

Reductions in Perceived Injustice are Associated With Reductions in Disability and Depressive Symptoms After Total Knee Arthroplasty

Esther Yakobov, BSc,* Whitney Scott, PhD,†

William D. Stanish, MD,‡ Michael Tanzer, MD,§ Michael Dunbar, MD,‡

Glen Richardson, MD,‡ and Michael J.L. Sullivan, PhD*

Introduction: Perceptions of injustice have been associated with problematic recovery outcomes in individuals with a wide range of debilitating pain conditions. It has been suggested that, in patients with chronic pain, perceptions of injustice might arise in response to experiences characterized by illness-related pain severity, depressive symptoms, and disability. If symptoms severity and disability are important contributors to perceived injustice (PI), it follows that interventions that yield reductions in symptom severity and disability should also contribute to reductions in perceptions of injustice. The present study examined the relative contributions of postsurgical reductions in pain severity, depressive symptoms, and disability to the prediction of reductions in perceptions of injustice.

Methods: The study sample consisted of 110 individuals (69 women and 41 men) with osteoarthritis of the knee scheduled for total knee arthroplasty (TKA). Patients completed measures of perceived injustice, depressive symptoms, pain, and disability at their pre-surgical evaluation, and at 1-year follow-up.

Results: The results revealed that reductions in depressive symptoms and disability, but not pain severity, were correlated with reductions in perceived injustice. Regression analyses revealed that reductions in disability and reductions in depressive symptoms contributed modest but significant unique variance to the prediction of postsurgical reductions in perceived injustice.

Discussion: The present findings are consistent with current conceptualizations of injustice appraisals that propose a central role for symptom severity and disability as determinants of perceptions of injustice in patients with persistent pain. The results suggest that the inclusion of psychosocial interventions that target depressive symptoms and perceived injustice might augment the impact of rehabilitation programs made available for individuals recovering from TKA.

Key Words: perceived injustice, disability, pain, depressive symptoms
(*Clin J Pain* 2018;34:415–420)

Several research studies have highlighted the deleterious physical and mental health consequences of perceived injustice (PI).^{1–5} Perceived injustice has been defined as an

appraisal process characterized by attributions of blame, a sense of unfairness, and a tendency to construe one's losses as severe and irreparable.³ Perceptions of injustice have been prospectively associated with poor recovery outcomes in patients with musculoskeletal injuries.^{1,3} Elevated presurgical scores

on a measure of perceived injustice have been shown to be prospectively associated with persistent pain 1 year following knee replacement surgery.⁶ In addition, in several studies of individuals with whiplash injuries, PI predicted the persistence of posttraumatic and depressive symptoms following rehabilitation treatment.^{5,7}

Although research has been consistent in showing a relation between PI and problematic recovery outcomes, little is currently known about the factors that contribute to the development and maintenance of perceptions of injustice. The lack of information about the factors that contribute to the emergence of perceptions of injustice will necessarily impede efforts to develop effective interventions aimed at reducing perceptions of injustice.

It has been suggested that perceptions of injustice are likely to arise in response to experiences characterized by suffering and loss.^{8–11} The experience of debilitating health conditions can be construed in terms of suffering and loss.^{11,12} The suffering associated with pain-related conditions might include symptoms of pain and emotional distress.^{13,14} Pain symptoms can also interfere with physical functioning, and lead to the experience of losses in multiple life domains. The losses associated with pain-related disability might include loss of independence, employment, financial security, and the loss of identity.^{15,16} The magnitude of losses associated with debilitating health conditions has been previously discussed as a possible contributor to PI.^{3,9,10,17}

Osteoarthritis (OA) is a debilitating health condition that affects up to 40% of the population by the age of 65 years.¹⁸ In advanced stages of the disease, joint deterioration can lead to significant pain and limitations of function.^{19,20} Progressive increase in pain and impairment in function often lead to loss in one's ability to participate in many activities of daily life.²¹ Total knee arthroplasty (TKA) is a surgical procedure that involves the replacement of diseased tissue and bone with a prosthetic joint. TKA has been shown to be highly successful in reducing pain and disability in majority of cases.²² If symptom severity and disability are important contributors to PI, it follows that interventions that yield reductions in symptom severity and disability should also contribute to reductions in perceptions of injustice. No research to date has investigated the relative contributions of reductions in symptom severity and disability to reductions in PI following a surgical intervention.

Received for publication March 14, 2017; revised July 11, 2017; accepted August 15, 2017.

From the Departments of *Psychology; †Surgery, McGill University Montreal, Canada; ‡Institute of Psychiatry, Psychology, and Neuroscience, King's College London, London, UK; and §Department of Surgery, Dalhousie University Halifax, Canada.

Supported by funds from the Canadian Institutes for Health Research and the Canada Research Chairs Program.

The authors declare no conflict of interest.

Reprints: Michael J.L. Sullivan, PhD, Department of Psychology, McGill University, 1205 Doctor Penfield Avenue, Montreal, QC, Canada H3A 1B1 (e-mail: michael.sullivan@mcgill.ca).

Copyright © 2017 Wolters Kluwer Health, Inc. All rights reserved.

DOI: 10.1097/AJP.0000000000000551

The primary objective of the present study was to examine whether reductions in symptom severity (ie, pain and depressive symptoms) and disability following TKA contributed to reductions in perceptions of injustice. Participants completed measures of PI, depressive symptom severity, pain severity, and disability before surgery and at 1-year follow-up. Regression analyses were used to examine whether postsurgical reductions in symptom severity and disability were associated with reductions in perceptions of injustice. It was hypothesized that PI would decrease as a function of post-TKA reductions in symptom severity and disability.

The identification of determinants of change in perceptions of injustice after TKA might contribute to a better understanding of the factors that influence injustice appraisals in patients with OA. Increasing our understanding of the determinants of change of PI in this population might contribute to the empirical foundation for the development of novel interventions aimed at promoting successful recovery after TKA.

METHODS

Participants

The study sample consisted of 110 individuals (69 women and 41 men) with severe OA of the knee scheduled for TKA. The age range of the study sample was from 50 to 85 years (mean = 66.9; SD = 8.3). The presurgical body mass index (BMI) ranged from 20.52 to 45.2 (mean = 31.00; SD = 5.0). Sixty-one individuals had TKA of the right knee and 49 had TKA of the left knee. More than 80% of the participants were married and completed at least 12 years of education. The data reported in this paper were drawn from a larger study examining predictors of recovery trajectories following TKA.^{6,23}

MEASURES

PI

PI was assessed with the Injustice Experiences Questionnaire adapted for use in patients with chronic conditions (IEQ-*chr*). The original IEQ asks patients to assess the effect of their injury on their life. The instructional set of the original IEQ³ was modified to ask respondents to assess the effects of their chronic condition on their life, and the suffix “*chr*” (for chronic) was added to the scale name to distinguish it from the original version. The IEQ-*chr* contains 12 items that assess respondents’ appraisals of their illness in terms of unfairness (It all seems so unfair), the severity and irreparability of losses (My life will never be the same), and attributions of blame (I am suffering because of someone else’s negligence). Respondents are asked to rate the frequency with which they experience the thoughts described in the item-content of the IEQ-*chr* on a 5-point Likert-type scale with the endpoints (0) = never and (4) = all the time. Previous research has supported the reliability and validity of the IEQ-*chr* as a measure of health-related PI.²³

Pain Severity and Disability

Pain severity and disability were assessed with The Western Ontario and McMaster University Osteoarthritis Index (WOMAC).²⁴ The WOMAC is a 24-item measure that yields a total score and subscale scores for (1) Pain, (2) Stiffness, and (3) Physical Function. For the purposes of the present study, only the subscale scores for pain and physical

function are reported. For each item of the WOMAC, respondents are asked to rate the severity of their OA-related symptoms and limitations on a 5-point Likert scale with the endpoints (0) = none to (4) = extreme. The scores range from 0 to 20 for pain subscale and 0 to 68 for physical function subscale. The reliability and validity of the WOMAC have been demonstrated in patients in several studies.^{24–26}

Depressive Symptomatology

Depressive symptoms were assessed with the Patient Health Questionnaire-9 (PHQ-9).²⁷ Respondents are asked to rate the frequency with which they experience nine symptoms that are considered in the diagnostic criteria for major depressive disorder. For each item of the PHQ-9, respondents make their ratings on a 4-point frequency scale with the endpoints (0) = not at all to (3) = nearly every day. The PHQ-9 has been shown to be reliable and valid measure of depressive symptom severity in individuals with various health conditions.^{28–30}

PROCEDURE

Participants in the current study were recruited from 3 hospitals located in Eastern Canada. Criteria for inclusion in the present study included a diagnosis of primary OA of the knee, age between 50 and 85 years and scheduled for TKA at one of the 3 collaborating sites. Exclusion criteria included: (1) diagnosis of rheumatoid arthritis, (2) previous arthroplasty of the knee, (3) previous patellectomy, (4) major bone loss requiring structural bone graft, and (5) requiring bilateral TKA within 1 year of the index procedure.

Participants were informed that the study was concerned with the physical and psychological determinants of recovery after surgery. Patients interested in study participation provided written informed consent and received \$25 as compensation for completing the questionnaires. The research was approved by the Research Ethics Boards of the McGill University Health Centre, the Hôpital Maisonneuve-Rosemont, and the Capital Health Authority of Nova Scotia. Participants were asked to complete the questionnaires at the time of their presurgical evaluation (within 4 wk of surgery) and at their 1-year postsurgical follow-up. Outcomes of all surgical procedures in the present sample were considered as clinically successful. Findings from cross-sectional and prospective analyses on a portion of these data have been reported in 2 previous papers.^{6,23}

Data Analysis

Out of 116 participants at presurgical evaluation, 110 completed the follow-up questionnaires and were retained in study analyses. All data analyses were conducted with SPSS version 20.³¹ Independent sample *t* tests were used to assess sex differences on all study measures. Paired sample *t* tests were computed to assess the differences between presurgical and postsurgical scores on measures of pain severity, disability, depressive symptoms, and perceptions of injustice. Change scores were computed for pain severity, disability, depressive symptoms, and PI. Zero-order Pearson correlations were used to examine the associations between changes in pain, disability, depressive symptoms, and PI. A hierarchical regression equation was conducted to examine the unique contribution of changes in symptom severity and disability to the prediction of changes in scores on perceptions of injustice.

TABLE 1. Means and SD of Pretreatment and Posttreatment Variables

Variables	Pretreatment	Posttreatment	P	Cohen <i>d</i>
Pain intensity	10.6 (3.3)	3.4 (3.4)	0.000	1.82
Disability	37.8 (11.8)	14.4 (11.5)	0.000	1.79
Depressive symptoms	6.8 (7.0)	3.5 (5.2)	0.000	0.54
IEQ-chr	8.9 (8.4)	6.3 (8.4)	0.000	0.40

N = 110.

Depressive symptoms indicates PHQ9; Disability, Womac Function; IEQ-chr, Injustice Experiences Questionnaire; Pain intensity, Womac Pain Intensity.

RESULTS

Sample Characteristics

Men and women did not differ significantly on any demographic or study variable except for post-TKA depressive symptoms where women reported higher scores ($M = 4.3$; $SD = 6.1$) than men ($M = 2.2$; $SD = 2.9$) $t(108) = 2.5$; $P < 0.05$. There was a significant decrease in pain severity $t(109) = 19.13$; $P < 0.001$; $d = 1.82$, disability $t(109) = 18.80$; $P < 0.001$; $d = 1.79$, depressive symptoms $t(109) = 5.69$; $P = 0.001$; $d = 0.54$ and PI $t(109) = 4.16$, $P < 0.001$; $d = 0.40$ from the pre to postsurgical evaluation (Table 1).

Correlations Among Study Variables

Zero-order correlations revealed that, before surgery, PI was associated with depressive symptoms ($r = 0.52$; $P < 0.001$), pain severity ($r = 0.50$; $P < 0.001$), and disability ($r = 0.53$; $P < 0.001$). Pain intensity was associated with age ($r = -0.26$; $P < 0.05$) and BMI ($r = 0.24$; $P < 0.05$) (Table 2).

Pearson correlations were computed between change scores for pain, disability, depressive symptoms, and PI (Table 3). Zero-order correlations revealed that postsurgical reductions in depressive symptom severity were associated with reductions in PI ($r = 0.24$; $P < 0.05$), and reductions in disability ($r = 0.20$; $P < 0.05$). Postsurgical reductions in pain severity were associated with reductions in disability ($r = 0.71$; $P < 0.001$) but were not significantly correlated with reductions in PI ($r = 0.10$; $P = 0.29$). Postsurgical reductions in disability were associated with reductions in PI ($r = 0.20$; $P < 0.05$). Presurgical BMI was associated with reductions in pain ($r = 0.26$; $P < 0.05$) and disability ($r = 0.25$; $P < 0.05$).

TABLE 2. Correlations Among Variables Before Surgery

	1	2	3	4	5	6
Age						
BMI	-0.38*					
Sex	-0.06	-0.03				
IEQ-chr	-0.08	-0.02	-0.05			
Depressive symptoms	-0.09	-0.04	-0.01	0.52**		
Pain intensity	-0.26*	0.24*	-0.07	0.50**	0.31*	
Disability	-0.18	0.17	0.01	0.53**	0.39**	0.71**

N = 110.

BMI indicates presurgical body mass index; IEQ-chr, Injustice Experiences Questionnaire.

* $P < 0.05$.

** $P < 0.001$.

TABLE 3. Correlations Among Change Scores Pretreatment and Posttreatment

	1	2	3
Δ IEQ-chr			
Δ Depressive symptoms	0.24*		
Δ Pain intensity	0.10	0.07	
Δ Disability	0.29*	0.20*	0.71**

N = 110.

Δ IEQ-chr indicates changes in Injustice Experiences Questionnaire; Δ depressive symptoms, changes in depressive symptoms; Δ pain intensity, changes in pain intensity; Δ disability, changes in disability.

* $P < 0.05$.

** $P < 0.001$.

Determinants of Changes in PI

A hierarchical regression was computed to assess the contribution of changes in depressive symptoms, and disability to changes in perception of injustice from presurgery to postsurgery. Because reduction in pain severity was not correlated with reductions in PI, changes in pain severity were not included in regression analyses. The overall model was significant, $F(5, 104) = 3.38$; $P < 0.05$ and accounted for 14% of the variance (10% adjusted) (Table 4). Demographic variables were entered in the first step of the analysis but did not make a significant contribution to the prediction of reductions in PI. Changes in depressive symptom severity were entered in the second step of the analysis and accounted for 6% of the variance in changes in PI. Changes in disability were entered in the last step and accounted for additional 7% of the variance in changes in PI. Examination of the standardized beta weights from the final regression equation indicated that only reductions in depressive symptom severity ($\beta = 0.19$; $P < 0.05$), and reductions in disability ($\beta = 0.27$; $P < 0.05$) contributed significant unique variance to the prediction of reductions in perceptions of injustice. A hierarchical regression analysis using residualized change scores was also conducted yielding a comparable pattern of findings.

DISCUSSION

The goal of the present study was to examine whether reductions in pain severity, depressive symptoms, and disability following TKA would be associated with reductions

TABLE 4. Regression Analyses Predicting Posttreatment Changes in Perceived Injustice

	Beta	R ² change	F change
Dependent = Change in scores of IEQ			
Step 1			
Age	-0.08		
BMI	-0.09		
Sex	-0.09	0.02	0.68 (3, 106)
Step 2			
Δ Depressive symptoms	0.19*	0.06	6.18 (1, 105)*
Step 3			
Δ Disability	0.27*	0.07	8.00 (1, 104)*

N = 110. Standardized Betas are reported for the final step.

Presurgical BMI indicates body mass index; Δ depressive symptoms, changes in depressive symptoms; Δ disability, changes in disability.

* $P < 0.05$.

in perceptions of injustice. The results of the present investigation were consistent with previous research showing significant cross-sectional relations between perceptions of injustice, pain severity, depressive symptom severity, and disability. The findings of the present study extend previous research in showing that reductions in depressive symptom severity and reductions in disability contributed uniquely to reduction in perceptions of injustice.

Numerous research investigations have reported significant associations between perceptions of injustice, symptom severity and disability. Sullivan et al³ reported that in a sample of individuals with musculoskeletal injuries PI was associated with pain severity, disability, and depressive symptoms. Similar findings were reported across several patient samples including whiplash, spinal cord injury, fibromyalgia, rheumatoid arthritis, and osteoarthritis of the knee.^{1,4,23,32–34}

Little is currently known about the determinants of PI. It has been suggested that life events including illness or injury that lead to suffering, deprivation of resources, and losses might give rise to PI.^{8,11,12,35} Contributions of loss and suffering to PI can be conceptualized within the theories of distributive justice and equity norms.^{11,36} At the core of the principles of distributive justice and equity norms is the assumption that all individuals are “entitled” to the same benefits or resources as others. The losses or suffering associated with debilitating illness or injury can be appraised as a violation of equity norms, leading to PI. Darley and Pittman go further to suggest that individuals also expect to be compensated for suffering and losses when they believe that harm was not done unintentionally (ie, poor medical care, health care professional’s neglect). The absence of compensation for suffering and losses associated with chronic illness may also contribute to the experience of PI. To date, empirical research on dimensions and determinants on injustice in pain context is lacking and conceptual models of PI in this area have yet to be put forward.

The mechanisms by which PI compromises recovery outcomes are not well understood. There is a paucity of research on the specific challenges that individuals with high scores on PI may face in rehabilitation context. In one study, PI was associated with poor therapeutic alliance and poor rehabilitation outcomes in patients with musculoskeletal pain following injuries.³⁷ In another study of patients with musculoskeletal pain, anger mediated the relations between PI, pain severity, and depressive symptoms.³⁸ The associations between PI, anger, and therapeutic alliance have not been investigated in patients with OA.

Consistent with recent investigations on PI and pain outcomes, in the current study, the relation between perceptions of injustice and disability was stronger than the relation between PI and pain severity.^{3,4,39} In the present study, reduction in disability, but not reduction in pain was associated with reduction in PI. At present, there is no conceptual framework that predicts that disability is weighted more heavily in PI than pain severity. It is possible that availability of medication that can reduce the intensity of pain may reduce the degree to which pain severity is construed a violation of justice principles. In addition, it has been suggested that injustice appraisals are influenced by comparisons that individuals make to others in their reference group.¹¹ For many individuals with OA the severity of symptoms peaks towards retirement years.⁴⁰ Although pain in old age might be perceived as a relatively normal phenomenon, this may not be the case for disability. For many individuals, the retirement years

are intended for realization of life dreams and aspirations. For individuals with severe OA PI may arise not only because of losses associated with functional limitations, but also because of the inability to fulfill retirement dreams. Surgical intervention aimed at reducing or minimizing disability might recover some of these losses restoring breaches in justice violation and reducing PI.

In the present study, reductions in depressive symptoms were associated with reductions in PI even when controlling for reductions in disability. These findings indicate that depressive symptoms impact on PI through mechanisms that are at least partly independent of the experience of disability. Several empirical investigations highlighted strong associations between PI and depressive symptoms.^{3,7,33} Clinical psychology literature suggests that part of the phenomenology of depression entails a sense of being unfairly punished.⁴¹ The relation between PI and depressive symptoms is reflected in the content of an item “I feel I am being punished” of the BDI-II, an instrument that is widely used to assess depression.⁴² In addition, punitive and invalidating responses of others to one’s suffering have been discussed as important contributors to psychological distress,^{43–46} and have been identified as important contributors to PI in individuals with chronic pain.⁴⁷ The results of the present study suggest that reductions in depressive symptoms after TKA might trigger a reappraisal of injustice cognitions. Future research is needed to explore the processes by which reductions in depressive symptomatology lead to reductions in PI.

The results of hierarchical regression analyses revealed that presurgical BMI and demographic variables reductions in depressive symptoms and reductions in disability accounted for approximately 10% of the variance in the prediction of reduction in PI, leaving 90% of the variance unaccounted for. In one study, Scott et al³⁷ interviewed individuals with whiplash injuries about sources of injustice. They found that participants identified their employers, insurers, family members, health care providers, and other individuals from their social circle as sources of injustice. Reasons for identifying these sources included inadequate assessment and treatment by health professionals, invalidation, and lack of social support.⁴⁷ It is possible that similar factors might contribute to PI in patients with severe OA of the knee.

In the present study the scores on PI ($M=8.9$; $SD=8.4$) were similar to those reported in another study with OA patients ($M=12.0$; $SD=1.7$) but lower than scores reported in individuals with musculoskeletal pain following work injuries ($M=17.3$; $SD=12.2$), spinal cord injury ($M=16.66$; $SD=12.38$), motor vehicle accidents ($M=25.1$; $SD=11.8$), and traumatic injuries ($M=17.07$; $SD=14.55$).^{3,35,47–49} It is possible that these variations in IEQ scores might reflect condition-relevant differences in the phenomenology of injustice. First, when compared to individuals who have sustained injuries, individuals with conditions that have an insidious onset often do not have an identifiable source for pain onset. As such, attributions of blame for illness-related suffering and disability in individuals with OA are expected to be lower than in populations with traumatic onset of symptoms caused by someone else’s mistake or negligence (ie, other driver, coworker). In line with this perspective, inspection of individual items of the IEQ-*chr* in the present study confirmed that the item that reflects attributions of blame had the lowest mean of all IEQ-*chr* items. It is also possible that age might influence appraisals of injustice.⁵⁰ Most individuals with OA experience pain and disability as they approach their

retirement years. Young individuals who experience a sudden onset of symptoms forecasting a life of suffering and limited opportunities might appraise their situation with greater injustice than individuals whose symptoms only became prominent later in life.^{38,47}

There are significant clinical implications to current findings. The findings suggest that interventions designed to reduce disability might have a greater impact on reducing perceptions of injustice than interventions designed to reduce pain severity. The findings also suggest that interventions designed to reduce depressive symptoms might also be important in reducing perceptions of injustice. Even though depression has been identified as a prognostic indicator for poor recovery outcomes following TKA, there have been few reports addressing the management of depressive symptoms in this population. Future studies need to investigate whether the outcomes of TKA might be enhanced by the provision of interventions designed to target depressive symptoms and perceptions of injustice.

The findings of the present study must be interpreted in light of several limitations. The sample size was modest, and replication is needed to support the reliability of the findings. Assumptions were made about the specific principles of justice that were violated by the experience of symptom severity and disability associated with OA. The tenability of assumptions has to be taken in consideration, and in the absence of empirical verification of these assumptions, confidence in the conclusions drawn must await replication. In addition, participants in this study received medical services under publicly funded health care system. Publicly funded health care systems are known to have longer wait times for knee replacement surgery than privately funded health care systems. Longer wait time may have played a role in a pattern of findings relevant to perceptions of injustice.

Although the discussion has proceeded from the perspective that reductions in depressive symptoms and disability might lead to reductions in PI, it is very likely that this association is bidirectional. In other words, although reductions in disability and depressive symptoms might contribute to reductions in PI, reductions in PI might also contribute to reductions in depressive symptoms and increases in function. Although surgery would not be considered an intervention designed to reduce perceptions of injustice, being the recipient of a surgical intervention might have been experienced as a form of compensation, leading to reductions in PI, and in turn, yielding reductions in depressive symptoms.

Despite the limitations, this was the first study that to demonstrate that changes in depressive symptoms and severity of disability are significant correlates of changes in PI following TKA. The present findings call for the inclusion of interventions designed to reduce perceptions of injustice and depressive symptoms in the rehabilitation programs made available to individuals recovering from TKA. Future research is needed to determine whether psychosocial interventions that target depressive symptoms and perceptions of injustice might promote more successful recovery following TKA.

REFERENCES

1. Scott W, Trost Z, Milioto M, et al. Further validation of a measure of injury-related injustice perceptions to identify risk for occupational disability: a prospective study of individuals with whiplash injury. *J Occup Rehabil*. 2013;23:557–565.
2. Scott W, Sullivan MJL. perceived injustice moderates the relationship between pain and depressive symptoms among individuals with persistent musculoskeletal pain. *Pain Res Manag*. 2012;17:335–340.
3. Sullivan MJL, Adams H, Horan S, et al. The role of perceived injustice in the experience of chronic pain and disability: scale development and validation. *J Occup Rehabil*. 2008;18:249–261.
4. Sullivan MJL, Davidson N, Garfinkel B, et al. perceived injustice is associated with heightened pain behavior and disability in individuals with whiplash injuries. *Psychol Inj Law*. 2009;2:238–247.
5. Sullivan MJL, Thibault P, Simmonds MJ, et al. Pain, perceived injustice and the persistence of post-traumatic stress symptoms during the course of rehabilitation for whiplash injuries. *Pain*. 2009;145:325–331.
6. Yakobov E, Scott W, Stanish W, et al. The role of perceived injustice in the prediction of pain and function after total knee arthroplasty. *Pain*. 2014;155:2040–2046.
7. Scott W, Trost Z, Milioto M, et al. Barriers to change in depressive symptoms after multidisciplinary rehabilitation for whiplash: the role of perceived injustice. *Clin J Pain*. 2015;31:145–151.
8. Darley JM, perceived injustice T. The psychology of compensatory and retributive justice. *Pers Soc Psychol Rev*. 2003;7:324–336.
9. Lind EA, Tyler TR. *The Social Psychology of Procedural Justice*. New York: Plenum; 1988.
10. Montada L. Injustice in harm and loss. *Soc Just Res*. 1994;7:5–28.
11. Montada L. Coperceived injustice with life stress injustice and the question “who is responsible?”. In: Steensma H, Vermunt R, eds. *Social Justice in Human Relations: Societal and Psychological Consequences of Justice and Injustice*. Boston, MA: Springer US; 1991:9–30.
12. McParland J, Eccleston C. “It’s not fair” social justice appraisals in the context of chronic pain. *Curr Dir Psychol Sci*. 2013;22:484–489.
13. Berglund A, Bodin L, Jensen I, et al. The influence of prognostic factors on neck pain intensity, disability, anxiety and depression over a 2-year period in subjects with acute whiplash injury. *Pain*. 2006;125:244–256.
14. Nederhand MJ, Hermens HJ, Ijzerman MJ, et al. Chronic pain disability due to an acute whiplash injury. *Pain*. 2003;102:63–71.
15. Lyons R, Sullivan MJL. Curbing loss in illness and disability. In: Harvey J, ed. *Perspectives on Personal and Interpersonal Loss*. New York: Taylor & Francis; 1998:579–605.
16. Walker J, Sofaer B, Holloway I. The experience of chronic back pain: accounts of loss in those seeking help from pain clinics. *Eur J Pain*. 2006;10:199–207.
17. Montada L. Attribution of responsibility for losses and perceived injustice. In: Montada L, Sigrun-Heide F, Lerner MJ, eds. *Life Crises and Experiences of Loss in Adulthood*. Hillsdale: Lawrence Erlbaum and Associates; 1992.
18. Salaffi F, Carotti M, Grassi W. Health-related quality of life in patients with hip or knee osteoarthritis: comparison of generic and disease-specific instruments. *Clin Rheumatol*. 2005;24:29–37.
19. Felson DT. An update on the pathogenesis and perceived injustice epidemiology of osteoarthritis. *Radiol Clin North Am*. 2004;42:1–9.
20. Martel-Pelletier J, Boileau C, Pelletier JP, et al. Cartilage in normal and osteoarthritis conditions. *Best Pract Res Clin Rheumatol*. 2008;22:351–384.
21. Farr Li J, Miller LE, Block JE. Quality of life in patients with knee osteoarthritis: a commentary on nonsurgical and surgical treatments. *Open Orthop J*. 2013;7:619–623.
22. Robertsson O, Dunbar M, Pehrsson T, et al. Patient satisfaction after knee arthroplasty: a report on 27,372 knees operated on between 1981 and 1995 in Sweden. *Acta Orthop Scand*. 2000;71:262–267.
23. Yakobov E, Scott W, Stanish W, et al. Validation of injustice experiences questionnaire adapted for use with patients with severe osteoarthritis of the knee. *J Arthritis*. 2014;3:130–136.

24. Bellamy N, Buchanan W, Goldsmith G, et al. Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of hip or knee. *J Rheumatol*. 1988;15:1833–1840.
25. Bellamy N. Pain assessment in osteoarthritis: experience with the WOMAC osteoarthritis index. *Semin Arthritis Rheu*. 1989;18:14–17.
26. Bellamy N, Kean WF, Buchanan WW, et al. Double blind randomized controlled trial of sodium meclofenamate (Meclomen) and diclofenac sodium (Voltaren): post validation reapplication of the WOMAC Osteoarthritis Index. *J Rheumatol*. 1992;19:153–159.
27. Spence D, Williams JBW, Kroenke K, et al. *Patient Health Questionnaire—9 Prime MD Today*. New York: Pfizer Inc; 1999.
28. Gilbody S, Richards D, Brealey S, et al. Screening for depression in medical settings with the Patient Health Questionnaire (PHQ): a diagnostic meta-analysis. *J Gen Intern Med*. 2007;22:1596–1602.
29. Huang FY, Chung H, Kroenke K, et al. Using the Patient Health Questionnaire-9 to measure depression among racially and ethnically diverse primary care patients. *J Gen Intern Med*. 2006;21:547–552.
30. Li C, Friedman B, Conwell Y, et al. Validity of the Patient Health Questionnaire 2 (PHQ-2) in identifying major depression in older people. *J Am Geriatr Soc*. 2007;55:596–602.
31. IBM Corp. *Statistical Package for the Social Sciences (SPSS, Version 20 for Windows) Rel 0914*. Armonk, NY: IBM; 2011.
32. Ferrari R, Russell AS. perceived injustice in fibromyalgia and rheumatoid arthritis. *Clin Rheumatol*. 2014;33:1501–1507.
33. Rodero B, Luciano JV, Montero-Marin J, et al. perceived injustice in fibromyalgia: psychometric characteristics of the Injustice Experience Questionnaire and relationship with pain catastrophising and pain acceptance. *J Psychosom Res*. 2012;73:86–91.
34. Trost Z, Agtarap S, Scott W, et al. perceived injustice after traumatic injury: associations with pain, psychological distress, and quality of life outcomes 12 months after injury. *Rehabil Psychol*. 2015;60:213–221.
35. McParland J, Eccleston C, Osborn M, et al. It's not fair: an Interpretative Phenomenological Analysis of discourses of justice and fairness in chronic pain. *Health*. 2011;15:459–474.
36. Adams JS. Inequity in social exchange. In: Berkowitz L, ed. *Advances in Experimental Social Psychology*. New York: Academic Press; 1965.
37. Scott W, Milioto M, Trost Z, et al. The relationship between perceived injustice and the working alliance: a cross-sectional study of patients with persistent pain attending multidisciplinary rehabilitation. *Disabil Rehabil*. 2016;38:2365–2373.
38. Scott W, Trost Z, Bernier E, et al. Anger differentially mediates the relationship between perceived injustice and chronic pain outcomes. *Pain*. 2013;154:1691–1698.
39. Yakobov E, Scott W, Thibault P, et al. Treatment-related reductions in disability are associated with reductions in perceived injustice following treatment of whiplash injury. *Psychol Inj Law*. 2016;9:41–47.
40. Neustadt DH. Intra-articular injections for osteoarthritis of the knee. *Clev Clin J Med*. 2006;73:897–898.
41. Freud S, Strachey J, Freud A, et al. Mourning and Melancholia. *The Standard Edition of the Complete Psychological Works of Sigmund Freud on the History of the Psycho-Analytic Movement, Papers on Metapsychology and Other Works*. London: The Hogarth Press; 1917:237–258.
42. Beck AT, Steer RA, Brown GK. *Manual for the Beck Depression Inventory—II*. San Antonio TX: Psychological Corporation; 1996.
43. Dickerson SS, Gruenewald TL, Kemeny ME. When the social self is threatened: shame, physiology, and health. *J Pers*. 2004;72:1191–1216.
44. Ghavidel-Parsa B, Amir Maafi A, Aarabi Y, et al. Correlation of invalidation with symptom severity and health status in fibromyalgia. *Rheumatol*. 2015;54:482–486.
45. Gilbert P. The relationship of shame, social anxiety and depression: the role of the evaluation of social rank. *Clin Psychol Psychother*. 2000;7:174–189.
46. Sullivan MJL, Yakobov E, Scott W, et al. perceived injustice and adverse recovery outcomes. *Psychol Inj Law*. 2014;7:325–334.
47. Scott W, McEvoy A, Garland R, et al. Sources of injustice among individuals with persistent pain following musculoskeletal injury. *Psychol Inj Law*. 2016;9:6–15.
48. Ferrari R. A cross-sectional study of perceived injustice and disability in hip osteoarthritis. *Eur J Rheumatol*. 2015;2:47–51.
49. Trost Z, Monden KR, Buelow M, et al. perceived injustice predicts intention to litigate: findings from a perceived unjust cord injury sample. *Psychol Inj Law*. 2016;9:31–40.
50. Shaw AB. In defence of ageism. *J Med Ethics*. 1994;20:188–191.