear) and criterion (disability) measures reported across primary studies. Reliability artifact distributions are presented in Table 2.

Table 2. Reliability Artifact Distributions for Predictor and Criterion Variables

Variable	α	SD	N	k
Predictor: Pain-related fear				
All measures	.83	.09	2,729	13
FABQ	.90	.07	113	2
FABQ-W	.91	.09	113	2
FABQ-PA	.75	.25	113	2
TSK	.79	.08	2,433	12
PASS	.92	—	31	1
FOPQ	.96	—	296	1
Criterion: Disability				
All measures	.88	.05	3,091	13
RMDQ	.84	.04	681	3
PDI	.87	.04	1,911	5
QBPDS	.94	.04	1,111	3
NDI	.87	—	94	1
BPI	.90	—	104	1

Abbreviations: α, reliability artifact distribution mean; SD, reliability artifact distribution standard deviation; N, reliability artifact distribution sample size; *k*, number of samples from which the reliability artifact distribution was derived; FABQ-W, Work subscale of the FABQ; FABQ-PA, Physical Activity subscale of the FABQ; TSK, Tampa Scale for Kinesiophobia; PASS, Pain Anxiety Symptoms Scale; FOPQ, Fear of Pain Questionnaire; NDI, Neck disability Index; PDI, Pain Disability Index; QBPDS, Quebec Back Pain Disability Scale; RMDQ, Roland-Morris Disability Questionnaire; BPI, Brief Pain Inventory.

NOTE. Reliability coefficients were not provided for the Pictorial Fear of Activity Scale–Cervical, Functional Disability Index, Shoulder Pain and Disability Index, Disability Rating Index, Child Activities Limitations Interview, and Disability of the Arm, Shoulder, and Hand Questionnaire.

To address assumptions of independence, 1 correlation between pain-related fear and disability was included from each primary study. When primary studies reported correlations between multiple measures, composite formulas were used to generate a single effect size for each sample.[51] In these instances, reliability coefficients were also pooled using formulas by Nunnally.[51] The average correlation between pain-related fear and disability was calculated for 2 studies that did not report all information required to employ composite formulas.[2,46]

Two types of moderator analyses were conducted. For categorical moderators, meta-analytic calculations were conducted separately within each level of the hypothesized moderator. Similar to our estimate of the overall effect size, the average sample size–weighted correlation was calculated using a random-effects model, and the artifact distribution method was used to generate an effect size estimate that also corrected for reliability of the predictor and criterion measures. Subgroup analyses were conducted in the same manner, in order to test whether the average sample size–weighted correlation ($\bar{r}$) or the average corrected correlation ($\bar{\rho}$) varied across groups. Continuous moderators were tested using weighted least squares regression with method-of-moments parameters.[43,90]

Risk of availability bias was assessed using formulas for file drawer analyses provided by Hunter and Schmidt.[31] Analyses calculated the number of studies with null findings that would be needed in order to reduce the average correlation to practical insignificance.

Specifically, we calculated the number of studies required to reduce the correlation between pain-related fear and disability below that which could be considered a small effect size (ie, to a correlation of .1).

Results

Study Coding

The meta-analysis included 46 independent samples (N = 9,579) from 41 primary studies. With regard to moderator analyses, pain intensity data were available for 37 samples. Adequate information that allowed for classification of pain duration was reported in a total of 40 samples. Coded variables from each sample are presented in Table 3. Initial agreement between the 2 independent raters was 85%, and consensus reached 100% via discussion and reference to the coding manual.

Estimate of the Average Correlation Between Pain-Related Fear and Disability

Results of all meta-analytic calculations are presented in Table 4. The average sample size–weighted correlation ($\bar{r}$) between pain-related fear and disability was found to be .42, which can be classified as moderate to large in magnitude.[11] Results indicated that approximately 35% of the variance observed in the sample correlations was accounted for by sampling error. After correcting for reliability in the criterion and predictor variables, the average corrected correlation ($\bar{\rho}$) between pain-related fear and disability was .50, which can be classified as a large effect. Approximately 41% of the variance observed in the sample correlations was found to be attributable to sampling error and reliability artifacts of pain-related fear and disability measures.

Moderator Analyses

Type of Measure Used to Assess Predictor and Criterion Variables

A total of 43 samples reported individual correlations between disability and the 2 subscales (ie, physical activity, work) of the Fear-Avoidance Beliefs Questionnaire (FABQ).[87] Both the sample size–weighted correlations and the average corrected correlations were greater when pain-related fear was measured with the Physical Activity subscale ($\bar{r}$ = .38, $\bar{\rho}$ = .44) than with the Work subscale ($\bar{r}$ = .31, $\bar{\rho}$ = .36). A greater percentage of the variance attributable to sampling error was also observed when pain-related fear was measured with the Physical Activity subscale relative to the Work subscale. Confidence intervals around the estimated correlations were observed to be nonoverlapping, which may suggest that scores on the Physical Activity subscale of the FABQ are more strongly related to disability than are scores on the Work subscale. Additional analyses were conducted to test whether the magnitude of the relation between pain-related fear and disability varied between studies that used the FABQ or the Tampa Scale for Kinesiophobia.[49] Overlapping confidence intervals were observed around both the average sample-size weighted correlation ($\bar{r}$) and the average corrected correlation ($\bar{\rho}$), which indicated that the relation between pain-related fear and disability remained stable when measured with either the FABQ or the Tampa Scale for Kinesiophobia.

When meta-analytic calculations were performed separately for each type of disability measure, the average sample size–weighted correlation ranged from .33 to .45, and the average corrected correlation ranged from .38 to .52 (see Table 4). In both cases, the lowest correlations were estimated from primary studies that utilized the Neck Disability Index,[80] and the highest correlations were estimated from primary studies that utilized the Pain Disability Index.[56] However, large, overlapping confidence intervals indicated that the type of disability measure may not moderate the relation between pain-related fear and disability.

Demographic Characteristics

Age and gender composition of the sample (% female) were tested as continuous moderators. Results indicated that neither average age ($r = -.04$, $P = .75$) nor the gender composition of the sample ($r = -.01$, $P = .96$) moderated the association between pain-related fear and disability.

Pain Characteristics

Pain intensity was tested as both a categorical and a continuous moderator. First, a median split was utilized to categorize samples as either high (k = 18) or low (k = 19) intensity, and meta-analytic calculations were conducted separately for each group. Results indicated that correlations between pain-related fear and disability did not differ across groups. Similar results were observed when pain intensity was tested as a continuous moderator ($r = .18$, $P = .26$). All other pain characteristics were tested as categorical moderators. The estimated correlation between pain-related fear and disability did not differ as a function of pain location, pain duration, type of chronic pain condition, or whether samples were derived from treatment-seeking populations.

Risk of Availability Bias

A file drawer analysis was conducted in order to determine the number of studies with null findings that would be needed in order to reduce the average correlation to practical insignificance. Results indicated that more than 147 studies, which found no relation between pain-related fear and disability, would be needed in order to reduce the average correlation below that which could be considered a small effect size.

Discussion

Two methods were used to estimate the magnitude of the relation between pain-related fear and disability among persons experiencing acute or chronic pain. Relative to the average sample size–weighted correlation

Table 3. Summary of Information Coded From Adult and Pediatric Samples

		Measures					Demographics		Pain Characteristics				
Reference	N	Pain-Related Fear	Disability	R_{XY}	α_X	α_Y	Age (M)	% F	Type	<3 mo	<1 y	Treatment Seeking	Intensity (M)*
Adult studies													
Ayre and Tyson (2001)[1]	121	FABQ-W; FABQ-PA	QBPDS	.43	—	—	39.42	35.54	LBP	Yes	Yes	No	5.45
Boersma and Linton (2006)[2]	141	TSK activity; TSK somatic	RMDQ	.43	—	—	47.70	80.15	Other	No	No	Yes	4.50
Calley et al (2010)[5]	80	FABQ-W; FABQ-PA; TSK	ODI	.48	—	—	46.60	57.50	LBP	No	No	Yes	3.70
Chaory et al (2004)[7]													
Sample 1	147	FABQ-W; FABQ-PA	QBPDS	.37	—	—	45.30	—	LBP	No	No	Yes	33.10
Sample 2	70	FABQ-W; FABQ-PA	QBPDS	.05	—	—	42.50	—	LBP	No	No	Yes	48.60
Cleland et al (2008)[9]	78	FABQ-W; FABQ-PA; TSK-17; TSK-13	NDI	−.09	.97	—	42.00	67.95	Other	No	No	Yes	4.70
Cook et al (2006)[12]	469	TSK avoidance; TSK harm	PDI	.43	.84	.86	46.30	63.97	Other	—	—	Yes	72.30
Coudeyre et al (2007)[13]	2,727	FABQ-W; FABQ-PA	QBPDS	.43	—	—	44.00	43.34	LBP	No	—	No	6.80
Crombez et al (1999)[14]													
Sample 1	35	FABQ-W; FABW-PA; TSK-13	RMDQ	.68	.89	.85	36.10	68.57	Other	No	No	Yes	61.70
Sample 2	31	TSK; PASS	RMDQ	.34	.92	.80	41.61	51.61	Other	No	No	Yes	56.80
Denison and Lindberg (2004)[17]													
Sample 1	210	TSK	PDI	.47	.74	.85	45.00	75.71	Other	No	No	Yes	4.80
Sample 2	161	TSK	PDI	.53	.83	.86	47.00	64.60	Other	No	No	Yes	6.00
French et al (2007)[21]	200	FABQ-W; FABQ-PA; TSK	QBPDS	.35	.84	—	40.00	54.00	Other	—	—	Yes	5.20
Fritz et al (2001)[22]	78	FABQ-W; FABQ-PA	ODI	.42	—	—	37.40	38.46	LBP	Yes	Yes	Yes	—
Gauthier et al (2006)[24]	255	TSK	PDI	.41	.77	—	41.40	46.67	Other	—	—	Yes	—
Gheldof et al (2006)[25]	890	TSK	QBPDQ; PDI	.54	—	.98	39.52	12.47	Other	—	—	No	2.96
Grotle et al (2004)[27]													
Sample 1	123	FABQ-W; FABQ-PA	ODI	.24	—	—	37.80	55.28	LBP	Yes	Yes	No	47.70
Sample 2	233	FABQ-W; FABQ-PA	ODI	.33	—	—	42.00	54.51	LBP	No	No	Yes	59.20
Grotle et al (2012)[26]	87	FABQ-PA	ODI; DRI	.35	—	—	34.40	100	Other	No	No	No	49.50
Huis in 't Veld et al (2007)[30]	58	FABQ-W; FABQ-PA; mFABQ; mTSK-17	NDI	.41	—	—	49.34	100	Other	No	No	No	—
Kall (2009)[33]	47	TSK	PDI	.50	—	—	31.00	63.93	Other	Yes	Yes	Yes	46.30
Koho et al (2001)[36]	51	TSK-17	ODQ	.36	—	—	44.60	52.94	Other	No	No	Yes	70.60
Kovacs et al (2006)[39]	209	FABQ-W; FABQ-PA; FABQ	RMDQ	.51	.93	—	45.70	57.89	LBP	Yes	Yes	Yes	6.20
Kovacs et al (2007)[38]	439	FABQ-PA	RMDQ	.46	—	—	80.40	64.92	LBP	No	—	Yes	5.20
Lewis et al (2012)[42]	47	TSK; PASS-20	RMDQ	.52	—	—	46.20	61.70	LBP	—	—	Yes	4.80
McCracken et al (1996)[46]	45	FABQ-W; FABQ-PA; FABQ	PDI	.46	—	—	46.30	53.33	Other	No	No	Yes	—
Meyer et al (2009)[48]	78	FABQ-W; FABQ-PA	RMDQ	.68	—	—	50.00	66.67	LBP	No	No	Yes	5.30
Mintken et al (2010)[50]	80	FABQ-WB; FABQ-WC; FABQ-PA; TSK-11	SPADI	.33	—	—	41.20	60.00	Other	No	No	Yes	50.80
Pedler and Sterling (2011)[53]	96	TSK-17; PFActS-C	NDI	.51	—	—	37.10	62.24	Other	Yes	Yes	No	3.60

Table 3. Continued

		Measures					Demographics		Pain Characteristics				
Reference	N	Pain-Related Fear	Disability	R_{XY}	α_X	α_Y	Age (M)	% F	Type	<3 mo	<1 y	Treatment Seeking	Intensity (M)*
Peters et al (2005)[54]	100	PASS-20; TSK	QBPDS	.38	—	.90	49.90	56.00	LBP	No	No	Yes	69.00
Samwel et al (2007)[63]	181	TSK	PDI	.42	—	—	48.70	64.09	Other	No	No	Yes	—
Schutze et al (2010)[64]	104	TSK	BPI	.44	.83	.90	54.50	68.27	Other	No	Yes	Yes	5.89
Swinkels-Meewisse et al (2006a)[67]	93	TSK-17	RMDQ	.43	—	—	44.80	51.61	LBP	Yes	Yes	Yes	40.10
Swinkels-Meewisse et al (2003 and 2006b)†	615	TSK-17 harm; TSK-17 avoidance; TSK; FABQ-W; FABQ-PA	RMDQ	.36	—	.87	42.65	—	LBP	Yes	Yes	Yes	59.50
2003[69]	615	TSK-17 harm; TSK-17 avoidance; TSK	RMDQ	.34	—	.87	42.30	—	LBP	Yes	Yes	Yes	59.50
2006b[68]	615	FABQ-W; FABQ-PA	RMDQ	.43	—	—	43.00	—	LBP	Yes	Yes	Yes	—
Thomas et al (2010)[70]	50	FABQ-W; FABQ-PA; TSK	RMDQ	.61	—	—	50.26	30.00	LBP	No	Yes	Yes	—
Thompson et al (2010)[71]	94	TSK-17	mNDI	.08	.66	.87	51.10	52.13	Other	No	No	Yes	1.80
Valencia et al (2011)[76]	108	FABQ-W; FABQ-PA	ODI	.57	—	—	37.60	63.89	LBP	No	Yes	Yes	4.67
Van den Hout et al (2001)[77]	122	FABQ-W; FABQ-PA; TSK	RMDQ	.38	—	—	40.00	27.87	LBP	No	No	Yes	—
Verbunt et al (2003)[78]	37	TSK-17	RMDQ	.44	—	—	45.20	29.73	LBP	No	No	Yes	—
Vernon et al (2011)[79]	91	TSK-17	NDI	.45	—	—	41.70	46.15	Other	No	Yes	Yes	68.30
Vlayen et al (1995)[82]	33	TSK-DV	RMDQ	.49	—	—	37.40	51.52	LBP	No	No	Yes	51.60
Vranceanu et al (2010)[85]	120	PASS-20	DASH	.25	—	—	61.00	57.50	Other	—	—	Yes	—
Waddell et al (1993)[87]	184	FABQ-W; FABQ-PA	RMDQ activity; RMDQ work loss; RMDQ work loss past year	.39	—	—	39.70	44.57	Other	No	No	Yes	—
Pediatric studies													
Martin et al (2007)[44]	21	PASS-20	FDI	.63	—	—	14.24	76.19	Other	—	—	Yes	6.80
Simons et al (2011)[65]	296	FOPQ-C; FOPQ-FOP; FOPQ-A	FDI	.45	.96	—	13.80	80.07	Other	No	No	Yes	—
Wilson et al (2011)[89]	42	FABQ-PA	CALI	.42	—	—	14.90	73.81	Other	No	Yes	Yes	6.57

Abbreviations: TSK, Tampa Scale for Kinesiophobia; FABQ-W, Work subscale of the FABQ; FABQ-PA, Physical Activity subscale of the FABQ; PASS-20, Pain Anxiety Symptom Scale–20 Item; NDI, Neck Disability Index; mNDI, modified Neck Disability Index; ODI, Oswestry Disability Index; PDI, Pain Disability Index; QBPDS, Quebec Back Pain Disability Scale; RMDQ, Roland Morris Disability Questionnaire; CALI, Child Activities Limitations Interview; DASH, Disability of the Arm, Shoulder, and Hand Questionnaire; FOPQ-C, Fear of Pain Questionnaire–Child; FOPQ-FOP, Fear of Pain Questionnaire–Fear of Pain; FOPQ-A, Fear of Pain Questionnaire Avoidance of Activities; PFActS-C, Pictorial Fear of Activities Scale–Cervical; FDI, Functional Disability Index; SPADI, Shoulder Pain and Disability Index; DRI, Disability Rating Index; BPI, Brief Pain Inventory; LBP, lower back pain.

NOTE. R_{xy} = correlation between pain-related fear and disability; α_x = reliability of pain-related fear measure; α_y = reliability of disability measure; % F = percent of sample that were female; <3 mo = pain lasting less than 3 months; <1 y = pain lasting less than 1 year.

*Pain intensity was measured on numerical rating scales of 0 to 10 or 0 to 100. When primary studies reported pain intensity on a 0 to 10 scale, a linear transformation was used in order to convert all pain ratings to a single metric (0–100).

†Swinkels-Meewisse et al (2003)[69] and Swinkels-Meeswisse et al (2006b)[68] contained some overlap in participants, and were therefore treated as multiple groups within the same sample (ie, information was combined using composite formulas as outlined in the methods).

Table 4. Meta-Analysis Results for the Correlation Between Pain-Related Fear and Disability

			Model 1: Random-Effects Method, Correcting for Sampling Error				Model 2: Artifact Distribution Method, Correcting for Sampling Error and Artifacts				
Predictor	N	k	$\bar{r}$	SD_R	% Var_1	95% CI	$\bar{\rho}$	SD_ρ	% Var_2	95% CI	80% CV
Pain-related fear	9,579	46	.42	.10	34.69	.40– .45	.50	.09	41.14	.46– .53	.39– .61
Moderator analyses											
Pain-related fear measure											
FABQ	5,468	21	.42	.08	43.83	.38– .45	.49	.06	53.62	.45– .53	.44– .57
TSK	3,798	21	.45	.09	43.55	.41– .48	.52	.07	51.68	.48– .57	.43– .61
FABQ subscale											
FABQ-W	5,391	20	.31	.10	27.83	.26– .35	.36	.10	30.74	.31– .41	.23– .49
FABQ- PA	5,959	23	.38	.07	50.91	.35– .41	.45	.05	59.83	.41– .48	.38– .52
Disability measure											
NDI	325	4	.33	.24	17.43	.10– .56	.39	.25	18.08	.11– .66	.07– .71
ODI	593	5	.37	.11	54.23	.27– .46	.43	.08	58.08	.32– .54	.33– .53
PDI	1,368	7	.45	.04	100	—	.52	0	100	—	—
QBPDS	3,487	7	.41	.06	43.79	.37– .45	.48	.04	61.35	.43– .53	.43– .53
RMDQ	1,992	13	.44	.09	59.19	.39– .49	.51	.06	68.15	.46– .57	.44– .59
Other	837	8	.37	.13	40.95	.28– .46	.44	.11	43.62	.33– .54	.29– .58
Pain intensity											
High	5,605	18	.43	.05	75.21	.41– .46	.50	.01	97.12	.48– .53	.49– .52
Low	2,746	19	.42	.16	18.95	.34– .49	.49	.16	21.25	.40– .57	.28– .69
Pain type											
LBP	5,510	20	.42	.08	43.21	.38– .45	.49	.06	53.37	.45– .53	.41– .56
Other	4,069	26	.43	.12	30.11	.39– .48	.51	.51	34.56	.45– .56	.36– .65
Pain duration = 3 mo											
<3 mo	4,958	10	.43	.09	15.63	.37– .49	.50	.09	22.93	.44– .57	.38– .63
>3 mo	3,380	29	.41	.11	48.65	.37– .45	.48	.09	53.23	.43– .53	.37– .59
Pain duration = 1 y											
<1 y	5,933	17	.44	.09	24.20	.40– .48	.51	.08	32.49	.46– .56	.41– .62
>1 y	2,534	23	.40	.12	46.24	.35– .45	.47	.10	50.16	.41– .53	.35– .59
Seeking pain treatment											
No	4,104	7	.45	.06	27.71	.40– .49	.52	.05	44.60	.47– .58	.45– .59
Yes	5,475	39	.41	.11	39.14	.37– .44	.48	.10	43.50	.43– .52	.35– .60

Abbreviations: LBP, low-back pain; CV, credibility interval; TSK, Tampa Scale for Kinesiophobia; FABQ-W, Work subscale of the FABQ; FABQ-PA, Physical Activity subscale of the FABQ; NDI, Neck Disability Index; ODI, Oswestry Disability Index; PDI, Pain Disability Index; QBPDS, Quebec Back Pain Disability Scale; RMDQ, Roland-Morris Disability Questionnaire; LBP, lower back pain.

NOTE. $\bar{r}$ = mean sample size–weighted correlation; SD_r = sample size–weighted observed standard deviation of r values; % Var_1 = percent variance attributable to sampling error; CI = confidence interval; $\bar{\rho}$ = average correlation corrected for artifacts; SD_ρ = corrected standard deviation of corrected correlations; % Var_2 = percent variance attributable to sampling error and artifacts.

($\bar{r}$ = .42), the correlation between pain-related fear and disability was larger when the artifact distribution method was used ($\bar{\rho}$ = .50). Thus, it appears that the magnitude of the relationship can be classified as moderate to large.[11] Additional analyses were conducted to test potential moderating factors. Results were stable across demographic and pain characteristics. The average sample size–weighted correlations and the average corrected correlations did not vary as a function of sample age, gender composition, average pain intensity, pain location, pain duration, or whether the sample was derived from a population that was seeking pain-treatment. With regard to measures used to assess pain-related fear and disability, the FABQ Physical Activity subscale appeared to be more highly related to disability than did the FABQ Work subscale, but no other differences were observed.

Results from the current meta-analysis suggest that the relationship between pain-related fear and disability is relatively large and stable across demographic and pain characteristics. Assessment for risk of availability bias also indicated that a large number of missing studies would be required to reduce this association to practical insignificance. The current findings are consistent with the fear-avoidance model of chronic pain, which posits that pain-related fear may contribute to greater disability among persons with chronic pain. Importantly, the fear-avoidance model also predicts that reductions in pain-related fear may improve pain-related disability outcomes, and pain-related fear has been identified as a target for pain treatment.[40] Indeed, cognitive-behavioral therapy has been shown to reduce reported levels of pain-related fear,[3] and there is some evidence to suggest that persons high in pain-related fear may benefit from behavioral interventions that increase physical activity.[35]

In the current study, there was some evidence to suggest that the magnitude of the relation between pain-related fear and disability was less robust when the pain-related fear measure was specific to work-related activities (ie, FABQ Work subscale). This finding may reflect a multidimensional conceptualization of disability, which extends beyond occupational functioning to include social, recreational, and general physical (eg, sleep, self-care) functioning. As such, it may suggest that fear of general physical activity (vs work-related activity) is a stronger predictor of global levels of pain-related disability. Additional research is needed to determine the clinical significance of this finding. For example, settings that aim to reduce patient burden may investigate whether administration of only the FABQ Physical Activity Subscale (4 items) is sufficient for predicting disability or guiding interventions that target pain-related fear in clinical populations.

Given the observed strength of association between pain-related fear and disability, it is notable that pain characteristics (eg, duration, intensity) did not moderate this relation. For example, the current results demonstrated a robust relation between pain-related fear and disability, even among persons experiencing acute pain (ie, less than 3 months). This finding is consistent with the fear-avoidance model of chronic pain, in that pain-related fear may predict disability following acute injury, and that pain-related fear may serve to maintain disability in the presence of recurring pain. Future research may examine the extent to which reducing pain-related fear following acute injury may impede progression to chronic pain. For example, there is some evidence to suggest that reductions in pain-related fear are associated with recovery following acute injury.[49] Although pain intensity was not observed to moderate the relation between pain-related fear and disability in the current study, pain intensity has been associated with negative outcomes, including disability,[22] depression,[15] and suicidal ideation.[66] Thus, these findings should not preclude future investigations of how pain characteristics may influence treatments that address pain-related fear, as such outcomes may vary as a function of pain duration and/or intensity.

Similarly, although these results indicated that average age and gender composition of the sample did not moderate the relation between pain-related fear and disability, both have been associated with pain-treatment outcomes,[20,28] and future research would benefit from examining how sociodemographic characteristics may influence the outcomes of treatments that target pain-related fear. Future studies should also explore additional psychosocial variables (eg, attentional processes, negative affectivity, emotion regulation) that may moderate the relation between pain-related fear and disability. For example, greater attention to pain has been associated with increased emotional distress and reduced psychosocial functioning among persons with chronic pain,[45] and reductions in pain-related fear have been associated with decreased pain-related attentional bias following pain-treatment.[16] Similarly, affect and emotion regulation have been associated with pain reactivity, and engagement of maladaptive emotion regulation strategies (eg, suppression) has been associated with negative pain-treatment outcomes.[34]

To our knowledge, the current investigation provides the first meta-analytic estimate of the magnitude of the relation between pain-related fear and disability. However, several limitations should be noted. First, primary studies were cross-sectional investigations, which preclude inferences of causality. Second, there is little consensus regarding definitions of acute and chronic pain,[73,74] and many primary studies either provided minimal descriptions of their pain sample (eg, provided only a median pain duration) or did not specify pain duration as an inclusion criterion. Therefore, our tests of pain duration as a moderator were likely limited by the extent to which samples could be categorized as acute or chronic in nature. Third, many primary studies (78%) did not provide reliability coefficients for the measures used in their samples, which prohibited analyses that correct for artifacts specific to each sample (ie, individual corrections meta-analysis),[31] and may have limited the extent to which the corrected correlations reflect an estimate of the construct-level correlation. Finally, we were unable to test relations between pain-related fear, disability, and other potentially relevant individual differences (eg, affect) because of the small number of primary studies that reported such data.

In summary, results of the current meta-analysis indicated a robust relation between pain-related fear and disability, which can be classified as moderate to large in magnitude. The magnitude of this relation was observed to be stable across relevant demographic and pain characteristics. Consistent with these findings, pain-related fear has been identified as an important target for pain treatment, and evidence suggests that reductions in pain-related fear may be associated with improved treatment outcomes.[53] Future research should seek to identify potential pain-related, psychosocial, and sociodemographic factors that may influence the course and outcomes of treatments designed to target pain-related fear.

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