Prognostic value of coping strategies in a community-based sample of persons with chronic symptomatic knee osteoarthritis

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Abstract

Radiographic knee osteoarthritis (OA) is a highly prevalent condition that has been the focus of a number of studies identifying factors that are prognostic of continued or worsening pain and function. Although prior prognostic studies have identified a number of demographic, physical, and psychological factors that are predictive of outcome, minimal focus has been placed on pain coping skills as prognostic factors, despite cross-sectional evidence suggesting that pain coping skills are associated with pain and function in knee OA. The present study reports on the use of pain coping skills as prognostic factors for changes in pain and/or function over a 1-year period. Participants were drawn from the Osteoarthritis Initiative, a prospective longitudinal cohort study of persons recruited from the community who either had knee OA or were at high risk for developing knee OA. Data from the Coping Strategies Questionnaire were compared against 1-year change in pain, function, or both, using established criteria for defining whether the patient got better, worse, or stayed the same over the 1-year period. Results revealed a significant effect for praying/hoping, increased behavioral activities, and pain catastrophizing as prognostic of pain outcomes; ignoring pain and praying/hoping were prognostic of function outcomes; and increased behavioral activities and pain catastrophizing were prognostic of a combined pain and function outcome. The findings provide important new evidence regarding the potential clinical relevance of a number of pain coping responses hypothesized to influence future pain and function in persons with arthritis.

Keywords

Coping; Disability; Function; Pain

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Conflict of interest statement
Kevin N. Alschuler, Ivan R. Molton, and Daniel L. Riddle report no conflicts of interest.

1. Introduction

Radiographic knee osteoarthritis (OA) is present in 19.2% to 27.8% of persons >45 years old, and increases to 37% of persons >60 years old, making it the most prevalent joint condition in the United States [10,13,30,50]. Systematic reviews and large sample longitudinal cohort studies have identified factors that are prognostic of continued or worsening pain and function in persons with knee OA, including demographics (age, gender, education, ethnicity, social class), physical factors (pain severity, stiffness, hip pain, comorbidities, body mass index), and psychological factors (general health perception, fear of pain, anxiety) [7,9,16,23,32,35,40,42], supporting a biopsychosocial model of knee OA pain.

The association of pain coping skills with outcomes has been ignored in the prognostic literature. We found only 1 study that considered pain coping skills as a prognostic factor, which reported that frequent use of distraction and infrequent use of worrying at initial testing were associated with worse functioning 2 years later [16]. We found no studies that explored the prognostic value of pain coping skills for pain intensity outcomes in knee OA.

In contrast to the paucity of longitudinal studies exploring the prognostic utility of pain coping skills, many cross-sectional studies have found weak to moderate associations of pain coping skills with pain and functional status in persons with arthritis. Pain catastrophizing (excessive worry about pain) is the coping response most consistently associated with higher levels of pain intensity, psychological and physical disability, and measures of physical dysfunction in patients with OA [25,26,33,37,46]. Evidence also supports an association between other coping responses and pain or functional status. For example, one study reported that passive coping strategies (retreating, worrying, resting) were more strongly associated with higher levels of pain and worse function than active coping strategies (pain transformation, distraction, reducing demands) [33]. Taken together, cross-sectional associations of pain coping skills with pain and functional status suggest that there is good reason to explore whether the pain coping skills a person uses at one time point may be predictive of knee OA outcomes at a later time point.

The purpose of this study was to determine the prognostic capability of pain coping skills for predicting 1-year pain and function outcomes in a community-based sample of persons with chronic symptomatic knee OA. Pain coping skills were operationalized as the domains assessed by the commonly used Coping Strategies Questionnaire [22], a measure of pain coping strategies that assesses 5 adaptive and 2 maladaptive strategies. To produce clinically relevant conclusions, outcomes were based on criteria for categorizing improvement and worsening described by the Osteoarthritis Research Society International Standing Committee for Clinical Trials Response Criteria Initiative and the Outcome Measures in Rheumatology [36]. Broadly, we expected that greater use of adaptive strategies would be predictive of positive outcomes and that greater use of maladaptive strategies would predict negative outcomes. More specifically, we hypothesized that pain catastrophizing would be the most likely pain coping response to predict a clinically important worsening of 1-year pain and function.

2. Methods

2.1. Study design

The Osteoarthritis Initiative (OAI) is a publicly and privately funded prospective longitudinal cohort study of persons recruited from the community who either had knee OA or were at high risk for developing knee OA. The OAI admitted 4976 persons who were examined yearly over a 5-year period. Subjects were recruited from the University of Maryland School of Medicine, Baltimore; Ohio State University, Columbus; University of Pittsburgh, Pittsburgh, Pennsylvania; and Memorial Hospital of Rhode Island, Pawtucket, Rhode Island. No treatment was provided to subjects as part of the study, which was approved by the research institutional review boards of the participating sites. We used data from the 4- and 5-year follow-up visits (release versions 6.2.1 and 7.2.1) because these were the only visits in which the Coping Strategies Questionnaire [22] was completed by the subjects.

2.2. Selection of sample for present study

Exclusion criteria in the OAI at the baseline visit included the presence of rheumatoid arthritis, bilateral knee arthroplasty or pre-existing plans to undergo bilateral (not unilateral) knee arthroplasty in the next 3 years, bilateral end stage knee OA, positive pregnancy test, inability to provide a blood sample, use of ambulatory aids other than a single straight cane for more than 50% of the time, comorbid conditions that might interfere with 4-year participation, or being unlikely to reside in the clinic area for at least 3 years.

Inclusion criteria for our study were radiologically confirmed knee OA and chronic knee pain. Knee OA was confirmed by a Kellgren-Lawrence knee OA grade of 2 or higher in at least one knee [1,2]. The OAI used a validated system for obtaining standing flexed knee radiographs [28,34]. Because of the potential impact of knee or hip replacement surgery on subsequent pain and function, we excluded persons who had hip or knee replacement surgery during the year pertinent to our study or the year before. All radiographic readings were made by the OAI investigators, who were blinded to patient symptom status. Chronic knee pain was judged to be present when a person reported knee pain on most days in a month for at least 6 of the past 12 months before the year 4 data collection session.

2.3. Measures

2.3.1. Coping: Coping Strategies Questionnaire (CSQ)—The CSQ was originally constructed as a 50-item self-report measure of 8 pain coping strategies [41]. Recently, a brief version of the CSQ was developed for use in large-scale surveys or settings where longer measures are not practical, with 14 items selected to represent 2-item scales of 7 pain coping strategies (adaptive strategies: Diverting Attention, Reinterpreting Pain Sensations, Ignoring Sensations, Coping Self-Statements, Increased Behavioral Activities; maladaptive strategies: Catastrophizing, Praying or Hoping) [22]. Scores are measured on a scale of 0 to 6 representing the frequency of use of each pain coping response. Research supports the validity of these 2-item scales on the basis of their strong associations with the parent scales (Pearson $r = 0.78$ to 0.92), as well as their moderate associations with a variety of criterion variables in samples of patients seeking treatment for chronic pain [22,47]. A recent study

supported moderate associations of this brief version of the CSQ with criterion variables in knee OA [37].

2.3.2. Pain intensity: 0 to 10 numerical rating scale

—The 0 to 10 numerical rating scale is one of the most commonly used methods of measuring pain intensity; it has a large body of research supporting its reliability and validity [21]. In the present study, participants were asked, "Please rate the pain that you've had in your [right/left] knee during the past 7 days by pointing to the number on this card that best describes the pain at its worst." The scale was anchored with 0 = "no pain" and 10 = "pain as bad as you can imagine." Because we wanted to capture person-level scores of knee pain (to match the person-level nature of pain coping skills), we used the highest knee pain score from the right and left knees at each time period as our outcome.

2.3.3. Physical function: Western Ontario and McMaster Universities Arthritis Index (WOMAC) Physical Function subscale

—The WOMAC Physical Function is a 17-item measure of functional limitations. Items are scored on a 0 to 4 range, with total scale scores ranging from 0 (normal function) to 68 (severely affected function). There is a substantial body of evidence supporting the reliability and validity of the WOMAC Physical Function scale [4–6]. In the OAI, participants completed a WOMAC Physical Function scale for both the right and left knees. Because the scale was designed to quantify person-level limitations in daily function [4–6], we used the higher of the right and left WOMAC scores at both the baseline and 1-year follow-up time points in the analyses.

2.3.4. Clinically important improvement or worsening

—Participants were classified as having demonstrated overall clinical improvement by meeting criteria as described by the Osteoarthritis Research Society International (OARSI) Standing Committee for Clinical Trials Response Criteria Initiative and the Outcome Measures in Rheumatology (OMERACT) [36]. These responder criteria represent a consensus-based and evidence-driven best estimate of changes in pain and function that are necessary to conclude that a clinical meaningful change has occurred in an individual. Although the OARSI-OMERACT criteria were initially developed for use in clinical trials, these consensus-based estimates have since become a common and useful way to guide interpretation of the clinical relevance of changes in pain and function in research trials and in observational studies [3,11,14,15,44]). Three change criteria were identified: (1) participants were classified as having improved in pain if their pain intensity decreased by at least 50% or worsened in pain if their pain intensity increased by at least 50%; (2) participants were classified as having improved in physical function if their WOMAC Physical Function score decreased by at least 50% or worsened in physical function if their WOMAC Physical Function score increased by 50%; and (3) participants were classified as having improved in combined pain and function if both their pain and physical function scores improved by 20% or more, and worsened in combined pain and function if both pain and function worsened by 20% or more. For both the pain and function measures, worsening reflects higher scores and improvement is indicated by lower scores.

2.3.5. Potential confounder variables—A number of variables were used to control for potential confounding. These were age, pain duration (because OAI collected categorical baseline data on pain duration of <1 year, 1 to 5 years, and >5 years, we collapsed the data at year 4 to indicate whether the person reported pain, aching, or stiffness in at least one knee for   9 years or >9 years), sex, medical comorbidities (taken from the validated Modified Charlson Comorbidity Scale [24]), body mass index (BMI), and baseline score for pain intensity.

2.4. Data analysis

2.4.1. Exploratory and descriptive analyses—We first conducted exploratory analyses to ensure adequate management of missing data for the variables used in our analyses, as well as to ensure there was no evidence for significant skew, kurtosis, outliers, or heteroscedasticity for any of the variables. We then calculated the change variables and classified patients as improved, the same, or worse over the 1-year period for pain intensity, physical functioning, or both. Descriptive statistics along with univariate t tests or chi-square comparisons are reported for the study variables. These are presented in Tables 1–3.

2.4.2. Predictive analyses—To evaluate the prognostic capability of baseline pain coping skills for predicting 1-year pain and function outcomes, a series of multinomial logistic regression analyses were completed with change status (pain, function, or both categorized as "better," "same," or "worse") as the outcome and coping strategy subscale scores as predictors. A similar approach was used for physical function and then the combined pain and physical function outcomes. Control variables for each analysis were age, pain duration, sex, severity of medical comorbidities, BMI, and baseline pain severity.

In order to provide some control over the large number of coping predictors in our model (ie, the 6 CSQ subscales), we first performed a gatekeeping procedure in which we ran a single global multinomial logistic regression for each of the 3 study outcomes (pain intensity, physical functioning, and a combination score). This model included (1) the control variables above, and (2) all 6 coping subscales entered in a single block. Only if the entire block of coping subscales was significant (ie, added predictive power to the model) did we move forward with analysis of the individual coping subscales, again using multinomial logistic regression. Results were interpreted by Exp(B), which reflects is the amount by which the relative risk (log odds) is multiplied when the predictor variable is increased by 1 unit, controlling mathematically for all other variables in the model.

3. Results

3.1. Participants

Participants comprised 797 persons with chronic pain and documented knee OA. The sample was 59.0% female and had a mean age of 65.31 years (SD 8.95 years). The majority of the participants were white (76.7%), with the remainder black/African American (21.0%), Asian (0.4%), or other nonwhite (2.0%). Almost half of the sample (43.0%) had experienced their knee pain for at least 9 years.

There were very few demographic differences between outcome response groups, with 2 exceptions: there was a slightly lower proportion of white participants in the "stayed the same" group, and in the combined pain and function category, those with higher BMI were more likely to be in the "better" or "worse" groups than in the "stayed the same" group. However, this very small difference in BMI is not likely to be clinically important (BMI 30.9 and 30.8 vs 29.5 kg/m2, respectively). The groups did not differ in terms of participant age, sex, or medical comorbidity. These results are presented in Tables 1–3.

3.2. Coping skills that predict change in pain

Descriptive analyses using the criteria of ±50% change in pain score indicated that 14.3% improved, 69.1% remained the same, and 16.6% got worse over the study period. As shown in Table 1, participants categorized as staying the same started and ended with higher pain scores than the other 2 groups. Persons who improved had pain of shorter duration than persons who stayed the same or got worse. Regarding coping variables, the overall multivariate model (including all 6 coping predictors) was significant ($\chi^2 = 283.2$, $P < .001$) and accounted for 22.5% of the variance in the model using the McFadden statistic.

Follow-up analyses using each coping predictor individually demonstrated a significant effect for praying/hoping ($\chi^2 = 7.6$, $P < .05$), increased behavioral activities ($\chi^2 = 7.7$, $P < .05$), and pain catastrophizing ($\chi^2 = 9.0$, $P < .05$) after adjustment for potential confounding. Greater initial levels of praying/hoping were associated with a greater likelihood of staying the same rather than getting better [Exp(B) = 1.3; 95% confidence interval (CI) 1.04–1.44] or with getting worse relative to getting better [Exp(B) = 1.3; 95% CI 1.02–1.62]. Reports of higher scores for increased behavioral activities were associated with a greater likelihood of staying the same rather than getting better [Exp(B) = 1.2; 95% CI 1.05–1.34]. Finally, higher levels of pain catastrophizing were associated with a greater likelihood of getting worse relative to staying the same [Exp(B) = 1.26; 95% CI 1.02–1.55] or getting better [Exp(B) = 1.48; 95% CI 1.14–1.91].

3.3. Coping skills that predict change in function

Using the criterion of ±50% change in function score, 16.2% of the sample was categorized as improved, 27.1% of the sample got worse, and 56.7% stayed the same. As in the prior comparison based on pain, the participants categorized as staying the same started with worse physical function than the other 2 groups (Table 2). Again, persons who improved in function were those who had pain of shorter duration than persons who stayed the same or who declined in function.

Regarding coping, the overall model (including all 6 coping predictors) was significant ($\chi^2 = 106.9$, $P < .001$) and accounted for 7.3% of the variability in function scores using the McFadden statistic. Follow-up analyses using each coping predictor individually demonstrated a significant effect for ignoring pain ($\chi^2 = 7.1$, $P < .05$) and praying/hoping ($\chi^2 = 15.3$, $P < .01$). Regarding direction of relationship, those who reported a greater tendency to ignore pain were more likely to get worse relative to staying the same [Exp(B) = 1.14; 95% CI 1.03–1.26]. Those who reported a greater tendency to engage in praying/hoping

were more likely to stay the same relative to getting worse [Exp(B) = 1.28; 95% CI 1.12–1.47].

3.4. Coping skills that predict change in combined pain and function

Using the criterion of 20% change in both pain and function, 15.7% of the sample was categorized as improved, 16.6% of the sample got worse, and 67.8% of the sample stayed the same. Different from the prior groupings, individuals who stayed the same or improved had higher pain at baseline as compared to those who got worse (Table 3).

When all 6 coping predictors were entered in the same model, the model was significant (χ^2 = 152.9, $P < .001$) and accounted for 11.8% of the variance in the combined outcome using the McFadden statistic. Follow-up analyses looking at the individual CSQ predictors revealed significance for increased behavioral activities (χ^2 = 6.8, $P < .001$) and for pain catastrophizing (χ^2 = 5.6, $P < .05$). Higher scores for increased behavioral activities was associated with a greater likelihood of staying the same [Exp(B) = 1.14; 95% CI 1.01–1.28] or getting worse [Exp(B) = 1.21; 95% CI 1.04–1.42] relative to getting better. Higher levels of pain catastrophizing were associated with an increased likelihood of getting worse relative to staying the same [Exp(B) = 1.23; 95% CI 1.03–1.46) or getting better [Exp(B) = 1.26; 95% CI 1.02–1.55].

4. Discussion

The present study sought to better understand the association of coping strategies assessed at one time point with subsequent changes in pain and/or functioning over a 1-year period to better identify which patients are at risk for negative outcomes. Although the results supported our hypothesis that pain catastrophizing would be associated with worse outcomes in pain intensity, as well as in combined pain and function, praying/hoping, increased behavioral activities, and ignoring pain were also implicated as important variables with respect to at least one of the outcomes. In addition, the strongest evidence arose for predictors of worsening or staying the same, with relatively less evidence that there are coping strategies that are predictive of improvement.

As hypothesized, the coping variable with the strongest evidence for negative impact is pain catastrophizing. Specifically, we found that a higher initial level of pain catastrophizing is associated with clinically important worsening as compared to staying the same or improving. Although this differs from Holla and colleagues' [16] finding that *less* catastrophic worrying was associated with worse functioning, it is not clear that the definition of pain catastrophizing is consistent across the measure used in that study (Pain Coping Inventory [PCI] [29]) and the present study (CSQ), as the pain catastrophizing items on the PCI are more oriented toward worrying and the items on the CSQ are more oriented toward imagining the worst possible pain-related outcomes. The results are consistent with the cross-sectional research indicating an association of pain catastrophizing with higher levels of pain intensity, psychological disability, physical disability, and measures of physical dysfunction in patients with OA [25,26,33,46]. Our findings therefore support the literature suggesting that pain catastrophizing is an important (and perhaps the most important) psychosocial treatment target, as higher catastrophizers had worse outcomes in

our analyses. This finding is consistent with those from studies testing the efficacy of treatments that target pain catastrophizing in persons with knee OA. For example, recent efforts have focused on the development of a pain coping skills intervention that targets pain catastrophizing in patients with knee OA, and the findings from these studies support the efficacy of this treatment in combination with other active interventions [17,45]. Similarly, a self-management intervention that included a coping skills component also demonstrated a promising impact on outcomes [18].

We also found that individuals who use more praying/hoping are more likely to stay at a relatively high level of pain and poor function than to get better or worse. The relationships between praying/hoping and pain outcomes are complex and multifaceted, as reflected by mixed results in the literature. Praying/hoping has been shown to be associated with feelings of helplessness, pain catastrophizing, avoidance behavior, higher pain, and greater disability [8,27,31,41], but other studies have shown that praying/hoping is associated with decreased pain [48], and others found no significant findings for praying/hoping predicting pain intensity or disability [27,49]. These conflicting findings suggest the possibility that this category of coping might be dysfunctional in some situations or with some patients, or adaptive in others, or might have mixed benefits/costs, depending on the patient. The current findings demonstrating an association with no change in a group that reported high levels of pain and poor function suggest that the coping response is, at best, not usually beneficial. Future research could explore important hypotheses, such as whether the overreliance on this strategy prevents patients from using coping responses that might be more helpful. If that were the case, it might be useful to consider encouraging other coping responses, such as strategies that may give patients a stronger sense of control over pain and its impact, like self-hypnosis training [19,20] or training in adaptive coping responses [38,39].

Regarding increasing behavioral activities and ignoring pain, we found that these coping strategies were associated with either staying the same in individuals reporting high levels of pain intensity and poor function or getting worse. Neither coping response was associated with getting better on either outcome domain. This finding was surprising, given previous research suggesting that these coping responses either do not influence pain or function [25,26] or that increasing activity improves functioning and pain intensity [43]. There are a number of possible explanations for this unexpected finding and further research on this area is clearly necessary. Given that this is the first time, to our knowledge, that these constructs were tested for their association with longitudinal outcomes in a sample of individuals with arthritis, the stability of the finding is not known. If this finding is replicated, a logical next step would be to gain a better understanding of why the use of these coping responses at one time point affects outcomes at a second time point, so as to better identify how to intervene with this patients. It is also notable that one of the items on the subscale for increased behavioral activities asks the individual whether they engage in household chores or other similar activities when in pain. This highlights the possibility that the type of activity may be important to consider when making treatment recommendations, as much of the theory behind increased behavioral activities is that outcomes are improved by engagement in pleasant activities [12], and household chores may not be a pleasant activity for many individuals. In any case, additional research is needed to determine the generalizability of these results.

Although our primary focus here was to determine whether pain coping responses are prospective predictors of change in function, the findings also provide important new information regarding the patterns of change in pain and disability over time in patients with arthritis. For example, it is notable that we found a high percentage of patients who stayed the same in terms of pain, function, and the combined metric, and that this group tended to report the highest levels of pain and dysfunction at both assessment points. This suggests the possibility of a large subset of patients with arthritis who experience pain and poor function and who may require assistance to get out of a pattern of chronic, refractory pain and disability. Additional research is needed to determine whether treatment programs can be developed for this large subset of patients who appear to be in need of help.

Our study has several important limitations. Although we used outcomes that are clinically important and endorsed by OARSI-OMERACT [36], our methods depended on self-report of coping and function. Although self-report is the gold standard for some of our key study variables (eg, pain severity), it is not ideal for measuring variables involving behavioral change (eg, physical activity). Our interpretations would be strengthened by the inclusion of mixed methods for assessing these outcomes, perhaps involving behavioral observation, objective measurement of activity, daily logging, or significant other report. Relatedly, we relied on a brief measure of pain coping in which scales were formed of only 2 items each. Although the psychometric properties of these short pain coping scales are supported relative to longer instruments [22,47], it may be that these shorter scales are statistically less stable than would be expected if they were composed of more items. However, the efficiency of brief reports of pain coping in busy clinical practices makes them more amenable to patient-centered research. Finally, for the purposes of making clinically relevant conclusions, we chose to categorize participant improvement or worsening based upon the established OARSI-OMERACT criteria, rather than using continuous outcome measures.[1] We acknowledge that the trade-off of making this decision is a reduction in statistical power. Additionally, while this analytic approach was instructive for informing whether a participant's level of use of a coping strategy at one time point is predictive of their pain, functioning, or both at another time point, the study did not describe whether changes in pain and/or functioning are related to changes in the use of these coping strategies. Future research on mechanisms of change would make an important contribution to the literature in this area.

Despite these limitations, the findings provide important new evidence regarding the potential clinical relevance of a number of pain coping responses hypothesized to influence future pain and function in persons with arthritis. The potential negative impact of pain catastrophizing was supported, indicating the need to address this response in treatment programs designed to improve pain and functioning. The lack of positive associations between 2 coping responses thought to be important to outcomes on the basis of research in other pain populations (increasing behavioral activities and ignoring pain) was surprising

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[1]For purposes of comparison, we also performed these analyses based on continuous versions of the pain and function outcomes described here using linear regression. As anticipated, as a result of the nuances of using different statistical methods, these results were largely similar, but they also produced subtle differences. For example, for the function outcome, a continuous approach suggested a very small effect for increased behavioral activities ($\beta = -.08$). Pain outcomes did not differ appreciably using this method. Results of continuous variable analyses are available from the study authors.

and must be replicated, but it could be of significance for treatment programs in patients with arthritis. Finally, the association found between the use of praying/hoping and a maintenance of high levels of pain and disability, if replicated in future studies, similarly suggests that this coping response may be a predictor of maintaining a poor response to pain, and that such patients might benefit from learning additional coping responses that may result in more positive outcomes.

Acknowledgments

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Table 1

Demographics and descriptive study variables by pain change status.

Characteristics	Better (N = 114, 14.3%)		Same (N = 551, 69.1%)		Worse (N = 132, 16.6%)	
	M	SD	M	SD	M	SD
Demographics						
Sex (% female)	59.6%	–	59.7%	–	55.3%	–
Race (% white)	82.4%	–	74.4%	–	81.1%	–
Age	65.1	8.6	65.3	8.9	65.3	9.4
Medical comorbidities (SAQ Comorbidity Score)	53	1.0	70	1.2	52	1.2
Body mass index	31.0	5.0	30.6	5.1	30.2	5.3
Pain variables						
Pain duration (% less than 9 y)	70.1%[†‡]	–	54.9%[*]	–	53.8%[*]	–
Highest 7-d pain for either knee at baseline	5.52[†‡]	2.51	6.03[*‡]	2.19	2.52[*†]	1.70
WOMAC Physical Function at baseline	15.48[†‡]	11.73	20.80[*‡]	12.77	10.87[*†]	9.30
CSQ scores						
Ignoring Sensations	3.01	1.70	3.04	1.74	2.98	1.83
Coping Self-Statements	3.16[†]	1.94	3.63[*]	1.78	3.34	1.90
Praying or Hoping	0.83[†]	1.42	1.33[*‡]	1.71	0.72[†]	1.19
Reinterpreting Pain Sensations	0.86	1.15	1.04[‡]	1.29	0.75[†]	1.24
Increased Behavioral Activities	2.27[†]	1.66	2.81[*]	1.80	2.54	1.86
Catastrophizing	0.73[†]	1.26	1.08[*‡]	1.47	0.71[†]	1.21

[*] Significant difference compared to "better" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).

[†] Significant difference compared to "same" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).

[‡] Significant difference compared to "worse" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).

Table 2

Demographics and descriptive study variables, by functional change status.

Characteristics	Better (N = 129, 16.2%)		Same (N = 452, 56.7%)		Worse (N = 216, 27.1%)	
	M	**SD**	**M**	**SD**	**M**	**SD**
Demographics						
Sex (% female)	56.5%	–	61.0%	–	56.0%	–
Race (% white)	82.2%	–	71.4%[‡]	–	84.3%[†]	–
Age	65.4	8.9	64.9	8.9	66.1	9.0
Medical comorbidities (SAQ Comorbidity Score)	53	1.0	69	1.2	62	1.2
Body mass index	30.8	4.9	30.8	5.2	30.1	4.8
Pain variables						
Pain duration (% less than 9 y)	70.5%[†‡]	–	52.6%[*]	–	57.8%[*]	–
Highest 7-d pain for either knee at baseline	5.3[†‡]	2.4	5.9[*‡]	2.4	4.3[†*]	2.5
WOMAC Physical Function at baseline	18.69[†‡]	11.59	23.18[*‡]	12.18	8.36[†*]	7.47
CSQ scores						
Ignoring Sensations	3.17	1.63	2.86[‡]	1.75	3.27[‡]	1.77
Coping Self-Statements	3.30	1.91	3.54	1.79	3.60	1.87
Praying or Hoping	0.99[†]	1.56	1.44[*‡]	1.74	0.67[†]	1.18
Reinterpreting Pain Sensations	0.92	1.25	1.06[‡]	1.31	0.80[†]	1.17
Increased Behavioral Activities	2.56	1.77	2.64	1.77	2.86	1.87
Catastrophizing	0.74[†‡]	1.20	1.15[*‡]	1.50	0.72[†*]	1.27

[*] Significant difference compared to "better" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).

[†] Significant difference compared to "same" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).

[‡] Significant difference compared to "worse" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).

Table 3

Demographics and descriptive study variables by combined outcome change status.

Characteristics	Better (N = 125, 15.7%)		Same (N = 540, 67.8%)		Worse (N = 132, 16.6%)	
	M	SD	M	SD	M	SD
Demographics						
Sex (% female)	64.0%	–	58.9%	–	54.5%	–
Race (% white)	80.8%	–	73.7%*‡	–	84.8%†	–
Age	64.5	8.6	65.3	8.9	66.3	9.5
Medical comorbidities (SAQ Comorbidity Score)	57	1.0	68	1.2	60	1.1
Body mass index	30.9‡	5.4	30.8‡	5.1	29.5*†	4.8
Pain variables						
Pain duration (% less than 9 y)	63.2%	–	55.0%	–	59.1%	–
Highest 7-d pain for either knee at baseline	5.9‡	2.5	5.8‡	2.3	3.2*†	2.0
WOMAC Physical Function at baseline	20.19‡	12.08	20.17‡	12.86	9.55*†	8.09
CSQ scores						
Ignoring Sensations	3.23	1.64	2.95	1.76	3.13	1.77
Coping Self-Statements	3.33	1.84	3.59	1.84	3.40	1.79
Praying or Hoping	1.11	1.70	1.27‡	1.66	0.76†	1.24
Reinterpreting Pain Sensations	0.82	1.15	1.0	1.31	0.82	1.17
Increased Behavioral Activities	2.39	1.65	2.73	1.81	2.77	1.87
Catastrophizing	0.99	1.43	1.0	1.42	0.81	1.35

*
Significant difference compared to "better" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).

†
Significant difference compared to "same" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).

‡
Significant difference compared to "worse" by *t* test for continuous measures and chi-square test for dichotomous measures (*P* < .05).