THE RELATIONSHIP OF FEAR-AVOIDANCE TO DISABILITY: A QUANTITATIVE REVIEW

By

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Pain-related fear and its attendant avoidance behaviors have been identified as key psychosocial variables in the development and maintenance of chronic low back pain. A growing number of prospective studies have indicated that fear-avoidance models are useful in predicting long-term disability. However, longitudinal data have yielded varying and sometimes conflicting results. A systematic quantitative review of prospective studies was conducted to examine the effect sizes of fear avoidance variables in the prediction of disability in patients with low back pain. A literature search resulted in 12 studies which met initial inclusion criteria. Analyses revealed that while fear avoidance variables typically share moderate zero order correlations with disability measured at baseline, effect sizes decrease to small effects over time, particularly when controlling for relevant variables such as initial pain intensity, or psychosocial variables such as distress. This pattern of results indicates that fear avoidance variables may share substantial statistical and conceptual overlap with other psychosocial variables and may be best viewed as part of a larger psychosocial model, rather than as independent predictors of disability.

CHAPTER 1
INTRODUCTION

Chronic Low Back Pain: A Statement of the Problem

Pain is one of the most common reasons people seek medical attention (Schappert, 1989). When pain becomes chronic, there are serious negative consequences for physical, psychological, and social functioning, with deleterious effects noted in both work and family life (Turk, 2001).

Low Back Pain (LBP) is one of the most common forms of pain reported (Mantyselka et al.., 2001; Sternbach, 1986), with 53% of adults in the general population experiencing some disability from LBP in a six month period (Walker, Muller, & Grant, 2004). LBP is a significant source of cost to both the individual and society, associated with increased healthcare expenditures and lost productivity (Andersson, Ejlertsson, Leden, & Rosenberg, 1993; Stang, Von Korff, & Galer, 1998; Stewart, Ricci, Chee, Morganstein, & Lipton, 2003; Tacci, Webster, Hashemi, & Christiani, 1998; Walker et al.., 2004). It has long been asserted that only a small percentage of patients who experience an acute episode will develop chronic LBP (Watson, Main, Waddell, Gales, & Purcell-Jones, 1998). However, recent data suggests that acute LBP evolves into a chronic or recurrent condition more frequently than previously suspected (Hestbaek, Leboeuf-Yde, & Manniche, 2003).

Chronic LBP, with an estimated prevalence of 15 to18% in the adult population, is of special concern (Frank et al.., 1996). The cost of chronic LBP to society has been estimated at $18 billion annually (Linton & van Tulder, 2001), a figure which distinguishes chronic LBP as the most expensive benign medical condition in industrialized countries (Mayer, 1991). The associated prevalence and costs highlight chronic LBP as an important public health concern,

and underscore the need for research focused on the identification and treatment of those at risk for developing chronic LBP.

Because an underlying physical pathology responsible for the development and maintenance of chronic LBP has not been discovered in the majority of patients who suffer with this condition, the development of biomedically oriented prevention and treatment strategies has not been successful (Hart, Deyo, & Cherkin, 1995; Linton & van Tulder, 2001; Loeser, 1994). Randomized, clinical trials have repeatedly shown that commonly used strategies intended to prevent the development of LBP, such as back schools, lumbar supports, and ergonomic interventions, are ineffective (Linton & van Tulder, 2001; Scheer, Radack, & O'Brien, 1995). However, studies have consistently identified psychosocial factors rather than physical impairments as better predictors of which patients will develop chronic disability from an acute episode of LBP (Burton, Tillotson, Main, & Hollis, 1995; Frank et al.., 1996; Gatchel, Polatin, & Mayer, 1995; Pincus, Burton, Vogel, & Field, 2002)

The Fear-Avoidance Model of Exaggerated Pain Perception

The Fear-avoidance Model of Exaggerated Pain Perception (FAMEPP), first proposed by Lethem and colleagues in 1983, has been posited as one explanation for why a subgroup of patients develop chronic LBP and its attendant disability (Lethem, Slade, Troup, & Bentley, 1983; Slade, Troup, Lethem, & Bentley, 1983). This model proposes that fear-avoidance beliefs and pain catastrophizing are the primary psychosocial factors responsible for the development of chronic LBP symptoms. More specifically, a patient's response to LBP can fall along a continuum of confrontation to avoidance. A confrontation response is viewed as adaptive as it supports the patient's participation in daily social and vocational activities, encouraging a recovery of function. An avoidance response to pain results from higher levels of pain related fear and avoidance, and has negative psychological and physical consequences for the individual.

Psychologically, exaggerated pain perception results from elevated levels of fear (George, Dannecker, & Robinson, 2006; George, Wittmer, Fillingim, & Robinson, 2007). Patients also may develop depressive and anxious symptoms as a result of their perceived loss of function, factors which are known to be associated with decreased pain tolerance (Vlaeyen & Linton, 2000). Physically, patients with LBP experience "disuse syndrome" (decreased spine range of motion, loss of muscle force, and weight gain) as a result of their avoidant response to the fear of pain (Bortz, 1984; Kottke, 1966; Lethem et al.., 1983; Slade et al.., 1983). A continuous feedback loop is therefore created in which the patient's elevated fear results in avoidant behavior, which consequently leads to increasing disability, emotional distress, and the maintenance of the fear and avoidance.

Vlaeyen and colleagues have further elaborated on this model by proposing a Cognitive Model of Fear of Movement/(Re)injury (Vlaeyen, Kole-Snijders, Boeren, & van Eek, 1995). This model conceptualized the pain related fear as a specific fear of movement, particularly that which the patient believes may result in further injury. This model also highlights the role of pain catastrophizing, defined as the belief that the pain experience will lead to the worst possible outcome (Sullivan et al.., 2001), as a psychosocial variable which increases the patient's fear of movement and subsequent avoidance behaviors (Vlaeyen & Linton, 2000).

Initial investigations have consistently demonstrated that elevated levels of pain related fear and avoidance are associated with the development and maintenance of chronic low back pain and its attendant disability. A study by Crombez and colleagues in 1998 categorized subjects as having either a confrontational or avoidance coping style, and found that those classified as Avoiders had greater pain related fear and levels of disability, and more difficulty with physical activities (Crombez, Vervaet, Lysens, Baeyens, & Eelen, 1998). Further evidence

of the relationship of pain related fear and functional limitations has been found in studies investigating the performances of patients with CLBP during a task which measured walking speed (Al-Obaidi, Al-Zoabi, Al-Shuwaie, Al-Zaabie, & Nelson, 2003) and a lifting task (Vlaeyen et al.., 1995). A growing body of literature exists which has demonstrated a relationship between higher levels of fear-avoidance and greater levels of disability (Asmundson, Norton, & Allerdings, 1997; Crombez, Vlaeyen, Heuts, & Lysens, 1999; Severeijns, Vlaeyen, van den Hout, & Weber, 2001; Waddell, Newton, Henderson, Somerville, & Main, 1993).

However, much of the research performed has been, until recently, cross sectional in nature, and thus unable to establish a causal relationship between elevated pain related fear and the development of chronic LBP disability. In 1995, Klenerman and colleagues published the first prospective study examining the relationship between these variables, and found higher levels of pain related fear to be a significant contributor to chronic LBP disability (Klenerman et al.., 1995). Many of the prospective studies which followed also found this relationship (Boersma & Linton, 2006; Fritz, George, & Delitto, 2001; George, Fritz, Bialosky, & Donald, 2003; Picavet, Vlaeyen, & Schouten, 2002; Woby, Watson, Roach, & Urmston, 2004). However; the results of these studies were more mixed than those of the cross sectional examinations. Several studies were unable to find significant prospective relationships between pain related fear, and disability (Grotle, Vollestad, & Brox, 2006; Grotle, Vollestad, Veierod, & Brox, 2004; Sieben et al.., 2005; Staerkle et al.., 2004).

Aims and Hypotheses

Although it appears that both cross sectional and prospective studies have indicated that fear-avoidance beliefs may play a role in the development of chronic LBP disability, the magnitude of these effects has not been systematically examined in the literature. With a

growing body of prospective literature, it is an opportune time to investigate the strength of the relationship between fear-avoidance beliefs and disability in order to guide future research endeavors. Our study proposes a quantitative review of the prospective literature to examine the relationship between fear avoidance variables measured at baseline and a follow-up time point, with the intention of assessing the magnitude of the relationship between pain related fear and disability.

The first aim of our study was to examine the relationship of fear-avoidance variables to initial disability ratings in patients with LBP. We hypothesize that fear-avoidance variables will be highly correlated with measures of disability.

The second aim is too assess the effectiveness of the fear-avoidance model in predicting later disability in patients with LBP. We hypothesize that fear-avoidance variables will demonstrate large effect sizes in models predicting later LBP related disability.

CHAPTER 2
METHODS

A review of the literature was undertaken to identify prospective studies using Fear-avoidance Beliefs as an independent variable predicting a measure of disability. A Medline database search was conducted using the following search terms: Pain, Fear-avoidance; Pain, Kinesiophobia; Pain, Fear of Movement/(Re)Injury. A publication cutoff date of September, 2006, was used; however, no backward cutoff date was specified. Additional articles were identified using the bibliographies of the studies located through Medline database.

Twenty-five studies were initially identified for inclusion in the review. Because this is a small but increasing body of research available with a relatively new construct, liberal exclusion criteria were developed. The first exclusion criterion precluded the inclusion of multiple studies which used the same data set. When these studies were identified, only the first study published using the data was included. This resulted in the exclusion of two studies. An exception to this criterion was made for the two studies conducted by Grotle et al.., as the second study added an additional population and used a different method of analysis.

The second exclusion criterion required that studies use standardized instruments to measure Fear-avoidance Beliefs and Disability in order to be included in the review. Studies with non-standardized instruments were permitted if they provided pilot data for the measure they selected. Two studies were excluded for the use of non-standard measures. Because the great majority of the literature has addressed only back pain, the use of a mixed pain population was the third basis for exclusion, disqualifying three studies. The fourth criterion required that studies use a sample size of 10 or more subjects. This resulted in the exclusion of four studies with sample sizes of four, six, six, and eight. After exclusion criteria were applied, 14 studies were eligible for inclusion. A summary of the excluded studies can be found in Table 2-1.

Analyses were planned to examine the correlations between fear-avoidance variables at baseline, and to calculate effect size estimates in order to examine the strength of the relationship between the fear-avoidance variables and measures of disability after a period of time. Of the 14 eligible studies, two were deemed to contain sufficient data at publication to allow for the strength of the relationship between fear-avoidance and disability to be examined at both baseline and follow-up. Therefore, twelve e-mail requests were made to corresponding authors to obtain the additional data required for the planned analyses. Of the twelve requests, one author could not be reached, and two authors did not respond. However, one of these articles contained enough information for one of the two planned analyses, and therefore was included. In total, twelve articles were included in the final review, with ten studies examining fear-avoidance variables as predictors of disability and two studies using an observed change in fear-avoidance variables as predictors of change in disability.

The studies reviewed included both acute and chronic pain populations recruited from a variety of settings, including primary care clinics, pain clinics, and general population surveys. The number of subjects included in the studies ranged from 54 to 1,571. Subjects were followed for time periods ranging from one month to two years. A summary of included studies can be found in Table 2-2.

All studies measured the independent variable of pain related fear by the administration of one of two standard self-report questionnaires: the Fear-avoidance Beliefs Questionnaire (FABQ) or the Tampa Scale of Kinesiophobia (TSK). The Fear-avoidance Beliefs Questionnaire (FABQ) is a measure described by Waddell and colleagues (Waddell et al.., 1993). It contains 16 items, each scored on a 6-point Likert scale with higher numbers indicating increased levels of fear-avoidance beliefs. Two subscales have been identified within the FABQ: a seven-item

work subscale and a four-item physical activity subscale. The TSK (Miller RP, 1991) is a 17 item self report questionnaire with items scored on a 4-point Likert scale. Recent investigations have indicated that the TSK can be divided into two subscale which describe the contructs of somatic focus (five items) and activity avoidance (eight items)(Goubert et al.., 2004; Roelofs, Goubert, Peters, Vlaeyen, & Crombez, 2004).

The dependent variable of disability was measured using a variety of methods, both dichotomous and continuous. Dichotomous measures included work status, and self report measures such as the TSK from which arbitrary categories were created. Continuous measures included the Roland Morris Disability Questionnaire (RMDQ), Oswestry Disability Index (ODI), or the Quebec Back Pain Disability Scale (QBPDS). The RMDQ (M. Roland, Morris R., 1983) is a 24-item self-report questionnaire known to have excellent reliability and validity (M. Roland & Fairbank, 2000; M. Roland, Morris R., 1983). Scores on the RMDQ range from 0 to 18, with higher scores reflecting greater levels of disability. The ODI is a 10-item self-report scale originally described by Fairbank and colleagues (Fairbank, 1980). Each item is scored on a five-point Likert scale with higher numbers indicated greater disability. The QBPDS (Kopec et al.., 1996) contains 20 items that describe different activities, such as getting dressed, climbing the stairs, etc. The level of difficulty for each activity is expressed on a 6-point Likert scale, with higher scores indicating greater difficulty.

In each study, the relationship of fear avoidance to disability was assessed at baseline by examining the Pearson correlation coefficients and to obtain an estimate of the magnitude of the relationship between the variables. Cohen's conventions were then used to designate the relationship as small (.1), medium (.3) or large (.5 or greater). (Cohen, 1988).

To examine the prospective relationship between fear-avoidance and disability, effect sizes were calculated or estimated based on the type of analysis conducted in each study. All studies using dichotomous outcome measures of disability conducted logistic regressions, which gave rise to odds ratios as measures of effect size. Although no standard convention exists, it is generally accepted that an odds ratio of 1.0 to 3.0 represents a weak relationship, whereas an odds ratio over 3.0 for positive associations (or less than one-third for negative associations) indicates a moderate to strong relationship (Haddock CK, 1998).

Studies in which continuous outcome measures of disability were assessed employed a variety of regression analyses. When hierarchical linear regressions were used and fear avoidance variables were entered as a separate block, Cohen's f^2 was calculated as a measure of effect size. By convention, f^2 effect sizes of 0.02, 0.15, and 0.35 are considered small, medium, and large, respectively (Cohen, 1988). One study made use of backwards stepwise regression which produced a final model that did not include fear-avoidance variables, and a value of zero assigned to the estimation of the effect size of fear-avoidance. In hierarchical linear regressions where fear avoidance variables were not entered as a separate block but included with other variables, or when simultaneous regression was used, an estimate of the unique proportion of the variance explained by fear avoidance variables was obtained by squaring the standardized beta weights and expressed in terms of a percentage of variance explained. Cohen's conventions of .01 for a small effect, .06 for a medium effect, and .14 for a large effect were then used to assess the magnitude of the relationship. (Cohen, 1988). This convention was also applied to a third category of studies which used change in fear avoidance measures to predict change in disability measures.

Table 2-1. Excluded Studies

Author	Year	Subject population	N	Reason for exclusion
Fritz & George	2002	Acute	78	2nd publication from data set
George, Fritz & McNeil	2006	Acute	63	2nd publication from data set
Klenerman et al.	1995	Acute	300	Use of non-standard measure for fear-avoidance
Linton & Hallden	1998	Acute, Subacute	137	Mixed pain population
Lotters et al.	2006	Mixed	187	Mixed pain population
Nederhand et al.	2004	Mixed	82	Head/neck pain population
Turner et al.	2006	Chronic	1,068	Use of non-standard measure for fear-avoidance
Vlaeyen et al.	2001	Chronic	4	Fewer than ten participants
Vlaeyen et al.	2002	Chronic	6	Fewer than ten participants
Jong et al.	2005	Chronic	6	Fewer than ten participants
Jong et al.	2005	Chronic	8	Fewer than ten participants

Table 2-2. Included Studies

Author	Year	Subject population	N	Length of study (months)
Boersma & Linton	2006	Mixed	141	12
Dionne, et al.	2006	Mixed	860	24
Fritz, George & Delito	2001	Acute	69	1
George, et al.	2003	Acute, Subacute	66	6
Grotle, Vollestad & Brox	2006	Mixed	173	12
Grotle, et al.	2005	Acute	123	3
Mannion, et al.	2001	Chronic	148	3
Picavet, Vlaeyen & Schouten	2002	Mixed	1,571	6
Sieben, et al.	2005	Acute	158	12
Staerkle, et al.	2004	Mixed	255	6
Swinkels-Meewisse, et al.	2006	Acute	431	6
Woby et al.	2004	Chronic	54	2

CHAPTER 3
RESULTS

Table 3-1 summarizes the correlations between fear avoidance variables and disability at baseline. Examination of the correlations of these studies indicated that, with the exception of the fear-avoidance for work subscale of the FABQ in the acute population studied by Grotle et al. (2005), fear avoidance variables were significantly correlated with disability. Applying Cohen's criteria, the subscale of FABQ-W in Grotle's acute population, as well as both subscales of the TSK examined in the acute population studied by Sieben et al. (2005), yielded small correlations. Large correlations were noted by Staerkle et al. (2004) between the FABQ subscales and disability. Woby and colleagues (2004) also noted a large correlation between the FABQ physical activity subscale (FA-p) and disability. The remaining studies all demonstrated moderate correlations between the fear-avoidance variables and disability measures at baseline.

The studies were next examined to determine the unique effects of fear-avoidance in the prediction of disability, after controlling for other relevant clinical variables. Common covariates included variable such as initial disability rating, initial pain intensity, and demographic variables such as age and gender. A review of the statistical significance of fear avoidance variables in the various models predicting later disability yielded mixed results for studies which used fear avoidance variables to predict disability. Two studies which used the total FABQ or total TSK score rather than their subscales as the independent variable found the fear avoidance variables to be significant predictors of disability (George et al.., 2003; Swinkels-Meewisse et al.., 2006). Two studies which used the subscales of the FABQ or TSK were unable to obtain significant results for any subscale (Grotle et al.., 2006; Sieben et al.., 2005). The remaining studies, all of which used the FABQ and TSK subscales as independent predictors of disability, found mixed significance. Of note is the study by Staerkle and colleagues (2004),

which examined the FABQ subscales as predictors of two dependent variables: perceived disability and days of work lost. The FABQ-W was found to be a significant predictor of reported days of work lost, although the FABQ-P was not. Neither subscale was significant in predicting disability as measured by the RMDQ. Overall, three of the four analyses yielded non-significant associations. Conversely, in the study by Dionne et al. (2006) which examined the role of fear avoidance in predicting disability separately for each sex, the subscales of the FABQ were independent predictors of disability, with the only exception being the FABQ-P in men. The two studies which used changes in fear avoidance variables to predict changes in disability both yielded significant results.

Examination of the effect sizes for the studies which used a continuous outcome measure (including those analyzing change in disability resulting from change in fear avoidance) revealed uniformly small effects of fear avoidance variables in the models. Cohen's f^2 effect sizes ranged from .03 to .13, and are all considered small by Cohen's conventions. If only significant results are considered, the effect sizes range from .03 to .10. In the five studies for which the proportion of variance explained was used as an effect size estimate, results range from 0% (when the variables were not included in the final model) to 6.6%. If only significant results are considered, the estimates range from 3.7% to 6.6%.

Odds Ratios were used as measures of effect size in the studies which used dichotomous outcome measures. Small effect sizes were noted in the study be Fritz et al. (Fritz et al.., 2001). Picavet and colleagues divided the TSK into tertiles, and used the middle and highest tertile as predictors of classification by the Quebec Back Pain Disability Questionnaire as disabled (Picavet et al.., 2002). Although the odds ratios are considered small, the odds ratio of the TSK, highest tertile [2.6(1.4-4)] approaches a moderate effect size. Dionne and colleagues examined

the subscales of the FABQ as predictors of a “return to work in good health,” and examined the results by gender (Dionne et al.., 2006). The subscale FA-P was not included in the final model for men, and resulted in a small effect size estimate for women [1.98(1.01-3.89)]. The FA-W subscale demonstrated moderate to large effects for both men [4.08(1.76-9.44)] and women [3.01(1.14-7.91)]; however, examination of the confidence intervals indicate that the odds ratios are unstable and must be interpreted with caution.

The data on statistical significance and effect size estimates for studies using continuous variables, dichotomous variables, and studies measuring change are summarized in Tables 3-2, 3-3, and 3-4, respectively.

Table 3-1. Baseline Correlations between Fear-Avoidance and Disability

Author	N	Measure used	Baseline correlations
Boersma & Linton	141	TSK Subscales	.39(TSK-sf)*, .43(TSK-aa)*
Dionne, et al.	369 Female	FABQ	.43(FA-p)*, .49(FA-w)*
	491 Male	Subscales	.42(FA-p)*, .49(FA-w)*
Fritz, George & Delito	69	FABQ Subscales	.34(FA-p)*, .40(FA-w)*
George, et al.	66	FABQ Subscales	.33(FA-p)*, .42(FA-w)*
Grotle, Vollestad &	123 Acute	FABQ	.34(FA-p)*, .08(FA-w)
Brox	47 Chronic	Subscales	.39(FA-p)*, .34(FA-w)*
Grotle, et al.	123	FABQ Subscales	.34(FA-p)*, .08(FA-w)
Mannion, et al.	148	FABQ Total	Unavailable
Picavet, Vlaeyen & Schouten	1,571	TSK Total	.33*
Sieben, et al.	158	TSK Subscales	.16(TSK-sf)*, .28(TSK-aa)*
Staerkle, et al.	255	FABQ Subscales	Disability: .56(FA-p)*, .57(FA-w)* Work Loss: .42(FA-p)*, .47(FA-w)*
Swinkels-Meewisse, et al.	431	TSK Total	.398*
Woby et al.	54	FABQ Subscales	.55(FA-p)*, .40(FA-w)*

* Indicates significant correlations

Table 3-2. Significance and Effect Sizes of Studies with Continuous Variables

Author	N	Significance	Effect size estimate
Boersma & Linton	141	Not retained in model (TSK-sf)	0% (TSK-sf)
		$p < .01$ (TSK-aa)	5.1% (TSK-aa)
Fritz, George & Delito	69	$p = .009$ (FA-w)	.10 (FA-w)
		$p = .083$ (FA-p)	.04 (FA-p)
George, et al.	66	$p = .049$ (FABQ total at 1 month)	.05 (FABQ)
		$p = .034$ (FABQ total at 6 months)	.08 (FABQ)
Grotle, Vollestad & Brox	123 Acute	$p = .23$ (FA-w), $p = .71$ (FA-p)	.07 (FABQ)
	47 Chronic	$p = .13$ (FA-w), $p = .07$ (FA-p)	.13 (FABQ)
Sieben, et al.	158	TSK not retained in model	0%
Staerkle, et al.	255	Disability: $p > .05$ for FABQ subscales	.02(FABQ)
		Work Loss: $p < .05$(FA-w), $p > .05$(FA-p)	.03(FABQ)
Swinkels-Meewisse, et al.	431	$P < .01$ (TSK total)	5.2%

Table 3-3. Significance and Effect Sizes of Studies with Dichotomous Variables

Author	N	Significance	Effect size estimate (odds ratio)
Dionne, et al.	269 female	$p < .05$ for FABQ subscales	FA-w 3.01(1.14 – 7.91)
			FA-p 1.98(1.01 – 3.89)
	491 male	$p < .05$ for FA-w, FA-p not retained	FA-w 4.08(1.76 – 9.44)
Fritz, George &	78	$p = .003$ (FA-w)	1.17(1.04 – 1.31)
Delito		$p = .23$ (FA-p)	1.14(.96 – 1.34)
Grotle, et al.	123	$p > .05$ (FA-w, high FA)	1.31(.44 – 3.85)
		$p > .05$ (FA-p, high FA)	1.58(.57 – 4.4)
Picavet, Vlaeyen	1571	$p < .05$ (TSK, middle tertile)	1.3(.6 – 2.7)
& Schouten		$p < .05$ (TSK, highest tertile)	2.6(1.4 – 4)

Table 3-4. Significance and Effect Size of Studies Measuring Change

Author	N	Significance	Effect size estimate (percent of variance)
Mannion, et al.	143	$p < .05$	3.7%
Woby, et al.	54	$p < .05$ (FA-w)	4.4%
		$p < .01$ (FA-p)	6.6%

CHAPTER 4
DISCUSSION AND CONCLUSIONS

The results of this review did not support the hypothesis that fear-avoidance variables would be highly correlated with measures of disability at baseline. Of the 26 correlations available for review, 20 fell within the moderately correlated range. Three high correlations and three low correlations were noted.

The data provided by the studies also did not support the hypothesis that fear-avoidance variables would demonstrate large effects in models predicting later disability. All eight Cohen's f^2 effect sizes calculated were less than .13, and therefore are considered small by convention (Cohen, 1988). The proportion of variance accounted for was used as an effect size estimate for five studies. The estimates ranged from 0% variance to 6.6%, with an average of 3.6% of the variance accounted for in the prediction of disability. If only significant results are considered, the average increases to 5%. When Cohen's conventions are applied to these results, all studies demonstrate small effects, with the exception of the moderate effect size of 6.6% reported by Woby and colleagues (Woby et al.., 2004). The review of the dichotomous category of studies, in which ORs were used as measures of effect size, continued to provide evidence that fear avoidance variables demonstrate small effects in the estimation of disability. The ORs ranged from 1.14 to 4.08, with three of the four studies reviewed demonstrating consistently small effects (ORs less than three). The fourth study, by Dionne and colleagues (2006), contains mixed results. The effect size of the FA-P subscale was not provided, as it was not significant. The FA-P subscale for women demonstrated an OR of 1.98, which is generally considered small. The ORs of FA-W for men and women, 4.08 and 3.01 respectively, could be considered moderate to large. However, the confidence intervals for these two ORs are quite large, a factor which indicates an unstable odds ratio, and may make these results difficult to replicate. Overall,

although this category of study demonstrated the most variation, the results of the studies using dichotomous outcome measures are generally consistent with those of the studies using continuous outcome measures in demonstrating small effect sizes for fear avoidance variables.

When the results are considered together, it appears that fear-avoidance initially correlates moderately with disability, but when relevant variables (i.e. initial pain intensity or disability, etc.) are controlled for, fear avoidance variables cannot account for significant variance in the development and maintenance of disability from LBP. When considered within the context of the Fear Avoidance Model of Exaggerated Pain Perception and the initial body of literature on fear avoidance and LBP, these findings are unexpected. It is therefore important to consider common factors which may have influenced the results of the studies.

There are some indications that measurement error may have been a significant factor affecting the results in this review. Most of the studies used the subscales of the FABQ or TSK as independent variables. However, three of the four studies which obtained consistently significant results did so using the FABQ or TSK as a whole, rather than using the measure subscales. This provides preliminary indication that the subscales of these measures may lack the necessary stability to be reliably used in models predicting disability. Additionally, one third of the studies used the TSK to assess the level of fear avoidance in their samples. Investigations into the TSK have suggested several different factor structures, and indicated that the measurement properties of the TSK may be problematic (Burwinkle, Robinson, & Turk, 2005; French, France, Vigneau, French, & Evans, 2007; Roelofs et al.., 2004). However, this potential problem in measurement is unlikely to provide a sufficient explanation for the small effect sizes across studies, as eight of the twelve studies used the FABQ, but also demonstrated small effect sizes for fear-avoidance.

A more compelling explanation of the findings can be found in examining the conceptual and statistical overlap that may occur between the construct of fear-avoidance and other psychosocial constructs, such as distress or depression. Systematic reviews of the literature have consistently identified a variety of psychosocial variables as potentially important to the transition from acute to chronic pain, to include stress, mood and depression, and cognitive variables (i.e. coping style, self-efficacy) (Linton, 2000; Pincus et al.., 2002). Additionally, Pincus and colleagues found moderate effect sizes demonstrated by depression and distress in relation to a variety of outcomes, including disability (Pincus et al.., 2002). Four of the studies in the present review examined the influence of other psychosocial beliefs on the outcome of disability, either as individual predictors or in conjunction with fear-avoidance beliefs. Although no baseline correlations between fear avoidance and distress were provided, Grotle and colleagues, using a logistic regression analysis, found that, rather than fear-avoidance, distress was the best psychosocial predictor of disability at three months, and therefore did not include fear-avoidance in their final model (Grotle et al.., 2006). Staerkle et al. found that the FABQ subscales shared moderate baseline correlations with the Zung Depression Scale, and that depressive symptoms accounted for slightly more variance in the model predicting scores on the RMDQ than did the FABQ subscales (R. sq. changes of .02 vs .01), although both variables demonstrated small effects (Staerkle et al.., 2004). Mannion and colleagues conducted a stepwise regression and found that depression and fear-avoidance beliefs accounted for 4.1% and 3.7% of the variance, respectively (Mannion et al.., 2001). Finally, Boersma and Linton (2006) found that, with the exception of the TSK-A subscale and pain expectancy, the TSK subscales shared moderate correlations with pain and expectancy and negative affect, ranging from .384 - .482. These variables were then entered together in a hierarchical regression predicting

disability, and resulted in moderate effect size ($f^2 = .17$). This led them to conclude, " … the strong interrelationships between these variables should caution for treating them as separate entities. ." (Boersma & Linton, 2006) This statement highlights the issue of the potential for shared variance between fear-avoidance and other psychosocial variables.

Although this review followed standard recommendations for the interpretation of effect sizes, there is a great deal of debate about the interpretation of effect sizes in the psychological sciences. There are no universally accepted conventions by which these numbers can be assigned a categorical ranking of small, medium, or large; rather, the judgment of effect size must be considered within the context of the dependent variable. It can be argued that questionnaire scores as a proxy for disability do not represent a clear and robust outcome measure; therefore, greater proportions of the variances must be accounted for to judge the effect size estimates as large. When considered within this context, it is reasonable to conclude that the effect size estimates yielded by the proportion of the variance accounted for are small. Examination of the aggregate results also supports the conclusion that the effect size for fear avoidance variables in later disability is small. Although the reliability of the measures, the heterogeneity of the populations studies, and the specific levels of the variable being examined varied across studies, the effect sizes demonstrated remained consistently small.

Overall, the literature reviewed does not support the contention that fear- avoidance variables play a central role in the development and maintenance of chronic LBP. However, it would be premature to conclude that they are not related to LBP, and should not be a subject of continued investigation. Relative to the population suffering with LBP, the sample sizes examined in this review were small, as is the body of literature addressing this issue. Further investigation examining different populations of sufferers may identify important interactions

between fear avoidance variables and population-specific factors. Additionally, this review provides preliminary support to the idea that fear-avoidance variables may be better conceptualized and studied as part of a multidimensional psychosocial model with interrelated variables such as distress, pain catastrophizing, and negative expectancy. Because of variance shared, it is likely that considering these variables together, as part of a larger "negative affect" construct, will be better able to predict outcomes for patients with LBP. Finally, it is important to continue to investigate fear-avoidance variables, as well as other psychosocial predictors, because—due to the lack of biomedical explanations—psychosocial variables represent some of the only intervention points currently available to patients with LBP. When compared to the options of making no intervention or to expensive medical procedures, interventions based on fear avoidance variables may prove to be cost effective and relatively useful, and should therefore not be ignored as a possibility which warrants continued investigation.

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BIOGRAPHICAL SKETCH

Alisa Diane Hassinger was born on May 21, 1973 in Harrisburg, Pennsylvania. The youngest of two, she grew up in the greater Harrisburg area, graduating from Millersburg Area High School in 1991. She earned her B.A. in psychology from Indiana University of Pennsylvania. Upon graduating with honors in 1995, she began graduate studies in social work at Arizona State University. Alisa graduated with Master of Social Work in 1997, and subsequently accepted a commission to serve in the United States Army as a social work officer.

Upon her honorable discharge from the military in 2003, Alisa continued to work for the Department of Defense at Fort Benning, Georgia as a case manager and therapist for soldiers with deployment related mental health concerns. Alisa relocated to Gainesville, Florida in August of 2005 to begin her graduate career in clinical psychology. Upon completion of the M.S., Alisa will continue on in her program and apply for doctoral candidacy in the Department of Clinical and Health Psychology at the University of Florida.