

# Association of Pain Catastrophizing With Static Balance, Mobility, or Functional Capacity in Patients With Knee Osteoarthritis: A Blind Cross-sectional Study

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## ABSTRACT

**Objective:** The aim of this study was to investigate whether catastrophizing is associated with static balance, mobility, and functional capacity in patients with knee osteoarthritis.

**Methods:** A blind, cross-sectional study was conducted involving 60 volunteers (males and females), ages 40 to 80 years, with a diagnosis of knee osteoarthritis. Patients were recruited from a physical therapy clinic in the city of São Paulo, Brazil. The following measures were used for the evaluations: Pain-Related Self-Statement Scale, Functional Reach Test, Timed Up and Go Test, Lower Extremity Functional Scale, and Western Ontario and McMaster University Osteoarthritis Index. In statistical analysis, histograms were created to determine distribution of data. Spearman's correlation coefficients ( $r_s$ ) were then calculated to determine the strength of the associations among the variables.

**Results:** No significant correlation was found between the Pain-Related Self-Statement Scale score and the other clinical measures employed in the present study: Functional Reach Test ( $r_s = 0.151$ ;  $P = .249$ ), Timed Up and Go Test ( $r_s = -0.147$ ;  $P = .264$ ), Lower Extremity Functional Scale ( $r_s = 0.023$ ;  $P = .860$ ), and Western Ontario and McMaster University Osteoarthritis ( $r_s = -0.222$ ;  $P = .088$ ).

**Conclusions:** In this study, catastrophizing was not associated with static balance, mobility, or functional capacity in patients with knee osteoarthritis. (J Manipulative Physiol Ther 2018;41:42-46)

**Key Indexing Terms:** *Catastrophization; Pain; Postural Balance*

## INTRODUCTION

Osteoarthritis (OA) is a progressive disorder resulting from the localized loss of joint cartilage and the formation of a new bone matrix.<sup>1,2</sup> Knee OA often causes recurring pain, leading to restrictions in the performance of activities

of daily living, such as getting out of bed, standing up from a chair, walking, and going up and down stairs.<sup>3</sup> A recent study suggested that pain sensitivity is found in individuals with knee OA and may be associated with severity of symptoms,<sup>4</sup> as well as being directly involved in both peripheral and central processes.<sup>5</sup>

As central processes are strongly influenced by biologic and psychosocial aspects,<sup>5</sup> 2 cognitive predictors seem to worsen functional incapacity in patients with OA: catastrophizing and pain-related fear.<sup>6</sup> Catastrophizing is a negative mental state that arises in the context of actual or anticipated pain, leading to a tendency to excessive worrying and the amplification of the sensation of pain.<sup>6,7</sup> Researchers have stated that catastrophizing is related to chronic diseases, including knee OA, and leads to further functional limitations.<sup>8-10</sup> However, studies investigating the association between catastrophizing and specific measures (scales, questionnaires, and tests) for individuals with knee OA aimed at evaluating static balance, mobility, and functional capacity are scarce.

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Paper submitted May 25, 2016; in revised form August 10, 2017; accepted August 23, 2017.  
0161-4754

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<https://doi.org/10.1016/j.jmpt.2017.08.002>

The aim of the present study was to investigate whether catastrophizing is associated with static balance, mobility, and functional capacity in patients with knee OA. The hypothesis tested is that catastrophizing exerts a significant negative influence on the clinical measures analyzed.

## METHODS

### Study Design and Ethical Considerations

A blind, cross-sectional study was conducted. One physiotherapist was in charge of recruitment, as well as the diagnosis and measurement of catastrophizing. Another physiotherapist was in charge of administering the other measures. A third researcher processed and analyzed the data. Patients were recruited from a physical therapy clinic in the city of São Paulo (SP, Brazil). Invitations to participate were made through telephone or personal contacts. All participants signed a statement of informed consent, and the study received approval from the Human Research Ethics Committee of Nove de Julho University number 24568013.0.0000.5511.

The inclusion criteria for the present investigation were based on studies involving individuals with OA and were based on the participation of patients who represent the population with OA to minimize the possibility of selection and volunteer bias. Participants were recruited using the waiting list for treatment at a physical therapy clinic that specialized in orthopedic and rheumatologic conditions. All assessment tools were administered personally and individually, with no time constraints, and the evaluations were scheduled on the basis of the availability of the participants to minimize non-response bias.

### Sample

The sample size was calculated using the Ene program, version 3.0 (Autonomous University of Barcelona, Barcelona, Spain), with the study conducted by Zou et al<sup>11</sup> as reference. The calculation was based on the detection of moderate associations ( $r = 0.50$ ) among the variables. Considering an 80% test power and 5% alpha, a minimum requirement of 30 patients was determined. The sample was doubled to increase statistical power, resulting in a total of 60 individuals.

Male and female individuals, ages 40 to 80 years, with knee pain in the previous 6 months and a diagnosis of unilateral knee OA, based on the criteria established by the American College of Rheumatology and radiographic confirmation (grade 2 or 3 of the Kellgren-Lawrence Classification), were included in the study.<sup>12</sup> The diagnosis of knee OA was determined through an examination by and the written opinion of a specialist in rheumatic diseases. The following exclusion criteria were adopted: history of knee trauma, cognitive impairment, psychological disorder, neurologic (sensory or motor) disorder, cancer, diabetes, any acute adverse health condition, signs of OA of the hip, and the use of a gait-assistance device. No participants had been submitted to physical therapy or medical therapy in the previous 6 months.

### Pain-Related Self-Statement Scale

The Pain-Related Self-Statement Scale (PRSS) was used to assess catastrophizing. This scale has been adapted and validated for use in the Brazilian population.<sup>13</sup> The PRSS consists of 9 items, each with response options with scores ranging from 0 (almost never) to 5 (almost always). The total score is determined by the sum of the items divided by the number of items answered. No cutoff points were established and higher scores indicated a greater degree of catastrophizing.

### Functional Reach Test

The Functional Reach Test (FRT) defines maximum forward functional reach beyond one's arm length while maintaining a fixed foot base. The participant was barefoot with feet parallel to the wall and near the beginning of a metric tape, with the wrists in neutral position, elbows extended, and shoulders flexed at 90 degrees. The individual was instructed to lean the body forward without touching the tape. The movement of the wrist over the tape was read. Three readings were made, and the mean value was used for the statistical analysis. The FRT has demonstrated good reliability in patients with knee OA.<sup>14</sup>

### Timed Up and Go Test

The Timed Up and Go Test (TUGT) simulates functional activities of daily living (sitting to standing, walking, and sitting down again). The chronometer was started after the verbal command "Go" and stopped when the participant returned to the initial sitting position. The test was performed twice. The first trial was to familiarize the participant with the procedure, and the time required to complete the second trial was recorded. An armless chair with an adjustable height was used to position the knees of each individual flexed at 90 degrees. The TUGT has demonstrated good reliability in patients with knee OA.<sup>15</sup>

### Lower Extremity Functional Scale

The Lower Extremity Functional Scale (LEFS) is a scale consisting of 20 items developed to evaluate musculoskeletal dysfunction of the lower limbs and has been validated for use on the Brazilian population.<sup>16</sup> Each item is scored as follows: 0 (extreme difficulty or unable to perform the activity), 1 (quite a bit of difficulty), 2 (moderate difficulty), 3 (a little bit of difficulty) and 4 (no difficulty). The maximum score is 80 points. The participants were asked to report their current problems with the lower limbs.<sup>16</sup>

### Western Ontario and McMaster University Osteoarthritis Index

The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) is a specific index for the evaluation of pain, stiffness, and physical function in individuals with OA of the knee and/or hip and has been validated for use on the Brazilian population.<sup>17</sup> This index offers separate scores for different subscales and contains 24 items divided into 3

subscales: 5 on pain, with the score ranging from 0 to 20 points; 2 on stiffness, with the score ranging from 0 to 8 points; and 17 on physical functioning, with the score ranging from 0 and 68 points. Thus, the total score ranges from 0 to 96 points. The participants were asked to report their perception of these items in the previous 72 hours. Higher scores indicated worse pain, stiffness, and function.<sup>18</sup>

### Statistical Analysis

Histograms were created to determine the data normality. As non-normal distribution of the variables was demonstrated; Spearman's correlation coefficients ( $r_s$ ) were calculated to determine the strength of the associations among the variables. The magnitude of the correlations was determined based on the classification proposed by Zou et al<sup>11</sup>: 0 = no correlation;  $0 \leq 0.20$  = weak correlation;  $0.20 \leq 0.50$  = moderate correlation;  $0.50 \leq 0.80$  = strong correlation; and  $0.80 \leq 1.00$  = perfect correlation. The statistical analysis was performed using the Statistical Package for the Social Sciences, version 17.0 (SPSS Inc, Chicago, Illinois).

### RESULTS

Seventy-four patients with knee OA were recruited for the present study, but 14 were excluded for the following reasons: 5 patients had a history of knee trauma, 4 used a gait-assistance device, 3 had hip OA, 1 had a neurologic disease, and 1 had cardiopulmonary disease. Thus, 60 patients were included (55 women and 5 men). Forty-three had OA in the right knee. Mean age was 65.70 years (standard deviation [SD] = 4.30) and the mean body mass index was 27.29 kg/m<sup>2</sup> (SD = 2.68).

Table 1 displays the central tendency and dispersion values of the variables analyzed. Table 2 displays the correlations among the variables. No significant correlation ( $P > .05$ ) was found between the PRSS score and the other clinical measures investigated (FRT, TUGT, LEFS, and WOMAC).

### DISCUSSION

As indicated by the findings in the present study, catastrophizing is not associated with clinical and functional measures analyzed: static balance, mobility, and functional capacity in patients with knee OA. In contrast, previous studies involving individuals with OA had found an association between catastrophizing and functionality.<sup>6,19</sup> A possible explanation for this is a tendency for individuals with a diagnosis of OA to focus on and amplify pain sensations and feel helpless in relation to recurring pain, which can result in an increase in functional limitations.<sup>6</sup> However, the studies that offer support to this explanation did not use the same scales and questionnaires employed in the present study; these assessment

**Table 1.** Median, First Quartile, and Third Quartile of Variables Investigated ( $n = 60$ )

| Variable    | Median | 1st Quartile | 3rd Quartile |
|-------------|--------|--------------|--------------|
| PRSS score  | 3.30   | 3.11         | 3.55         |
| FRT, cm     | 13.00  | 11.00        | 16.00        |
| TUGT, s     | 21.07  | 14.22        | 31.37        |
| LEFS score  | 15.00  | 12.00        | 22.00        |
| WOMAC score | 78.00  | 76.00        | 81.00        |

FRT, Functional Reach Test; LEFS, Lower Extremity Functional Scale; PRSS, Pain-Related Self-Statement Scale; TUGT, Timed Up and Go Test; WOMAC, Western Ontario and McMaster University Osteoarthritis Index.

**Table 2.** Correlation Between Catastrophizing and Clinical Measures Investigated ( $n = 60$ )

| Variables   | PRSS Score               |
|-------------|--------------------------|
| FRT, cm     | $r_s = 0.151, P = .249$  |
| TUGT, s     | $r_s = -0.147, P = .264$ |
| LEFS score  | $r_s = 0.023, P = .860$  |
| WOMAC score | $r_s = -0.222, P = .088$ |

FRT, Functional Reach Test; LEFS, Lower Extremity Functional Scale; PRSS, Pain-Related Self-Statement Scale; TUGT, Timed Up and Go Test; WOMAC, Western Ontario and McMaster University Osteoarthritis Index.

tools are widely used in clinical practice and are specific, reliable and validated for this clinical condition.

In support of our findings, a recent study conducted by Sánchez-Herán et al<sup>20</sup> found that catastrophizing was correlated with postural stability in patients with OA of the knee and hip. However, Sánchez-Herán et al employed the Multi-Directional Functional Reach Test, whereas balance was evaluated using the FRT and the TUGT in the present study. Although all these assessment tools are reliable and validated, they evaluate only particular aspects of postural balance.

Scopaz et al<sup>10</sup> conducted an important study on the relationship between psychological variables and physical function in patients with knee OA. Those authors reported that higher anxiety was related to poorer function on the WOMAC, that both high anxiety and fear-avoidance beliefs were related to poorer function on the LEFS and Knee Outcome Survey-Activities of Daily Living Scale, and that no association was found between the psychological variables and the TUGT. Moreover, Scopaz et al discussed the importance of catastrophizing by these patients and listed the non-evaluation of this psychological aspect as a limitation of their study. Thus, the aim of the present investigation was to fill this scientific gap and contribute to the understanding of the relationship between psychological factors and both function and balance.

As suggested in the study conducted by Fingleton et al,<sup>4</sup> we believe that there is a subgroup of individuals with knee OA whose pain condition is characterized by central overexcitability and is more influenced by cognitive components in comparison with patients with only peripheral impairment. Thus, further studies should be conducted to identify these subgroups for the investigation of probable relationships with functionality.

The present findings can provide important information to health care professionals in the field of rehabilitation with regard to the evaluation and treatment of patients with knee OA. It is important to understand that cognitive characteristics, such as catastrophizing, should be included in the evaluation and follow-up of such patients. However, catastrophizing should not be considered a direct factor with regard to limitations involving static balance, mobility, and functional capacity, as we believed when formulating the hypothesis that was rejected in the present investigation.

### Limitations

This study has some limitations, which should be addressed by future studies. Individuals with knee OA have compromised muscle activation, which is an important variable to be analyzed and is related to functionality. Fear-avoidance beliefs can affect the performance of exercises, further compromising functionality. The participants in this study represented individuals from a single clinic and primarily a single geographical area, and the majority was female, all of which are limiting factors with regard to extrapolation of the results to all individuals with knee OA. Finally, 14 individuals were excluded because of the presence of clinical conditions that are commonly found in patients with knee OA and can aggravate some factors, such as catastrophizing, balance, mobility, and functional capacity.

### CONCLUSIONS

On the basis of the scientific methodology employed for this group of patients, we concluded that catastrophizing was not significantly associated with static balance, mobility, or functional capacity in patients with knee OA.

### FUNDING SOURCES AND CONFLICTS OF INTEREST

No funding sources or conflicts of interest were reported for this study.

### CONTRIBUTORSHIP INFORMATION

Concept development (provided idea for the research): C.A.F.P.G., A.V.D.F.

Design (planned the methods to generate the results): C.A.F.P.G., A.V.D.F., D.A.B.G., F.P., P.T.C.C.

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Data collection/processing (responsible for experiments, patient management, organization, or reporting data): C.A.F.P.G., D.A.B.G., F.P., P.T.C.C.

Analysis/interpretation (responsible for statistical analysis, evaluation, and presentation of the results): C.A.F.P.G., A.V.D.F.

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Critical review (revised manuscript for intellectual content, this does not relate to spelling and grammar checking): C.A.F.P.G., A.V.D.F.

### Practical Application

- Catastrophization measurement should be considered in the evaluation and follow-up of patients with knee osteoarthritis.
- However, caution should be used in that catastrophizing should not be considered a direct factor regarding limitations involving static balance, mobility, and functional capacity.

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