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RUNNING TITLE: Perceived injustice, disability and depressive symptoms

Reductions in perceived injustice are associated with reductions in disability and depressive symptoms after total knee arthroplasty

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Introduction: Perceptions of injustice have been associated with problematic recovery outcomes in individuals suffering from a wide range of debilitating pain conditions. It has been suggested that perceptions of injustice are likely to arise in response to experiences characterized by suffering and loss. If suffering and loss are important contributors to perceived injustice, it follows that interventions that yield reductions in suffering and loss should also contribute to reductions in perceptions of injustice. The present study examined the relative contributions of post-surgical reduction 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 severe osteoarthritis of the knee scheduled for total knee arthroplasty. Patients completed measures of perceived injustice, depressive symptoms, pain and disability approximately one week before surgery, and at one year follow-up. Reductions in symptom severity were used as a proxy for reductions in suffering. Reductions in disability were used as a proxy for reductions in losses. **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 significant unique variance to the prediction of reductions in perceived injustice. **Discussion:** The present findings are consistent with conceptual frameworks that propose a central role for suffering and loss in the emergence of perceptions of injustice. From a clinical perspective, the results suggest that supplementing surgical and rehabilitation treatment with psychosocial interventions that target depressive symptoms and perceived injustice might improve total knee arthroplasty outcomes.

Key words: Perceived injustice, disability, pain, depressive symptoms

Several studies have highlighted the deleterious health and mental health consequences of justice-related appraisals. Perceptions of injustice have been prospectively associated with poor recovery outcomes in patients with musculoskeletal injuries [1, 2]. Pre-surgical scores on measures of perceived injustice have been shown to be prospectively associated with persistent pain one year following knee replacement surgery [3]. Additionally, in several studies with individuals with whiplash, perceived injustice predicted the persistence of posttraumatic and depressive symptoms [4, 5].

Although research has been consistent in showing a relation between perceived injustice and problematic recovery outcomes, little is currently known about the factors that contribute to the development and persistence 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 [6-9]. The experience of debilitating health conditions can be construed in terms of suffering and loss [9, 10]. The suffering associated with pain-related conditions might include symptoms of pain and emotional distress [11, 12]. The losses associated with pain-related disability might include loss of independence, employment, financial security, and the loss of identity [13, 14].

Osteoarthritis is a debilitating health condition that affects up to 40% of the population by the age of 65 years [15]. In advanced stages of the disease, joint deterioration can lead to significant pain and limitations of function [16, 17]. Progressive increase in pain and impairment in function often lead to loss in one's ability to participate in many activities of daily life [18].

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. [19]. If suffering and loss are important contributors to perceived injustice, it follows that interventions that yield reductions in suffering and losses 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 perceived injustice following a surgical intervention.

The primary objective of the present study was to examine whether reductions in symptom severity (i.e., pain and depressive symptoms) and disability following TKA were associated with reductions in perceptions of injustice. Participants completed measures of perceived injustice, depressive symptomatology, pain severity, and disability one week before the surgery and at one year follow-up. Reductions in symptom severity were used as a proxy for reductions in physical and emotional suffering. Reductions in disability were used as proxy for reductions in OA-related losses. It was hypothesized that perceived injustice would decrease as a function of post-TKA reductions in suffering (i.e., pain severity and depressive symptoms) and loss (i.e., disability).

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 pre-surgical 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.

Measures

Perceived injustice

Perceived injustice was assessed with the Injustice Experiences Questionnaire adapted for use in patients with chronic health conditions (IEQ-*chr*). The item-content of the original IEQ addresses injustice appraisals related to an injury that has been sustained. The item-content of the IEQ-*chr* addresses injustice appraisals related to the experience of a chronic health condition [2]. 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 perceived injustice [20].

Pain severity and disability

Pain severity and disability were assessed with The Western Ontario and McMaster University Osteoarthritis Index (WOMAC) [21]. 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 [21-23].

Depressive symptomatology

Depressive symptoms were assessed with the Patient Health Questionnaire-9 (PHQ-9) [24]. Respondents were asked to rate the frequency with which they experienced nine symptoms that are considered in the diagnostic criteria for major depressive disorder. For each item of the PHQ-9, respondents made 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 [25-27].

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 three collaborating sites. Exclusion criteria included; a) diagnosis of rheumatoid arthritis, b) previous arthroplasty of the knee, c) previous patellectomy, d) major bone loss requiring structural bone graft, e) 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 pre-

surgical evaluation 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 two previous papers [20, 28]

Data Analysis

All data analyses were conducted with SPSS version 20 [29]. 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 pre and postsurgical reports of pain severity, disability, depressive symptoms and perceptions of injustice. Raw change scores were computed for pain severity, disability, depressive symptoms, and perceived injustice. Zero order Pearson correlations were used to compute the associations between changes in pain, disability, depressive symptoms and perceived injustice. A hierarchical regression equation was conducted to examine the unique contribution of changes in symptom severity and disability to changes in scores of perceptions of injustice while controlling for demographic variables.

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 ($M = 2.2$; $SD = 2.9$) $t(108) = 2.5, p < .05$. There was a significant decrease in pain severity $t(109) = 19.13, p < .001, d = 1.82$, disability $t(109) = 18.80, p < .001, d = 1.79$, depressive symptoms $t(109) = 5.69, p = .001, d = 0.54$ and perceived injustice $t(109) = 4.16, p < .001, d = 0.40$ from the pre to postsurgical evaluation (Table 1).

Correlations among study variables

Zero-order correlations revealed that, before surgery, perceived injustice was associated with depressive symptoms ($r = .52, p < .001$), pain severity ($r = .50, p < .001$), and disability ($r = .53, p < .001$). Pain intensity was associated with age ($r = -.26, p < .05$) and BMI ($r = .24, p < .05$). (Table 2).

Pearson correlations were computed between raw change scores of pain, disability, depressive symptoms, perceived injustice (Table 2). Zero-order correlations revealed that post-surgical reductions in depressive symptom severity were associated with reductions in perceived injustice ($r = .24, p < .05$). Post-surgical reductions in pain severity were not significantly correlated with reductions in perceived injustice ($r = .10, p = .29$). Post-surgical reductions in disability were associated with reduction in perceived injustice ($r = .29, p < .05$). Post-surgical reductions in disability were also associated with reductions in depressive symptom severity ($r = .20, p < .05$). Reductions in pain severity were also associated with reductions in disability ($r = .71, p < .001$). BMI was associated with reductions in pain ($r = .26, p < .05$) and disability ($r = .25, p < .05$).

Determinants of changes in perceived injustice

A hierarchical regression was computed to assess the contribution of changes in depressive symptoms, and disability to changes in perception of injustice from pre to post-surgery. Because reduction in pain severity was not correlated with reductions in perceived injustice, changes in pain severity were not included in regression analyses. The overall model was significant, $F(5, 104) = 3.38, p < .05$ 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 perceived injustice. Changes in depressive symptom severity were entered in the third step of the analysis and

accounted for 6% of the variance in changes in perceived injustice. Changes in disability were entered in the last step and accounted for additional 7% of the variance in changes in perceived injustice. Examination of the standardized beta weights from the final regression equation indicated that only reduction in depressive symptom severity ($\beta=0.19, p <.05$), and reductions in disability ($\beta=0.28, p <.05$) 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 the reductions in OA-related suffering and loss following TKA would be associated with reductions 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 and colleagues reported that, in a sample of individuals with musculoskeletal injuries, perceived injustice was associated with pain severity, disability and depressive symptoms [2]. Similar findings were reported across several patient samples including whiplash, spinal cord injury, fibromyalgia, rheumatoid arthritis, and osteoarthritis of the knee [1, 20, 30-33].

The relations between suffering, loss and perceptions of injustice have been addressed by several authors. It has been suggested that life events, including illness or injury, that lead to

suffering, deprivation of resources, and losses might give rise to perceived injustice [6, 9, 10, 34]. Contributions of loss and suffering to perceived injustice can be conceptualized within the theories of distributive justice and equity norms [9, 35]. 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. To date, there has been limited empirical research on the determinants of injustice in the context of debilitating pain conditions and conceptual models of the antecedents and consequences of health-related perceptions of injustice have yet to be put forward.

Consistent with previous research, the results of the present study revealed that the relation between perceptions of injustice and disability was stronger than the relation between perceived injustice and pain severity [2, 32, 36]. In the present study reductions in disability, but not reductions in pain were associated with reductions in perceived injustice. At present there is no conceptual framework that addresses why disability-related losses would be a stronger determinant of perceived injustice than pain severity. One possibility is that pain in later years might be appraised as normative and as such, might not be appraised, as a violation of justice principles [9]. However, for many individuals, the retirement years are intended for the realization of many life dreams. The loss of the ability to realize the dreams of retirement as a result of limitations associated with OA might be more likely to be appraised as a violation of justice principles. Surgical intervention aimed at reducing or minimizing disability might recover some of these losses restoring breaches in justice violation and reducing perceived injustice.

In the present study, reductions in depressive symptoms were associated with reductions in perceived injustice even when controlling for reductions in disability. These findings indicate

that emotional suffering impacts on perceived injustice through mechanisms that are at least partly independent of the experience of disability-related losses. Several empirical investigations have highlighted strong associations between perceived injustice and depressive symptoms [2, 5, 31]. Clinical psychology literature suggests that part of the phenomenology of depression entails a sense of being unfairly punished [37]. The relation between perceived injustice and depressive symptoms is reflected in the item-content of measures of depressive symptoms (i.e., “I feel I am being punished” (BDI-II, item 6)” [38]. Additionally, punitive and invalidating responses of others to one’s suffering have been discussed as important contributors to psychological distress [39-42], and have been identified as important contributors to perceived injustice in individuals with chronic pain [43]. Future research is needed to explore the processes by which reductions in depressive symptomatology lead to reductions in perceived injustice.

The results of hierarchical regression analyses revealed that reductions in depressive symptoms and disability accounted for approximately 10% of the variance in the prediction of reductions in perceived injustice, leaving 90% of the variance not accounted for. A recent study by Scott and colleagues points to additional factors that might be associated with perceived injustice in individuals with debilitating pain conditions. The investigators interviewed individuals with whiplash injuries about sources of injustice. Participants pointed to the actions of employers, insurers, family members, health care providers, and other individuals from their social circle as sources of injustice. Some reasons for identifying the sources included inadequate assessment and treatment by health professionals, invalidation, and lack of social support [43]. It is possible that similar factors might contribute to perceived injustice in patients with severe OA of the knee.

There are important 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 present findings. Assumptions were made about how symptom severity and disability can be construed as proxies for suffering and loss. Assumptions were also 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 will have implications for the confidence that can be placed in the conclusions drawn. Additionally, participants in this study received medical services under publicly funded health care system. Publically 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.

Despite the limitations, this was the first study that to demonstrate that emotional suffering and disability-related losses are important determinants of perceived injustice in individuals with OA of the knee. Post- surgical reductions in disability-related losses and emotional suffering, but not pain severity, were associated with reductions in perceived injustice.

The present findings argue for importance of supplementing surgical and rehabilitative treatment with psychosocial interventions designed to target depressive symptoms and perceived injustice. Future research is needed to determine whether supplementing TKA with psychosocial interventions that target depressive symptoms and perceptions of injustice may translate in more positive recovery outcomes after TKA.

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Table 1: Means and Standard Deviations of Pre and Post treatment variables

Variables	Pre-treatment	Post-treatment	<i>P</i>	Cohen's d
Pain intensity	10.6 (3.3)	3.4 (3.4)	.000	1.82
Disability	37.8 (11.8)	14.4 (11.5)	.000	1.79
Depressive symptoms	6.8 (7.0)	3.5 (5.2)	.000	0.54
IEQ-chr	8.9 (8.4)	6.3 (8.4)	.000	0.40

Note: *N*= 110. IEQ-chr = Injustice Experiences Questionnaire

Table 2. Correlations among variables before surgery

	1	2	3	4	5	6
1. Age						
2. BMI	-.38*					
3. Sex	-.06	-.03				
4. IEQ-chr	-.08	-.02	-.05			
5. Depressive symptoms	-.09	-.04	-.01	.52**		
6. Pain intensity	-.26*	.24*	-.07	.50**	.31*	
7. Disability	-.18	.17	.01	.53**	.39**	.71**

Note: $N = 110$; IEQ-chr =Injustice Experiences Questionnaire

* $p < .05$, ** $p < .001$

Table 3. Correlations among change scores pre and post treatment

	1	2	3	4	5	6
1. Age						
2. BMI	-.33*					
3. Sex	-.04	-.04				
4. Δ IEQ-chr	-.13	-.01	-.03			
5. Δ Depressive symptoms	-.15	-.02	.15	.24*		
6. Δ Pain intensity	-.14	.26*	-.02	.10	.07	
7. Δ Disability	-.15	.25*	.08	.29*	.20*	.70**

Note: $N = 110$; Δ IEQ-chr = Changes in Injustice Experiences Questionnaire; Δ Depressive symptoms = Changes in Depressive Symptoms; Δ Pain intensity = Changes in Pain intensity; Δ Disability = Changes in disability.

* $p < .05$, ** $p < .001$

Table 4. Regression analyses predicting post-treatment changes in perceived injustice

	Beta	R ² change	F change
Dependent = Change in scores of IEQ			
Step 1			
Age	-.08		
BMI	-.09		
Sex	-.09	.02	.68 (3, 106)
Step 3			
Δ Depressive symptoms	.19*	.06	6.18 (1, 105)*
Step 4			
Δ Disability	.27*	.07	8.00 (1,104)*

Note: *N* = 110; BMI = Body Mass Index; Δ Depressive symptoms = Changes in Depressive Symptoms; Δ Pain intensity = Changes in Pain intensity; Δ Disability = Changes in disability. Standardized Betas are reported for the final step.

**p* < .05