

Perceived Injustice and Its Correlates after Mild Traumatic Brain Injury

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Abstract

Perceived injustice is a belief that one has been treated unfairly and disrespectfully, and is suffering unnecessarily as a result of another person's actions. Perceived injustice predicts chronic disability after musculoskeletal injury but to our knowledge has not been empirically studied in people with mild traumatic brain injuries (mTBIs). We examined perceived injustice and its correlates in patients who were slow to recover from mTBI. Patients ($n=102$) were recruited from four concussion clinics. The sample was on average 41.2 years old (standard deviation [SD]=11.7; range=21–64), 53.9% were women, and patients were evaluated 2–26 weeks post-injury (mean=12.1, SD=6.3). Patients completed measures assessing perceived injustice (Injustice Experience Questionnaire; IEQ), post-concussion symptoms, post-traumatic stress, depression, pain, disability, and neuropsychological performance validity. Patients frequently endorsed items such as “I just want to have my life back” (85.2%) and “people don’t understand how severe my condition is” (89.1%), with 23.5% of the sample scoring in the clinically significant range on the IEQ (Total Score >30). Internal consistency was high (Cronbach’s $\alpha=0.91$). Patients who failed performance validity testing (Cohen’s $d=0.48$) or were seeking/receiving compensation ($d=0.92$) reported greater perceived injustice. Greater perceived injustice was associated with greater post-concussion symptoms ($r=0.48$), traumatic stress ($r=0.69$), depression ($r=0.60$), bodily pain ($r=0.32$), and negative expectations for recovery ($r=0.40$; all $p<0.01$). Given that perceived injustice is a belief system that can influence health behaviors, it might be a viable target for psychological treatment.

Keywords: concussion; mild traumatic brain injury; outcome; perceived injustice

Introduction

PERCEIVED INJUSTICE is a belief that one has been treated unfairly and disrespectfully, and is suffering unnecessarily as a result of another person's actions. In the context of sustaining an injury, it may include appraisals regarding the severity and irreparability of loss.¹ Perceived injustice can influence a person's experience and reporting of symptoms, therapeutic working alliance in rehabilitation, and treatment adherence, as well as contribute to worse overall outcome.²

The literature on perceived injustice in people with bodily injuries and chronic pain conditions has grown rapidly in the past few years. A summary of 16 studies that have examined perceived injustice is presented in Table 1.^{2–17} Most were conducted in pain clinics. In some studies, none of the subjects had returned to work at

the time of assessment.^{4,6,15,17} Perceived injustice is associated with worse physical and mental well-being in people with chronic pain.¹ It is associated with greater pain,^{8,12} opioid use,^{14,17} pain catastrophizing,^{11,12} depression,^{8–10} traumatic stress,^{6,10} and anger.⁸ Perceived injustice might augment the association between pain severity and depressive symptoms.⁷ High perceptions of injustice are associated with low return-to-work expectancies,¹⁵ elevated disability ratings,^{8,15} and overall greater difficulties with return to work following bodily injuries.¹⁶

Decades ago in his seminal study, Rutherford¹⁸ reported that attributing blame to an employer or impersonal organization was disproportionately common in patients with persistent symptoms following mild traumatic brain injury (mTBI). Blame attribution toward others during acute rehabilitation is associated with worse future psychological outcomes in some people with moderate to

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TABLE 1. PREVIOUS STUDIES USING THE INJUSTICE EXPERIENCE QUESTIONNAIRE

<i>First author (Year)</i>	<i>Country</i>	<i>N</i>	<i>% Female</i>	<i>Age: M (SD), range</i>	<i>Education, employment, marital status, and time since injury</i>	<i>Group characteristics</i>	<i>IEQ total score: M (SD)</i>
Sullivan (2008) ³	Canada	266	53.8%	39.8, 20–60	Education % ≥ 12 years = NR % Working = NR % Married/common law = NR Mean time since injury (months) = NR	Participants with musculoskeletal injuries due to a MVA or work accidents	Total: 19.6 (12.6)
Sullivan and colleagues (2008) – Study 1 ⁴	Canada	226	53.0%	MVA: 35.2 (9.5) Work accident: 41.4 (8.8)	Education % ≥ 12 years = NR % Working = 0 % Married/common law = NR Mean time since injury (months) = NR	Participants with musculoskeletal injuries from multidisciplinary pain rehabilitation clinics who were work-disabled due to a MVA or work accident	Work accident: 17.3 (12.2) MVA: 25.1 (11.8) Men: 21.7 (12.5) Women: 18.0 (12.3)
Sullivan and colleagues (2008) – Study 2 ^{*4}	Canada	70	57.1%	Total: 37.7, 20–55 MVA: 33.1 (9.3) Work accident: 40.2 (8.1)	Education % ≥ 12 years = NR % Working = 0 % Married/common law = NR Mean time since injury (months) = NR	Participants in a functional restoration rehabilitation program who were work-disabled due to a MVA or work accident	Total: 17.7 (12.7) Work accident: 17.3 (12.2) MVA: 25.1 (11.8) Men: 21.6 (12.9); women: 14.8 (12.0)
Sullivan and colleagues (2009a) ⁵	Canada	85	52.9%	39.1, 20–59	Education % ≥ 12 years = 73% % Working = 0 % Married/common law = 81% Mean time since injury (months) = 18.2	Participants who sustained whiplash injuries in rear-collision MVAs recruited via newspaper ads and rehabilitation clinics	Men: 24.3 (10.6) Women: 26.0 (11.1)
Sullivan and colleagues (2009) ^{**6}	Canada	112	67.8%	35.8, 20–60	Education % ≥ 12 years = 80% % Working = 0 % Married/common law = 59% Mean time since injury (months) = 18.3	Participants from rehabilitation clinics with whiplash injuries in rear-collision MVAs completing a multidisciplinary rehabilitation program	Total: 22.3 (9.7) Men: 24.8 (9.2); women: 21.1 (9.7) Low-low PTSD: 17.3 (7.9) High-low PTSD: 24.5 (7.8) High-high PTSD: 31.5 (6.7)
Scott and Sullivan (2012) ⁷	Canada	107	58.9%	41, 20–60	Education % ≥ 12 years = 60% % Working = 51% % Married/common law = 64% Mean time since Injury (months) = NR	Participants with persistent musculoskeletal pain recruited via newspaper ads and rehabilitation clinics	Men: 23.4 (11.2) Women: 26.8 (11.6)
Scott and colleagues (2013) ⁺⁸	Canada	173	65.3%	49.7 (9.7), 21–65	Education % ≥ 12 years = 68% % Working = 35% % Married/common law = 54% Mean time since injury (months) = NR	Participants with diagnosed chronic musculoskeletal pain, recruited through a pain registry, who received treatment at a tertiary pain management clinic	Total: 28.9 (11.1) Pain post-injury: 30.6 (11.1) Pain not post-injury: 26.4 (10.7)

(continued)

TABLE 1. (CONTINUED)

<i>First author (Year)</i>	<i>Country</i>	<i>N</i>	<i>% Female</i>	<i>Age: M (SD), range</i>	<i>Education, employment, marital status, and time since injury</i>	<i>Group characteristics</i>	<i>IEQ total score: M (SD)</i>
Scott and colleagues (2013b) ⁺⁺¹⁷	Canada	103	69.9%	35.9 (9.5), 20–60	Education % ≥ 12 years = 84% % Working = 0 % Married/common law = 48% Mean time since Injury (months) = 18.2	Participants from rehabilitation clinics with whiplash injuries in rear-collision MVAs completing a multidisciplinary rehabilitation program	Total: 22.2 (9.9) Men: 25.3 (9.4); women: 20.8 (9.8) Work returned: 21.2 (9.6) Not work returned: 24.3 (10.3) Low pain: 18.8 (9.2); high pain: 25.4 (9.5) Using narcotics: 27.1 (11.3) Not using narcotics: 20.5 (8.8)
Scott and colleagues (2015) ⁹	Canada	103	67.9%	34.7 (8.2)	Education % ≥ 12 years = 84.9% % Working = 0 % Married/common law = 49.1% Mean time since injury (months) = NR	Participants from rehabilitation clinics with whiplash injuries in rear-collision MVAs completing a multidisciplinary rehabilitation program	Total: 26.4 (9.0)
Trost and colleagues (2015) ¹⁰	USA	155	41.3%	47.5 (17.7), 18–88	Education % ≥ 12 years = 66.5 % Working = NR % Married/common law = 40.0% Mean time since injury (months) = NR	Participants admitted to a Level 1 trauma center	Total: 17.1 (14.6)
Margiotta and colleagues (2017) ¹¹	Ireland	80	47.0%	49.0 (15.7), 22–90	Education % ≥ 12 years = NR % Working = 55.0% % Married/common law = 64.0% Mean time since injury (months) = NR	Participants were first-time attendees at pain clinics	Total (median): 22.5 Pain post-trauma (median): 30 Pain post-MVA (median): 24
Miller and colleagues (2016) ¹²	USA	139	71.9%	15.0 (2.1), 8–18	Education % ≥ 12 years = NR % Working = NR % Married/common law = NR Mean time since injury (months) = NR	Participants presented with chronic pain at a tertiary care pediatric pain management clinic	Total: 19.1 (12.3)
Scott and colleagues (2016) ²	Canada	66	51.5%	40.0 (8.9), 24–60	Education % ≥ 12 years = 97.0% % Working = 0 % Married/common law = 44.0% Mean time since injury (months) = 11.6	Participants with musculoskeletal injuries from rehabilitation clinics who were work-disabled due to a MVA or work accident	Total: 31.7 (8.6)
Sturgeon and colleagues (2016) ¹³	USA	302	62.6%	47.6 (14.6), 18–87	Education % ≥ 12 years = NR % Working = 46.0% % Married/common law = 52.3% Mean time since injury (months) = NR	Participants from a tertiary care pain clinic	Total: 17.9 (11.4)

(continued)

TABLE 1. (CONTINUED)

<i>First author (Year)</i>	<i>Country</i>	<i>N</i>	<i>% Female</i>	<i>Age: M (SD), range</i>	<i>Education, employment, marital status, and time since injury</i>	<i>Group characteristics</i>	<i>IEQ total score: M (SD)</i>
Carriere and colleagues (2017a) ¹⁴	USA	344	67.0%	48.0, 18–85	Education % ≥ 12 years = 91.0% % Working = NR % Married/common law = 54.0% Mean time since injury (months) = NR	Participants presenting at an outpatient pain management clinic	No opioid prescription: 15.6 (11.4) Opioid prescription: 20.2 (10.5)
Carriere and colleagues (2017b) ¹⁵	Canada	152	46.7%	36.4 (9.3)	Education % ≥ 12 years = 55.0% % Working = 0 % Married/common law = 58.0% Mean time since injury (months) = NR	Participants from rehabilitation clinics with whiplash injuries in MVAs completing a multidisciplinary rehabilitation program	Total : 16.2 (8.3)
Giummarra and colleagues (2017) ⁶	Australia	364	22.3%	43.0 (13.2), 17–64	Education % ≥ 12 years = 80.2% % Working = 84.2% % Married/common law = NR Mean time since injury (months) = NR	Participants recruited from a trauma registry that were employed at the time of injury	Total (median): 14 Compensable injury: 20.3 (14.2) Non-compensable injury: 11.8 (11.2)
Current study	Canada	102	53.9%	41.2 (11.7), 19–64	Education % ≥ 12 years = 92.2% % Working = 26.5% % Married/common law = 53.9 or 43.1 Mean time since injury (weeks) = 12	Participants presenting to rehabilitation clinics with persistent symptoms following mild traumatic brain injury	Total: 20.8 (10.94)

*Sullivan and colleagues (2008) reported IEQ scores at Week 1 of an intervention in Study 2. The values reported were collected at baseline.

**Sullivan and colleagues (2009) reported IEQ scores at three testing occasions over the course of a rehabilitation intervention. All values reported were collected at baseline/admission. Low-low PTSD refers to participants that obtained an Impact of Events Scale-Revised (IES-R) score below the clinical cutoff at both admission and discharge, high-low PTSD refers to participants that obtained an IES-R score above the clinical cutoff at admission, but not at discharge, and high-high PTSD refers to participants obtaining an IES-R score above the clinical cutoff at both admission and discharge.

†Scott and colleagues (2013a) calculated IEQ scores for participants with pain precipitated by an injury, abbreviated above "Pain post-injury" and pain not precipitated by an injury, abbreviated above "Pain not post-injury."

††Scott and colleagues (2013b) reported pre- and post-treatment IEQ scores. The values reported were collected at baseline.

M, mean; SD, standard deviation; IEQ, Injustice Experience Questionnaire; NR, not reported; MVA, Motor vehicle accident; PTSD, post-traumatic stress disorder.

severe traumatic brain injuries.¹⁹ To our knowledge, there are no published studies on perceived injustice in people who have sustained mTBIs. The purpose of this study was to explore the psychometric properties of a widely used perceived injustice questionnaire, and the frequency and correlates of perceived injustice in people presenting to specialty clinics because they are slow to recover from mTBI. We hypothesized that perceived injustice would be associated with greater post-concussion symptoms, bodily pain, and psychological distress (depression and traumatic stress). We also hypothesized that perceived injustice would be greater in patients who were seeking/receiving financial compensation or who failed performance validity testing.

Methods

Participants

Participants were recruited from a sample of consecutive referrals to four outpatient concussion clinics in the greater Vancouver area between March 2015 and February 2017. Inclusion criteria included: 1) age 18 to 65; 2) sustained an mTBI by the World Health Organization (WHO) Neurotrauma Task Force operational definition²⁰ within the past 6 months; 3) fluent in English; and 4) employed prior to injury, because the current study was embedded in a larger research program investigating return to work following mTBI. Of the 273 patients screened for eligibility, 102 were eligible and consented. The study received approval from the University of British Columbia Behavioral Research Ethics Board, the Vancouver Coastal Health Research Institute, and the Fraser Health Research Institute.

The enrolled participants were 102 adults between the ages of 19 and 64 (mean [M]=41.2, standard deviation [SD]=11.7; 46.1% men). They were recruited at the time they presented to the clinic, 2–26 weeks following injury (M=12.1, SD=6.3 weeks). The mechanism of injury of the sample was as follows: struck by object, 29.4%; motor vehicle accident, 28.4%; fall, 27.5%; assault, 4.9%; sports, 4.9%; and other, 4.9%. The breakdown of the sample by loss of consciousness was as follows: no, 48.0%; suspected (unwitnessed), 22.6%; witnessed, 17.7%; and unknown, 11.8%. Post-traumatic amnesia was <1 min in 19.6%, > 1 min in 24.5%, of unclear duration in 21.6%, and absent in 34.3%. The race/ethnicity breakdown of the sample was as follows: Caucasian, 73.5%; Hispanic, 2.9%; Black, 2.0%; Asian, 14.7%; First Nations, 5.9%; and other, 1.0%. The majority had at least a high school education (92.2%), and more than two-thirds had at least some post-secondary education (69.6%). About half of the patients reported a history of psychiatric problems (48.0%), and 39.2% reported a prior history of mTBI. Most were seeking or receiving compensation (87.3%) through worker's compensation, disability insurance, or personal injury litigation at the time of the initial assessment. The return-to-work status of the sample at the time of initial assessment was as follows: full, 10.8%, partial, 15.7%; still off work, 71.6%; and other, 2.0%.

Measures

The Injustice Experience Questionnaire (IEQ).⁴ The IEQ is a 12-item self-report measure designed to assess the perception of injustice associated with injury. The IEQ operationalizes perceived injustice as a set of cognitions on how individuals think about their injury and the consequences of their injury. Each item is rated on the frequency of how often each cognition occurs, ranging from never (0 points) to all the time (4 points). The IEQ provides a total score (range: 0 to 48) and two subscale scores, including Blame/Unfairness (range, 0 to 24) and Severity/Irreparability (range, 0 to 24). It has been used repeatedly to evaluate perceived injustice among individuals with musculoskeletal injuries,^{2,4,7,8} whiplash

injuries,^{6,9,15,17} and chronic pain.^{11–14} As seen in Table 1, all prior studies report total scores for the IEQ, but only three provide results for the subscales.^{2,3,8}

British Columbia Postconcussion Symptom Inventory (BC-PSI). The BC-PSI²¹ prompts respondents to rate the frequency and intensity with which they have experienced a range of physical, cognitive, and emotional symptoms over the previous week. It is widely used in mTBI research.^{22–24} Participants rated “how often” and “how bad” they had been experiencing 13 physical, cognitive, and emotional symptoms over the preceding week on a 6-point Likert Scale.

Patient Health Questionnaire (PHQ-9). The PHQ-9 is a self-report measure of symptoms of depression.²⁵ The nine-item questionnaire aligns with the diagnostic criteria for a major depressive episode from the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5)²⁶ by assessing the frequency of each symptom over the past 2 weeks (“not at all”=0, “several days”=1, “more than half the days”=2, “nearly every day”=3; score range, 0–27). This scale is shown to be sensitive for assessing depression following TBI.^{27–29}

PTSD Checklist for DSM-5 (PCL-5).³⁰ The PCL-5 is a 20-item self-report measure that quantifies symptoms of posttraumatic stress. Participants rate how much they were bothered by symptoms of posttraumatic stress in the past month. Each symptom is ranked on a Likert-type scale, ranging from not at all (0 points) to extremely (4 points), with scores ranging from 0 to 80. Psychometric evaluations of PCL-5 scores have demonstrated strong reliability and evidence for both convergent and discriminant validity.³¹

Brief Pain Questionnaire. A brief, five-item pain questionnaire was used to assess current pain intensity (0=“none” to 3=“severe” pain “at this moment”) in multiple bodily regions: the head/skull, neck, chest/abdomen/back, arms/shoulders, and pelvis/legs (possible score range 0–15). This measure has been shown to correlate with functional outcome from mTBI.³²

Illness Perception Questionnaire-Revised (IPQ-R)-Timeline Scale. The IPQ-R was developed to assess the five components of illness representation described in Leventhal's self-regulation model.^{33,34} In this study, only the six-item Timeline scale was administered. This scale assesses how patients perceive the chronicity of their symptoms (e.g., “This illness will last a long time”). Each item is rated on a 5-point Likert scale from strongly disagree to strongly agree (possible score range 5–30). This scale has been validated for use in mTBI.³⁵ Multiple studies have reported an association between pessimistic expectations for recovery and poor outcome from mTBI.

Connor-Davidson Resilience Scale-2 (CD-RISC2). The CD-RISC2 is a two-item questionnaire to assess resilience, that is, the personal qualities that enable one to thrive in the face of adversity.³⁶ The items on this abbreviated scale (“able to adapt to change”; “tend to bounce back after illness or hardship”) were selected by the original scale's creators because they capture the essence of resilience.³⁷ The original scale has been used when examining resilience following brain injury.³⁸

Social Support Questionnaire, Short Form-Satisfaction Scale (SSQS). The SSQS measures how satisfied people are with the support they have received from those around them.³⁹ Each of the six items is rated on a 6-point Likert Scale from very satisfied to very dissatisfied. The overall score is obtained by averaging the individual items (possible score range: 1–6).

Medical Symptom Validity Test (MSVT).⁴⁰ The MSVT is a purpose-built performance validity test that is sensitive to motivational factors, but insensitive to the effects of TBI or genuine memory impairment.^{41–43} The “easy” subtests (Immediate Recognition, Delayed Recognition, and Consistency) have evidence-based cut-offs for identifying cases with probable below-capacity performance.⁴³ We used those cutoffs as our criteria for suspected poor effort.⁴⁰ We also used the scores as continuous variables in correlational analyses.

Statistical analyses

Mean, median, standard deviation, and interquartile range (IQR) were calculated for each item, the Blame/Unfairness scale, the Severity/Irreparability scale, and the total IEQ score. The proportion of the sample that rated each item as “sometimes” and “often” was calculated for the individual items, as was the proportion of the sample that had clinically elevated levels of perceived injustice (i.e., total IEQ score >30).³ Cronbach’s α was computed to quantify the internal consistency of the total scale as well as its two subscales. Principal component analysis (PCA) was used to evaluate the dimensionality of the IEQ in this mTBI sample. While other analytic methods, such as exploratory factor analyses, may be more appropriate for identifying underlying dimensions in a set of questionnaire items, PCA was chosen so the results of this study could be compared with past studies that examined the IED in musculoskeletal injuries and heterogeneous trauma samples.^{4,44,45} The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO)⁴⁶ and Bartlett’s Test of Sphericity⁴⁷ were used to determine the suitability of the data for PCA. Extraction with an oblique rotation was performed in accordance with Sullivan and colleagues⁴ and Rodero and colleagues⁴⁴ to allow correlations among factors. Like with the original validation study,⁴ components with eigenvalues greater than 1.0 were retained. After evaluating these results and visually inspecting the scree plot and variance accounted for by the proposed components, we proceeded with two additional analyses. We specified a two-factor structure in accordance with prior results,⁴⁸ as well as a parsimonious one-factor structure because most prior studies analyzed only the IEQ total score and reported strong internal consistency.^{4,11,13–15}

Independent samples *t*-tests were used to calculate differences in IEQ scores in the following groups: gender, race/ethnicity (i.e.,

Caucasian vs. non-Caucasian), effort (i.e., MSVT pass vs. fail), work versus non-work-related injuries, and compensation-seeking status. A one-way analysis of variance was used to assess differences in perceived injustice across various mechanisms of injury with Tukey’s *post hoc* comparisons to elucidate specific differences between groups. Pearson bivariate correlations were calculated between the IEQ scores and the other measures. These correlations were re-calculated after excluding those who were perceived to have poor effort on cognitive testing (i.e., fail MSVT). All analyses were completed using SPSS version 21.0.

Results

Descriptive statistics for the individual items, subscales, and total score for the IEQ are presented in Table 2. The large majority of the sample reported feeling as if people do not understand what has happened to them (89.1%) and that they want their life back (85.2%). More than half felt as if they were not being taken seriously, life will never be the same, they might be permanently affected, and they should not have to live this way. A large minority thought that they were suffering because of someone else’s negligence (41.2%) and that their situation was “so unfair” (40.2%). The IEQ manual³ reported that total scores above 30 are considered a clinically-elevated level of perceived injustice; 25% of chronic pain patients presented in the manual scored above this level. In the present sample, 23.5% scored above 30. In a study of patients with whiplash injuries undergoing multidisciplinary treatment, a post-treatment score of greater than 19 optimally identified individuals who had returned to work from those who had not.¹⁷ In the present sample, 53.9% scored >19 on the IEQ.

The internal consistency reliabilities (Cronbach’s α) for the subscale and total scores were as follows: Blame/Unfairness = 0.891, Severity/Irreparability = 0.817, and Total Score = 0.915. The KMO measure of sampling adequacy was 0.86, which exceeds the recommended minimum value of 0.60. Bartlett’s Test of Sphericity was significant ($p < 0.001$) suggesting the data is suitable for PCA. The PCA results including pattern matrices are presented in Table 3. Retaining eigenvalues greater than 1 in the PCA yielded a three-component solution. The second component

TABLE 2. ITEM AND SCALE DESCRIPTIVE STATISTICS FOR PERCEIVED INJUSTICE IN THE TOTAL SAMPLE

	<i>M</i>	<i>Md</i>	<i>SD</i>	<i>IQR</i>	2+ (%)	3+ (%)
Severity/Irreparability						
1. People don’t understand	2.66	3	0.99	2–3	89.1	61.7
2. Life never the same	1.50	2	1.06	1–2	55.5	15.9
4. Shouldn’t have to live this way	1.72	2	1.37	2–3	51.0	34.3
5. Want my life back	3.05	4	1.29	2.75–4	85.2	75.4
6. Permanently affected	1.67	2	1.11	1–2	56.9	19.6
8. Not taken seriously	1.73	2	1.21	1–3	56.8	27.4
Blame/Unfairness						
3. Suffering because of negligence	1.31	1	1.37	0–2	41.2	18.7
7. So unfair	1.38	1	1.32	1–2	40.2	21.6
9. Nothing will ever make up for this	1.29	1	1.40	0–2	36.3	19.6
10. Robbed of something precious	1.54	1	1.41	0–2.25	41.6	24.5
11. May never achieve my dreams	1.49	1	1.36	0–2	46.0	21.5
12. Can’t believe this has happened	1.48	1	1.30	0–2	43.2	21.6
Blame/Unfairness Score	8.50	7	6.56	3–13	–	–
Severity/Irreparability Score	12.28	13	5.13	9–16	–	–
Total Score	20.79	21	10.94	12–30	–	–

Ratings of 2 = “sometimes” and ratings of 3 = “often.”

M, mean; Md, median; SD, standard deviation; IQR, interquartile range.

TABLE 3. PATTERN MATRIX LOADINGS DERIVED FROM PRINCIPAL COMPONENT ANALYSIS OF 12-ITEM INJUSTICE EXPERIENCE QUESTIONNAIRE (N=102)

	Eigenvalue >1			2 Component solution		1 Component solution
	1	2	3	1	2	1
Initial eigenvalue cumulative % variance explained	6.26 52.2	1.20 62.2	1.06 71.0	6.26 52.2	1.20 62.2	6.26 52.2
1. People don't understand	0.002	0.93	0.02	-0.04	0.92	0.44
2. Life never the same	-0.05	0.17	-0.78	0.56	0.26	0.68
3. Suffering because of negligence	0.82	-0.22	0.04	0.76	-0.28	0.60
4. Shouldn't have to live this way	0.80	0.25	0.13	0.66	0.18	0.74
5. Want my life back	0.53	0.33	-0.06	0.54	0.31	0.69
6. Permanently affected	-0.04	-0.01	-0.92	0.67	0.09	0.71
7. So unfair	0.74	0.03	-0.14	0.81	-0.01	0.79
8. Not taken seriously	0.15	0.62	-0.31	0.37	0.64	0.70
9. Nothing will ever make up for this	0.78	-0.06	-0.18	0.89	-0.09	0.82
10. Robbed of something precious	0.54	0.02	-0.47	0.88	0.03	0.89
11. May never achieve my dreams	0.18	-0.13	-0.79	0.79	-0.06	0.75
12. Can't believe this has happened	0.70	0.14	-0.07	0.72	0.10	0.76

¹Principal Component Analysis with Oblimin Rotation and Kaiser Normalization. Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy 0.86 for all three solutions. Bartlett's Test of Sphericity $p < 0.001$ for all three solutions. Component loadings > 0.50 are presented in bold.

explained 10.0% of variance and contained only two items (reflecting feeling invalidated by others), and so should be considered unstable. A third component explaining 8.8% of the variance contained three items seemingly related to permanency expectations. Choosing to retain exactly two components essentially forced the three "permanency expectations" items onto the first component, failing to replicate the item structure (Blame/Unfairness and Severity/Irreparability subscales) found in the derivation study.⁴ A single-component solution explained 52.2% of the variance, with communalities above 0.40 for 10 of the 12 items. Based on the PCA results and high internal consistency, we favored the single-component solution in this sample. The remaining analyses were conducted with the IEQ total score.

The IEQ total score showed a small negative correlation with age ($r = -0.21$, $p = 0.03$). Total IEQ was not correlated with time since injury ($r = 0.04$, $p = 0.72$). Men and women reported similar levels of perceived injustice [$M = 20.17$, $SD = 12.00$ vs. $M = 21.33$, $SD = 10.03$; $t(100) = 0.53$, $p = 0.60$, for men and women, respectively, Cohen's $d = -0.10$]. Caucasian patients reported similar levels of perceived injustice compared to non-Caucasian patients [Caucasian: $M = 21.40$, $SD = 10.29$, Non-Caucasian = 19.11,

$SD = 12.64$; $t(100) = 0.93$, $p = 0.35$, $d = 0.20$]. Mechanism of injury was associated with perceived injustice [$F(5,96) = 3.48$, $p = 0.006$]. Tukey's *post hoc* tests revealed that those who were in motor vehicle accidents ($M = 23.62$, $SD = 12.19$) and those struck by an object ($M = 24.04$, $SD = 9.03$) had higher perceived injustice than patients who sustained sports injuries ($M = 7.20$, $SD = 6.76$). There were no differences in perceived injustice between those with work-related injuries ($M = 22.70$, $SD = 10.46$) versus non-work related injuries [$M = 19.23$, $SD = 11.17$; $t(100) = -1.60$, $p = 0.11$, $d = 0.32$]. Patients who were seeking/receiving compensation reported more perceived injustice than those who were not [$M = 22.00$, $SD = 10.59$ vs. $M = 12.54$, $SD = 10.02$; $t(100) = -3.03$, $p = .003$, $d = 0.92$]. The IEQ had medium significant positive correlations with symptoms of traumatic stress, depression, post-concussion symptoms, and negative expectations for recovery (Table 4). There were small significant positive correlations between IEQ total scores and bodily pain. Because prior authors have hypothesized a relationship with anger,^{49,50} we extracted a single item that assessed "irritable behavior, angry outbursts, or acting aggressively" (PCL-5, Item 15). This item showed a significant positive correlation with perceived injustice (Spearman's $\rho = 0.43$, $p < 0.001$). When dichotomizing

TABLE 4. BIVARIATE CORRELATIONS BETWEEN PERCEIVED INJUSTICE AND OTHER MEASURES

	Total sample			MSVT fails excluded		
	Total score	Blame/unfairness	Severity/irreparability	Total score	Blame/unfairness	Severity/irreparability
Post-concussion Symptoms (BC-PSI)	0.477***	0.394***	0.516***	0.517***	0.439***	0.533***
Depression (PHQ-9)	0.598***	0.511***	0.605***	0.606***	0.528***	0.608***
Traumatic stress (PCL-5)	0.689***	0.632***	0.637***	0.708***	0.657***	0.661***
Brief Pain Questionnaire	0.322**	0.252*	0.369***	0.297**	0.210	0.359**
Negative expectations (IPQ-R Timelines subscale)	0.404***	0.358***	0.406***	0.491***	0.446***	0.467***
Resilience (CD-RISC-2)	-0.066	-0.060	-0.058	-0.124	-0.110	-0.123
Social support satisfaction	-0.202*	-0.153	-0.238*	-0.249	-0.187	-0.286*

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

BC-PSI British Columbia Postconcussion Symptom Inventory; PHQ-9, Patient Health Questionnaire; PCL, PTSD Checklist; IPQ-R, Illness Perceptions Questionnaire-Revised; CD-RISC-2, Connor-Davidson Resilience Scale-2 item version.

responses to this item, those who responded “moderate” or greater ($n=42$, 41.2%; IEQ Total: $M=25.88$, $SD=10.56$) had greater perceived injustice than those who responded “none” or “a little bit” ($n=60$, 58.8%; IEQ Total: $M=17.23$, $SD=9.81$; $t(100)=-4.25$, $p<0.001$, $d=0.85$).

The IEQ total score was not significantly correlated with the Immediate Recognition ($r=-0.14$, $p=0.17$) or Delayed Recognition ($r=-0.07$, $p=0.51$) scores on the MSVT, and had a small significant negative correlation with the Consistency ($r=-0.20$, $p=0.048$) score. Note that these MSVT scores were highly skewed, with 50.0–64.7% of participants achieving the ceiling score, which likely attenuated its correlations with the IEQ. The total sample was divided into two groups, those who passed and those who failed the MSVT. Participants who failed the MSVT ($n=23$, $M=24.96$, $SD=12.05$) scored higher on the IEQ Total score than those who passed [$n=79$, $M=19.58$, $SD=10.37$; $t(100)=-2.11$, $p=0.04$, $d=0.48$].

Discussion

Some people have persistent symptoms and problems for months or years following mTBI.^{51,52} Having structural or microstructural damage to the brain is not a strong predictor of persistent symptoms and problems.^{24,53–59} Psychosocial factors, such as pre-injury mental health problems,^{53,60} resilience,⁶¹ maladaptive coping strategies,^{58,62–64} traumatic stress,^{65,66} and depression^{58,65} are related to poor medium and long-term outcome following injury. This study identified another potential psychological risk factor for poor outcome, perceived injustice.

Perceived injustice was common in this sample of people who were seeking treatment for persistent symptoms following mTBI. The total scores on the IEQ were similar in this sample of people with mTBI, compared with samples of people with chronic pain published in prior studies (Table 1). Most of the sample reported some degree of “wanting my life back,” feeling as if they “shouldn’t have to live this way,” and thinking “this is so unfair” (40–85%; Table 2). Greater perceived injustice was associated with greater post-concussion symptoms, traumatic stress, depressive symptoms, bodily pain, and pessimistic expectations for recovery (Table 4). Perceived injustice was not related to resilience in this sample. The two-item measure of resilience had a restricted range in our sample, possibly contributing to this negative finding. Patients who were injured at work did not report greater perceived injustice, but it is important to appreciate that a large percentage of those injured outside of work (i.e., 78.6%) were either involved in personal injury litigation, receiving benefits, or eligible for compensation. Those who were seeking or receiving compensation reported greater perceived injustice than those who were not. Individuals who failed performance validity testing reported greater perceived injustice. It is possible that perceived injustice, which includes feelings of invalidation (not being “taken seriously”), motivates test-takers to “prove” their injury-related problems through exaggeration. It also is possible that high perceived injustice scores merely reflect a general over-reporting bias. Alternatively, poor performance on effort measures may be less volitional and more a consequence of factors beyond conscious control, such as pre-injury characteristics (e.g., substance use, personality, trauma history), beliefs and expectations about recovery following TBI, and experiences of anger or injustice when seeking a claim.^{49,50}

Experiencing injustice might be one factor that leads patients to pursue personal injury litigation or compensation.⁶⁷ There is also some prior evidence to suggest the perceived injustice-litigation relationship goes in the other direction. In one previous study, individuals claiming compensation following injuries had a greater

sense of injustice, but they also had complaints about the claims process and dissatisfaction with medico-legal assessments.⁶⁸ Both the involvement of a lawyer and the completion of medical assessments have been associated with reduced perceptions of fairness when pursuing a claim.⁶⁹ Attribution of fault to another person and the involvement of a lawyer each explain a significant amount of variance in perceived injustice following traumatic injury.⁷⁰ Further, the compensation process itself may be stress-inducing and adversely affect mental health.^{71,72}

The blame/unfairness and severity/irreparability subscales of the IEQ originally identified by Sullivan and colleagues⁴ did not replicate in the present sample, even though we used the same analytic methods. A coherent multidimensional solution was not present in this study, and a one-component solution appeared to best fit the data. Four prior studies have examined the factor structure of the IEQ, with varying methods. In a fibromyalgia sample, PCA produced a two-component solution,⁴⁴ though the items that loaded on each of the two components were different than the loadings in the derivation study⁴ and four of the items had high cross-loadings (>0.4) on both factors. Yamada and colleagues⁷³ used exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) in a Japanese sample with injury-related pain and proposed a three-factor structure over one- and two-factor structures.⁷³ Kennedy and Dunstan⁷⁴ and Agtarap and colleagues⁴⁵ both used CFA on one- and two-factor solutions with musculoskeletal and mixed trauma samples, respectively. Kennedy and Dunstan reported that neither provided an acceptable fit, but a *post hoc* model with two correlated factors and one error covariance provided a good fit.⁷⁴ Agtarap and colleagues also found that both CFA models had poor fit statistics and showed in follow-up EFAs that a one-factor model fit better than a two-factor model.⁴⁵

We believe the IEQ may be best analyzed as a unidimensional construct in mTBI for the following reasons: 1) greater internal consistency of the total score, compared with the subscales; 2) poor interpretability of the two-component solution found by Sullivan and colleagues⁴ based on the content of the items; 3) the two components found by Sullivan and colleagues⁴ and Rodero and colleagues⁴⁴ were strongly correlated and at least one-third of the items had high cross-loadings (>0.40) on both components; 4) poor reproducibility of a multifactor solution; 5) sufficiently high item communalities (>0.40 ; not shown) with one component extracted on 10 of the 12 items using the present data; and 6) other studies have also suggested a one-factor solution may be sufficient^{44,45} because of high correlations between two-factor solutions.

There are several limitations to consider when interpreting these results. The patients in this study were recruited from specialty concussion clinics because of prolonged symptoms and/or worker’s compensation claims. These results may not be generalizable to patients with mTBI seen in other clinical settings. There may be bias introduced by the research recruitment process, because patients self-selected to be a part of the study, with approximately 37% of those eligible completing the initial assessment. Prior medical records were not available to review before entry in this study and mTBI may be diagnosed differently among various community practitioners. We conducted a structured interview to confirm that all participants sustained an mTBI according to the WHO Neurotrauma Task Force operational definition.²⁰

Another potential limitation is that some patients had pre-injury comorbidities that may influence these findings (e.g., 52% with prior mental health treatment). However, comorbidities are common in slow-to-recover clinics, and may inherently be linked to their prolonged recovery. Previous researchers have predicted a relationship between pre-injury traits and beliefs and recovery

following TBI.^{49,50} Excluding such patients would make these results less generalizable. There were no control groups in this study (e.g., workers who experienced orthopedic injuries), so it is difficult to disentangle how individuals recovering from an mTBI may be uniquely affected following an injury. This was a cross-sectional study that only examined the experience of perceived injustice at patients' initial clinic visits. This precludes our ability to test the causal pathways as to which factors may mediate and/or moderate the relationship between pre-/peri-injury factors, perceived injustice, and outcomes. It will be important for future studies to examine if there is an association between perceived injustice and clinical outcomes (e.g., persistent symptoms, disability, and return to work status).

To our knowledge, perceived injustice has not been previously studied in people with chronic problems following mTBI; however, previous researchers^{49,50} have posited a relationship between invalid symptom reporting or performances following mTBI and perceived injustice, anger, and the attribution of blame to others. Perceived injustice was common in our clinic sample, it was similar to some samples of people with chronic pain, and it was associated with greater post-concussion symptoms, mental health difficulties, and bodily pain. The present study cannot determine whether perceived injustice amplifies symptom reporting and psychiatric complications, having worse injury sequelae enhances perceptions of injustice, or more likely, that these relationships are bidirectional. Prior research in patients with musculoskeletal injuries and chronic pain suggests that perceived injustice predicts poor treatment adherence and outcomes, but further research will be needed to confirm if these relationships hold in mTBI. Future research should also explore how modifiable injustice beliefs are with cognitive-behavioral therapy or other psychological interventions.

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