

A Systematic Review of the Association Between Perceived Injustice and Pain-Related Outcomes in Individuals with Musculoskeletal Pain

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Abstract

Objective. A growing body of literature shows that justice-related appraisals are significant determinants of pain-related outcomes and prolonged trajectories of recovery. We conducted a systematic review of the literature assessing the relationship between perceived injustice and pain-related outcomes in individuals with musculoskeletal pain. **Design and Participants.** A search of published studies in English in PubMed, PsychInfo, Embase, and Cochrane Database of Systematic Reviews from database inception through May 2019 was performed. Search terms included "perceived injustice," "injustice appraisals," "perceptions of injustice," and "pain" or "injury." **Results.** Thirty-one studies met inclusion criteria. Data for a total of 5,969 patients with musculoskeletal pain were extracted. Twenty-three studies (71.9%) reported on individuals with persistent pain lasting over three months, and 17 studies (53.1%) reported on individuals with injury-related musculoskeletal pain. Significant associations were found between perceived injustice and pain intensity, disability and physical function, symptoms of depression and anxiety, post-traumatic stress disorder, quality of life and well-being, and quality of life and social functioning. **Conclusions.** This systematic review summarizes the current evidence for the association between perceived injustice and pain-related outcomes. There is strong evidence that perceived injustice is associated with pain intensity, disability-related variables, and mental health outcomes. Implications and directions for future research are discussed.

Key Words: Perceived Injustice; Injustice Appraisals; Pain; Musculoskeletal; Pain Outcomes

Introduction

In the past decade, numerous investigations have examined the role of perceived injustice on health and mental health outcomes associated with pain. An emerging body of research suggests that, for some individuals, life following accidental injury might be experienced with a sense of injustice [1]. In addition to significant and persistent physical and emotional suffering, postinjury life might be replete with loss, including the loss of employment, financial security, independence, and social activities [2–4]. Although some of these losses might be

temporary, others might be permanent [5–7]. The experience of suffering as a result of another's actions and the experience of irreparable loss are likely to give rise to the perception of injustice [8,9].

In the context of debilitating injury, perceived injustice has been defined as an appraisal of the severity and irreparability of injury-related losses, unfairness, and external attribution of blame [10]. Perceptions of injustice are likely to arise in circumstances under which individuals consider that they have suffered undeserved losses or hardship [11–16]. Clinicians report that the discourses of individuals with persistent pain frequently include

verbalizations such as “I wish he could see what he has done to my life,” “What did I do to deserve this?” or “Nothing will ever make up for what I have gone through” [17]. Together, these statements reflect the perceived unfairness of suffering, the magnitude of loss consequent to injury, the inadequacy of compensation, and the desire for retribution. Findings suggest that justice-related appraisals are likely to trigger a cascade of cognitive, emotional, and behavioral responses that ultimately compromise the recovery process following injury [1].

A growing body of literature shows that justice-related appraisals are significant determinants of adverse pain-related outcomes and prolonged trajectories of recovery. In the past decade, two narrative reviews have addressed the associations between perceptions of injustice and adverse recovery outcomes [1,17], both concluding that there is strong evidence of an association between perceived injustice and pain-related outcomes, particularly disability-related outcomes. In cross-sectional, prospective, and experimental research, perceived injustice has been associated with greater chronicity and severity of pain, prolonged work disability, reduced functioning, the persistence of symptoms of depression and post-traumatic stress, heightened displays of pain behavior, and medication use [18–25]. Perceived injustice has been shown to be a strong predictor of adverse pain outcomes even when controlling for other pain-related psychological factors, such as pain catastrophizing and fear of movement [23,26–28]. To date, research has focused primarily on individuals with musculoskeletal (MSK) pain following debilitating injury. However, recent studies have demonstrated the negative impact of perceived injustice in noninjury samples, including individuals suffering from a wide range of debilitating MSK pain conditions, such as osteoarthritis [28,29] and fibromyalgia [26,30].

The bulk of research examining the relation between perceived injustice and pain-related outcomes has been conducted using the Injustice Experiences Questionnaire (IEQ). The IEQ consists of 12 items reflecting various justice-related appraisals relevant to the experience of injury and is comprised of two subscales that have been labeled severity/irreparability of loss and blame/unfairness [10]. A recently developed short version of the IEQ (IEQ-SF) has been adapted to patients suffering from a wide range of debilitating health and mental health conditions; it allows for easier and quicker patient screening, particularly with insurers [31]. In addition, a measure of trait perceived injustice has been developed and validated in a healthy sample to examine the trait-like characteristics of perceived injustice [32]. In recent years, the IEQ has also been validated in Japanese [33] and Persian [34]. It has also been validated in Australian [35] and Irish populations [36] and individuals with acute trauma [37], osteoarthritis of the knee [29], fibromyalgia [26], and sickle cell disease [38].

Given the expansion of this research area, it is timely to provide researchers and clinicians with a

comprehensive summary of available research on the association between perceived injustice and pain-related outcomes in individuals with MSK pain. We present a systematic review of the relationship between perceived injustice and adverse pain-related outcomes in adults with MSK pain. From a review of available findings, we endeavor to address the theoretical models that account for the body of existing literature, and we discuss implications for the development and implementation of pain-reducing interventions.

Methods

Search Strategy

The electronic databases of PubMed, PsychInfo, Embase, and Cochrane Database of Systematic Reviews were searched for the terms/concepts “perceived injustice” (or “injustice perception” and “injustice appraisal”) and “pain” or “injury.” Additional studies were identified through assessment of reviews [1,17]. All citations were imported into Papers 3.4.18, and duplicates were removed.

Study Selection

The current systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist [39]. Abstracts of articles were reviewed by two authors (JSC and SDP), and studies were selected if they met the following inclusion criteria based on title and abstract: 1) involved participants over 18 years of age; 2) at least 50% of the sample reported MSK pain; 3) published in the English language; 4) reported a quantitative association between perceived injustice and pain-related outcomes. All abstracts included by either reviewer underwent a full-text review. Studies could recruit from a variety of settings, including clinical or community settings. Studies that did not directly measure perceptions of injustice (e.g., measures of just-world beliefs) were excluded from this review. Moreover, we only included studies that reported cross-sectional associations and prospective associations in which perceived injustice was measured before or at the same time as the assessment of the pain-related outcomes. We did not include studies that reported associations in which perceived injustice was measured at a later time point than the pain-related outcomes. Full-text articles of remaining citations were retrieved and assessed for inclusion by the same two authors using the same criteria. Disagreements were resolved by discussion with a third author, if necessary. For the purpose of this systematic review, all injustice-associated comorbidities are referred to as “pain-related variables” or “pain-related outcomes.”

Data Extraction

Data for a total of 5,969 patients were extracted. It must be noted that there were overlapping samples in studies

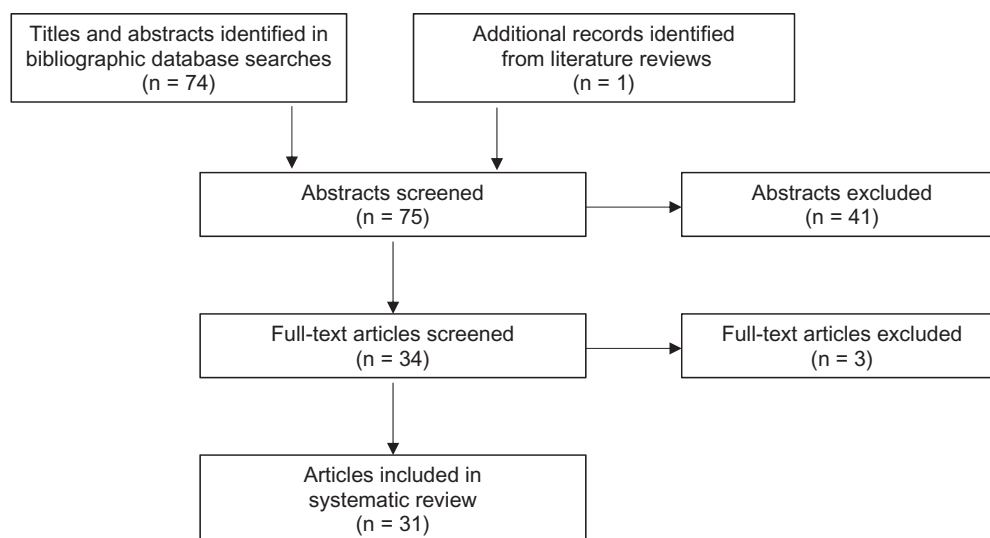


Figure 1. Study flow diagram.

on individuals with osteoarthritis [28,40–42], whiplash injury [20,42,43], and chronic pain [24,44,45]. When overlapping samples were identified, data were extracted from secondary studies if they reported associations with pain-related variables that were not included in the primary paper.

For included studies, data were extracted on author group, year of publication, type of MSK pain, country of study origin, sample age, sex, duration of pain, and study setting. Data were also extracted on the measure of perceived injustice, the mean perceived injustice score, and the nature of the association with pain-related outcomes of interest, such as pain intensity, disability, physical function, pain interference, return to work, symptoms of depression and anxiety, post-traumatic stress disorder (PTSD), health and well-being, quality of life, and social functioning. If more than one measure was available for each domain, we extracted data for the most commonly used measure across included studies. Data were not extracted from healthy samples (individuals without MSK pain or with unspecified chronic pain), as this was not the aim of this review.

Quality Assessment

Study quality was assessed using the Modified Newcastle-Ottawa Quality Assessment Scale (NOS) for nonrandomized studies [46], which has been used in previous research [47]. A score for quality was used to assess study selection, study comparability, and quality of the outcome variables. Under the “study selection” criterion, studies received 1 point for representativeness if the sample was truly or somewhat representative of the average adult with MSK pain, 1 point if a justification for sample size and/or power calculation was provided, 1 point if a validated measurement tool was used to assess perceived injustice, and 1 point if the response rate was provided. Under the “study comparability” criterion, studies

received 1 point if basic demographic measures (e.g., age, sex, marital status, education) were controlled for and a total of 2 points if other pain-related variables (e.g., pain intensity, pain catastrophizing, fear of movement) were also controlled for. Under the “quality of outcome variables” criterion, studies received 1 point if self-report was used to assess the outcomes, 1 point if appropriate statistical analyses were conducted, and 1 point if the duration of the follow-up was over six months. Each study was assigned a numerical score out of a possible 9 points (Kappa score = 0.82), which represents the sum of the scores in each criterion. Quality assessments were classified as low (between 0/9 and 3/9), moderate (between 4/9 and 6/9), or strong (between 7/9 and 9/9).

Results

Study Selection

The electronic search identified 74 papers after duplicates were removed. One additional article was identified from examining the bibliographies of included manuscripts. Following selection based on titles and abstracts, 34 articles were selected for full-text review. Following full-text review, 31 full-text articles met the inclusion criteria and were selected for data extraction (Figure 1).

Study Characteristics

Table 1 presents the characteristics of each study, and Table 2 presents the quality assessment. The mean age for patients in all the studies (with one exception [45]) was 45.3 years. Sturgeon et al. [45] reported a median age of between 40 and 49 years. Overall, samples consisted of 56% women. On average, the mean duration of pain was 5.6 years, with eight studies reporting pain duration under one year, six studies reporting pain duration between one and five years, and eight studies reporting pain duration over five years.

Table 1. Characteristics of selected studies

Authors	Year	Pain Type	Persistent Pain (>3 mo)	Injury-Related	Country	Sample Size	Mean Age, y	% Women	Mean Pain Duration	Perceived Injustice Measure	Mean (SD)	Study Setting
Agrarap et al.	2016	Mixed MSK injury (motor vehicle accident, falls, other)	Yes	Yes	United States	206	47.5	40.3	1.00	IEQ	16.74 (14.92)	Prospective
Carriere et al. (a)	2017	Whiplash injury (neck and back pain)	No	Yes	Canada	152	36.4	47.0	0.29	IEQ	16.15 (8.29)	Prospective
Carriere et al. (b)	2017	Mixed chronic pain (muscle, disk, nerve, other)	Yes	N/S	United States	344	48.0	67.0	N/A	IEQ	N/A	Cross-sectional
Carriere et al.	2018	Mixed chronic pain (muscle, disk, nerve, other)	Yes	N/S	United States	354	47.5	67.0	N/A	IEQ	16.80 (11.41)	Cross-sectional
Ferrari et al.	2015	Whiplash injury (neck and back pain)	No	Yes	Canada	134	36.6	54.5	0.04	IEQ	7.40 (1.60)	Longitudinal
Giummarra et al.	2016	Mixed MSK trauma (motor vehicle, work-related injury, victim of crime, other)	Yes	Yes	Australia	364	43.0	22.3	1.00	IEQ	11.79 (11.24)	Cross-sectional
Giummarra et al.	2017	Mixed MSK injury (traffic injury, work-related injury, home injury, other)	Yes	Yes	Australia	433	44.8	25.2	1.13	IEQ	16.24* (13.22)*	Prospective
Ioannou et al.	2016	Mixed MSK injury (motor vehicle crash and work injury)	Yes	Yes	Australia	160	43.0	25.0	1.12	IEQ	20.52 (14.61)	Cross-sectional
Margiotta et al.	2017	MSK pain (back pain, neck pain, joint pain, neuropathy)	Yes	Yes	Ireland	80	49.0	59.0	2.00	IEQ	28.91 (11.10)	Cross-sectional
Martel et al.	2017	Mixed MSK pain (fibromyalgia, back pain, neck pain, neuropathic pain, arthritis, other)	Yes	N/S	Canada	475	51.0	80.9	N/A	IEQ	29.10 (10.30)	Cross-sectional
Rahbari et al.	2019	Mixed MSK pain (motor vehicle accident, work-related, others)	Yes	N/S	Iran	230	41.6	53.0	3.62	IEQ-Persian	20.15 (9.36)	Cross-sectional
Rodero et al.	2012	Fibromyalgia	Yes	N/S	Spain	250	52.4	95.6	18.3	IEQ	30.10 (12.20)	Cross-sectional
Scott et al.	2012	Unspecified MSK pain	Yes	N/S	Canada	107	41.0	59.0	8.30	IEQ	24.79* (11.36*)	Cross-sectional
Scott et al. (a)	2013	Low back pain, fibromyalgia, myofascial pain, and pain of the cervical spine	Yes	N/S	Canada	173	49.7	65.0	9.98	IEQ	28.91 (11.11)	Cross-sectional
Scott et al. (b)	2013	Whiplash injury and work-related back injury	No	Yes	Canada	103	35.9	70.0	0.35	IEQ	22.15 (9.87)	Prospective
Scott et al.	2015	Whiplash injury (neck and back pain)	Yes	Yes	Canada	103	34.7	70.0	N/A	IEQ	26.43 (9.03)	Prospective
Scott et al.	2016	Neck and back pain	Yes	Yes	Canada	66	40.0	52.0	0.96	IEQ	31.71 (8.55)	Cross-sectional
Scott et al.	2019	Mixed chronic pain (low back, generalized, lower limbs, shoulder, neck, others)	Yes	N/S	United Kingdom	300	45.2	68.3	13.37	IEQ	31.84 (9.96)	Prospective
Sturgeon et al.	2016	Muscle pain, disk pain, bone problems, and others	Yes	N/S	United States	302	47.6	62.6	8.67	IEQ	17.92 (11.40)	Cross-sectional
Sturgeon et al.	2017		Yes	N/S	United States	330	N/A	90.0	15.00	IEQ	30.00 (10.30)	Cross-sectional

(continued)

Table 1. continued

Authors	Year	Pain Type	Persistent Pain (>3 mo)	Injury-Related	Country	Sample Size	Mean Age, y	% Women	Mean Pain Duration	Perceived Injustice Measure	Mean (SD)	Study Setting
		Mixed chronic pain (fibromyalgia, headaches, muscle pain, pelvic pain, others)										
Sullivan et al.	2008	Neck and back pain (work injury or motor vehicle accident)	N/S	Yes	Canada	226	37.7	53.0	N/A	IEQ	19.48* (12.09)*	Prospective
Sullivan et al.	2009	Whiplash injury	No	Yes	Canada	112	35.8	68.0	0.35	IEQ	22.3 (9.7)	Prospective
Trost et al.	2015	Mixed MSK injury (motor vehicle, work-related, falls, and others)	Yes	Yes	United States	155	47.5	41.3	N/A	IEQ	17.07 (14.55)	Cross-sectional
Trost et al.	2016	Low back pain	Yes	N/S	United States	53	39.2	47.0	N/A	IEQ	21.91 (13.08)	Cross-sectional
Trost et al.	2017	Spinal cord injury	Yes	Yes	United States	53	47.6	34.0	0.56	IEQ	15.37 (12.35)	Cross-sectional
Trost et al.	2019	Low back pain	Yes	N/S	United States	137	41.0	46.7	8.52	IEQ	24.81 (12.44)	Cross-sectional
Van Leeuwen et al.	2016	Orthopedic trauma	No	Yes	United States	124	54.0	50.0	0.21	IEQ	16.00 (11.00)	Cross-sectional
Yamada et al.	2016	Mixed MSK injury (motor vehicle accident, work-related injury, falls, other)	N/A	Yes	Japan	71	50.7	53.5	N/A	IEQ-japanese	24.10 (12.00)	Cross-sectional
Yakovob et al.	2014	Knee osteoarthritis	Yes	N/S	Canada	116	67.0	61.0	7.60	IEQ-Chr	9.00 (8.70)	Prospective
Yakovob et al. (a)	2018	Whiplash injury (neck and back pain)	No	Yes	Canada	146	36.6*	45.2	0.17*	IEQ	22.80 (9.70)	Prospective
Yakovob et al. (b)	2018	Knee osteoarthritis	Yes	N/S	Canada	110	66.9	62.7	N/A	IEQ-Chr	8.90 (8.40)	Prospective

Persistent pain = average pain duration longer than three months.

IEQ = Injustice Experience Questionnaire; IEQ-Chr = Injustice Experience Questionnaire-Chronic; MSK = musculoskeletal; N/S = not specified.

* Calculated from raw data.

Table 2. Study quality assessment using the modified Newcastle-Ottawa Quality Assessment Scale

Authors	Year	Selection	Comparability	Outcome	NOS Score
Agtarap et al.	2016	***		**	5/9
Carriere et al. (a)	2017	***	**	***	8/9
Carriere et al. (b)	2017	**	*	**	5/9
Carriere et al.	2018	**	**	**	6/9
Ferrari et al.	2015	****		**	6/9
Giummarra et al.	2016	**	**	**	6/9
Giummarra et al.	2017	***	**	***	8/9
Ioannou et al.	2016	***		**	5/9
Margiotta et al.	2017	***		**	5/9
Martel et al.	2017	**		**	4/9
Rahbari et al.	2019	**	**	**	6/9
Rodero et al.	2012	**	**	**	6/9
Scott et al.	2012	**	*	**	5/9
Scott et al. (a)	2013	****	*	**	7/9
Scott et al. (b)	2013	**	*	***	6/9
Scott et al.	2015	**	*	**	5/9
Scott et al.	2016	**		**	4/9
Scott et al.	2019	**	**	**	6/9
Sturgeon et al.	2016	**	*	**	5/9
Sturgeon et al.	2017	***		**	5/9
Sullivan et al.	2008	**	*	***	6/9
Sullivan et al.	2009	**	*	**	5/9
Trost et al.	2015	***	**	***	8/9
Trost et al.	2016	**		**	4/9
Trost et al.	2017	**	**	**	6/9
Trost et al.	2019	***	*	**	6/9
Van Leeuwen et al.	2016	***	*	**	6/9
Yakovov et al.	2014	**	**	***	7/9
Yakovov et al. (a)	2018	**	**	**	6/9
Yakovov et al. (b)	2018	**	**	***	7/9
Yamada et al.	2016	***		**	5/9

NOS score was calculated as the sum of points for study selection (representativeness of sample, power calculation, quality of risk factor measurement tool, response rate), study comparability (use of controls), and quality of the outcome variables (type of assessment of outcomes, appropriate statistical analyses, use of long-term follow-up data [more than six months]).

NOS = Newcastle-Ottawa Quality Assessment Scale.

*Asterisk indicates one point on the modified NOS.

From the 31 studies included in this review, 19 used a cross-sectional study design, 11 used a prospective study design, and one used a retrospective cohort design. Twenty-three studies (71.9%) reported on individuals with persistent pain lasting over three months, and 17 studies (53.1%) reported on individuals with injury-related MSK pain (e.g., motor vehicle accidents, work-related injuries, falls, etc.). Two studies reported exclusively on individuals with osteoarthritis, and one on individuals with fibromyalgia. Most studies were conducted in Canada (N=13) and the United States (N=10). Others were conducted in Spain, Ireland, Australia, Japan, the United Kingdom, and Iran.

All studies used the Injustice Experience Questionnaire to measure perceived injustice as a risk factor for problematic recovery. Five of these studies were validation studies for the IEQ in Danish, Japanese, and Persian languages, as well as in Australian, Irish, and trauma samples. Across all studies, the mean IEQ score (SD, range) was 20.98 (10.80, 7.40–31.84). The mean IEQ score did not differ significantly between individuals with persistent pain (average pain duration over three

months; M [SD]=21.77 [7.31]) and individuals with acute pain (average pain duration under three months; M [SD]=18.80 [5.1], $t(1, 28) = -1.19$, $P = 0.251$). However, correlational analyses revealed that perceived injustice was significantly associated with average pain duration ($r = 0.532$, $P = 0.01$). The mean IEQ score did not differ significantly between individuals with trauma-related pain (M [SD]=19.72 [6.14]) and non-trauma-related pain (M [SD]=22.63 [7.76], $t(1, 28) = 1.11$, $P = 0.277$).

Study Quality Assessment

Overall, the global rating for study quality was moderate (N=26) or strong (N=5). No studies were identified as being of low quality. All studies used representative/somewhat representative samples and described demographics and sample characteristics adequately. All studies also used validated measures of perceived injustice and self-report assessments. Only eight studies reported results for follow-up periods over six months. Most studies lacked an adequate description of statistical power (N=22) and response rates (N=26). Ten studies did not

account for possible confounders. Basic demographic confounders were included in 10 studies, and 12 studies controlled for confounders such as pain intensity, pain duration, and/or other biopsychosocial factors.

Study Findings

Table 3 provides a summary of all the study findings. Also shown is whether perceived injustice was found to be a significant predictor of pain-related outcomes in univariate or multivariate analyses and whether the construct was part of a predictive model.

Perceived Injustice and Pain Intensity

The majority of the studies included in this review examined the association between perceived injustice and pain intensity. Based on this review, there is moderate evidence that perceived injustice is associated with heightened pain intensity. Twenty-two studies (88% of those that evaluated associations between IEQ scores and pain intensity) reported that perceived injustice was associated with higher pain intensity [10,19,24–26,28,33,34,36,37,42,44,45,48–56], nine of which used multivariate analyses [10,19,25,34,44,49–51,53], and three were part of a predictive model [10,28,45]. However, three studies reported nonsignificant associations in univariate analyses [23,27,57], and two reported nonsignificant associations in multivariate analyses [54,55]. Across these studies, the most common measures of pain intensity were the numeric rating scale (NRS; 0–10), the visual analog scale (VAS; 0–100), and the McGill Pain Questionnaire Pain Intensity Index and Present Pain Index [58].

Perceived Injustice and Disability-Related Variables

There is strong evidence of an association between perceived injustice and disability-related variables. Twelve studies (100% of those who examined associations between IEQ scores and disability-related variables) reported a significant association between perceived injustice and disability [10,19,23,33,34,40,42,48,49,54,56,57], six reported an association between perceived injustice and physical function [26,28,44,54,55,59], and six reported an association between perceived injustice and pain interference [33,40,45,48,50,51]. In addition, four studies demonstrated that perceived injustice was associated with return to work status [10,20,40,43], and one study reported an association with self-reported recovery [18]. Of these studies, three reported nonsignificant multivariate associations with disability and/or function [10,44,55]. The most common measures for disability-related variables were the Pain Disability Index [60], the Western Ontario and McMaster Universities Osteoarthritis Index [61], the Brief Pain Inventory [62], and Patient-Reported Outcomes Measurement Information System measures [63,64]. It must be noted

that certain measures, such as the Western Ontario and McMaster Universities Osteoarthritis Index, were used to measure both disability and physical function.

Perceived Injustice and Mental Health Outcomes

There is strong evidence that perceived injustice is associated with mental health outcomes. Nineteen studies (100% of which examined associations between IEQ scores and depression) reported a significant association with symptoms of depression [10,19,21,23–27,34,37,40,42,45,48–50,53,54,57], three reported a significant association with symptoms of anxiety [26,41,48], and seven reported a significant association with PTSD symptoms [23,25,37,40,42,48,53]. None of these studies reported nonsignificant associations between perceived injustice and mental health outcomes. Common measures were the Patient Health Questionnaire [65], the Beck Depression Inventory [66,67], the Hospital Anxiety and Depression Scale [68], and the Primary Care PTSD Screen [69,70].

Perceived Injustice and Quality of Life and Health Status

Perceived injustice was significantly associated with quality of life in two studies [25,37], although Trost et al. reported a nonsignificant association between perceived injustice and physical quality of life in multivariate analyses. One study reported a nonsignificant multivariate association between perceived injustice and health status [40]. There was mixed evidence of an association between perceived injustice and opioid status, with one study reporting a significant univariate association between perceived injustice and opioid status [24] and one study reporting a nonsignificant association between perceived injustice and opioid status in multivariate analyses [44]. Finally, one study also reported a prospective association between perceived injustice and life satisfaction [45].

Perceived Injustice and Social Functioning

Three studies reported an association between perceived injustice and social functioning [45,50,51]. Of these, two reported significant associations using multivariate analyses [50,51]. Given the limited number of studies, measures for social functioning varied greatly.

Discussion

This systematic review investigates the association between perceived injustice and adverse pain-related outcomes in individuals with MSK pain. The results of this review are in accordance with a growing body of literature demonstrating an association between perceived injustice and problematic recovery in individuals with pain conditions. More specifically, this review provides significant evidence that perceived injustice is associated with

Table 3. Summary of study findings

Outcome	Author Group	Year	Outcome Measure	Univariate	Multivariate	Part of Predictive Model	Outcome
Pain intensity	Agtarap et al.	2016	NRS 0–10	✓			Associated with higher pain intensity
	Carriere et al. (b)	2017	NRS 0–10	✓			Associated with higher pain intensity
	Carriere et al.	2018	NRS 0–10	✓	✓		Associated with higher pain intensity
	Ioannou et al.	2016	MPQ	✓			Associated with higher pain intensity
	Margiotta et al.	2017	NRS 0–10	✓			Associated with higher pain intensity
	Martel et al.	2017	NRS 0–10	✓	✓		Associated with higher pain intensity
	Rahbari et al.	2019	MPQ	✓	✓		Associated with higher pain intensity
	Rodero et al.	2012	VAS 0–100	✓			Associated with higher pain intensity
	Scott et al.	2012	NRS 0–10	X			Not associated with pain intensity
	Scott et al. (a)	2013	NRS 0–10	✓	✓		Associated with higher pain intensity
	Scott et al.	2016	VAS 0–10	X			Not associated with pain intensity
	Scott et al.	2019	NRS 0–4	✓	✓		Associated with higher pain intensity
	Sturgeon et al.	2016	NRS 0–10	✓	✓		Associated with higher pain intensity
	Sturgeon et al.	2017	NRS 0–10	✓		✓	Associated with higher pain intensity
	Sullivan et al.	2008	MPQ	✓	✓	✓	Associated with higher pain intensity
	Sullivan et al.	2009	NRS 0–10	X			Not associated pain intensity
	Trost et al.	2015	NRS 0–10	✓	✓		Associated with higher pain intensity
	Trost et al.	2016	NRS 0–10	✓			Associated with higher pain intensity
	Trost et al.	2017	MPQ-PPI	✓	✓		Associated with higher pain intensity
	Trost et al.	2019	MPQ-PRI	✓	X		Associated with higher pain intensity in univariate analyses, but not in multivariate analyses
Disability	Van Leeuwen et al.	2016	PROMIS pain	✓	X		Associated with higher pain intensity in univariate analyses, but not in multivariate analyses
	Yamada et al.	2016	MPQ-PRI	✓			Associated with higher pain intensity
	Yakovov et al.	2014	WOMAC	✓		✓	Associated with presurgical and postsurgical pain
	Yakovov et al. (a)	2018	WOMAC	✓			Associated with higher pain intensity
	Yakovov et al. (b)	2018	MPQ	✓			Associated with higher pain intensity
	Ioannou et al.	2016	PDI	✓			Associated with higher disability
	Giummarra et al.	2017	GOS-E		✓		Associated with higher disability
	Martel et al.	2017	PDI	✓	✓		Associated with higher disability
	Rahbari et al.	2019	PDI	✓	✓		Associated with higher disability
	Scott et al. (a)	2013	PDI	✓	✓		Associated with higher disability
Function	Scott et al.	2016	PDI	✓			Associated with higher disability
	Sullivan et al.	2008	PDI	✓	X		Associated with higher disability in univariate analyses, but not in multivariate analyses
	Sullivan et al.	2009	NDI	✓			Associated with higher neck disability
	Trost et al.	2019	PDI	✓	✓		Associated with higher disability
	Yamada et al.	2016	PDI	✓			Associated with higher disability
	Yakovov et al. (a)	2018	WOMAC	✓			Associated with higher disability
	Yakovov et al. (b)	2018	NDI	✓			Associated with higher neck disability
	Carriere et al.	2018	PROMIS physical function	✓	X		Associated with lower physical function in univariate analyses, but not in multivariate analyses
	Rodero et al.	2012	FIQ	✓	✓		Association with higher function
	Trost et al.	2019	RMDQ	✓	✓		Associated with higher functional limitation
Pain interference	Van Leeuwen et al.	2016	PROMIS physical function	✓	X		Associated with lower physical function in univariate analyses, but not in multivariate analyses
	Yakovov et al.	2014	WOMAC	✓		✓	Associated with presurgical and postsurgical function
	Ioannou et al.	2016	BPI	✓			Associated with higher pain interference
	Giummarra et al.	2017	BPI		✓		Associated with higher pain interference
	Scott et al.	2019	BPI	✓	✓		Associated with higher pain interference
	Sturgeon et al.	2016	PROMIS pain interference	✓	✓		Associated with higher pain interference
	Sturgeon et al.	2017	PROMIS pain interference	✓		✓	Associated with higher pain interference
RTW	Yamada et al.	2016	BPI	✓			Associated with higher pain interference
	Carriere et al. (a)	2017	RTW status (yes/no)			✓	Associated with decreased likelihood of return to work at 1-y follow-up
	Giummarra et al.	2016	RTW status (yes/no)		✓		Associated with decreased likelihood of return to work at 1-y follow-up

(continued)

Table 3. continued

Outcome	Author Group	Year	Outcome Measure	Univariate	Multivariate	Part of Predictive Model	Outcome
	Scott et al. (b)	2013	RTW status (yes/no)			✓	Associated with decreased likelihood of return to work at 1-y follow-up
	Sullivan et al.	2008	RTW status (yes/no)			✓	Associated with decreased likelihood of return to work at 1-y follow-up
Self-reported recovery	Ferrari et al.	2015	“Do you feel you have recovered from your injuries?” with responses of “yes,” “no,” or “not sure”	X			Not associated with self-reported recovery at 3-mo follow-up Associated with higher self-reported recovery at 6-mo follow-up
Depressive symptoms	Agtarap et al.	2016	PHQ-8	✓			Associated with higher depressive symptoms
	Carriere et al. (b)	2017	PROMIS depression	✓			Associated with higher depressive symptoms
	Giummarra et al.	2016	HADS	✓			Associated with higher depressive symptoms
	Ioannou et al.	2016	HADS	✓			Associated with higher depressive symptoms
	Martel et al.	2017	PHQ-8	✓	✓		Associated with higher depressive and anxiety symptoms
	Rahbari et al.	2019	BDI-II	✓	✓		Associated with higher depressive symptoms
	Rodero et al.	2012	HADS	✓	✓		Associated with higher depressive symptoms
	Scott et al.	2012	BDI-II	✓	✓		Associated with higher depressive symptoms
	Scott et al. (a)	2013	PHQ-9	✓	✓		Associated with higher depressive symptoms
	Scott et al.	2015	BDI-II			✓	Associated with less change in depressive symptoms
	Scott et al.	2016	PHQ-9	✓			Associated with higher depressive symptoms
	Scott et al.	2019	PHQ-9	✓	✓		Associated with higher depressive symptoms
	Sturgeon et al.	2017	PROMIS depression	✓		✓	Associated with higher depressive symptoms
	Sullivan et al.	2008	BDI-II	✓	✓		Associated with higher depressive symptoms
	Sullivan et al.	2009	BDI-II	✓			Associated with higher depressive symptoms
	Trost et al.	2015	PHQ-8	✓	✓		Associated with higher depressive symptoms
	Trost et al.	2017	PHQ-9	✓	✓		Associated with higher depressive symptoms
	Trost et al.	2019	PHQ-9	✓	✓		Associated with higher depressive symptoms
	Yakobov et al. (a)	2018	PHQ-9	✓			Associated with higher depressive symptoms
Anxiety symptoms	Giummarra et al.	2016	HADS	✓			Associated with higher anxiety symptoms
	Ioannou et al.	2016	HADS	✓			Associated with higher anxiety symptoms
	Rodero et al.	2012	HADS	✓	✓		Associated with higher anxiety symptoms
PTSD symptoms	Agtarap et al.	2016	PC-PTSD	✓			Associated with higher PTSD symptoms
	Giummarra et al.	2016	PTSD checklist	✓			Associated with higher PTSD symptoms
	Ioannou et al.	2016	PC-PTSD checklist	✓			Associated with higher PTSD symptoms
	Sullivan et al.	2009	IES-R	✓		✓	Associated with higher PTSD symptoms
	Trost et al.	2015	PC-PTSD	✓	✓		Associated with higher PTSD symptoms
	Trost et al.	2017	PC-PTSD	✓	✓		Associated with higher PTSD symptoms
	Yakobov et al.	2018	IES-R	✓		✓	Associated with higher PTSD symptoms
QoL	Agtarap et al.	2016	VR-12	✓			Associated with higher physical quality of life
			VR-12	✓			Associated with lower mental quality of life
	Trost et al.	2015	VR-12	✓	X		Associated with lower physical quality of life in univariate analyses, but not in multivariate analyses
			VR-12	✓	✓		Associated with lower mental quality of life
Health status	Giummarra et al.	2017	EQ-5D		X		Not associated with health status
Opioid use	Carriere et al. (b)	2017	Opioid status (yes/no)	✓			Associated with opioid use status
	Carriere et al.	2018	Opioid status (yes/no)		X		Not associated with opioid use status
Life satisfaction	Sturgeon et al.	2017	SWLQ	✓		✓	Associated with lower life satisfaction

(continued)

Table 3. continued

Outcome	Author Group	Year	Outcome Measure	Univariate	Multivariate	Part of Predictive Model	Outcome
Social functioning	Scott et al.	2019	WSAS	✓	✓		Associated with lower social adjustment
	Sturgeon et al.	2016	PROMIS social isolation	✓	✓		Associated with higher social isolation

✓ = $P < 0.05$; X = $P > 0.05$.

BPI = Brief Pain Inventory; EQ-5D = EuroQOL Five Dimensions Questionnaire; FIQ = Fibromyalgia Impact Questionnaire; GOS-E = Glasgow Outcome Scale-E; HADS = Hospital Anxiety and Depression Scale; HOOS = Hip Disability and Osteoarthritis Outcome Score; IEQ = Injustice Experience Questionnaire; IES-R = Impact of Events Scale-Revised; MPQ = McGill Pain Questionnaire; MPQ-PPI = McGill Pain Questionnaire-Present Pain Index; MPQ-PRI = McGill Pain Questionnaire-Pain Rating Index; NDI = Neck Disability Index; PC-PTSD = primary care PTSD screen; PDI = Pain Disability Index; PHQ = Patient Health Questionnaire; PROMIS = Patient-Reported Outcomes Measurement Information System; PTSD = post-traumatic stress disorder; QoL = quality of life; RMDQ = Roland and Morris Disability Questionnaire; RTW = return to work; SQAS = Work and Social Adjustment Scale; SWLS = Satisfaction with Life Questionnaire; VR-12 = Veterans RAND 12-item Health Survey; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

*Calculated from raw data.

pain intensity, disability-related outcomes, and mental health outcomes. Evidence also exists to support an association between perceived injustice and quality of life, as well as between perceived injustice and social functioning. Although the focus of previous research has primarily been on perceptions of injustice following injury, this review demonstrates that injuries are not the only MSK condition under which perceived injustice may negatively impact pain-related outcomes. Perceptions of injustice are associated with the presence of disabling (i.e., impairing physical, emotional, social, and other types of function) pain in individuals with a variety of MSK pain conditions, including osteoarthritis and fibromyalgia.

Results revealed that perceived injustice was more reliably associated with disability-related variables than with pain intensity. In correlational analyses, every study that examined disability outcomes reported significant associations between perceived injustice and disability-related variables. The magnitude of the correlations between perceived injustice and disability variables was moderately high, ranging from $r = 0.3$ to $r = 0.75$. On the other hand, three studies reported nonsignificant correlations between perceived injustice and pain intensity, along with relatively low correlations, ranging between $r = 0.1$ and $r = 0.4$. Previous research has suggested that perceived injustice may be a better predictor of disability, whereas other psychological variables, such as pain catastrophizing, may be more strongly associated with pain intensity [10]. Our results also suggest that perceived injustice is closely tied to mental health outcomes, such as symptoms of depression and anxiety, as well as post-traumatic stress symptoms. The magnitude of the correlations between perceived injustice and mental health outcomes was relatively high, ranging from $r = 0.3$ to $r = 0.8$. These findings suggest that perceptions of injustice not only interfere with physical recovery after injury, but also negatively impact recovery of the mental health problems associated with the pain experience. It is possible that the negative emotions involved in the pain

experience may also contribute to the maintenance or worsening of disability.

To date, research has proceeded in the relative absence of a guiding conceptual framework. Therefore, the development of a viable model would need to address the different pathways through which perceptions of injustice might impact health and mental health outcomes. Current research on perceived injustice is based on the assumption that injustice appraisals arise consequent to an event characterized by a violation of basic human rights, transgressions of status or rank, or challenges to equity norms and just world beliefs [71–73]. Conceptual models of justice-related appraisals in the context of pain have also highlighted the potential role of blame, loss, and suffering in the subjective experience of injustice [10,72,74]. However, it is likely that any situation that interferes with equal access to resources or opportunities and that is associated with suffering and loss (i.e., the development of a chronic pain condition, even one that did not begin with an identifiable injury) can give rise to perceptions of injustice [1]. Yakobov et al. recently demonstrated that healthy individuals who have a propensity to interpret a wide range of adverse life experiences in terms of injustice react to experimental pain with higher levels of perceived injustice [32]. In this sense, perceptions of injustice may have trait-like characteristics that even in the absence of an eliciting event (i.e., illness or injury) may augment perceptions of injustice and impede the recovery process.

In a recent review, Scott et al. examined the potential sources of injustice among individuals with persistent pain following MSK injury [75]. Results demonstrated that multiple relationships within an individual's social network may be important sources of injustice. Individuals identified employers and colleagues, other drivers, insurers, health care providers, family, significant others, friends, and society as sources of injustice. Common reasons for identifying these sources of injustice were their contribution to the injury, inadequate

assessment or treatment of pain, and punitive responses toward participants' pain expression.

Research is beginning to shed light on the processes through which perceptions of injustice might lead to adverse outcomes in individuals with MSK pain. A greater understanding of processes by which perceived injustice impacts pain-related outcomes might contribute to the development of a theoretical model of perceived injustice in chronic pain and may facilitate the development and implementation of interventions aimed at mitigating the effects of perceived injustice on pain-related outcomes. Although research on these processes is in its infancy, several empirical investigations suggest that affective, cognitive, and behavioral variables might act as pathways by which perceived injustice contributes to adverse outcomes.

Research suggests that anger may serve as an affective pathway by which perceived injustice impacts pain-related outcomes. Evidence from experimental research suggests that injustice appraisals likely trigger anger [13,25,76]. Evidence from clinical research exists to show that anger directed at physicians is common in patients with chronic pain [77,78]. In the context of chronic pain, Scott et al. reported that anger mediated the association between perceived injustice and pain severity in individuals with MSK pain [19]. Trost et al. also demonstrated that perceived injustice mediated the association between perceived injustice and post-traumatic stress symptoms following spinal cord injury [53]. Moreover, anger has been shown to mediate the association between perceived injustice and the therapeutic working alliance in individuals with chronic MSK pain [57]. It is likely that focusing on blame and unfairness might give rise to anger reactions that, in turn, trigger a cascade of psychological and physiological responses that ultimately result in adverse pain outcomes [19]. It has been suggested that anger reactions may take the form of nonadherence to treatment recommendations and may give rise to revenge motives to "right the wrongs" of the unjust situation [9,79]. Finally, feelings of anger are associated with endogenous opioid dysfunction in response to painful stimuli, and the induction of anger has been shown to increase muscle tension and systolic blood pressure, possibly augmenting sensitivity to pain [80,81]. Pain acceptance has been discussed as a potential process by which perceived injustice may contribute to adverse pain-related outcomes. Studies have reported strong associations between high perceived injustice and low pain acceptance in individuals with chronic pain [26,49]. A recent investigation demonstrated that pain acceptance mediated the impact of perceived injustice on physical function, pain intensity, and opioid use [82]. This suggests that individuals who experience high levels of perceived injustice may be less willing to experience pain and to engage in meaningful activities despite pain. It is also possible that perceptions of injustice lead individuals to become "stuck" and resort to passive coping mechanisms that do not promote healthy recovery [83]. The ineffective struggle

to control and avoid pain may undermine pain-related outcomes in individuals with MSK pain.

It has been suggested that perceived injustice might impact pain outcomes in a similar way as pain catastrophizing [1,17]. The strong correlations and possible conceptual overlap between these constructs suggest that perceived injustice may lead to rumination and to an excessive focus on pain, suffering, and losses [1]. It has also been suggested that, similar to the consequences of catastrophizing, perceived injustice may lead to attentional disengagement difficulties, emotional distress, and maladaptive coping mechanisms that compromise the recovery process [17,52]. Trost et al. reported that attentional bias toward pain was associated with higher perceived injustice in patients with chronic low back pain [52].

Expectancies have also been discussed as a mechanism by which perceived injustice impacts recovery. In a study of individuals with whiplash injury, Carriere et al. demonstrated that low recovery expectancies mediated the association between perceived injustice and return to work [43]. It has been suggested that expectancies have a detrimental impact on behavior by compromising the effort that individuals invest in achieving their goals [84,85]. In this sense, it is possible that expectancies have a detrimental impact by reducing motivation to actively engage in behaviors that promote recovery and rehabilitation. Research has also shown that individuals preferentially process information that is consistent with expectancies and discount information that is inconsistent with expectancies [86]. In the context of pain, individuals may discount information related to recovery and functional improvement and focus their attention on expectancy-consistent information such as symptom severity and limitations.

Numerous studies to date have suggested that pain behavior may be another pathway by which perceived injustice impacts pain-related outcomes. Pain behavior refers to movement alterations or expressive displays, such as holding or rubbing affected areas of the body, activity avoidance, facial grimaces, and vocalizations [87]. Research has shown that high levels of perceived injustice are associated with heightened pain behaviors in individuals with whiplash injury [22]. It has been suggested that heightened pain behaviors may be a vehicle through which individuals with high perceptions of injustice communicate or emphasize the magnitude of their suffering [17,22]. However, the expression of pain behavior may inadvertently have unintended negative effects. It is possible that pain behavior may contribute to prolonged disability by compromising task performance and influencing other individuals' judgments about their ability to perform certain tasks. For example, the expression of heightened pain behavior might lead prescribers to infer high levels of pain and disability and, in turn, consider more aggressive medical pain management [24]. Indeed, a cross-sectional investigation reported that pain

behavior mediated the relationship between perceived injustice and opioid use in individuals with chronic pain [24].

Research has also pointed to the role of litigation, or involvement in a compensation system, in negative pain-related outcomes [88,89]. Such retribution motives are likely to arise in the context of feeling wronged as a result of another person's negligent, reckless, or intentional behavior and may augment perceptions of injustice [1,90]. A study in individuals with spinal cord injury demonstrated that high perceived injustice was associated with intention to litigate [91]. Accordingly, in a review, compensation status and legal representation were associated with poorer physical and psychological outcomes following MSK injury [92]. Perceived injustice may be the only currency by which individuals seek to restore perceptions of unfair suffering and losses that were inflicted upon them. The issue with perceived injustice is that there is not just a subjective component, but also an objective reality, which makes it difficult to target and change in clinical settings [1]. In the context of injury, seeking compensation or pursuing litigation is one means by which the individual can seek retribution [1]. In some cases, "disability" may be the only "power" that an individual possesses in efforts to bring retribution for losses sustained [17].

Accumulating evidence highlighting the adverse impact of perceived injustice on pain-related outcomes calls for the development of interventions for the treatment and management of perceived injustice in patients with pain. At present, multidisciplinary approaches incorporating components of cognitive-behavioral therapy are the standard treatment for individuals with MSK pain. However, these interventions focus on problematic cognitions such as pain catastrophizing and fear of movement. The clinical management of perceived injustice in the treatment of individuals with persistent MSK pain has not been systematically addressed. Research has shown that multidisciplinary approaches in rehabilitation programs have a negligible impact on reducing significantly the levels of perceived injustice [10]. In a study examining treatment-related changes in psychosocial risk factors following participation in a multidisciplinary rehabilitation program, perceived injustice was the risk factor that showed the least improvement [10]. Current progress in the development of interventions aimed at reducing perceptions of injustice is impeded by the lack of information about the determinants of perceived injustice and processes by which it impacts recovery.

It has been suggested that perceptions of injustice are distinct from other psychological variables due to the multiplicity of sources from which they can arise [1]. Personal, social, and systemic influences combine and render perceived injustice one of the most challenging risk factors to target clinically [93]. Acceptance-based interventions may be useful in reducing anger associated with perceptions of injustice [94]. Acceptance-based

interventions direct behavior toward achieving valued life goals, rather than controlling and avoiding difficult experiences, such as pain and anger [75]. It has also been suggested that screening for other psychological factors such as depression may be important in the treatment of perceptions of injustice. A prospective study demonstrated that postsurgical reductions in depressive symptoms and reductions in disability were associated with reductions in perceptions of injustice in patients with osteoarthritis [95]. Optimal management of perceived injustice might also require interventions that address the social context within which perceptions of injustice arise. For example, research suggests that interventions involving workplace accommodations reduce employee-employer conflict, increase coworker support, and contribute to more successful return-to-work outcomes [96].

An important consideration in the clinical management of perceived injustice is that perceptions of injustice are not merely mental representations but may also be reactions to objective injustices that characterize the environment in which painful conditions occur. For example, negligent actions of other drivers or employers may have been responsible for an individual's injury. It is also possible for individuals to experience disrespectful, invalidating, or adversarial encounters with clinicians and insurers or to face unequal access to the services and resources necessary to foster recovery. It has also been suggested that other individuals, such as significant others, friends, and family may fail to provide the support needed or expected by the individual. It is necessary to consider the adaptive aspects of perceiving situations as unjust; such perceptions are often the first step in addressing and retaliating against the sources of injustice so as to avoid future transgressions [13,97-99]. Given the adaptive function of perceived injustice, one of the main challenges in the development of clinical interventions is to distinguish the potential adaptive value of injustice appraisals from their detrimental influence on health and mental health outcomes.

Several limitations should be considered when interpreting these findings. First, the focus of this paper has been on perceptions of injustice in individuals with MSK pain. As such, these findings are of unknown generalizability to the general population or to other chronic pain populations. It seems likely (to us) that perceived injustice may act as a general risk factor for an array of pain conditions, including cancer-related pain and neuropathic pain, and this represents an important area for future research. Moreover, the participants included in most of the studies of this review predominately identified as white and were from North American countries, which may also limit the generalizability of these findings. Future research will be needed to examine the overall impact of perceived injustice on recovery and illness trajectories in more diverse samples of individuals with debilitating health conditions such as cancer, HIV, and others. Second, all variables in these studies were assessed

using self-report measures, which are subject to numerous well-known limitations, including memory-related biases. Third, the correlational nature of many of the studies included in this review precludes strong statements about the direction of causality. However, the results of prospective studies suggest that perceptions of injustice impede successful recovery in individuals with MSK pain. Fourth, we did not conduct a comprehensive examination of the psychometric properties of the IEQ. Given the large number of studies using the IEQ, future research may consider a more systematic evaluation of the psychometric properties of this scale. Finally, although a large search strategy in multiple databases was performed, it is possible that relevant studies were not identified for this review.

Based on this systematic review, the research that has been conducted to date suggests that perceived injustice is a significant determinant of adverse pain-related outcomes in individuals with MSK pain. More specifically, there is strong evidence that perceived injustice is associated with heightened pain intensity, disability-related variables, and mental health outcomes. There is also evidence that perceived injustice is associated with reduced quality of life and well-being, as well as reduced social functioning. Although research examining the mechanisms by which perceived injustice may contribute to prolonged recovery is still in its infancy, a number of potential processes have been put forward. From a clinical standpoint, there are grounds for suggesting that perceived injustice should be an important target for interventions for MSK pain.

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