ORIGINAL ARTICLE

# Relationships of Fear, Anxiety, and Depression With Physical Function in Patients With Knee Osteoarthritis

*Kristen A. Scopaz, MD, MS, Sara R. Piva, PT, PhD, Stephen Wisniewski, PhD, G. Kelley Fitzgerald, PT, PhD*

ABSTRACT. Scopaz KA, Piva SR, Wisniewski S, Fitzgerald GK. Relationships of fear, anxiety, and depression with physical function in patients with knee osteoarthritis. Arch Phys Med Rehabil 2009;90:1866-73.

**Objectives:** To explore whether the psychologic variables anxiety, depression, and fear-avoidance beliefs, and interactions between these variables, are associated with physical function in patients with knee osteoarthritis (OA). We hypothesized lower levels of function would be related to higher anxiety, higher depression, and higher fear-avoidance beliefs, and that high levels of 2 of these factors simultaneously might interact to have a greater adverse effect on physical function.

**Design:** Cross-sectional, correlational design.

**Setting:** Institutional practice.

**Participants:** Subjects included patients with knee OA (N=182; age, mean ± SD, 63.9±8.8y; 122 women).

**Interventions:** Not applicable.

**Main Outcome Measures:** Self-report measures of function included the Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index, the Lower Extremity Function Scale (LEFS), and the Knee Outcome Survey-Activity of Daily Living Scale. The Get Up and Go test was used as a physical performance measure of function. Self-report measures for psychologic variables included the Beck Anxiety Inventory, the Center for Epidemiological Studies Depression Scale, and the Fear Avoidance Belief Questionnaire-Physical Activity Scale modified for the knee.

**Results:** Higher anxiety was related to poorer function on the WOMAC physical function. Both high anxiety and fear-avoidance beliefs were related to poorer function on the LEFS and Knee Outcome Survey-Activity of Daily Living Scale. There was no association between the psychologic variables and the Get Up and Go test. The anxiety × depression interaction was associated with the LEFS.

**Conclusions:** Anxiety and fear-avoidance beliefs are associated with self-report measures of function in patients with knee OA. Depression may influence scores on the LEFS under conditions of low anxiety.

**Key Words:** Anxiety; Depression; Fear; Knee; Osteoarthritis; Rehabilitation.



OVER 4.3 MILLION OLDER adults in the United States are affected by knee OA, a chronic and disabling condition that is among the leading causes of pain and functional limitations.[1] Multiple studies have examined determinants of function in knee OA and found that a wide variety of factors including demographic, clinical, and biomechanical factors have significant associations with functional status.[2-7] In addition, growing evidence suggests psychologic factors such as anxiety, fear, and depression may also relate to physical function in patients with knee OA.[8-12]

Although the terms anxiety and fear are often used simultaneously, Leeuw et al[13] have described a distinction between these 2 variables.[13] According to Leeuw,[13] fear is an emotional reaction to a specific, identifiable threat that may increase sympathetic nervous system arousal and induce defensive or escape behavior to remove the specific threat. Where fear is concerned, the threatening stimulus or event is in the present tense. Anxiety is similar to fear in that it is also an emotional reaction associated with a heightened state of arousal, but the focus of the threat is unclear.[13] The threatening stimulus is not specific and identifiable, and anxiety may be more associated with an anticipation (future tense) of a threatening situation, rather than a well defined threatening stimulus.[13] Anxiety may induce more preventive behaviors such as avoidance of situations that the person might anticipate could be potentially threatening or anxiety-producing. Anxious people may be hypervigilent, in that they are overfocused on scanning their environment for potential threats.[13]

Fear and anxiety may both contribute to the fear-avoidance model in musculoskeletal disorders. The fear-avoidance model is based on the idea that the way a person interprets pain may lead to 1 of 2 pathways: (1) an adaptive response in which acute pain, while an annoyance, is not perceived as threatening, and so the person confronts the pain and is more likely to return to and maintain daily activities that help achieve functional recovery; or (2) a nonadaptive response in which pain is

**List of Abbreviations**

| | |
|---|---|
| BAI | Beck Anxiety Inventory |
| CES-D | Center for Epidemiological Studies Depression Scale |
| FABQ-PA | Fear Avoidance Belief Questionnaire-Physical Activity Scale |
| ICC | intraclass correlation coefficient |
| LEFS | Lower Extremity Function Scale |
| OA | osteoarthritis |
| WOMAC | Western Ontario and McMaster Universities |
| WOMAC-PF | Western Ontario and McMaster Universities Osteoarthritis Index-Physical Function Subscale |

From the Department of Physical Therapy, School of Health and Rehabilitation Sciences (Piva, Fitzgerald), and the Epidemiological Data Center, School of Public Health (Wisniewski), University of Pittsburgh; and the Department of Family Medicine, University of Pittsburgh School of Medicine (Scopaz), Pittsburgh, PA.

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Correspondence to G. Kelley Fitzgerald, PT, PhD, University of Pittsburgh, Dept of Physical Therapy, 6035 Forbes Tower, Pittsburgh, PA 15260, e-mail: *kfitzger@pitt.edu.* Reprints are not available from the author.

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perceived as threatening and leads to maladaptive behaviors including pain-related fear, avoidance, and hypervigilance.[13] In the long term, these behaviors may result in increased disuse and disability, which further decrease the opportunity to disprove the fear of movement and fear of pain.

Avoidance behaviors have been associated with disability in a variety of musculoskeletal conditions,[14,15] most notably in low back pain, in which fear-avoidance beliefs have been shown to predict changes in disability.[16] Fear is thought to lead to avoidance of activities believed to be painful or harmful, which may lead to increased disability through the detrimental effects of physical inactivity and weakening of the musculoskeletal system.[14] A study by Heuts et al[11] found that pain-related fear and fear of movement were present and associated with function in patients with knee OA. Some investigators have also found anxiety to be associated with function measures in subjects with knee OA,[8-10] while others have not found this to be the case.[12]

In addition to fear and anxiety, depression may be associated with reduced function in people with knee OA. According to the National Institute of Mental Health, depression is a mood disorder that can be characterized by persistent sadness; feelings of helplessness, hopelessness, or worthlessness; pessimism; and irritability.[17] A person with depression may also lose interest in daily activities, hobbies, and recreation.[17] Therefore, it is understandable that depression could be associated with poor physical function. Where knee OA is concerned, there is conflicting evidence regarding the association of depression with measures of physical function, with some investigators reporting significant associations[8,9] and others finding no association.[10,12]

The psychologic variables of fear, anxiety, and depression can be associated with each other, and therefore it may be possible that they could interact to have a greater effect on physical function. For example, Leeuw et al[13] suggest that fear of pain may be secondary to the fear of anxiety-related sensations associated with pain. In such an instance, it may be possible that in someone who is already an anxious person, the combined effect of both fear and anxiety may have a greater manifestation of poor function, which might create more difficulty in overcoming functional deficits associated with musculoskeletal pathology. To our knowledge, there have been no studies that have examined how fear, anxiety, and depression may interact to influence physical function in subjects with knee OA.

The current evidence suggests that fear, anxiety, and depression may play a role in determining the functional status of patients with knee OA. However, the results of studies examining the association of these variables in subjects with knee OA are not consistent and are sometimes limited by small sample size. In addition, the potential interactive effects of these variables on measures of physical function in subjects with knee OA have not yet been explored. Therefore, we believe that further examination of the role these psychologic variables have in influencing measures of physical function was warranted. The aim of this study was to explore whether fear, anxiety, and depression and interactions among these factors are associated with physical function in patients with knee OA. We hypothesized that lower levels of function would be related to higher fear, higher anxiety, and higher depression, and that high levels of 2 of these factors at once might interact to have a greater adverse effect on physical function.

## METHODS

The data reported here were drawn from an ongoing randomized controlled trial comparing 2 exercise rehabilitation regimens for patients with knee OA.[18] The current cross-sectional study looks at associations using the baseline data.

### Subjects

Subjects included 182 people, 40 years of age and older, who met the 1986 American College of Rheumatology clinical criteria for knee OA,[19] and had grade II or greater Kellgren and Lawrence[20] radiographic changes. The 1986 criteria for diagnosis of knee OA include knee pain and osteophytes with at least 1 of the following: age 50 years or older, morning stiffness less than 30 minutes, or crepitus with active motion of the knee. Subjects were excluded from the study if they (1) had only patellofemoral joint radiographic changes, (2) had conditions that would place them at risk for injury during the exercise training program (eg, requiring an assistive device for ambulation, history of 2 or more falls in the previous year, unable to ambulate 100 feet independently), (3) had undergone total knee arthroplasty, (4) exhibited uncontrolled hypertension, (5) had a history of cardiovascular disease, (6) had a history of neurologic disorders that affected lower extremity function (eg, stroke, peripheral neuropathy), (7) had conditions that would place them at risk for reinjury during quadriceps strength testing (eg, recent corticosteroid injection to the quadriceps or patellar tendons, quadriceps or patellar tendon rupture, patellar fracture), or (8) reported vision problems that affected their ability to perform basic mobility tasks. All subjects signed an informed consent form approved by the University of Pittsburgh Institutional Review Board prior to participation in the study.

### Measures

Data for this study were collected in 1 session. Subjects completed surveys on demographic information, fear avoidance beliefs, anxiety, depression, and self-report measures of physical function. They also completed the Get Up and Go test, a performance-based measure of physical function.

Fear-avoidance beliefs were measured using the FABQ-PA, which was originally developed for low back pain.[21] A modified version of the FABQ-PA has been used by van Baar et al[22] to assess fear-avoidance beliefs in people with knee pathology. The FABQ-PA for our study was modified from the low back version by replacing the word "back" with "knee," and replacing the example physical activities of "bending, lifting, walking and driving" with "running, walking, kneeling, and driving." The FABQ-PA quantifies the level of fear associated with physical activity including querying on beliefs about the association of physical activity with pain and harm to the knee. The scale consists of 4 items, each scored 0 to 6, with a maximum of 24. Higher scores represent greater fear avoidance beliefs. The Cronbach alpha value of the FABQ-PA subscale in our sample of patients with knee OA was .75, indicating adequate internal consistency. There have been no other studies that we are aware of that have formally examined the psychometric properties of the FABQ-PA modified for the knee.

Anxiety was measured using the BAI.[23] The BAI consists of 21 items, each scored 0 to 3, with higher scores representing higher levels of anxiety. It has been shown to be a reliable and valid measure to assess the presence and magnitude of anxiety symptoms.[23,24]

Depression was measured using the CES-D.[19] The CES-D is a 20-item self-report depression scale, each item scored 0 to 3, with higher scores representing greater symptoms of depression. The CES-D has been shown to be a reliable, valid, and sensitive tool for detecting depressive symptoms and changes in depression over time.[25-27]