Complementary Health Approaches for Chronic Low Back Pain and the Role of Fear Avoidance Beliefs in Worsening Physical Dysfunction.

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Dedication

I would like to dedicate this to my mother, Bernice Wood (Gillies). She taught me how to love and how to be a compassionate human being. Without her strong presence, endurance, love, and guidance there would never have been an attempt at research.

I would like to acknowledge my committee, Drs Howard, Saper, Damus, and Roberts, you have been amazing. Each of you has brought your own unique contribution to my scholarship and research. I will be forever grateful. Namaste.
Abstract

Chronic low back pain is a biopsychosocial disorder and a public health care issue. Despite rising costs, disability rates have not improved. In addition, opioids are a common management approach and their overuse has significant public health ramifications. The need for continued research on how to effectively manage chronic low back pain has become apparent. This dissertation will review some common complementary health approaches for back pain and their effectiveness. In addition, it will review the influence fear avoidance beliefs have on worsening physical dysfunction and suggest clinical treatment approaches. Finally, it will analyze data from a randomized controlled trial to determine whether high fear avoidance beliefs are associated with worsening physical dysfunction in a predominately minority population. It will identify whether a group difference exists in a yoga, physical therapy or education intervention at influencing these beliefs. It will also identify whether high fear avoidance beliefs scores at baseline are predictive of treatment attendance rates.

*Keywords:* chronic low back pain, cost, opioids, physical function, treatment approaches.
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COMPLEMENTARY HEALTH APPROACHES AND FEAR AVOIDANCE BELIEFS

Introduction

Despite the increasing use and cost of back pain treatments, disability rates are increasing. In approximately 90% of back pain cases, no anatomical cause can be identified. In addition, low correlations exist between back pain severity and disability.

Back pain is well recognized as having biopsychosocial contributors. Current clinical guidelines recommend the screening of psychosocial factors that increase the risk for developing chronic low back pain. Fear of movement and fear of pain have been recognized as psychological risk factors that worsen physical dysfunction. What is unknown is if fear influences worsening disability among a minority population. It is also unknown if a difference exists in a yoga, physical therapy or education intervention at reducing fear as it relates to movement and pain. Finally, no literature known exists on whether fear adversely affects treatment adherence rates.

This dissertation includes three separate manuscripts. The first manuscript will review complementary health approaches for back pain along with their efficacy. The second will discuss the relationship of fear avoidance beliefs and worsening physical dysfunction and suggest ways to clinically manage patients. The third manuscript is a secondary data analysis aimed at determining whether a relationship exists between fear and worsening physical function in a minority population, whether one intervention (yoga, physical therapy, or education) is more superiority than another at reducing fear and whether a predictive relationship exists between fear and treatment attendance rates. This research is guided by the biopsychosocial model of care that encompasses the biology, psychological, and social attributes that contribute to human functioning.
Chapter 1

Abstract

Back pain is the number one cause of global disability. Despite rising treatment costs in the United States related to the use of medications, spinal injections, and surgery, disability rates have not improved. Complementary health approaches are part of the recommended treatment guidelines for the management of nonspecific chronic low back pain. The most commonly used approaches: acupuncture, massage spinal manipulation, and yoga will be reviewed. Evidence from systematic reviews to support their safety and efficacy will be presented. A discussion will follow regarding recommendations for their use in the clinical area.

Keywords: Nonspecific chronic low back pain, complementary health approaches, acupuncture, massage, spinal manipulation, yoga, treatment efficacy and safety.
An Overview of Complementary Health Approaches for Nonspecific Chronic Low Back Pain

Low back pain (LBP) is the number one cause of global disability (Hoy et al., 2014). Despite the rising cost of back pain treatment related to the increased use of medication, spinal injections, and surgery, functional disability in the United States (US) has not improved. A clinical approach that examines the chronic nature of LBP while recognizing that treatment effectiveness relies on eliciting patients as both partners in their healthcare and users of self-care strategies may prove more beneficial than the use of mainstream services (Deyo, Mirza, Turner, & Martin, 2009). Current guidelines from the American College of Physicians and the American Pain Society recommend considering the use of non-pharmacological therapy which includes acupuncture, massage, spinal manipulation, and yoga for chronic low back pain (cLBP) (Chou et al., 2007).

The purpose of this paper is to review current clinical guidelines for cLBP treatment. It will review commonly used complementary health approaches (CHA) for the treatment of cLBP including, acupuncture, massage, spinal manipulation, and yoga. Treatment efficacy and the recommendations of systematic reviews (SR) published in the past five years will be reviewed.

**Nonspecific Chronic Low Back Pain**

Low back pain includes tension, stiffness, and or soreness in the lower back region, defined as the area between the lower ribs and the gluteal folds (Hoy, et al., 2014). It is identified as nonspecific in approximately 90% of the presenting cases (Krismer, van Tulder, & 2007) when no specific radiculopathy, spinal stenosis, or other specific spinal causes are identified (Swinkels-Meewisse et al., 2006). Pain lasting for three months or longer is termed chronic; 20% of people affected by acute back pain go on to develop cLBP with persistent pain remaining beyond a year.
(National Institute of Neurological Disorders and Stroke, 2014). Back pain has a life-time prevalence reported to be as high as 84% (Balagué, Mannion, Pellisé, & Cedraschi, 2012) with an overall direct and indirect economic burden of at least 100 billion dollars a year with 5% of the patients that present with cLBP consuming 75% of the cost (Katz, 2006).

**Management of Back Pain**

Clinical recommendations from the American College of Physicians and the American Pain Society, (2007) exist to aid in the management of patients suffering from LBP (Chou & Huffman, 2007). A focused patient history and physical exam along with identification of psychosocial risk factors for developing chronic pain such as fear and depression should be performed. Patients with LBP should be triaged into three categories: nonspecific LBP, back pain potentially associated with radiculopathy or spinal stenosis, or pain potentially associated with another specific spinal cause. The use of radiographic imaging or other diagnostic testing should be reserved for patients with progressive neurological deficits or when a serious underlying condition is suspected on the basis of the patient’s history and exam. An MRI (preferred) or CT scan is recommended for radiculopathy or spinal stenosis if the potential exists for surgery or an epidural steroid injection. Clinicians should provide patients with evidence based information regarding expected treatment course, the need to remain active and effective self-care options.

A critical evaluation should be made regarding the severity of baseline pain, functional deficits, and potential risks, benefits, and long-term efficacy of treatment choice. First line medication options include acetaminophen or nonsteroidal anti-inflammatory drugs. For patients who do not improve with self-administered medications, non-pharmacological therapy with likely benefits should be considered. Exercise therapy, intensive interdisciplinary rehabilitation, and
complementary alternative health approaches including acupuncture, massage therapy, spinal manipulation, and yoga should be considered.

**Complementary Health Approaches**

A survey done by the National Institute of Health (NIH) reported that approximately 33% of adults living in the US have used some form of CHA (Clarke, Black, Stussman, Barnes, & Nahin, 2015) with 60% of the CHA users perceiving benefit (Kanodia, Legedza, Davis, Eisenberg, & Phillips, 2010). Back pain is a common cause for the use of CHA (Kanodia, et al., 2010). Acupuncture, massage, spinal manipulation, and yoga are some of the most commonly used treatment approaches for LBP and can be used as components of an integrative approach or as a standalone approach when self-care strategies and first line medications have not effectively managed symptoms. This review summarizes existing literature concerning the origin of these CHAs, mechanisms of action, and effectiveness with managing LBP.

**Acupuncture**

Acupuncture is one of the oldest medical procedures in the world, originating in China approximately 2000 years ago. Multiple physiological models have been proposed to understand why it works. Some theories implicate cytokines, hormones, biomechanical effects, electromagnetic effects, the immune system, and the autonomic and somatic nervous systems, but no model has been consistent enough to draw conclusions on exactly how acupuncture works within the western medical model (Ahn, 2014).

Although diversified, acupuncture encompasses a large array of styles. The most frequently used technique is the manual manipulation or electrical stimulation of thin, solid, metallic needles inserted into the skin. The Eastern theory is based on three concepts: vital energy known as QI,
ying and yang (or the opposing forces of nature) and the five elements: wood, fire, earth, water, and metal. The human body is depicted as a microcosmic reflection of the macrocosms of the universe. In this scenario, the clinician’s goal is to diagnose and attempt to restore the harmonious balance of the body with the external environment by the insertion of needles in defined points along meridian channels, the pathway along which QI is believed to flow. This is done to correct the disruption in harmony manifested through a particular symptom. It has been found to be a generally safe intervention with complications comparable to that of any intervention that requires the insertion of needles (Lao, Hamilton, Fu, & Berman, 2003). Insurance coverage is variable with a trend toward increased coverage (The Kaiser Family Foundation, 2004).

**Treatment Efficacy**

Trigkilidas (2010) completed a SR done to determine the justification for recommendations made by the England National Institute of Health and Clinical Guidelines to offer 10 to 12 acupuncture sessions as a baseline treatment option for cLBP (Trigkilidas, 2010). This review of 4 RCTs found evidence to suggest that acupuncture was superior to “usual” care or “no care,” especially when patients had positive expectations regarding the use of acupuncture. Three out of the four studies “invited” participants wanting to participate in an acupuncture trial, limiting the study population to the people that felt acupuncture would help. In a systematic review (SR) of 18 RCTs (8 with low risk of bias), Rubinstein et al., (2010) suggested that acupuncture provided favorable short-term clinical effects for pain reduction and improved function when compared to a waiting list control or when used as an adjunct treatment to physical therapy, standard medical care, or exercise (Rubinstein et al., 2010).
There was conflicting evidence to allow any firm conclusions to be drawn in the review of 7 RCTs by Hutchinson and colleagues (Hutchinson, Ball, Andrews, & Jones, 2012). Whether acupuncture had any therapeutic value over other treatment modalities was confounded by the wide age range of the participants in the trials, the duration of LBP, and the acupuncture methods used. Despite these variances, there was evidence to suggest that acupuncture was more beneficial when compared to no treatment. In a 32 RCT SR and meta-analysis conducted by Lam and Curry, (2013) patients who had received acupuncture had statistically significant lower levels of pain and improved activity post intervention when compared to the group that received no treatment or medications such as analgesics, NSAIDS, or muscle relaxants (Lam & Curry, 2013). Patients who received acupuncture in addition to usual care were found to have decreased pain and improved function post intervention and at three months when compared to the “usual care” group.

In a meta-analysis by Xiu et al, (2013) acupuncture was found to be more effective at relieving pain than no treatment at long term follow-up, ranging from 4 to 52 weeks.(Xu et al., 2013). However, the effect diminished with the length of LBP chronicity. Overall, acupuncture was found to be more effective than “other treatments” not specifically defined within the review. In an overview of 7 SRs, Liu et al., (2015) found support for acupuncture being superior to no treatment at short term follow-up for reducing pain and improving function (Liu, Skinner, McDonough, Mabire, & Baxter, 2015). As an adjunct treatment to usual care such as medication, exercise, and physical therapy, acupuncture was consistently found to improve pain and function.

**Massage**

Multiple types of massage have evolved over time from a variety of cultural traditions. Generally, massage involves physical manipulation with varying intensity, direction, rate, and
rhythm applied to the soft tissues and fascia of the body in an attempt to loosen tight muscles (Sagar, Dryden, & Wong, 2007). The kneading or squeezing of tissues stimulates deep muscles and increases circulation. Myofascial techniques are performed to stretch and relax muscles that are tense and in spasm. Chronically tense muscles restrict blood flow and cause fatigue. By applying specific pressure to connective tissues and fascia, normal alignment and function can often be restored and as a result, chronic pain felt from tense, stiff muscles is relieved.

A “deeper dive” into the physiology of how massage actually works was carried out by Crane et al., (Crane et al., 2012). No treatment or massage was applied to the quadriceps of 11 young male participants after exercise induced muscle damage. Muscle biopsies were obtained at baseline, immediately after 10 min massage treatment, and after a 2.5 hour period of recovery. The massaged muscle was found to have activated signaling pathways potentiating mitochondrial biogenesis, attenuated production of inflammatory cytokines, and reduced shock protein, thereby lessening cellular stress resulting from injury.

Adverse events (AEs) from massage are rare. However, some documented serious events occurred from “exotic” types of massage use (Ernst, 2003). Electric hand massage devices have been associated with a high rate of serious AEs (Posadzki & Ernst, 2013). Most of massage therapy cost is paid by the patient. However, a number of health insurance plans have assembled “networks” of approved massage therapists which provide a 20 to 25 percent discount (Therapists, 2015).

**Treatment Efficacy**

In a SR of 13 RCTs, five of which were limited to participants with cLBP, Furlan and colleagues found moderate evidence to suggest that massage had superior beneficial effects on
pain and physical function when trialed against acupuncture, relaxation, or education for cLBP patients with benefits lasting up to one year (Furlan, Imamura, Dryden, & Irvin, 2009). A SR by van Middelkoop et al (2010) identified three RCTs comparing massage to relaxation or acupuncture, the pooled data, however, did not show a significant difference in pain intensity between the massage vs. the control groups (van Middelkoop et al., 2011). In a SR that reviewed five SRs on the effectiveness of massage for cLBP, Kumar et al., (2013) found an emerging body of evidence to suggest that massage had a small beneficial effect on cLBP (Kumar, Beaton, & Hughes, 2013). A recommendation for cautious interpretation was made due to the methodological flaws in the primary research that informed the reviews. In addition to this, four out of the five reviews analyzed within this SR had 3 or less RCTs included.

**Spinal Manipulation**

Spinal manipulation therapy (SMT) is a form of manual therapy used by chiropractors, physical therapists, and osteopaths that involves movement of a joint near the end of its range of motion (Shekellle, 2015). There are a variety of definitions that vary across the disciplines; the “umbrella” definition includes variations on soft tissue techniques, mobilization, and thrust manipulation (Maigne & Vautravers, 2003). The proposed hypotheses explaining benefits of manipulation include: relaxation of hypertonic muscle by stretching, especially the psoas muscle and paraspinal muscles often found to be tense and tender in the cLBP population, and by manipulation or thrust disrupting an articular or periarticular lesion, thereby unblocking motion segments, changing pain pathways, or stimulating reflexive muscle activation (Maigne & Vautravers, 2003; Millan, Leboeuf-Yde, Budgell, & Amorim, 2012).
SMT is generally considered a safe procedure with minor complaints and rare AEs (Shekelle, 2015). A SR of 5 prospective studies found transient adverse reactions, including dizziness, light headedness, headache, and numbness in 50% of patients undergoing spinal manipulation (Ernst, 2001). The most common serious AEs are vertebrobasilar accident, disk herniation or cauda equina syndrome, with an incidence of 1 per 400,000 to 1 per 2 million patients (Stevinson & Ernst, 2002). In a cohort study with Medicare B beneficiaries aged 66 to 99 years, the injury incidence was 40 per 100,000 subjects, with a likely increase of injury among patients with chronic coagulation defects, long-term use of anticoagulation therapy, inflammatory spondylopathy, osteoporosis, and aortic aneurysm. Most insurances pay part of the cost of SMT (Jensen & 1997).

**Treatment Efficacy**

Walker et al., in a SR of twelve RCTs, (three trials specific to the cLBP population) found no statistically significant group differences between the spinal manipulation group and the “other therapies” for pain reduction or improved disability at short, medium or long term follow-up (Walker, French, Grant, & Green, 2011). “Other therapies” was defined as intervention that included, NSAIDS, strengthening, exercise, cold, ultrasound, and pain clinic visits. Two of these three trials were scored as having low bias defined as a minimum score of “yes” given to randomization, allocation concealment, and outcome assessor blinding.

A SR of 26 RCTs done by Rubenstein et al., with a total of 6070 cLBP participants, found high quality evidence to support a small statistical significance, but not a clinically relevant difference for improved pain and functional status when SMT was compared to “other” forms of interventions (Rubenstein, van Middelkoop, Assendelft, de Boer, & van Tulder, 2013). The other
interventions included usual care, education, physical therapy, acupuncture, massage, and analgesics. Varying qualities of evidence support a short-term effect on pain relief and functional status when SMT was added to other interventions. In a later smaller SR evaluating SMT vs. prescribed exercise with a cLBP population, Merepeza found no conclusive evidence to favor either SMT or exercise as a more effective therapeutic intervention for reducing pain or disability in cLBP (Merepeza, 2014).

Yoga

Yoga is a mind body practice that is becoming increasingly popular for both health promotion and as a treatment approach for a variety of conditions (Woodyard, 2011). There are numerous schools of yoga; hatha yoga is the most popular form practiced in the United States. Hatha yoga includes a variety of styles including Ashtanga, Bikram, Kundalini, Iyengar, and Viniyoga (Health, 2014).

Although yoga’s ancient tradition is rooted in philosophical teachings, its modern practice generally includes varying forms and different levels of intensity concerning the three main components: postures (asanas), breath, and meditation (Evans, Sternlieb, Tsar, & Zettzer, 2009). With its continued practice, there is a gradual loosening of the muscle and connective tissues around the bones and joints (Woodyard, 2011). When joints are brought through their full range of motion, there is squeezing and twisting of cartilage, bringing fresh blood with its nutrients and oxygen to the area. It is through this process that conditions like arthritis and chronic pain are understood as preventable (McCall, 2007).

Some theories suggest that increasing tissue flexibility brought on by stretching through the different postures brings about a release of “feel good” endorphins through the control of breath
and meditation (Ulger & Yagli, 2010). The most common AEs from yoga include musculoskeletal injuries and worsening and acute glaucoma. Orbital varices or orbital vein occlusion are the next most common form of injury (Cramer, Krucoff, & Dobos, 2013). To date, no known insurance coverage exists for yoga.

**Treatment Efficacy**

In 2011, a SR by Posadzki and Ernst found support for the use of yoga in cLBP for improving pain severity and function in five out of the seven trials reviewed; the remaining two studies did not have sufficient power to detect a group change (Posadzki & Ernst, 2011). The review found the evidence inconclusive, however, because of the heterogeneity of the trials—there were varying definitions of cLBP used in terms of pain duration ranging from greater than 3 months to greater than 6 months to one episode over the past 18 months. There was also different core yoga interventions used along with wide range of intervention duration, ranging from a one-week intensive program to 24 weeks of two 90 minutes classes.

In a SR and meta-analysis of 10 RCTs with a total of 967 cLBP patients, Cramer et al., (2013), found strong evidence to support yoga’s short and long-term effect on pain and strong evidence to support short-term positive effects on disability and moderate evidence to support a long-term positive effect on disability (Cramer, Lauche, Haller, & Dobos, 2013). The available data precluded a definite judgment on whether yoga was inferior or superior to usual care or exercise. However, yoga was found to be superior to education. Diaz et al., (2013) in a 11 RCT SR that included 10 of the same RCTs used by Cramer and colleagues findings supported yoga as being beneficial in the treatment of cLBP (Diaz et al., 2013). A definite judgment regarding yoga’s
superiority to usual care or PT could not be made, however, due to the conflicting results of the RCTs. However, a recommendation for its use in addition to education and/or self-care was made.

Data from eight RCTs, a total of 743 patients, was combined and analyzed in a meta-analysis done by Holtzman and Beggs (Holtzman & Beggs, 2013). Outcome data from trials using education or a wait list control were used, limiting the generalizability of the findings to education or to a no-treatment comparison. The post-yoga treatment effect size for functional disability and pain were medium to large. Follow-up effect size was smaller but still statistically significant. The Orwin fail safe “n” was 11, indicating it would take 11 studies with insignificant results for yoga’s effect on pain to be reduced to a small effect. Despite the heterogeneity of the yoga interventions used, the interventions yielded a statistically similar effect size. The authors suggested that yoga’s general emphasis on strength, flexibility, breathing, and focused awareness may be more important than the specific asanas or sequences used. There is agreement in the literature that most of the yoga research done on cLBP has methodological concerns, limiting the ability to develop firm conclusions about the type, duration, and frequency required for efficacy (Cramer, Lauche, et al., 2013; Diaz, et al., 2013; Holtzman & Beggs, 2013).

Discussion

There is concern in the literature regarding the rising cost for back pain treatment, despite the lack of improvement in disability rates (Deyo, et al., 2009). The solution to this issue may rest in the need to treat persistent back pain as a chronic condition rather than an acute disorder. Patient engagement in self-care strategies may be the most beneficial strategy in managing pain and disability (Deyo, et al., 2009).
Back pain is the most common reason CHAs are used by consumers (Kanodia, et al., 2010). However, in clinical practice, treatment recommendation should follow evidence based guidelines. SRs can direct clinical guidelines but the strength of the review is dependent not only on its methodology, but also on the methodology and rigor of the primary studies being reviewed (Garg, Hackam, & Tonelli, 2008). Methodological concerns exist and the majority of the research done does not allow firm conclusions to be made. However, there is an overall tendency to suggest a potentially therapeutic role for these approaches as effective adjunct treatments for cLBP.

Along with treatment efficacy, consideration should be given to treatment safety. In order to prevent serious AEs, overall health status and co-morbidities should be considered. When massage, acupuncture, SMT and yoga are deemed appropriate treatments, patients should be encouraged to use only licensed or in the case of yoga, well trained personnel. Patients should be cautioned that research to date has yet to definitely confirm the benefit of CHAs, but they do hold promise as another avenue to manage the chronic nature of back pain.
References


Chapter 2

Abstract

Back Pain is a multidimensional disorder with global effects on disability. Its clinical assessment requires a critical investigation into the confounding biopsychosocial contributors. Fear has been identified as one of the psychological risk factors that can worsen disability from chronic low back pain. Fear of pain and fear of movement have been found to adversely affect outcomes for patients with low back pain. This paper suggests ways to identify fear and its consequences. In addition it will review ways to clinically manage patients who present with fear of pain and movement.

Keywords: back pain, biopsychosocial contributors, fear, clinical management
Fear and its Impact on Chronic Low Back Pain

Back pain is a significant health care problem (Kamper et al., 2014). It is well recognized as having physiological, psychological and social contributing factors (Chou & Shekelle, 2010; Kamper, et al., 2014). What can be easily overlooked in the clinical area, however, is that pain severity is not the only contributor to functional decline, variables with psychological and social underpinnings impact disability and need to be addressed early during patient encounters (Chou & Huffman, 2007; Crombez, Vlaeyen, Heuts, & Lysens, 1999; Wertli et al., 2014).

When the patient history and examination rule out the “red flags”—symptoms suggestive of systemic causes—disk herniation, spinal stenosis, osteoporotic compression fracture, inflammatory arthropathies, cancer, infections, caudal equine syndrome or visceral disorders, clinicians should screen for psychosocial risk factors or “yellow flags,” that increase the risk for chronic disabling back pain (Chou & Huffman, 2007). The “yellow flags” include the presence of psychological co-morbidities, poor coping ability, poor general health, limited functional ability, obesity, tobacco use, higher physical work demands, workman’s compensation or pending litigation (Chou & Shekelle, 2010).

Two psychological risk factors frequently identified as contributing to low back pain (LBP) and its chronicity are pain related fear and fear of re-injury (Rainville et al., 2011). The psychological experience of fear and how it relates to movement has been conceptualized through the Fear Avoidance Model (FAM) and is termed Fear Avoidance Beliefs (FABs) (Lethem, Slade, Troup, & Bentley, 1983). Swinkels-Meewisse and colleagues (2006) found that baseline fear of movement and re-injury were stronger predictors of perceived disability than baseline pain, disability, age, gender and level of education in a acute back pain population (Swinkels-Meewisse et al., 2006). Numerous studies implicate fear as a cause of chronic disability with back pain.
patients (Boersma & Linton, 2005; Crombez, et al., 1999; Guclu, Guclu, Ozaner, Senormanci, & Konkan, 2012; Meyer, Tschopp, Sprott, & Mannion, 2009; Wertli, et al., 2014; Woby, Watson, Roach, & Urmston, 2004; S. R. Woby, P. J. Watson, N. K. Roach, & M. Urmston, 2004). The purpose of this paper is to review the concept of fear through the FAM, its application and relevance in the clinical area among patients with a complaint of non-specific LBP.

**Conceptualization of the Fear Avoidance Model**

Lethem and colleagues (1983) identified the term fear avoidance as experienced in chronic low back pain (cLBP) through a multidisciplinary approach that conceptualized the adaptive and maladaptive experience of pain (Lethem, et al., 1983). Adaptive and non-adaptive responses were identified with adaptive mechanisms leading to restorative function while the mal-adaptive strategies caused an exaggerated pain experience and avoidance of painful activities. It is through the exaggerated responses to the actual pain, the asynchrony between pain and the response, that disability was theorized to occur.

Vlaeyen et al., (2000) graphically expanded Lethem’s model depicting two avenues of patient responses that determined the course of back pain, both pivoting on the concept of fear versus no fear (Vlaeyen & Linton, 2000). No fear is depicted as the adaptive course with resolution of symptoms. Negative emotions, anxiety and worry contribute and are moderators of pain-related fear leading to disuse, depression, and disability (See Figure 1).

The FAM has been applied using the Fear Avoidance Beliefs Questionnaire (FABQ) and the Tampa Scale of Kinesiophobia (TSK). Another instrument that has applied these concepts is the SIarT Back Screening Tool (SBST). Developed and used mostly in the United Kingdom, the SBST it is a risk factor rating “tool” for clinicians to use as to guide clinical decision making (Hill et al., 2008).
The Fear Avoidance Beliefs Questionnaire

To screen for people at risk for developing fear related disability, Waddell et al., (1993) developed the FABQ (Waddell, Newton, Henderson, Somerville, & Main, 1993). It was based on the FAM and the consequence related to avoidance of movement and how beliefs regarding pain and re-injury affect physical activity and work. It is a sixteen item self-administered Likert scale survey consisting of two subscales, the physical activity (FABQPA) and the work subscale (FABQW). Higher scores indicate high FABs.

Findings from a randomized controlled trial (RCT) found that pain anticipation adversely affected performance in subjects warned to anticipate pain, compared to members of a control group who learned that additional movement would not increase pain (Pfingsten et al., 2001). The study used FABQ, the pain intensity index, performance parameters, and visual analogues and found that the anticipation of pain led to significantly lower levels of behavioral performances, increased pain intensity and fear.

The FABQ has been used as an outcome measure in multiple studies exploring functional disability attributed to LBP. In a descriptive study done by Fritz and George, (2002), with 78 acute low back pain patients, the FABQW was found to be predictive of return to work status (Fritz & George, 2002). A positive likelihood ratio (LR) of 3.33 of not returning to work was found for patients scoring >34 on the FABQW, a negative LR was found for patients scoring <29. A secondary analysis done by George and colleagues, (2008), supported these findings: scores of >29 FABQW was found to predict disability and explain 24% of the variance in disability in the final regression model (George, Fritz, & Childs., 2008). Woby et al., (2004) used the FABQ in 83 patients to investigate how their adjustment to cLBP was influenced by FAB (Woby, et al., 2004). The findings supported the ability of the FABPA to predict the amount of self reported disability.
after adjusting for age, sex and pain intensity. Chan and Chi (2008) found similar findings (Chan & Chiu, 2008).

**Tampa Scale of Kinesiophobia**

The Tampa Scale of Kinesiophobia (TSK) is a screening tool used to measure fear of movement. Its initial unpublished 17 item self-administered 4 point Likert scale has been modified and translated in multiple languages. It has been found to be a reliable and valid instrument in the clinical setting to measure pain related fear with higher scores indicating higher fear of movement (de Moraes Vieira, de Goes Salvetti, Damiani, & de Mattos Pimenta, 2013; Monticone et al., 2013; Swinkels-Meewisse, Swinkels, Verbeek, Vlaeyen, & Oostendorp, 2003). Picavet et al., (2002) found the TSK predictive of disability at six months, controlling for pain severity and disability at baseline (Picavet, Vlaeyen, & Schouten, 2002).

**STarT Back Screening Tool**

The SBST is a relatively new prognostic screening used mostly in the UK (Hill, et al., 2008). It is based on the domains of larger questionnaires that predict non-recovery from LBP (Kongsted, Johannesen, & Leboeuf-Yde, 2011). It guides clinical decision making and helps determine who is at risk for developing cLBP and which patients require more intensive follow-up. Low scores are indicative of low risk and can be confidently managed with education and analgesia. Moderate and high risk requires referral beyond the primary care setting.

**Clinical Implications**

Back pain is one of the most common symptom related reasons for health care visits and the leading cause of global disability (Hoy et al., 2014). It has a reported lifetime prevalence rate of
84% (Balague, Mannion, Pellise, & Cedraschi, 2012) with direct and indirect costs of $100 billion per year (Crow & Willis, 2009).

In most patients, the cause of LBP cannot be identified and is termed non-specific (Manek & MacGregor, 2005). It is identified as non-specific in approximately 90% of the presenting cases (Krismer, van Tulder, & 2007) when no specific radiculopathy, spinal stenosis, or specific spinal causes are identified (Swinkels-Meewisse, et al., 2006). A low correlation exists between pain severity and disability; some people with high pain severity have low levels of disability while others with low pain severity experience high functional impairment (Takahashi et al., 2006).

Clinical practice guidelines from the American College of Physicians and the American Pain Society (2007) recommend against routine imaging unless there is neurological compromise or a serious underlying condition is suspected (Chou et al., 2007). Recommendations regarding the use of acetaminophen or NSAID as “first line drugs,” the importance of staying active and self options should be encouraged. For patients with non-specific acute LBP, that has not improved with the self care options, the use of spinal manipulation is suggested. For sub-acute and cLBP, an intensive interdisciplinary approach, exercise therapy, yoga, massage, acupuncture, spinal manipulation, cognitive behavior therapy and progressive relaxation are recommended. Despite these published clinical guidelines, imaging, opioids, injections and lumbar fusion rates have increased while self reported functional, mental and social limitations are on the increase (Deyo, Mirza, Turner, & Martin, 2009) (See Figure 2).

Clinical Approaches

Eighty to ninety percent of patients who present with LBP will recover within 6 to 8 weeks regardless of therapy (Chou & Shekelle, 2010). For patients with excessive FABs, successful
outcomes are achieved when fears are addressed (Wertli, et al., 2014). Initial screening for fear of pain, injury and movement can provide prognostic information regarding potential barriers to recovery and whether a referral is required. Education, exercise therapy and other multidisciplinary approaches are common treatment avenues for the fear avoidant patient.

**Education**

For the patient who presents with non-specific LBP, reassurance regarding its self limiting nature, the stability of the spine and the unnecessary need for further diagnostics should be communicated. The clinical importance of the continuation of usual activity along with the use of acetaminophen or NSAIDS are aligned with current practice guidelines (Chou & Huffman, 2007).

Burton and colleagues (1999) in a double blind RCT recruited 162 participants from a primary care setting. The *Back Book* was used as the experimental intervention with the traditional, biomedical booklet “*Handy Hints*” as the control (Burton, Waddell, Tillotson, & Summerton, 1999) (See Table 1). Questionnaires measuring pain, FAB, disability, and consequences of back trouble were used. The *Back Book* intervention group was found to have statistically significant improved FABs and improved pain scale rating at 2 weeks and at 3 months. Patients who received the *Back Book* were 2.5 times more likely to have reduced FAB and improved disability scores at 3 months. Godges et al. (2008) found similar benefits to counseling and education among acute LBP patients with a work related injury and high FABs (Godges, Anger, Zimmerman, & Delitto, 2008). Using a return to work status as an outcome measure, the group that received counseling, education along with physical therapy was able to return to work at a faster rate than the control group that had received only physical therapy.
Physical Therapy

Physical therapy is commonly prescribed for LBP patients (Freburger, Carey, & Holmes, 2005). A Cochrane Systematic review of 61 RCTs (2005) concluded that exercise was as effective as no treatment or conservative treatment for patients with acute LBP (Hayden, van Tulder, & Tomlinson, 2005). There was some evidence to suggest that graded exercise improved work absenteeism for the sub acute population and that exercise therapy was slightly effective at improving pain and function among the cLBP population.

There is limited research on the benefit of graded activity and exposure to fear producing activity among the population of patients with high FABs. Graded activity is based on operant conditioning. It uses positive reinforcement of healthy behaviors in a time contingent manner to achieve functional goals despite pain. Graded exposure, on the other hand, is achieved through the hierarchal identification of the least to most feared activities. Once the least feared activity has been successfully “mastered,” the patient progresses to the next level.

A systematic review done by Macedo et al., (2010), did not support the use of graded activity or exposure to feared activities versus other exercises (Macedo, Smeets, Maher, Latimer, & McAuley, 2010). The authors concluded that most studies reviewed were of low quality with varying outcome measures which limited the interpretation of the data. Leween et al., (2007), found no superiority at improving functional ability using either a graded activity or a graded exposure to feared activities in a RCT done with moderately fearful patients who scored greater than 33 on the TSK (Leeuw et al., 2007). In a study done by Woods et al., (2008), graded exposure to feared activity was found to be more effective than graded activity at impacting fear
but the findings did not reach statistical significance on the disability scale (Woods & Asmundson, 2008).

**Multidisciplinary Approach**

The use of a multidisciplinary biopsychosocial rehabilitation (MDR) program uses the expertise of a variety of healthcare providers including primary care providers, psychologists and therapists. In a RCT, Monticone et al, (2013), in a parallel group design, 90 LBP patients were randomized to either an exercise only or a psychologist led multidisciplinary group that consisted of exercise therapy and cognitive behavioral therapy (CBT) (Monticone, et al., 2013). The CBT consisted of patient education focusing on pain as a self-managed entity rather than a serious disease that required vigilant protection. The patients were guided through the graded exposure of activities that were previously identified as dangerous. They were encouraged to transfer their attention from fear of movement to increasing their level of activity. The TSK, the Roland Morris Disability Questionnaire, pain scale and the Short Form Quality of Life Health Survey (SF-36) were used at baseline, 5, 12 and 52 weeks post-intervention. Compared to exercise only, MDR was superior at reducing disability, FAB, pain and quality of life with effects that lasted for at least one year. The MDR approach was also supported in a systematic review using 41 RCTs (Kamper, et al., 2014). The review findings supported MDR as more effective than usual care or PT at reducing pain and disability and also supported a positive effect on return to work status.

**Managing the Patient Encounter**

Once a patient exam rules out for “the red flags” suggestive of a neurological or systematic disorder, a clinical assessment identifying risk factors.--- high maladaptive coping behaviors, the presence of nonorganic signs, functional impairment, poor health status and psychiatric co-
morbidities should be screened for (Chou & Shekelle, 2010). In a review on how fear relates to chronicity and disability Turk and Wilson (2010) outline a stepwise approach to treatment. (Turk & Wilson, 2010)

Step 1: Assess fear beliefs in general or use one of the standardized measures.

Step 2: Address fears through reassurance “pain does not equal harm”. For low fear patients education from the primary care provider may be adequate. For high fear patients referral to a MDR program may be indicated.

Step 3: Help patients set realistic expectations—individualized to the patient

Step 4: Gradually increase activity starting at a level that is appropriate and acceptable to a patient. Consider the use of graphs so that patients can monitor their activity and progress toward goals. For low fear patients self monitored gradual increase in activity maybe adequate, for high fear patients therapists (physical therapist and psychologist) guided and graded exposure to feared and avoided activity may be indicated.

Step 5. Encourage patient self monitoring in order to stay on target, provide a form of reinforcement to encourage continuation and observe progress, encourage self monitoring as a way to increase self efficacy and decrease catastrophizing beliefs.

The clinician should consider a cost-benefit analysis in decision making. Referrals to a MBR program should be made for patient with indicators of a high psychosocial risks (Kamper, et al., 2014). A high FAB would suggest a timely referral to an intervention that addresses and impacts the psychological contributor to cLBP.

**Conclusions**

Fear has an unfavorable effect on LBP outcome and addressing it leads to more successful patients outcomes (Wertli, et al., 2014). Clinicians should screen for excessive fear of pain,
movement and self-limiting activity restrictions. Initial interventions should include education regarding the structural soundness of the spine, the undesirable effects of restricting activity, and the self-limiting nature of non-specific LBP.

When excessive fears are identified, patient specific treatment strategies may include closer follow-up, structured exercise programs that focus on patient specific fears and or a multidisciplinary approach. Addressing the psychosocial aspect of LBP with all patients that present to the office can contribute to decreasing what is now the number one global cause of disability.
References


Figure 1 Fear Avoidance Beliefs Model

Figure 2  Increases of use for Various Services for Low Back Pain

Deyo, Mirza, Turner, & Martin, (2009)
## TABLE 1  Comparison of the Main Messages Given in the Control and Experimental Groups

<table>
<thead>
<tr>
<th>Control Booklet</th>
<th>Experimental Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handy Hints (Control Booklet)</td>
<td>The Back Book (Experimental Intervention)</td>
</tr>
<tr>
<td>Traditional biomedical concepts of spinal anatomy, injury and damage (implicit messages that the spine is easily damaged and that medicine should diagnose and treat the problem, but that there is often permanent damage.)</td>
<td>There is no sign of serious disease</td>
</tr>
<tr>
<td></td>
<td>The spine is strong, There is no suggestion of any permanent damage. Even when is it very painful, that does not meant there is any serious damage to your back&quot; hurt does not mean harm.</td>
</tr>
<tr>
<td>Avoid activity when in pain: your general practitioner may advise bed rest</td>
<td>Back pain is a symptom that your back is simply not moving and working quite as it should. It is unfit or out of condition.</td>
</tr>
<tr>
<td>Describes further investigations and surgery. (Reinforces the message that back pain is a medical problem, and that there is little the patient can do.)</td>
<td>There are a number of treatments that can help to control the pain, but lasting relief then depends on your own effort.</td>
</tr>
<tr>
<td>Concentrates on pain rather than activity. (Implicit message that restoring activity and function must await relief of pain.)</td>
<td>Recovery depends on getting your back moving and working again and restoring normal function and fitness. The sooner you get active, the sooner your back will feel better.</td>
</tr>
<tr>
<td>Encourages patient to be positive</td>
<td>Positive attitudes are important. Do not let your back take over your life. “Coopers” suffer less at the time, get better quicker and have less trouble in the long term.</td>
</tr>
</tbody>
</table>

Chapter 3

Abstract

Low back pain, the number one cause of global disability, is a multidimensional disorder with physical, psychological, and social influences. Fear avoidance beliefs, and their influence on pain and the avoidance of movement, is an important determinant for back pain intervention outcomes. There is, however, a limited translation of this knowledge into the clinical setting. Identifying these beliefs as significant barriers to recovery, along with establishing the superiority of one treatment approach over another at affecting high fear avoidance beliefs, paves the way for greater clinical application. This secondary analysis of data from a randomized clinical trial comparing yoga, physical therapy, and educational interventions for chronic low back pain aims to identify the role of fear avoidance beliefs and treatment approaches for low back pain in a predominantly minority population.

*Keywords: Low Back pain, disability, fear avoidance beliefs, treatment effectiveness*
The Impact of Yoga, Physical Therapy and Education on Fear Avoidance Beliefs in Chronic Low Back Pain

Low back pain (LBP) is the number one cause of global disability (Hoy et al., 2014) with a lifetime prevalence reported to be as high as 84% (Balagué, Mannion, Pellisé, & Cedraschi, 2012) and a direct economic burden of 100 billion dollars a year with 5% of the patients consuming 75% of the cost (Katz, 2006). Low back pain includes tension, stiffness, and/or soreness in the lower back region, defined as the area between the lower ribs and the gluteal folds (Hoy, et al., 2014). It is identified as non-specific in approximately 90% of the presenting cases (Krismer, van Tulder, & 2007) when no specific radiculopathy, spinal stenosis, or specific spinal causes are identified (Swinkels-Meewisse et al., 2006).

The term “chronic” is used to describe back pain lasting for 3 months or longer. Twenty percent of people affected by acute back pain go on to develop chronic back pain with persistent pain lasting up to one year (National Institute of Neurological Disorders and Stroke, 2014). Despite the rising costs of back pain treatment related to the increased use of medications (including acetaminophen, non-steroid anti-inflammatory drugs, and opioids), spinal injections and surgery, functional disability from this problem in the United States (US) has not improved (Deyo, Mirza, Turner, & Martin, 2009). These rising costs without improved disability rates along with the opioid epidemic support the need for additional research into back pain treatment approaches.

There has been growing recognition that pain is a complex experience influenced by a range of factors that include biological, psychological, and sociological attributes (Turk & Okifuji, 2002). Psychosocial factors have been deemed important determinants to the response to therapy
in chronic pain patients (Burton, Tillotson, Main, & Hollis, 1995). These factors have been implicated as predictors of the chronicity and the prolonged disability from LBP (Nagarajan & Nair, 2010; Nicholas, Linton, Watson, Main, & Group, 2011; Turk & Okifuji, 2002). Current clinical guidelines from the American College of Physicians and American Pain Society recommend identification of relevant psychosocial factors in order to recognize patients at risk for developing disability from LBP (Chou et al., 2007).

Kendall and colleagues termed psychosocial risks factors as “yellow flags”. These “yellow flags” identify risk factors that prolong both disability and return to work status (Kendal, Linton & Main, 1997). It was later suggested that the term “yellow flags” be used only to identify those features of a person that involve thoughts, feelings, and behaviors which adversely affect recovery from back pain. The terms “black” and “blue” flags should be used to identify issues that impact return to work status, like employee perception of workplace stress, an unsupportive workplace environment, or issues that surround the compensation system for work place injuries (Nicholas, et al., 2011).

Fear has been identified as one of the “yellow flag” psychological risk factors that may become more disabling than the pain itself (Crombez, Vlaeyen, Heuts, & Lysens, 1999). The level of fear together with baseline function are most predictive of recovery from an acute episode of LBP (Chou & Shekelle, 2010). Fear, and the belief that physical activity will result in worsening pain or injury, has been termed fear avoidance beliefs (FAB). FAB is identified as a significant variable among patients who go on to develop chronic low back pain (cLBP) (Davis et al., 2013; Elfving, Andersson, & Grooten, 2007; Fritz, George, & Delitto, 2001; Rainville et al., 2011). Fear and its consequences have been conceptualized through the Fear Avoidance
Model. The Fear Avoidance Beliefs Model (FAM) delineates a predictive approach concerning how pain-related fear leads to disability (Vlaeyen & Linton, 2000). The authors postulated that:

1. Negative appraisals about pain and its consequences, such as catastrophic thinking, is considered a potential precursor of pain-related fear.  
2. Fear is characterized by escape and avoidance behaviors, of which the immediate consequences are that daily activities (expected to produce pain) are not accomplished anymore. Avoidance of daily activities results in functional disability.  
3. Because avoidance behaviors occur in anticipation of pain rather than as a response to pain, these behaviors may persist because there are fewer opportunities to correct the (wrongful) expectancies and beliefs about pain as a signal of threat of physical integrity.  
4. Longstanding avoidance and physical inactivity has a detrimental impact on the musculoskeletal and cardiovascular systems, leading to the so-called ‘disuse syndrome’ which may further worsen the pain problem (Vlaeyen & Linton, 2000, pp. 319). The FAM describes two avenues of pain responses that range from avoidance to confrontation. Patients presenting with pain-related fear tend to avoid activity and as a result develop disuse syndrome, or disability not necessarily associated with back pathology or pain severity. The “no fear” avenue leads to confrontation and recovery (See Appendix A).

Fear avoidance beliefs (FAB) is measured through a validated questionnaire: the Fear Avoidance Beliefs Questionnaire (FABQ) (See Appendix B) (Waddell, Newton, Henderson, Somerville, & Main, 1993). Elevated levels of FAB have been found to be more predictive of long term disability than clinical findings and imaging studies (Carragee, Alamin, Miller, & Carragee, 2005; Fritz & George, 2002). The role of FAB has been identified as having a negative influence on people that develop cLBP. However, it is not known if this effect exists within a predominantly minority population or whether one treatment over another is more
effective with patients that present with high FAB. It is also unknown if there is a relationship between treatment compliance and fear of pain or re-injury.

This research project is a secondary analysis of data generated from the *Back to Health Study* which is a randomized controlled trial of an urban, predominantly minority population that compared yoga, physical therapy, and education cLBP (Saper et al., 2014). A brief description of the *Back to Health* study follows as the detailed study protocol has been previously published (Saper et al., 2014). Eligible adults with chronic non-specific low back pain were recruited from Boston Medical Center and its community health clinic affiliates. Inclusion criteria consisted of: current non-specific low back pain persisting for greater than 12 weeks, mean low back pain intensity over the previous week equal to 4 or greater on an 11 point numerical rating scale, English fluency sufficient to follow treatment instructions and to answer survey questions, and the willingness to list comprehensive contact information. The exclusion criteria were: used yoga or physical therapy in the previous 6 months, had read the Back Pain Helpbook or the Back Book in the previous 6 months, had previously participated in the study team’s previous yoga or physical therapy research trials, had new cLBP treatment started within the previous month or anticipated to begin in the next 12 months, were unable to understand English, or were knowingly pregnant. Participants with active or planned worker’s compensation, disability or personal injury claims, active substance or alcohol abuse, plans to move out of the area in the next 12 months, perceived religious conflict with the yoga intervention, or a lack of consent were also excluded. People with known significant physical pathology that included spinal stenosis, severe scoliosis, spondylolisthesis, ankylosing spondylitis, large herniated disk, sciatica pain equal to or greater than back pain, previous back surgery, history of vertebral fracture, active or recent malignancy, active or recent constitutional symptoms, rheumatoid arthritis, severe
fibromyalgia, severe or progressive neurological deficits, or other severe disabling chronic medical or psychiatric co-morbidities (e.g., severe heart failure, lung disease active treatment hepatitis B or C, psychosis) deemed by the principal investigator to prevent safe and/or adequate participation in the study were also excluded.

A total of 320 subjects were randomized into a 12-week, 3-arm controlled study comparing yoga, physical therapy and education. These three treatment approaches have been found to be effective in the treatment of chronic low back (Albaladejo, Kovacs, Royuela, del Pino, & Zamora, 1976; Cramer, Lauche, Haller, & Dobos, 2013; Freburger, Carey, & Holmes, 2005; Freburger, Holmes, & Carey, 2003; Tekur, Nagarathna, Chametcha, Hankey, & Nagendra, 2012; Udermann et al., 2004; Williams et al., 2005). After the 12-week active treatment phase, the yoga and physical therapy groups were re-randomized within their respective group into a 40-week structured vs. non-structured home maintenance phase. The education group participants continued the maintenance phase without re-randomization.

At baseline, socio-demographics characteristics, expectations, and preferences, other back pain treatments, and co morbidities were collected. The primary outcomes pain scores and back function measured by the Roland Morris Disability Questionnaire (RMDQ) scores also were obtained. Secondary outcomes included pain medication use, work productivity, health-related quality of life, (SF-36), (Ware, 2000), global improvement, and satisfaction with treatment were obtained. Exploratory outcomes and potential covariates obtained at baseline included: a history of alcohol or drug use or smoking, height and weight, FABQ (Waddell, et al., 1993), Pain Self Efficacy (PSE), (Anderson, Dowds, Pelletz, Edwards, & Peeters-Asdourian, 1995), Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989), Depression, (PHQ-8), (Lowe, Kroenke, Herzog, & Grafe, 2004), Anxiety, (GAD-7), (Spitzer, Kroenke,
Williams, & Lowe, 2006), Coping Strategies, (CSQ), (Utne et al., 2009) and Perceived Stress Scale,(PSS), (Cohen, Kamarck, & Mermelstein, 1983). Data from the primary and secondary outcomes, along with the FABQ and other back pain treatments, and exercise history were obtained at 6, 12, 26, 40, and 52 weeks. The remainder of the exploratory outcomes was measured again at 12 and 52 weeks.

The *Back to Health* primary outcome measures included pain measured on an 11-point numerical rating scale and back specific function measured by the 23-point RMDQ (Patrick et al., 1995). For this secondary data analysis, the Fear Avoidance Beliefs Questionnaire (FABQ), the Roland Morris Disability Questionnaire (RMDQ) and treatment (yoga and physical therapy) attendance rates were used.

The hypotheses for this study are: 1) There will be a positive linear relationship between baseline fear avoidance beliefs and disability as measured by the Roland Morris Disability Questionnaire. 2) Yoga is more effective than physical therapy or education at affecting high FABs scores; and 3) There will be a negative linear relationship between baseline fear avoidance beliefs and treatment adherence. Approval for this secondary data analysis was obtained through Northeastern University’s Office of Human Subject Research Protection, Boston, MA and Boston University Medical Campus Institutional Review Board, Boston, MA.

**Method**

**Study Design**

This is a secondary data analysis.

**Variables**
The FABQ is a 16-item measure scored on a 7-point Likert scale with greater values representing a higher level of fear avoidance beliefs. Two subscales exist: the FABQ physical activity (FABQPA) (range 0-24) and the FABQ work (FABQW) (range 0-24) scale (Waddell, et al., 1993) (See Appendix B). The modified RMDQ is a 23-item measure of physical function related to low back pain with higher scores indicating worse function (See Appendix C) (Roland & Fairbank, 2000). Participant attendance was recorded for both the yoga and physical therapy groups and an attendance rate percentage variable was created.

Data Analysis

Chi-square tests and analysis of variance were used to compare baseline characteristics among the groups. Multiple regression analysis was used to control for the confounding variables. Correlations were done at baseline. To test the first hypothesis concerning the relationship between the FABQ and the dependent variable RMDQ, a regression model was created based on FAM theory and existing literature that supported variables of a confounding nature (Basler, Luckmann, Wolf, & Quint, 2008; Chou & Shekelle, 2010; Woby, Watson, Roach, & Urmston, 2004). To test the second hypothesis, analysis of variance (ANOVA), using least squares means, was used to determine whether there was any significant differences among the three different intervention groups for affecting FAB scores at 12 weeks. To test the third hypothesis, concerning whether a negative linear relationship exists between high FABQ scores and intervention attendance rates, a regression analysis model was created using the FABQ as a predictor variable for attendance rates. Confounders identified in the literature as barriers to treatment adherence were used in the regression model (Jack, McLean, Moffett, & Gardiner, 2010).
Results

At baseline there were no statistical or clinical differences among the groups except for the RMDQ scores (p = 0.03) (See Table 1). Pearson correlation coefficients at baseline are reported in Table 2. As expected the FABQPA and the FABQW were significantly correlated with each other, r = .29, p < .0001. The FABQPA and the FABQW were significantly correlated with the RMDQ (r = .26, p < .001 and r = .32, p < .0001, respectively).

For the first hypothesis: there will be a positive linear relationship between FAB and disability measured by the RMDQ, a hierarchical regression analysis was used. The RMDQ was used as the dependent variable in the regression model and separate models were created for both the FABQPA and the FABQW. When the FABQPA, gender, age, income and race variables were entered into the model, 20% of the variance for disability was explained (See Table 3). When the pain scale was entered, the variance increased from 20 to 30% (See Table 4). When the pain self efficacy scale (PSEQ) and the depression scale (PHQ-8) were entered 45% of the variance in disability was explained (See Table 5). In the final model, FABQPA was predictive of disability with a β = .11, p = .001. Along with the FABQPA, the depression scale (PHQ-8), pain self efficacy (PSEQ), age, and pain intensity were statistically significant with pain being the strongest predictor with a β = .97, p = .001 (See Table 5). The same hierarchical method was applied using the FABQW scale. The FABQW was a less significant predictor of disability with β = .06, p = .004. Female gender became a significant predictor in the FABQW model with a β = .99, p = .04; pain was the next most significant predictor with a β = .95, p = .0001 (See Tables 6-8).
The second hypothesis: yoga is more effective than physical therapy or education at impacting fear avoidance beliefs was not supported. Adjusting for the baseline RMDQ, there were no group differences in 12 week FABQPA scores among the yoga and physical therapy groups (p = .41), yoga and education groups (p = .96) or between the PT and education groups (p = .39). Similar findings were found with the FABQW scores among the yoga and physical therapy groups (p = .43), yoga and education groups (p = .98) and between the PT and education groups, (p = .67).

The linear regression model results did not support the third hypothesis of a negative linear relationship between FAB and treatment adherence. The model included both FABQ subscales, pain, depression (PHQ-8), pain self efficacy (PSEQ), baseline physical dysfunction (RMDQ), treatment effect, age, gender, income and race. There was a 13% explained variance for attendance rate/adherence (See Table 9). Neither the FABQPA (p = .76) nor the FABQW (p = .76) reached statistical significance. Race, gender, and age reached statistical significance but had “weak” predictive ability [ (β = .15, p = .007), (β = .11, p = .02), and (β = .006, p = .0008), respectively].

Discussion

It was anticipated that high FAB scores would be associated with worse physical dysfunction. Both FABQPA and FABQW were predictive of disability at baseline. This is supported by Crombez et al, (1999) and George et al., (2010) findings that both subscales are predictors of disability while controlling for socio-demographics (Crombez, et al., 1999; George, Valencia, & Beneciuk, 2010). These findings were not supported by Cleland et al., (2010), however, in a retrospective review of electronic data from 5 PT clinics (Cleland, Fritz, & Brennan, 2008).
Despite higher FABQPA scores (14.6 SD 5.9) than reported in this study (13.1 ± 6.6), the FABQPA was not found to be predictive.

Thus, the literature reports varying and contradictory results despite some commonalities among baseline FABQ scores, populations, and methodology. As the FABQ consists of 2 subscales measuring physical activity or activity related to work, they are commonly viewed separately and often have different percentages of explained variance and predictive ability for disability. Some studies report positive findings with both the FABQPA and the FABQW,(Barr, 2008; George, et al., 2010; Waddell, et al., 1993) while others support only the FABQPA (Grotle, Vollestad, Veierod, & Brox, 2004; Wenneke et al., 2009; Woby, Watson, Roach, & Urmston, 2004). Still others support the FABQW’s predictive power (George, Fritz, & Childs., 2008). Some research suggest that no subscale of the FABQ supports a predictive relationship with the disability scale (Kovacs et al., 2005; Wertli, Rasmussen-Barr, Weiser, Bachmann, & Brunner, 2014). One study reported low fear avoidance scores predictive of increased levels of physical activity among an older adult population at 52 weeks (Larsson, Ekvall Hansson, Sundquist, & Jakobsson, 2016)). In a systematic review, Wertli et al., (2014) did not find support for the FABQPA or FABQW as predictors of disability in a cLBP population (Wertli et al., 2014). The predictive ability of FABQ subscales beyond baseline data are not accounted for in this research.

These overall contradictory results may indicate the presence of a mediator influencing the relationship between FAB and disability. In a cross-sectional study, 102 cLBP patients completed questionnaires on pain, disability, pain-related fear, and self-efficacy. Self-efficacy was found to mediate the relationship between pain-related fear and disability. Findings suggested that when self-efficacy is high, elevated pain-related fear may not lead to greater pain
or disability. In contrast, when self-efficacy is low, pain-related fear may increase pain and disability (Woby, Urmston, & Watson, 2007). These findings are supported in a cross-sectional study done to assess the relationship between FAB and self-efficacy. Low self-efficacy and high fear avoidance levels were related to increased levels of disability in cLBP patients (de Moraes Vieira, de Goes Salvetti, Damiani, & de Mattos Pimenta, 2013).

In a mediator predictive model explaining 61% of the variance in disability, Sherman et al., (2013) reported self-efficacy, improved sleep, and amount of previous back exercise as the most significant variables accounting for over 56% of the variance in the disability scores. The remaining 5% variance was shared among three variables, one of which was FAB (Sherman, Wellman, Cook, Cherkin, & Ceballos, 2013). These findings were supported in a longitudinal study where improved self-efficacy was found to mediate/improve the relationship between pain and disability with no evidence to support a role for FAB (Costa Lda, Maher, McAuley, Hancock, & Smeets, 2011). Denison et al., (2004), found similar results to support self-efficacy as a more important determinant than fear avoidance beliefs (Denison, Asenlof, & Lindberg, 2004). This supports the findings of Mannion et al., (2001), that self-efficacy beliefs over control of pain and fear of pain represent different dimension of pain cognitions (Mannion et al., 2001).

This is an area that requires more research on possible mediating variables and other instruments that include a wider range of cognitions. The STarT Back Screening Tool is one such measure that may aid in clinical decision-making. This primary care prognostic screening tool identifies biomedical, psychological, and social risk factors and categorizes patients as either low, medium, or high-risk with a matched treatment plan (Hill et al., 2008).
There was no evidence to suggest the superiority of one intervention over another at influencing FAB scores. In addition, there was no evidence to support FAB as a predictor to treatment attendance rates. One would intuitively expect that FAB, fear of pain, and re-injury may have a negative impact on participating with “active” interventions. Coombs’ (2014) finding that people with fear of movement may be less likely to participate in a pain therapy that involves physical movement was not supported here as FAB subscales were not a significant predictor or contributor to the small amount of variance obtained in the regression model predicting attendance rates (Combs & Thorn, 2014).

This analysis’ strength included data generated from a randomized controlled trial. It used a theory and research-based approach to identify confounding variables that impact back pain dysfunction. Because this was a secondary data analysis, it allowed an efficient method to answer these research questions. The Back to Health data base had a number of exploratory variables that were of interest. It also identified contradictory research on FAB and a possible mediator to its relationship with disability.

Some limitations in this research exist. Although all outcomes measures have adequate validity and reliability, self-reported measures can often have validity issues in regard to participants not understanding what is being asked, difficulty with the ability to “rate” how one feels on a Likert scale, and response bias. The employment rates were low in this population, which may have altered the validity of the FABQ work subscale as this scale is specific to one’s fear concerning work related activity. Lastly, the research participants were recruited from a predominantly minority urban population, limiting its generalizability to a predominately white population with higher socioeconomic status.
Conclusions

Chronic low back pain is a public health care issue. Despite rising costs, disability rates have not improved. In addition, opioids are a common management approach and their overuse has significant public health ramifications. The need for continued research on how to effectively manage cLBP has become apparent.

Back pain has been found to have biopsychosocial contributors and FAB has been found to be one of the variables associated with worsening low back pain disability. There is contradictory evidence, however, in the literature regarding its contribution to disability. However, there is enough support from our research and the literature to suggest FAB has a role in poor physical function. Further research is warranted. Future research should include both the FABQ and the pain self-efficacy scale to better understand their roles in affecting disability outcomes from low back pain.
References


Table 1

*Baseline Characteristics of Participants*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Yoga (N = 127)</th>
<th>PT (N = 129)</th>
<th>Education (N = 64)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age, years (SD)</td>
<td>46.4±10.4</td>
<td>46.4±11.0</td>
<td>44.2±10.8</td>
</tr>
<tr>
<td>Female- no. (%)</td>
<td>72 (56.7)</td>
<td>90 (69.8)</td>
<td>42 (65.3)</td>
</tr>
<tr>
<td>Race or ethnic group- no. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic-white</td>
<td>26 (20.5)</td>
<td>20 (15.5)</td>
<td>11 (17.3)</td>
</tr>
<tr>
<td>Non-Hispanic-black</td>
<td>71 (55.9)</td>
<td>73 (56.6)</td>
<td>39 (60.9)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>18 (14.2)</td>
<td>19 (14.7)</td>
<td>7 (10.9)</td>
</tr>
<tr>
<td>Other</td>
<td>12 (9.4)</td>
<td>17 (13.2)</td>
<td>7 (10.9)</td>
</tr>
<tr>
<td>US born no. (%)</td>
<td>91 (71.7)</td>
<td>84 (65.1)</td>
<td>51 (79.7)</td>
</tr>
<tr>
<td>College degree or more (%)</td>
<td>38 (29.9)</td>
<td>30 (23.3)</td>
<td>25 (39.1)</td>
</tr>
<tr>
<td>Employed (%)</td>
<td>60 (47.2)</td>
<td>53 (41.4)</td>
<td>30 (46/9)</td>
</tr>
<tr>
<td>Annual Income ≤ 30,000 (%)</td>
<td>76 (58.8)</td>
<td>71 (55.0)</td>
<td>41 (64.1)</td>
</tr>
<tr>
<td>Mean RMDQ score (±SD)*</td>
<td>13.9±5.6</td>
<td>15.6±5.7</td>
<td>15.0±5.0</td>
</tr>
<tr>
<td>Pain intensity previous week mean (SD)</td>
<td>7.1 (1.5)</td>
<td>7.2 (1.5)</td>
<td>7.0 (1.4)</td>
</tr>
<tr>
<td>Fear Avoidance Beliefs Questionnaire</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Activity (SD)</td>
<td>13.2 (7)</td>
<td>13.3 (6.4)</td>
<td>12.4 (6.5)</td>
</tr>
<tr>
<td>Work (SD)</td>
<td>14.2 (11.8)</td>
<td>16.6 (11.8)</td>
<td>14.4 (12.2)</td>
</tr>
<tr>
<td>Depression (PHQ-8) (SD)</td>
<td>7.8 (6.0)</td>
<td>8.7 (5.9)</td>
<td>8.3 (5.6)</td>
</tr>
<tr>
<td>Anxiety (GAD 7) (SD)</td>
<td>6.9 (6.0)</td>
<td>7.2 (5.9)</td>
<td>7.3 (5.7)</td>
</tr>
<tr>
<td>Pain Self Efficacy (PSEQ)</td>
<td>37.3 (14.8)</td>
<td>35.9 (13.6)</td>
<td>38.5 (11.8)</td>
</tr>
</tbody>
</table>

*p = .03*
Table 2

*Pearson Correlation Matrix (N=303)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>FABQPA</th>
<th>FABQW</th>
<th>RMDQ</th>
<th>LBP</th>
<th>PHQ8</th>
<th>PSEQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FABQPA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. FABQW</td>
<td>.29**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. RMDQ</td>
<td>.26**</td>
<td>.32**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. LBP</td>
<td>.09</td>
<td>.12*</td>
<td>.36**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. PHQ8</td>
<td>.13*</td>
<td>.35**</td>
<td>.40**</td>
<td>.22**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. PSEQ</td>
<td>-.12*</td>
<td>.26**</td>
<td>-.46**</td>
<td>-.14*</td>
<td>-.42**</td>
<td></td>
</tr>
</tbody>
</table>

1. FABQPA: Fear Avoidance Beliefs Physical Activity Subscale.
2. FABQW: Fear Avoidance Beliefs Work Subscale
3. RMDQ: Roland Morris Disability Questionnaire
4. LBP: Low back pain scores on 11 point scale.
5. PHQ8: Patient Health Questionnaire: instrument for screening diagnosing, monitoring and measuring the severity of Depression
6. PSEQ: Pain Self Efficacy Questionnaire.

* p-value <0.05
** p-value <0.0001
Table 3

*Regression Model 1: Predicting baseline RMDQ with FABQPA as the independent variable*

<table>
<thead>
<tr>
<th>Independent Measures</th>
<th>R Square</th>
<th>Regression Coefficient (β)</th>
<th>Lower CI</th>
<th>Upper CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABQPA (Baseline)</td>
<td>0.20</td>
<td>0.17</td>
<td>0.09</td>
<td>0.253</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Gender (Female vs. Male)</td>
<td>0.86</td>
<td>-0.25</td>
<td>1.98</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Age at Baseline</td>
<td>0.14</td>
<td>0.9</td>
<td>0.19</td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Household income (&gt; $30,000 vs. &lt;$30,000)</td>
<td>-2.36</td>
<td>-3.51</td>
<td>-1.20</td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Race (White vs. Non-White)</td>
<td>-1.22</td>
<td>-2.6</td>
<td>0.17</td>
<td>0.09</td>
<td></td>
</tr>
</tbody>
</table>

Table 4

*Regression Model 2: Predicting baseline RMDQ with FABQPA as the independent variable*

<table>
<thead>
<tr>
<th>Independent Measures</th>
<th>R Square</th>
<th>Regression Coefficient (β)</th>
<th>Lower CI</th>
<th>Upper CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABQPA (Baseline)</td>
<td>0.30</td>
<td>0.16</td>
<td>0.08</td>
<td>0.23</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>LBPSCORE (Baseline)</td>
<td>1.2</td>
<td>0.87</td>
<td>1.60</td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Age at Baseline</td>
<td>0.13</td>
<td>0.08</td>
<td>0.17</td>
<td></td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Household income (&gt; $30,000 vs. &lt;$30,000)</td>
<td>-1.20</td>
<td>-2.34</td>
<td>-0.06</td>
<td>0.04</td>
<td></td>
</tr>
</tbody>
</table>
Table 5

*Regression Model 3: Predicting baseline RMDQ with FABQPA as the independent variable*

<table>
<thead>
<tr>
<th>Independent Measures (N=319)</th>
<th>R Square</th>
<th>Regression Coefficient (β)</th>
<th>Lower CI</th>
<th>Upper CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABQPA (Baseline)</td>
<td>0.45</td>
<td>0.11</td>
<td>0.04</td>
<td>0.18</td>
<td>.001</td>
</tr>
<tr>
<td>LBPSCORE (Baseline)</td>
<td>0.97</td>
<td>0.63</td>
<td>1.30</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>PHQ8 (Baseline)</td>
<td>0.16</td>
<td>0.07</td>
<td>0.25</td>
<td>.0003</td>
<td></td>
</tr>
<tr>
<td>PSEQ (Baseline)</td>
<td>-0.11</td>
<td>-0.15</td>
<td>-0.08</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Age at Baseline</td>
<td>0.14</td>
<td>0.09</td>
<td>0.18</td>
<td>&lt;.0001</td>
<td></td>
</tr>
</tbody>
</table>

Table 6

*Regression Model 1: Predicting baseline RMDQ with FABQW as the independent variable*

<table>
<thead>
<tr>
<th>Independent Measures (N=315)</th>
<th>R Square</th>
<th>Regression Coefficient (β)</th>
<th>Lower CI</th>
<th>Upper CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABQW (Baseline)</td>
<td>0.25</td>
<td>0.14</td>
<td>0.09</td>
<td>0.18</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Gender: (Female vs. Male)</td>
<td>1.4</td>
<td>0.31</td>
<td>2.53</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Age at Baseline</td>
<td>0.13</td>
<td>0.08</td>
<td>0.18</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Household income (&gt; $30,000 vs. &lt; $30,000)</td>
<td>-1.7</td>
<td>-2.82</td>
<td>-0.50</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td>Race (White vs. Non-White)</td>
<td>-1.2</td>
<td>-2.59</td>
<td>0.14</td>
<td>0.08</td>
<td></td>
</tr>
</tbody>
</table>
Table 7

Regression Model 2: Predicting baseline RMDQ with FABQW as the independent variable

<table>
<thead>
<tr>
<th>Independent Measures (N=315)</th>
<th>R Square</th>
<th>Regression Coefficient (β)</th>
<th>Lower CI</th>
<th>Upper CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABQW (Baseline)</td>
<td>0.33</td>
<td>0.12</td>
<td>0.08</td>
<td>0.17</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>LBPSCORE (Baseline)</td>
<td>1.17</td>
<td>0.80</td>
<td>1.53</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Gender: (Female vs. Male)</td>
<td>1.19</td>
<td>0.14</td>
<td>2.24</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Age at Baseline</td>
<td>0.12</td>
<td>0.08</td>
<td>0.17</td>
<td>&lt;.0001</td>
<td></td>
</tr>
</tbody>
</table>

Table 8

Regression Model 3: Predicting baseline RMDQ with FABQW as the independent variable

<table>
<thead>
<tr>
<th>Independent Measures (N=315)</th>
<th>R Square</th>
<th>Regression Coefficient (β)</th>
<th>Lower CI</th>
<th>Upper CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABQW (Baseline)</td>
<td>0.45</td>
<td>0.06</td>
<td>0.02</td>
<td>0.11</td>
<td>.004</td>
</tr>
<tr>
<td>LBPSCORE (Baseline)</td>
<td>0.95</td>
<td>0.61</td>
<td>1.29</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>PHQ (Baseline)</td>
<td>0.14</td>
<td>0.05</td>
<td>0.23</td>
<td>.003</td>
<td></td>
</tr>
<tr>
<td>PSEQ (Baseline)</td>
<td>-0.11</td>
<td>-0.15</td>
<td>-0.08</td>
<td>&lt;.0001</td>
<td></td>
</tr>
<tr>
<td>Gender: (Female vs. Male)</td>
<td>0.99</td>
<td>0.03</td>
<td>1.95</td>
<td>.04</td>
<td></td>
</tr>
<tr>
<td>Age at Baseline</td>
<td>0.13</td>
<td>0.09</td>
<td>0.18</td>
<td>&lt;.0001</td>
<td></td>
</tr>
</tbody>
</table>
Table 9

*Multivariate Analysis determining the relationship of FABQW and FABQPA baseline scores with attendance rates for Physical Therapy and Yoga at 12 weeks*

<table>
<thead>
<tr>
<th>Independent Measures (N=252)</th>
<th>R Square</th>
<th>Regression Coefficient (β)</th>
<th>Lower CI</th>
<th>Upper CI</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABQW (Baseline)</td>
<td>0.13</td>
<td>-0.006</td>
<td>-0.0048</td>
<td>0.0035</td>
<td>0.76</td>
</tr>
<tr>
<td>FABQPA (Baseline)</td>
<td>0.0010</td>
<td>-0.0056</td>
<td>0.0077</td>
<td>0.76</td>
<td></td>
</tr>
<tr>
<td>LBPSCORE (Baseline)</td>
<td>0.0076</td>
<td>-0.0245</td>
<td>0.0397</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>PHQ8 (Baseline)</td>
<td>-0.0025</td>
<td>-0.0110</td>
<td>0.0059</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>PSEQ (Baseline)</td>
<td>0.0027</td>
<td>-0.0010</td>
<td>0.0063</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>RMDQ Score (Baseline)</td>
<td>-0.0057</td>
<td>-0.0160</td>
<td>0.0047</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>Treatment Arm (PT vs. Yoga)</td>
<td>-0.0607</td>
<td>-0.1450</td>
<td>0.0236</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Gender: (Female vs. Male)</td>
<td>0.1073</td>
<td>0.0187</td>
<td>0.1959</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Age at Baseline</td>
<td>0.0056</td>
<td>0.0014</td>
<td>0.0098</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td>Household income (&gt; $30,000 vs.&lt; $30,000)</td>
<td>0.0341</td>
<td>-0.0603</td>
<td>0.1285</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Race (White vs. Non-White)</td>
<td>0.1524</td>
<td>0.0424</td>
<td>0.2624</td>
<td>0.007</td>
<td></td>
</tr>
</tbody>
</table>
Appendix A

Fear Avoidance Beliefs Model

Appendix B

Fear-Avoidance Beliefs Questionnaire (FABQ) for Patients with Back Pain

Overview:
The Fear-Avoidance Beliefs Questionnaire (FABQ) can help measure how much fear and avoidance are affecting a patient with low back pain. This can help identify those patients for whom psychosocial interventions may be beneficial. The authors are from the Western Infirmary in Glasgow (Scotland) and the Hope Hospital in Salford (England).

NOTE: This scale can be modified to apply to patients with other types of chronic pain. Only items 3 and 11 mention "back".

Instructions: Here are some of the things which other patients have told us about their pain. For each statement please circle the number from 0 to 6 to say how much physical activities such as bending lifting walking or driving affect or would affect your back pain.

Statements:

(1) My pain is caused by physical activity.
(2) Physical activity makes my pain worse.
(3) Physical activity might harm my back.
(4) I should not do physical activities which (might) make my pain worse.
(5) I cannot do physical activities which (might) make my pain worse.

The following statements are about how your normal work affects or would affect you back pain:

(6) My pain was caused by my work or by an accident at work.
(7) My work aggravated my pain.
(8) I have a claim for compensation for my pain.
(9) My work is too heavy for me.
(10) My work makes or would make my pain worse.
(11) My work might harm my back.
(12) I should not do my normal work with my present pain.
(13) I cannot do my normal work with my present pain.
(14) I cannot do my normal work till my pain is treated.
(15) I do not think that I will be back to my normal work within 3 months.
(16) I do not think that I will ever be able to go back to that work.
**Appendix C**

**Roland–Morris disability questionnaire 23-item version**

When your back or leg hurts, you may find it difficult to do some things you normally do. This list contains sentences that people have used to describe themselves when they have back pain or sciatica. When you read them, you may find that some stand out because they describe you today. As you read the list, think of yourself today. When you read a sentence that describes you today, put a check in the ‘yes’ column. If the sentence does not describe you today, you check the ‘no’ column.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yes</strong></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td>1.</td>
<td>I stay at home most of the time because of my back problem or leg pain (sciatica).</td>
</tr>
<tr>
<td>2.</td>
<td>I change position frequently to try to get my back or leg comfortable.</td>
</tr>
<tr>
<td>3.</td>
<td>I walk more slowly than usual because of my back problem or leg pain (sciatica).</td>
</tr>
<tr>
<td>4.</td>
<td>Because of my back problem, I am not doing any of the jobs that I usually do around the house.</td>
</tr>
<tr>
<td>5.</td>
<td>Because of my back problem, I use a handrail to get upstairs.</td>
</tr>
<tr>
<td>6.</td>
<td>Because of my back problem, I have to hold on to something to get out of an easy chair.</td>
</tr>
<tr>
<td>7.</td>
<td>I get dressed more slowly than usual because of my back problem or leg pain (sciatica).</td>
</tr>
<tr>
<td>8.</td>
<td>I only stand for short periods of time because of my back problem or leg pain (sciatica).</td>
</tr>
<tr>
<td>9.</td>
<td>Because of my back problem, I try not to bend or kneel down.</td>
</tr>
<tr>
<td>10.</td>
<td>I find it difficult to get out of a chair because of my back problem or leg pain (sciatica).</td>
</tr>
<tr>
<td>11.</td>
<td>My back or leg is painful almost all the time.</td>
</tr>
<tr>
<td>12.</td>
<td>I find it difficult to turn over in bed because of my back problem or leg pain (sciatica).</td>
</tr>
<tr>
<td>13.</td>
<td>I have trouble putting on my socks (or stockings) because of the pain in my back or leg.</td>
</tr>
<tr>
<td>14.</td>
<td>I only walk short distances because of my back problem or leg pain (sciatica).</td>
</tr>
<tr>
<td>15.</td>
<td>I sleep less well because of my back problem.</td>
</tr>
<tr>
<td>16.</td>
<td>I avoid heavy jobs around the house because of my back problem.</td>
</tr>
<tr>
<td>17.</td>
<td>Because of my back problem, I am more irritable and bad tempered with people than usual.</td>
</tr>
<tr>
<td>18.</td>
<td>Because of my back problem, I go upstairs more slowly than usual.</td>
</tr>
<tr>
<td>19.</td>
<td>I stay in bed most of the time because of my back or leg pain (sciatica).</td>
</tr>
<tr>
<td>20.</td>
<td>Because of my back problem, my sexual activity is decreased.</td>
</tr>
<tr>
<td>21.</td>
<td>I keep rubbing or holding areas of my body that hurt or are uncomfortable.</td>
</tr>
<tr>
<td>22.</td>
<td>Because of my back problem, I am doing less of the daily work around the house than I would usually do.</td>
</tr>
<tr>
<td>23.</td>
<td>I often express concern to other people over what might be happening to my health.</td>
</tr>
</tbody>
</table>
Conclusion

Back pain is a public health issue and a leading cause of global disability. Despite the rising cost of treatment, disability rates have not improved. The need for additional research has become apparent. Understanding the contributing factors that worsen outcomes is foundational to exploring treatment options.

Fear of movement and fear of re-injury are variables that influence recovery from an episode of back pain. Improving awareness among clinicians regarding the negative impact fear has on physical function may have an effect on patient outcomes. Patient education regarding the soundness of the spine, the consequences of immobility, and the importance of movement empower patients’ journey towards wellness. Empowering patients with self-care techniques and promoting their ability to take “ownership” of their health may make the difference in a “disease” treatment model that currently does not support recovery from back pain.