

Systematic Review

The Prevalence of Perceived Injustice and Factors Associated With Perceived Injustice in People With Pain: A Systematic Review With Meta-analysis

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Background: Perceived injustice (PI) is a multidimensional appraisal cognition comprising the severity of loss consequent to injury, blame, a sense of unfairness, and/or irreparability of loss. PI gained increasing interest in pain research since it potentially contributes to the experience and burden of (chronic) pain.

Objectives: This systematic review aimed to determine the prevalence of PI and factors associated with PI in people with pain.

Study Design: Systematic review with meta-analysis.

Methods: Web of Science, PubMed, and Embase were screened for cross-sectional or cohort studies encompassing human patients who were diagnosed with a condition causing pain and reported prevalence rates for PI and/or associations between a factor and PI. Meta-analyses were carried out, and subgroup analyses were undertaken based on the methodological quality of the studies, the type of pain population, and whether the outcome measure was valid or not in case of heterogeneity ($P < 0.05$).

Results: Fifty-four studies were found eligible. The prevalence of PI ranged from 23% to 77% ($I^2 = 99%$, $P < 0.001$). Association with PI, assessed using the Injustice Experienced Questionnaire, were found with pain catastrophizing (pooled Pearson's $r [r_p] = 0.66 [0.64, 0.69]$, $P < 0.00001$), posttraumatic stress ($r_p = 0.63 [0.59, 0.67]$, $P < 0.00001$), anger ($r_p = 0.59 [0.49, 0.67]$, $P < 0.00001$), anxiety ($r_p = 0.59 [0.52, 0.64]$, $P < 0.00001$), pain acceptance ($r_p = -0.59 [-0.66, -0.49]$, $P < 0.00001$), depressive symptoms ($r_p = 0.57 [0.52, 0.60]$, $P < 0.00001$), kinesiphobia ($r_p = 0.57 [0.50, 0.64]$, $P < 0.00001$), academic functioning ($r_p = -0.54 [-0.65, -0.41]$, $P < 0.00001$), disability ($r_p = 0.53 [0.47, 0.59]$, $P < 0.00001$), emotional functioning ($r_p = -0.52 [-0.64, -0.39]$, $P < 0.00001$), pain interference ($r_p = 0.49 [0.35, 0.60]$, $P < 0.00001$), state anger ($r_p = 0.48 [0.41, 0.54]$, $P < 0.00001$), mental functioning ($r_p = -0.48 [-0.57, -0.38]$, $P < 0.00001$), symptoms of central sensitization ($r_p = 0.47 [0.39, 0.55]$, $P < 0.00001$), social functioning ($r_p = -0.47 [-0.60, -0.31]$, $P < 0.00001$), and physical functioning ($r_p = -0.43 [-0.53, -0.33]$, $P < 0.00001$), pain perceptions ($r_p = 0.40 [0.40, 0.64]$, $P < 0.00001$), trait anger ($r_p = 0.40 [0.29, 0.49]$, $P < 0.00001$), pain intensity ($r_p = 0.37 [0.33, 0.42]$, $P < 0.00001$), and anger inhibition ($r_p = 0.35 [0.26, 0.43]$, $P < 0.00001$).

Limitations: Some articles had to be excluded due to the absence of a full-text version. The findings can largely be applied to developed and high-income countries, but further research is needed in developing countries. Also, no validated cutoff values were available for the National Institutes of Health to determine the methodological quality of the included studies. Lastly, high heterogeneity was observed in many of the performed analyses. However, this was addressed by performing subgroup analyses, which could decrease heterogeneity in some cases.

Conclusions: The prevalence of PI was $\geq 33%$ in 75% of the studies indicating that PI is

important to consider in people with pain. There is evidence for the association of PI with psychological, pain, and quality of life characteristics in people with pain. The associations of PI with personal, injury, and recovery characteristics were overall not significant or negligible.

Key words: Pain, perceived injustice, psychological, quality of life, prevalence, association, systematic review, meta-analysis

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Pain is one of the most frequent and debilitating symptoms (1), particularly seen in people with low back pain and headache disorders (2). In addition, pain is the second most frequent reason for primary health care consultations (3). This implies that pain contributes strongly to the global burden of disease (4).

Pain is a subjective experience, which is strongly influenced by psychological factors (5). Maladaptive cognitive-emotional factors (e.g., pain catastrophizing, hypervigilance, and somatization) are known to contribute to the malfunctioning of the endogenous analgesic system, and thus amplification of pain (6). Besides that, they also play an important role in the transition from acute to chronic pain in people with chronic non-cancer pain (7,8). Therefore, the impact of psychological processes on the experience of pain is of growing interest (5).

A relatively novel construct in pain research is the justice-related appraisals in the experience of pain (9). Injustice perceptions are likely to occur in situations involving "a felt discrepancy between what is perceived to be and what is perceived should be," leading to feelings of undeserved hardship or irreparable loss (7,8). Some of these losses can be temporary and others permanent (10,11). When someone has the feeling of undeserved loss or hardship, injustice can be perceived (12).

Perceived injustice (PI) predicts adverse pain-related outcomes even when controlling for other pain-related psychosocial constructs, such as pain catastrophizing, and fear of movement (9,13). In people with PI increased protective pain behavior is seen (14,15). Pain behavior, rather than pain intensity and depressive symptoms, mediates the association between PI and opioid prescriptions (16). Feelings of injustice predict tentative opioid use at one-year follow-up (17), increasing the risk of side effects associated with long-term opioid use (18).

Moreover, PI acts on the social consequences of pain (19). The constant search for the cause of the pain can lead to mental isolation and depression (7) or

conflicts with family or friends (20). The vast majority of studies assessing PI investigated PI as a predictor of adverse physical and mental health outcomes associated with pain, such as long-term disability and poor rehabilitation outcomes (14), posttraumatic stress symptoms (21), pain severity, disability, and work absence at one-year follow-up (22). Given the expansion of the novel research area concerning PI as a possible predictor of adverse pain-related disability and mental outcomes, an overview of the prevalence of PI and factors associated to PI in populations with pain is warranted. Therefore, the aim of this systematic review and meta-analysis was (I) to examine the prevalence of PI in people with pain and (II) to explore all the factors associated with PI in people with pain.

METHODS

Search Strategy

PubMed, Web of Science, and Embase were searched on April 30, 2021 and complemented by a backward and forward hand searches of included articles as well as additional reviews about PI. In case of unavailable studies, the corresponding authors were contacted. The applied search terms were defined by AR and ES based on possible search terms elaborated by synonyms, terms found in relevant abstracts, and terms found in search term lists of other systematic reviews. Since this is an explorative study defining all factors associated with PI, all types of measurements/scales could be included. We did not define any scales or instruments a priori. Truncation and wildcards were used when applicable. Also, the subject heading was used if all terms underneath seemed relevant to the search strategy. The key chain was tested before use. An overview of the applied search terms can be found in Table 1 and the full search strategy can be found in Appendix 1.

Study Selection

This systematic review with meta-analyses was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses check-

list (23) and was registered a priori in the International Prospective Register of Systematic Reviews database on May 3, 2021 (No. CRD42021238317). After duplication removal, eligibility was assessed in a blinded manner by 2 researchers (AR and ES), using the Rayyan online tool (24). First, the title and abstract were examined. Second, full-text articles of the remaining studies were verified. In case of disagreements, a third independent researcher (ER) was consulted to resolve uncertainties. Studies were included if they met all of the following criteria: (I) Patients diagnosed with a disease that is causing pain; (II) Data available to determine the prevalence of PI or a factor, no matter which type of scale/measurement, associated with PI (in case of regression-

based analyses, studies must have identified PI as the dependent variable and the factor as the independent variable); (III) Studies written in English, French, Dutch, or German; and (IV) Study design being cross-sectional or cohort. Protocols, systematic reviews, narrative reviews, pilot studies, and randomized controlled trials were excluded. No publication date restrictions were imposed.

Data Extraction

Data from all included studies were extracted blindly by AR and ES on first author, publication year, country, study design, sample size, mean age, type of population with pain, disease duration, PI outcome

Table 1. Search terms.

| | P | E | O |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| | Patients with pain | Associations and prevalence rates | Perceived injustice |
| MeSH terms | Pain Causalgia Central Nervous System Sensitization Fibromyalgia Hyperalgesia Hyperesthesia Neuralgia Nociceptive Pain Paresthesia | Risk Probability Morbidity Basic reproduction number Epidemiology Causality Prognosis Epidemiologic Factor Survival analysis Odds ratio | Patient Harm |
| Free terms | Suffering Ache Type II Complex Regional Pain Syndrome CRPS Type II Sensitization Rheumatic Fibrositis Allodynia Oxyesthesia Neurodynia Nociceptive Formication | Incidence Prevalence Reproduction rate Reproduction ratio Determinant Frequency Occurrence Causation Cause Factor Etiology Cross-Product Ratio Relative Odd Prognose Epidemiologic Determinant Survival analyze Hazard ratio Characteristic Contributing Indicator Outcome Phenomenon Prediction Predictor Relative frequency Relative incidence Variable | Unfairness Irreparability Blame Inequality NOT Socioeconomic Perceived justice Perceived fairness Injustice |

Abbreviations: E, exposure; MeSH, Medical Subheading; O, outcome; P, population; PI, perceived injustice; CRPS, complex regional pain syndrome.

measure, and their cutoff. The prevalence of PI and standard error were extracted for studies reporting prevalence rates. The pain outcome measure, predictor and their outcome measure, the measure of association, and significance were extracted for included studies reporting factors associated with PI. In case of missing data, the first author was contacted to complete the table of results. If none of the contacted authors answered, the data was left missing. There was no restriction on data extraction based on adverse or beneficial results.

Quality Assessment

The quality assessment was performed by 2 independent researchers (AR and ES) using the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies of the National Institute of Health (25). This tool focuses on the key concepts for evaluating the internal validity of a study. Each item was classified as “yes,” “no,” or “not applicable/not reported/cannot determine.” Cohort studies were evaluated on 14 points and cross-sectional studies on 10 points (questions 6, 7, 12, and 13 are marked as not applicable), resulting in a different maximum score of 14 and 10 points (26). The quality categories proposed by Besora-Moreno et al (26) were applied, being, low (≤ 5 points), medium (6-9 points), and high quality (10-14 points) for cohort studies, and low (≤ 3 points), medium (4-7 points), and high quality (8-10 points) for cross-sectional studies. Uncertainties were again resolved by the third researcher (ER).

Data Synthesis and Analysis

For the prevalence rate, effect sizes were calculated manually for all studies reporting prevalence numbers to estimate the pooled prevalence rate of PI in people with pain. For the factors associated with PI in people with pain, all types of univariate association measures were tolerated for inclusion. Regression coefficients were omitted from the meta-analyses, due to the fact that the regression models from which they were retrieved included different covariates, making comparability across studies (even for standardized ones) problematic (27). All extracted data, both for univariate and multivariate associations, were summarized in a descriptive way in an evidence table divided into different clusters and further subdivided into all factors retrieved from the search (Table 2).

Accordingly, a meta-analysis was only conducted if at least 2 similar association measures were reported

for the analyzed factor and if the same PI outcome measure was used. In the case of different outcomes for the measurement of a factor within one study, the most common or overarching type of measurement was chosen. In the case of Pearson's correlation coefficients, these were first transformed to Fisher's Z test to stabilize the variance of correlation coefficients. Afterwards, model results were recalculated into Pearson's correlation coefficients for ease of interpretation (28). The size of correlation was respectively negligible (± 0.00 to ± 0.30), low (± 0.30 to ± 0.50), moderate (± 0.50 to ± 0.70), high (± 0.70 to ± 0.90), and very high (± 0.90 to ± 1.00) (29).

Review Manager 5.4 from the Cochrane Collaboration (30) was used to perform the meta-analyses. Random effects were used for all analyses done. The method presented by Higgins et al (31) was used to assess the consistency across studies. Subgroup analyses defined prior to the analyses were performed based on the methodological quality of the studies (low, medium, or high quality), the type of pain population, and whether the outcome measure was valid or not (valid or invalid). To determine the significance of heterogeneity among studies, a chi-squared (χ^2) test was interpreted wherefore a P value of 0.05 was used as a cutoff (32).

RESULTS

Study Selection

After removing duplicates, the systematic search resulted in 10,081 articles that were subsequently screened on title and abstract. Four authors were contacted (22,33-36) due to the unavailability of the study, of which 2 replied to the request (22,35,36). After initial screening, 153 articles were screened in full text. Two additional studies were identified by a forward and backward hand search. Ultimately, 54 studies (15,163 patients) were included: 3 for prevalence rates and 43 for factors associated with PI, and 8 for both the prevalence rates and the associated factors (Fig. 1).

Study Characteristics

The 54 included studies involved 44 cross-sectional (7,9,16,17,35-74) and 10 cohort studies (16,21,22,75-81). The included studies were all retrieved from high-income countries. Sample sizes ranged from 30 (35) to 4,516 (45) (Table 4). Three different PI outcomes were found across the studies: 50 used the Injustice Experienced Questionnaire (IEQ) (7,9,16,21,22,35-

Table 2. Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-----------------------------------------------------|--------|-----------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| PSYCHOLOGICAL CHARACTERISTICS AND COGNITIONS | | | | | | | | | | |
| Depressive symptoms^{MA} | | | | | | | | | | |
| Agratap 2016, United States (62) | CS | 206 | 47.48 | Traumatic injury | NRS [0/20]: NM | 12 mo | IEQ [0/48]: 16.74 ± 14.92 | NM | PHQ-8 | r = 0.681***MA |
| Boals 2020, United States (81) | C | 176 | 44.47 | Traumatic injury | NM | NM | IEQ [0/48]: - T1: 17.04 ± 12.93 - T2: 16.25 ± 14.10 - T3: 16.41 ± 15.63 | NM | - T1-T1 PHQ-8 - T2-T1 PHQ-8 - T3-T1 PHQ-8 - T1-T2 PHQ-8 - T2-T2 PHQ-8 - T3-T2 PHQ-8 - T1-T3 PHQ-8 - T2-T3 PHQ-8 - T3-T3 PHQ-8 | r = 0.61***MA r = 0.48*** r = 0.41*** r = 0.55*** r = 0.73***MA r = 0.72*** r = 0.62*** r = 0.69*** r = 0.80***MA |
| Monden 2019, United States (50) | CS | 74 | 47.6 | SCI | MPQ-SF-PPI [0/5]: NM | 51.5 (27.0 – 94.0) de | IEQ [0/48]: NM | NM | PHQ-8 | r = 0.45***MA SLOPE = 1.19*** |
| Trost 2015, United States (54) | CS | 155 | 47.5 | Traumatic injury | NRS [0/10]: 4.01 ± 3.00 | NM | IEQ [0/48]: 17.07 ± 14.55 | NM | PHQ-8 | r = 0.64***MA |
| Trost 2016 (b), United States (55) | CS | 45 | 48.80 | SCI | MPQ-SF-PPI [0/5]: 3.35 ± 2.5 | 82.49 ± 101.56 de | IEQ [0/48]: NM | NM | PHQ-8 | r = 0.49***MA SLOPE = 1.19*** |
| Trost 2017, United States (72) | CS | 53 | 47.62 | SCI | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | 204.51 ± 410.67 de | IEQ [0/48]: 15.37 ± 12.35 | NM | PHQ-8 | r = 0.44***MA |
| Iverson 2018, Canada (44) | CS | 102 | 41.2 | mTBI | BPQ [0/15]: NM | 12.1 ± 6.3 we | IEQ [0/48]: 20.79 ± 10.94 | > 30 > 19 | PHQ-9 | IEQ total: r = 0.598***MA IEQ blame: r = 0.511*** IEQ severity: r = 0.605*** |
| Scott 2013, Canada (83) | CS | 183 | 49.67 | Chronic MSK pain | PPI [0/10]: 5.82 ± 2.09 | 9.98 ± 8.20 yd | IEQ [0/48]: 28.91 ± 11.11 | NM | PHQ-9 | r = 0.56***MA |
| Scott 2016, Canada (52) | CS | 66 | 40.03 | Chronic MSK pain | MPQ-PRI [0/78]: 34.21 ± 14.16 | 11.55 ± 16.63 m | IEQ [0/48]: 31.71 ± 8.55 | NM | PHQ-9 | r = 0.44***MA |
| Scott 2019, United Kingdom (78) | C | 303 | 45.22 | Chronic pain | NRS [0/10]: 7.63 ± 1.60 | 13.37 ± 10.29 yd | IEQ [0/48]: 31.84 ± 9.96 | > 19 | PHQ-9 | r = 0.45***MA |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|--------------------------------|--------|-----------------|--------------|-----------------------------------|-----------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------|-------------------------------------------------------|
| Yakovov 2018 (a), Canada (76) | C | 110 | 66.9 | Knee OA scheduled for TKA | WOMAC [0/20]: - Pretreatment: 10.6 \pm 3.3 - Posttreatment: 3.4 \pm 3.4 | NM | Changes in IEQ-chr [0/48]: - Pretreatment: 8.9 \pm 8.4 - Posttreatment: 6.3 \pm 8.4 IEQ-chr [0/48]: - Pretreatment: 8.9 \pm 8.4 - Posttreatment: 6.3 \pm 8.4 | NM | PHQ-9 | $r = 0.24^*$ $\beta = 0.19^*$ $r = 0.52^{**MA}$ |
| Trost 2019, United States (53) | CS | 137 | 41.86 | CLBP | MPQ-SF-PRI [0/45]: 21.58 \pm 13.05 | 8.52 \pm 7.58 yd | IEQ [0/48]: 24.81 \pm 12.44 | NM | PHQ-9 | $r = 0.64^{**MA}$ |
| Ziadni 2020, Seattle (59) | CS | 137 | 41.9 | CLBP | MPQ-SF-PRI [0/45]: 21.96 \pm 13.02 | 8.52 \pm 7.58 yd | IEQ [0/48]: 25.09 \pm 12.27 | > 19 | PHQ-9 | $r = 0.630^{**MA}$ |
| Pâquet 2016, Canada (51) | CS | 100 | 25.50 | Women with PVD and their partners | MPQ [0/78]: 27.22 \pm 11.29 | 51.50 \pm 43.34 md | IEQ [0/48]: 21.86 \pm 10.71 | NM | BDI-II | $r = 0.05^{**MA}$ |
| Rahbari 2019, Iran (64) | CS | 230 | 41.57 | Chronic MSK pain | MPQ [0/78]: NM | 43.4 \pm 38.40 md | IEQ-P [0/48]: 20.15 \pm 9.36 | NM | BDI-II | $r = 0.40^{**MA}$ |
| Scott 2012, Canada (7) | CS | 107 | 41 | Chronic MSK pain | NRS [0/10]: - Women: 4.9 \pm 1.9 - Men: 4.1 \pm 2.2 | 8.3 y | IEQ [0/48]: - Women: 26.8 \pm 11.6 - Men: 23.4 \pm 11.2 | NM | BDI-II | $r = 0.42^{**MA}$ |
| Sullivan 2008, Canada (22) | C | 226 | 37.7 | Chronic MSK pain | MPQ-PRI: - Work accident: 24.3 \pm 15.6 - Motor accident: 26.6 \pm 15.7 | NM | IEQ [0/48]: - Work accident: 17.3 \pm 12.2 - Motor accident: 25.1 \pm 11.8 | NM | BDI-II | $r = 0.66^{**MA}$ |
| Sullivan 2009, Canada (15) | C | 112 | 35.8 | Whiplash injury | MPQ-PRI: 21.4 \pm 13.5 | 18.3 w | IEQ [0/48]: 22.3 \pm 9.7 | NM | BDI-II | $r = 0.43^{**MA}$ |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|-----------------|--------------|------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------|-----------------------------------------------------|
| Yakovov 2016, Canada (56) | CS | 71 | 35.8 | Whiplash injury | NPRS [0/10]: - Pretreatment: 5.2 \pm 1.8 - Posttreatment: 4.2 \pm 1.8 | 18.6 \pm 7.3 w | Changes in IEQ [0/48]: - Pre-treatment: 27.0 \pm 6.6 - Post-treatment: 22.6 \pm 9.7 | ≥ 18 | BDI-II (changes) | r = 0.16 ^{MA} |
| Penn 2019, United States (70) | CS | 60 | 47.6 | Chronic pain among PLWH | Rate [0/5]: NM | NM | IEQ [0/48]: 25.7 \pm 11.9 | NM | CES-D | r = 0.572 ^{**MA} |
| Penn 2020, United States (77) | C | 105 | 45.79 | CLBP | SPPB-Pain [0/100]: 27.37 \pm 27.41 | NM | IEQ [0/48]: 17.95 \pm 13.38 | NM | CES-D | r = 0.505 ^{**MA} |
| Carrieri 2017 (a), California (16) | CS | 344 | 48 | Chronic pain | NRS [0/10]: - No active opioid prescription: 4.44 \pm 2.78 - Active opioid prescription: 5.68 \pm 2.37 | NM | IEQ [0/48]: - No active opioid prescription: 15.60 \pm 11.40 - Active opioid prescription: 20.17 \pm 10.51 | NM | PROMIS depression | r = 0.656 ^{**MA} |
| Miller 2021, United States (35) | CS | 30 | 11.3 | Youth with SCD | PedsQL [0/100]: 68.43 \pm 19.11 | NM | IEQ [0/48]: 11.17 \pm 12.42 | NM | PROMIS depression | r = 0.60 ^{**MA} |
| Sturgeon 2017, United States (69) | CS | 330 | NM | Chronic pain | NRS [0/10]: 6.42 \pm 1.53 | 15 \pm 6.42 yd | IEQ [0/48]: 30.0 \pm 10.3 | NM | PROMIS depression | r = 0.608 ^{**MA} |
| Ysidron 2020, Greece (80) | C | 343 | NM | LBP | NRS [0/10]: 6.0 \pm 1.8 | NM | IEQ [0/48]: NM | NM | - PROMIS depression - PROMIS depression (after 3m) | r = 0.48 ^{**MA} r = 0.48 ^{***} |
| Giumarra 2017 (a), Australia (40) | CS | 354 | 42.97 | Traumatic injury | BPI, pain severity [0/10]: NM | NM | IEQ [0/48]: - Compensable: 20.26 \pm 14.20 - Non compensable: 11.79 \pm 11.24 | > 30 | HADS depression | r = 0.65 ^{***MA} |
| Ioannou 2016, Australia (42) | CS | 160 | 43.01 | Traumatic injury | BPI, pain severity [0/10]: 2.94 \pm 2.19 | 13.38 \pm 1.67 mc | IEQ [0/48]: 20.52 \pm 14.61 | ≥ 11 | HADS depression | r = 0.71 ^{**MA} |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|--------------------------|--------------|-------------------------------------------------|-----------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| La Cour 2017, Denmark (66) | CS | 358 | 45.5 | Chronic benign pain or a "somatoform" diagnosis | SF-36 Bodily pain [0/100]: 31.8 ± 25.5 | 9.8 ± 8.6 y | IEQ [0/48]: 26.8 ± 11.0 | > 30 | HADS depression | r = 0.573***MA |
| Rodero 2012, Spain (9) | CS | 250 | 52.4 | FM | PVAS [0/100]: 52.5 ± 16.8 | 18.5 ± 11.3 y | IEQ [0/48]: 30.1 ± 12.2 | > 30 | HADS depression | r = 0.67***MA |
| Yamada 2019, Japan (67) | CS | 130 | 33 | Menstrual pain | NRS [0/10]: 5.7 ± 2.2 | NM | IEQ-chr-J [0/48]: 14.2 ± 13.0 | NM | HADS depression | r = 0.62***MA |
| Bults 2020, the Netherlands (74) | CS | 53 (PR-UMCG) 228 (TC) | 42.2 | Chronic pain | NRS [0/10]: 7.0 ± 1.7 | 69.3 ± 81.5 md | IEQ [0/48]: 21.0 ± 11.5 | ≥ 30 | SCL-90-D | PR-UMCG: r = 0.62***MA TC: r = 0.69***MA |
| Posttraumatic stress ^{MA} | | | | | | | | | | |
| Agarap 2016, United States (62) | CS | 206 | 47.48 | Traumatic injury | NRS [0/20]: NM | 12 me | IEQ [0/48]: 16.74 ± 14.92 | NM | PC-PTSD | r = 0.602***MA |
| Boals 2020, United States (81) | C | 176 | 44.47 | Traumatic injury | NM | NM | IEQ [0/48]: - T1: 17.04 ± 12.93 - T2: 16.25 ± 14.10 - T3: 16.41 ± 15.63 | NM | - T1-T1 PC-PTSD - T2-T1 PC-PTSD - T3-T1 PC-PTSD - T1-T2 PC-PTSD - T2-T2 PC-PTSD - T3-T2 PC-PTSD - T1-T3 PC-PTSD - T2-T3 PC-PTSD - T3-T3 PC-PTSD | r = 0.47***MA r = 0.43*** r = 0.31** r = 0.46 r = 0.65***MA r = 0.54*** r = 0.43*** r = 0.57*** r = 0.67***MA |
| Trost 2015, United States (54) | CS | 155 | 47.5 | Traumatic injury | NRS [0/10]: 4.01 ± 3.00 | NM | IEQ [0/48]: 17.07 ± 14.55 | NM | PC-PTSD | r = 0.61***MA |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|--------------------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|------------------------------------------------------------------------------|--------------------|---------------------------|------------------------------------------------------------------------------------|
| Trost 2016 (b), United States | CS | 45 | 48.80 | SCI | MPQ-SF-PPI [0/5]: 3.35 ± 2.5 | 82.49 ± 101.56 de | IEQ [0/48]: NM | NM | PC-PTSD | r = 0.58***MA β = 0.52 |
| Trost 2017, United States (72) | CS | 53 | 47.62 | SCI | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | 204.51 ± 410.67 de | IEQ [0/48]: 15.37 ± 12.35 | NM | PC-PTSD | r = 0.6***MA |
| Bults 2020, the Netherlands (74) | CS | 53 (PR-UMCG) 228 (TC) | 42.2 | Chronic pain | NRS [0/10]: 7.0 ± 1.7 | 69.3 ± 81.5 md | IEQ [0/48]: 21.0 ± 11.5 | ≥ 30 | SCL-90-PTSD | PR-UMCG: r = 0.68***MA TC: r = 0.71***MA |
| Sullivan 2009, Canada (15) | C | 112 | 35.8 | Whiplash injury | MPQ-PRI: 21.4 ± 13.5 | 18.3 we | IEQ [0/48]: 22.3 ± 9.7 | NM | IES-R | r = 0.60***MA |
| Yakovov 2018 (b), Canada (73) | CS | 146 | 36.5 | Whiplash injury | MPQ-PRI: 22.0 ± 12.5 | 9.0 wd | IEQ [0/48]: 22.8 ± 9.7 | NM | IES-R | r = 0.61***MA |
| Giummarra 2017 (a), Australia (40) | CS | 354 | 42.97 | Traumatic injury | BPI, pain severity [0/10]: NM | NM | IEQ [0/48]: - Compensable: 20.26 ± 14.20 - Non compensable: 11.79 ± 11.24 | > 30 | PCL-C | r = 0.65***MA |
| Ioannou 2016, Australia (42) | CS | 160 | 43.01 | Traumatic injury | BPI, pain severity [0/10]: 2.94 ± 2.19 | 13.38 ± 1.67 mc | IEQ [0/48]: 20.52 ± 14.61 | ≥ 11 | PCL-C | r = 0.71***MA |
| Trost 2015, United States (54) | CS | 155 | 47.5 | Traumatic injury | NRS [0/10]: 4.01 ± 3.00 | NM | IEQ [0/48]: 17.07 ± 14.55 | NM | PCL-C | r = 0.61***MA |
| Iverson 2018, Canada (44) | CS | 102 | 41.2 | mTBI | BPQ [0/15]: NM | 12.1 ± 6.3 we | IEQ [0/48]: 20.79 ± 10.94 | > 30 > 19 | PCL-5 | IEQ total: r = 0.689***MA IEQ blame: r = 0.632*** IEQ severity: r = 0.637*** |
| Linnemorken 2020, Norway (46) | CS | 692 | 47.5 | Chronic pain | NRS [0/10]: 7.17 ± 1.71 | 7.55 ± 8.35 ye | IEQ [0/48]: 23.99 ± 11.18 | ≥ 33 | PCL-5 | OR: 1.09*** ORadja: 1.08*** |
| Pain acceptance ^{MA} | | | | | | | | | | |
| Bults 2020, the Netherlands (74) | CS | 53 (PR-UMCG) | 42.2 | Chronic pain | NRS [0/10]: 7.0 ± 1.7 | 69.3 ± 81.5 md | IEQ [0/48]: 21.0 ± 11.5 | ≥ 30 | AAQ-II | r = -0.81***MA |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-----------------------------------|--------|--------------------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Carriere 2018, United States (38) | CS | 354 | 47.5 | Chronic pain | NRS [0/10]: 4.72 ± 2.74 | NM | IEQ [0/48]: 16.8 ± 11.41 | NM | CPAQ-8 | r = -0.595***MA |
| Martel 2017, Canada (49) | CS | 475 | 51 | Chronic pain | NRS [0/10]: 5.93 ± 1.51 | NM | IEQ [0/48]: 29.1 ± 10.3 | > 19 | - CPAQ-8 total - CPAQ-8 subscale engagement - CPAQ-8 subscale willingness | r = -0.56***MA r = -0.42** r = -0.45** |
| Scott 2019, United Kingdom (78) | C | 303 | 45.22 | Chronic pain | NRS [0/10]: 7.63 ± 1.60 | 13.37 ± 10.29 yd | IEQ [0/48]: 31.84 ± 9.96 | > 19 | CPAQ-8 | r = -0.36***MA |
| Rodero 2012, Spain (9) | CS | 250 | 52.4 | FM | PVAS [0/100]: 52.5 ± 16.8 | 18.5 ± 11.3 yd | IEQ [0/48]: 30.1 ± 12.2 | > 30 | CPAQ | r = -0.62***MA |
| Ysidron 2020, Greece (80) | C | 343 | NM | LBP | NRS [0/10]: 6.0 ± 1.8 | NM | IEQ [0/48]: NM | NM | - CPAQ - CPAQ (after 1m) | r = -0.58***MA r = -0.59*** |
| Pain-related injustice appraisals | | | | | | | | | | |
| Boals 2020, United States (81) | C | 176 | 44.47 | Traumatic injury | NM | NM | IEQ [0/48]: T1: 17.04 ± 12.93 T2: 16.25 ± 14.10 T3: 16.41 ± 15.63 | NM | - T1-T2 IEQ - T1-T3 IEQ - T2-T1 IEQ - T2-T3 IEQ - T3-T1 IEQ - T3-T2 IEQ | r = 0.59*** r = 0.59*** r = 0.59*** r = 0.85*** r = 0.64*** r = 0.86*** |
| Daenen 2020, United Kingdom (61) | CS | 146 | 15.03 | Paediatric chronic pain | NRS [0/10]: 5.39 ± 2.39 | NM | GJWB [5/34]: 20.92 ± 5.47 PIWB [0/41]: 25.49 ± 6.83 | NM | IEQ | r = -0.13 r = -0.27** |
| Anxiety ^{MA} | | | | | | | | | | |
| Bults 2020, the Netherlands (74) | CS | 53 (PR-UMCG) 228 (TC) | 42.2 | Chronic pain | NRS [0/10]: 7.0 ± 1.7 | 69.3 ± 81.5 m | IEQ [0/48]: 21.0 ± 11.5 | ≥ 30 | SCL-90-A | PR-UMCG: r = 0.66***MA TC: r = 0.65***MA |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|-----------------|--------------|-------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------|--------------------|---------------------------|----------------------------------------------------------------------|
| Giummarra 2017 (a), Australia (40) | CS | 354 | 42.97 | Traumatic injury | BPI, pain severity [0/10]: NM | NM | IEQ [0/48]: - Compensable: 20.26 \pm 14.20 - Non compensable: 11.79 \pm 11.24 | > 30 | HADS anxiety | r = 0.58***MA |
| Ioannou 2016, Australia (42) | CS | 160 | 43.01 | Traumatic injury | BPI, pain severity [0/10]: 2.94 \pm 2.19 | 13.38 \pm 1.67 mc | IEQ [0/48]: 20.52 \pm 14.61 | \geq 11 | HADS anxiety | r = 0.67***MA |
| La Cour 2017, Denmark (66) | CS | 358 | 45.5 | Chronic benign pain or a "somatoform" diagnosis | SF-36 Bodily pain [0/100]: 31.8 \pm 25.5 | Disease duration: 9.8 \pm 8.6 y | IEQ [0/48]: 26.8 \pm 11.0 | > 30 | HADS anxiety | r = 0.533***MA |
| Rodero 2012, Spain (9) | CS | 250 | 52.4 | FM | PVAS [0/100]: 52.5 \pm 16.8 | 18.5 \pm 11.3 y | IEQ [0/48]: 30.1 \pm 12.2 | > 30 | HADS anxiety | r = 0.56***MA |
| Yamada 2019, Japan (67) | CS | 130 | 33 | Menstrual pain | NRS [0/10]: 5.7 \pm 2.2 | NM | IEQ-chr-J [0/48]: 14.2 \pm 13.0 | NM | HADS anxiety | r = 0.65***MA |
| Miller 2021, United States (35) | CS | 30 | 11.3 | Youth with SCD | PedsQL [0/100]: 68.43 \pm 19.11 | NM | IEQ [0/48]: 11.17 \pm 12.42 | NM | PROMIS anxiety | r = 0.072***MA |
| Kinesiophobia ^{MA} | | | | | | | | | | |
| Agatrap 2016, United States (62) | CS | 206 | 47.48 | Traumatic injury | NRS [0/20]: NM | 12 me | IEQ [0/48]: 16.74 \pm 14.92 | NM | TSK | r = 0.704***MA |
| Ioannou 2017, Australia (43) | CS | 433 | 44.8 | Traumatic injury | BPI, pain severity [0/10]: 2.60 \pm 2.05 | 13.5 \pm 1.6 mc | IEQ [0/48]: 16.26 \pm 13.79 | \geq 20 | TSK | r = 0.55***MA $\beta_{\text{unadj}} = 0.91^*$ $\beta = 0.48^*$ |
| Rahbari 2019, Iran (64) | CS | 230 | 41.57 | Chronic MSK pain | MPQ [0/78]: NM | 43.4 \pm 38.40 md | IEQ-P [0/48]: 20.15 \pm 9.36 | NM | TSK | r = 0.48***MA |
| Sullivan 2008, Canada (22) | CS | 226 | 37.7 | Chronic MSK pain | MPQ-PRI: - Work accident: 24.3 \pm 15.6 - Motor accident: 26.6 \pm 15.7 | NM | IEQ [0/48]: - Work accident: 17.3 \pm 12.2 - Motor accident: 25.1 \pm 11.8 | NM | TSK | r = 0.58***MA |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|-----------------|--------------|------------------------------|----------------------------------------------------------------------|-----------------------------|---------------------------------------------------------|--------------------|---------------------------|-------------------------------------------------------------------------------------------|
| Sullivan 2009, Canada (15) | C | 112 | 35.8 | Whiplash injury | MPQ-PRI: 21.4 ± 13.5 | 18.3 we | IEQ [0/48]: 22.3 ± 9.7 | NM | TSK | r = 0.62**MA |
| Yakobov 2014, Canada (75) | C | 116 | 67.0 | Knee OA scheduled for TKA | WOPAIN [0/100]: - Presurgery: 53.0 ± 17.7 - Postsurgery: 17.0 ± 17.2 | 7.6 ye | IEQ-chr [0/48]: 9.0 ± 8.7 | NM | TSK-13 | r = 0.48***MA |
| State anger ^{MA} | | | | | | | | | | |
| Monden 2019, United States (50) | CS | 74 | 47.6 | SCI | MPQ-SF-PPI [0/5]: NM | 51.5 (27.0 – 94.0) de | IEQ [0/48]: NM | NM | STAXI-II subscale state | Bivariate GLM: r = 0.49***MA SLOPE = 1.09*** Multivariate GLM: SLOPE = 0.51* r = 0.36**MA |
| Scott 2016, Canada (52) | CS | 66 | 40.03 | Chronic MSK pain | MPQ-PRI [0/78]: 34.21 ± 14.16 | 11.55 ± 16.63 me | IEQ [0/48]: 31.71 ± 8.55 | NM | STAXI-II subscale state | r = 0.60***MA β = -0.02 r = 0.50**MA |
| Trost 2016 (b), United States (55) | CS | 45 | 48.80 | SCI | MPQ-SF-PPI [0/5]: 3.35 ± 2.5 | 82.49 ± 101.56 de | IEQ [0/48]: NM | NM | STAXI-II subscale state | r = 0.58***MA |
| Trost 2019, United States (53) | CS | 137 | 41.86 | CLBP | MPQ-SF-PRI [0/45]: 21.58 ± 13.05 | 8.52 ± 7.58 y | IEQ [0/48]: 24.81 ± 12.44 | NM | STAXI-II subscale state | r = 0.42**MA |
| Trost 2017, United States (72) | CS | 53 | 47.62 | SCI | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | 204.51 ± 410.67 de | IEQ [0/48]: 15.37 ± 12.35 | NM | STAXI-II subscale state | r = 0.42**MA |
| Scott 2013, Canada (83) | CS | 183 | 49.67 | Chronic MSK pain | NRS [0/10]: 5.82 ± 2.09 | 9.98 ± 8.20 y | IEQ [0/48]: 28.91 ± 11.11 | NM | STAEI subscale state | r = 0.42**MA |
| Trait anger ^{MA} | | | | | | | | | | |
| Monden 2019, United States (50) | CS | 74 | 47.6 | SCI | MPQ-SF-PPI [0/5]: NM | 51.5 (27.0 – 94.0) de | IEQ [0/48]: NM | NM | STAXI-II subscale trait | Bivariate GLM: r = 0.49***MA SLOPE = 1.66*** |
| Scott 2016, Canada (52) | CS | 66 | 40.03 | Chronic MSK pain | MPQ-PRI [0/78]: 34.21 ± 14.16 | 11.55 ± 16.63 me | IEQ [0/48]: 31.71 ± 8.55 | NM | STAXI-II subscale trait | r = 0.34**MA |
| Trost 2016 (b), United States (55) | CS | 45 | 48.80 | SCI | MPQ-SF-PPI [0/5]: 3.35 ± 2.5 | 82.49 ± 101.56 de | IEQ [0/48]: NM | NM | STAXI-II subscale trait | r = 0.55***MA |
| Trost 2017, United States (72) | CS | 53 | 47.62 | SCI | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | 204.51 ± 410.67 de | IEQ [0/48]: 15.37 ± 12.35 | NM | STAXI-II subscale trait | r = 0.55***MA |
| Trost 2019, United States (53) | CS | 137 | 41.86 | CLBP | MPQ-SF-PRI [0/45]: 21.58 ± 13.05 | 8.52 ± 7.58 y | IEQ [0/48]: 24.81 ± 12.44 | NM | STAXI-II subscale trait | r = 0.33**MA |
| Scott 2013, Canada (83) | CS | 183 | 49.67 | Chronic MSK pain | NRS [0/10]: 5.82 ± 2.09 | 9.98 ± 8.20 y | IEQ [0/48]: 28.91 ± 11.11 | NM | STAEI subscale trait | r = 0.27**MA |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|--------------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|------------------------------|---------------------------|
| Anger expression^{MA} | | | | | | | | | | |
| Scott 2016, Canada (52) | CS | 66 | 40.03 | Chronic MSK pain | MPQ-PRI [0/78]: 34.21 \pm 14.16 | 11.55 \pm 16.63 me | IEQ [0/48]: 31.71 \pm 8.55 | NM | STAXI-II subscale expression | r = 0.34** ^{MA} |
| Trost 2019, United States (53) | CS | 137 | 41.86 | CLBP | MPQ-SF-PRI [0/45]: 21.58 \pm 13.05 | 8.52 \pm 7.58 y | IEQ [0/48]: 24.81 \pm 12.44 | NM | STAXI-II subscale expression | r = 0.26** ^{MA} |
| Trost 2017, United States (72) | CS | 53 | 47.62 | SCI | MPQ-PRI-PPI [0/5]: 1.49 \pm 0.91 | 204.51 \pm 410.67 de | IEQ [0/48]: 15.37 \pm 12.35 | NM | STAXI-II subscale expression | r = 0.42** ^{MA} |
| Scott 2013, Canada (83) | CS | 183 | 49.67 | Chronic MSK pain | NRS [0/10]: 5.82 \pm 2.09 | 9.98 \pm 8.20 y | IEQ [0/48]: 28.91 \pm 11.11 | NM | STAEI subscale expression | r = 0.10** ^{MA} |
| Anger inhibition^{MA} | | | | | | | | | | |
| Scott 2016, Canada (52) | CS | 66 | 40.03 | Chronic MSK pain | MPQ-PRI [0/78]: 34.21 \pm 14.16 | 11.55 \pm 16.63 me | IEQ [0/48]: 31.71 \pm 8.55 | NM | STAXI-II subscale inhibition | r = 0.40** ^{MA} |
| Trost 2019, United States (53) | CS | 137 | 41.86 | CLBP | MPQ-SF-PRI [0/45]: 21.58 \pm 13.05 | 8.52 \pm 7.58 y | IEQ [0/48]: 24.81 \pm 12.44 | NM | STAXI-II subscale inhibition | r = 0.33** ^{MA} |
| Trost 2017, United States (72) | CS | 53 | 47.62 | SCI | MPQ-PRI-PPI [0/5]: 1.49 \pm 0.91 | 204.51 \pm 410.67 de | IEQ [0/48]: 15.37 \pm 12.35 | NM | STAXI-II subscale inhibition | r = 0.42** ^{MA} |
| Scott 2013, Canada (83) | CS | 183 | 49.67 | Chronic MSK pain | NRS [0/10]: 5.82 \pm 2.09 | 9.98 \pm 8.20 y | IEQ [0/48]: 28.91 \pm 11.11 | NM | STAEI subscale inhibition | r = 0.33** ^{MA} |
| Anger^{MA} | | | | | | | | | | |
| Bults 2020, the Netherlands (74) | CS | 53 (PR-UMCG) | 42.2 | Chronic pain | NRS [0/10]: 7.0 \pm 1.7 | 69.3 \pm 81.5m | IEQ [0/48]: 21.0 \pm 11.5 | \geq 30 | NRS anger | r = 0.74** ^{MA} |
| Carriere 2018, United States (38) | CS | 354 | 47.5 | Chronic pain | NRS [0/10]: 4.72 \pm 2.74 | NM | IEQ [0/48]: 16.8 \pm 11.41 | NM | PROMIS anger | r = 0.550** ^{MA} |
| Sturgeon 2016, Canada (68) | CS | 302 | 47.6 | Chronic pain | NRS [0/10]: 5.66 \pm 2.25 | 8.67 \pm 10.13 y | IEQ [0/48]: 17.92 \pm 11.40 | NM | PROMIS anger | r = 0.543** ^{MA} |
| Psychological distress | | | | | | | | | | |
| Martel 2017, Canada (49) | CS | 475 | 51 | Chronic pain | NRS [0/10]: 5.93 \pm 1.51 | NM | IEQ [0/48]: 29.1 \pm 10.3 | $>$ 19 | HADS physical distress | r = 0.63** |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-------------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|---------------------------|---------------------------|
| McParland 2010, United Kingdom (47) | CS | 95 | 66.23 | Arthritis and FM | 7-item Chronic Pain Grade [0/100]: 69.06 \pm 20.35 | 16.21 \pm 14.66 yd | PJWB: 25.72 \pm 6.06 | NM | GHQ-28 | r = -0.45*** |
| McParland 2010, United Kingdom (47) | CS | 95 | 66.23 | Arthritis and FM | 7-item Chronic Pain Grade [0/100]: 69.06 \pm 20.35 | 16.21 \pm 14.66 yd | GJWB: 22.78 \pm 6.17 | NM | GHQ-28 | r = -0.12 |
| General Just-world beliefs (GJWB) | | | | | | | | | | |
| Daenen 2020, United Kingdom (61) | CS | 146 | 15.03 | Paediatric chronic pain | NRS [0/10]: 5.39 \pm 2.39 | NM | IEQ [0/48]: 18.98 \pm 12.54 PJWB [0/41]: 25.49 \pm 6.83 | NM | GJWB | r = -0.13 r = 0.59** |
| McParland 2010, United Kingdom (47) | CS | 95 | 66.23 | Arthritis and FM | 7-item Chronic Pain Grade [0/100]: 69.06 \pm 20.35 | 16.21 \pm 14.66 yd | PJWB: 25.72 \pm 6.06 | NM | GJWB | r = 0.43*** |
| Personal Just-world beliefs (PJWB) | | | | | | | | | | |
| Daenen 2020, United Kingdom (61) | CS | 146 | 15.03 | Paediatric chronic pain | NRS [0/10]: 5.39 \pm 2.39 | NM | IEQ [0/48]: 18.98 \pm 12.54 GJWB [5/34]: 20.92 \pm 5.47 | NM | PJWB | r = -0.27** r = 0.59** |
| Life satisfaction | | | | | | | | | | |
| Sturgeon 2017, United States (69) | CS | 330 | NM | Chronic pain | NRS [0/10]: 6.42 \pm 1.53 | 15 \pm 6.42 yd | IEQ [0/48]: 30.0 \pm 10.3 | NM | SWLS | r = -0.557** |
| Discrimination | | | | | | | | | | |
| Ziadni 2020, Seattle (59) | CS | 137 | 41.9 | CLBP | MPQ-SF-PRI [0/45]: 21.96 \pm 13.02 | 8.52 \pm 7.58 yd | IEQ [0/48]: 25.09 \pm 12.27 | > 19 | PEDQ | r = 0.345* |
| Negative experiences | | | | | | | | | | |
| Alirzadeh-Fard 2020, Iran (37) | CS | 142 | 42.18 | Breast cancer | PCS: 3.82 \pm 0.46 | 10.03 \pm 0.08 me | IEQ [0/48]: 25.72 \pm 10.7 | NM | ZTIP past negative | r = 0.43*** |
| Positive experiences | | | | | | | | | | |
| Alirzadeh-Fard 2020, Iran (37) | CS | 142 | 42.18 | Breast cancer | PCS: 3.82 \pm 0.46 | 10.03 \pm 0.08 me | IEQ [0/48]: 25.72 \pm 10.7 | NM | ZTIP past positive | r = -0.11 |
| Social isolation | | | | | | | | | | |
| Sturgeon 2016, Canada (68) | CS | 302 | 47.6 | Chronic pain | NRS [0/10]: 5.66 \pm 2.25 | 8.67 \pm 10.13 yd | IEQ [0/48]: 17.92 \pm 11.40 | NM | PROMIS social isolation | r = 0.540** |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|--------------------------|--------------|------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------|---------------------------------------------------------------------------------|
| Stress | | | | | | | | | | |
| Miller 2018, United States (71) | CS | 253 | 14.1 | Paediatric chronic pain | NRS [0/10]: 4.46 \pm 2.82 | NM | IEQ-C [0/48]: 18.94 \pm 11.98 | NM | NRS stress | r = 0.39** |
| Stigma | | | | | | | | | | |
| Scott 2019, United Kingdom (78) | C | 303 | 45.22 | Chronic pain | NRS [0/10]: 7.63 \pm 1.60 | 13.37 \pm 10.29 yd | IEQ [0/48]: 31.84 \pm 9.96 | > 19 | SSCI-8 | r = 0.52*** |
| PAIN CHARACTERISTICS | | | | | | | | | | |
| Pain intensity^{MA} | | | | | | | | | | |
| Agarap 2016, United States (62) | CS | 206 | 47.48 | Traumatic injury | NRS [0/20]: NM | 12 mo | IEQ [0/48]: 16.74 \pm 14.92 | NM | NRS pain intensity | r = 0.624*** ^{MA} |
| Bults 2020, the Netherlands (74) | CS | 53 (PR-UMCG) 228 (TC) | 42.2 | Chronic pain | NRS [0/10]: 7.0 \pm 1.7 | 69.3 \pm 81.5 m | IEQ [0/48]: 21.0 \pm 11.5 | \geq 30 | NRS pain intensity | PR-UMCG: r = 0.35 ^{MA} TC: r = 0.36*** ^{MA} |
| Carriere 2017 (a), California (16) | CS | 344 | 48 | Chronic pain | NRS [0/10]: - No active opioid prescription: 4.44 \pm 2.78 - Active opioid prescription: 5.68 \pm 2.37 | NM | IEQ [0/48]: - No active opioid prescription: 15.60 \pm 11.40 - Active opioid prescription: 20.17 \pm 10.51 | NM | NRS pain intensity | r = 0.333*** ^{MA} |
| Carriere 2018, United States (38) | CS | 354 | 47.5 | Chronic pain | NRS [0/10]: 4.72 \pm 2.74 | NM | IEQ [0/48]: 16.8 \pm 11.41 | NM | NRS pain intensity | r = 0.326*** ^{MA} |
| Daenen 2020, United Kingdom (61) | CS | 146 | 15.03 | Paediatric chronic pain | NRS [0/10]: 5.39 \pm 2.39 | NM | IEQ [0/48]: 18.98 \pm 12.54 GJWB [5/34]: 20.92 \pm 5.47 PJWB [0/41]: 25.49 \pm 6.83 | NM | NRS pain intensity | r = 0.41*** ^{MA} r = -0.06 ^{MA} r = -0.16 ^{MA} |
| Martel 2017, Canada (49) | CS | 475 | 51 | Chronic pain | NRS [0/10]: 5.93 \pm 1.51 | NM | IEQ [0/48]: 29.1 \pm 10.3 | > 19 | NRS pain intensity | r = 0.29*** ^{MA} |
| Miller 2018, United States (71) | CS | 253 | 14.1 | Paediatric chronic pain | NRS [0/10]: 4.46 \pm 2.82 | NM | IEQ-C [0/48]: 18.94 \pm 11.98 | NM | NRS pain intensity | r = 0.32*** ^{MA} |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-------------------------------------|--------|-----------------|--------------|------------------------------------------|-------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------|--------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Scott 2012, Canada (7) | CS | 107 | 41 | Chronic MSK pain | NRS [0/10]: - Women: 4.9 \pm 1.9 - Men: 4.1 \pm 2.2 | 8.3 y | IEQ [0/48]: - Women: 26.8 \pm 11.6 - Men: 23.4 \pm 11.2 | NM | NRS pain intensity | r = 0.15 ^{MA} |
| Scott 2013, Canada (83) | CS | 183 | 49.67 | Chronic MSK pain | NRS [0/10]: 5.82 \pm 2.09 | 9.98 \pm 8.20 y | IEQ [0/48]: 28.91 \pm 11.11 | NM | NRS pain intensity | r = 0.26 ^{**MA} |
| Scott 2019, United Kingdom (78) | C | 303 | 45.22 | Chronic pain | NRS [0/10]: 7.63 \pm 1.60 | 13.37 \pm 10.29 y | IEQ [0/48]: 31.84 \pm 9.96 | > 19 | NRS pain intensity | r = 0.20 ^{**MA} |
| Sturgeon 2016, Canada (68) | CS | 302 | 47.6 | Chronic pain | NRS [0/10]: 5.66 \pm 2.25 | 8.67 \pm 10.13 y | IEQ [0/48]: 17.92 \pm 11.40 | NM | NRS pain intensity | r = 0.347 ^{**MA} |
| Sturgeon 2017, United States (69) | CS | 330 | NM | Chronic pain | NRS [0/10]: 6.42 \pm 1.53 | 15 \pm 6.42 y | IEQ [0/48]: 30.0 \pm 10.3 | NM | NRS pain intensity | r = 0.293 ^{**MA} |
| Trost 2015, United States (54) | CS | 155 | 47.5 | Traumatic injury | NRS [0/10]: 4.01 \pm 3.00 | NM | IEQ [0/48]: 17.07 \pm 14.55 | NM | NRS pain intensity | r = 0.63 ^{**MA} |
| Trost 2016 (a), United Kingdom (79) | C | 53 | 39.13 | CLBP | NRS [0/10]: 2.39 \pm 2.30 | 9.18 \pm 6.9 y | IEQ [0/48]: 21.91 \pm 13.08 | NM | NRS pain intensity | r = 0.41 ^{**MA} |
| Yamada 2019, Japan (67) | CS | 130 | 33 | Menstrual pain | NRS [0/10]: 5.7 \pm 2.2 | NM | IEQ-chr-J [0/48]: 14.2 \pm 13.0 | NM | NRS pain intensity | r = 0.27 ^{**MA} |
| Ysidron 2020, Greece (80) | C | 343 | NM | LBP | NRS [0/10]: 6.0 \pm 1.8 | NM | IEQ [0/48]: NM | NM | NRS pain intensity NRS pain intensity (after 3m) | r = 0.35 ^{**MA} r = 0.45 ^{**MA} |
| Margiotta 2017, Ireland (48) | CS | 80 | 49 | Chronic pain | NRPS [0/10]: median 6 \pm IQR 2 | 24 \pm 51 m | IEQ [0/48]: median 22.5 \pm IQR 16.75 | \geq 30 | NPRS pain intensity | IEQ total: r = 0.25 ^{MA} IEQ blame: r = 0.11 IEQ severity: r = 0.31 ^{**} |
| Miller 2016, United States (36) | CS | 139 | 15 | Children & adolescents with chronic pain | NRPS [0/10]: 4.51 \pm 2.81 | NM | IEQ [0/48]: 19.11 \pm 12.29 | NM | NPRS | r = 0.31 ^{**MA} |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|--------------------------------|--------|-----------------|--------------|-----------------------------------|---------------------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------|-----------------------------------------|
| Sullivan 2009, Canada (15) | C | 112 | 35.8 | Whiplash injury | MPQ-PRI: 21.4 ± 13.5 | 18.3 we | IEQ [0/48]: 22.3 ± 9.7 | NM | NPRS MPQ-PRI | $r = 0.12^{MA}$ $r = 0.19^*$ |
| Yakobov 2016, Canada (56) | CS | 71 | 35.8 | Whiplash injury | NPRS [0/10]: - Pretreatment: 5.2 ± 1.8 - Posttreatment: 4.2 ± 1.8 | 18.6 ± 7.3 we | Changes in IEQ [0/48]: - Pre-treatment: 27.0 ± 6.6 - Post-treatment: 22.6 ± 9.7 Changes in IEQ [0/48]: - Pre-treatment: 27.0 ± 6.6 - Post-treatment: 22.6 ± 9.7 | ≥ 18 | NPRS changes NPRS | $r = 0.37^{**MA}$ $\beta = 0.16$ |
| Rahbari 2019, Iran (64) | CS | 230 | 41.57 | Chronic MSK pain | MPQ [0/78]: NM | 43.4 ± 38.40 m | IEQ-P [0/48]: 20.15 ± 9.36 | NM | MPQ | $r = 0.44^{**MA}$ |
| Yakobov 2018 (b), Canada (73) | CS | 146 | 36.5 | Whiplash injury | MPQ-PRI: 22.0 ± 12.5 | 9.0 w | IEQ [0/48]: 22.8 ± 9.7 | NM | MPQ | $r = 0.16^*$ |
| Pâquet 2016, Canada (51) | CS | 100 | 25.50 | Women with PVD and their partners | MPQ [0/78]: 27.22 ± 11.29 | 51.50 ± 43.34 md | IEQ [0/48]: 21.86 ± 10.71 | NM | MPQ-PRI | $r = 0.30^{MA}$ |
| Scott 2016, Canada (52) | CS | 66 | 40.03 | Chronic MSK pain | MPQ-PRI [0/78]: 34.21 ± 14.16 | 11.55 ± 16.63 me | IEQ [0/48]: 31.71 ± 8.55 | NM | MPQ-PRI | $r = 0.20^{MA}$ |
| Sullivan 2008, Canada (22) | C | 226 | 37.7 | Chronic MSK pain | MPQ-PRI: - Work accident: 24.3 ± 15.6 - Motor accident: 26.6 ± 15.7 | NM | IEQ [0/48]: - Work accident: 17.3 ± 12.2 - Motor accident: 25.1 ± 11.8 | NM | MPQ-PRI | $r = 0.54^{**MA}$ |
| Trost 2019, United States (53) | CS | 137 | 41.86 | CLBP | MPQ-SF-PRI [0/45]: 21.58 ± 13.05 | 8.52 ± 7.58 y | IEQ [0/48]: 24.81 ± 12.44 | NM | MPQ-SF-PRI | $r = 0.52^{**MA}$ |
| Ziadni 2020, Seattle (59) | CS | 137 | 137 | | 41.9 | | CLBP | | MPQ-SF-PRI [0/45]: 21.96 ± 13.02 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|--------------------------------------|--------|-----------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|---------------------------------------------------------|--------------------|----------------------------------------------------------------------------|------------------------|
| Trost 2017, United States (72) | CS | | 53 | | 47.62 | | SCI | | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | |
| Monden 2019, United States (50) | CS | | 74 | | 47.6 | | SCI | | MPQ-SF-PPI: NM | |
| Ioannou 2016, Australia (42) | CS | | 160 | | 43.01 | | Traumatic injury | | BPI, pain severity [0/10]: 2.94 ± 2.19 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 ± 2.05 | |
| McParland 2010, United Kingdom (47) | CS | | 95 | | 66.23 | | Arthritis and FM | | 7-item Chronic Pain Grade [0/100]: 69.06 ± 20.35 | |
| Van Leeuwen 2016, United States (57) | CS | | 124 | | 54 | | Orthopaedic trauma patients | | PROMIS-Pain Intensity [3/15]: 49 ± 8.4 | |
| Yakobov 2018 (a), Canada (76) | C | | 110 | | 66.9 | | Knee OA scheduled for TKA | | WOMAC [0/20]: - Pretreatment: 10.6 ± 3.3 - Posttreatment: 3.4 ± 3.4 | |
| Yakobov 2014, Canada (75) | C | | 116 | | 67.0 | | Knee OA scheduled for TKA | | WOPAIN [0/100]: - Presurgery: 53.0 ± 17.7 - Postsurgery: 17.0 ± 17.2 | |
| Penn 2020, United States (77) | C | | 105 | | 45.79 | | CLBP | | SPPB-Pain [0/100]: 27.37 ± 27.41 | |
| Leysen 2021, Belgium (60) | CS | | 110 | | 59.6 | | BCS | | VAS [0/100]: 24.3 ± 27.0 | |
| Rodero 2012, Spain (9) | CS | | 250 | | 52.4 | | FM | | PVAS [0/100]: 52.5 ± 16.8 | |
| Miller 2021, United States (35) | CS | | 30 | | 11.3 | | Youth with SCD | | PedsQL [0/100]: 68.43 ± 19.11 | |
| Penn 2019, United States (70) | CS | | 60 | | 47.6 | | Chronic pain among PLWH | | Rate [0/5]: NM | |
| Iverson 2018, Canada (44) | CS | | 102 | | 41.2 | | mTBI | | BPQ [0/15]: NM | |
| Pain catastrophizing ^{MA} | | | | | | | | | | |
| Agtarap 2016, United States (62) | CS | | 206 | | 47.48 | | Traumatic injury | | NRS [0/20]: NM | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-----------------------------------|--------|-----------------|--------------------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------|------------------------|
| Alizadeh-Fard 2020, Iran (37) | CS | | 142 | | 42.18 | | Breast cancer | | PCS: 3.82 \pm 0.46 | |
| Bults 2020, the Netherlands (74) | CS | | 53 (PR-UMCG) 228 (TC) | | 42.2 | | Chronic pain | | NRS [0/10]: 7.0 \pm 1.7 | |
| Ioannou 2016, Australia (42) | CS | | 160 | | 43.01 | | Traumatic injury | | BPI [0/10]: 2.94 \pm 2.19 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 \pm 2.05 | |
| Leysen 2021, Belgium (60) | CS | | 110 | | 59.6 | | BCS | | VAS [0/100]: 24.3 \pm 27.0 | |
| Margiotta 2017, Ireland (48) | CS | | 80 | | 49 | | Chronic pain | | NRPS [0/10]: median 6 \pm IQR 2 | |
| Rahbari 2019, Iran (64) | CS | | 230 | | 41.57 | | Chronic MSK pain | | MPQ [0/78]: NM | |
| Rodero 2012, Spain (9) | CS | | 250 | | 52.4 | | FM | | PVAS [0/100]: 52.5 \pm 16.8 | |
| Scott 2012, Canada (7) | CS | | 107 | | 41 | | Chronic MSK pain | | NRS [0/10]: - Women: 4.9 \pm 1.9 - Men: 4.1 \pm 2.2 | |
| Sturgeon 2017, United States (69) | CS | | 330 | | NM | | Chronic pain | | NRS [0/10]: 6.42 \pm 1.53 | |
| Sullivan 2008, Canada (22) | C | | 226 | | 37.7 | | Chronic MSK pain | | MPQ-PRI: - Work accident: 24.3 \pm 15.6 - Motor accident: 26.6 \pm 15.7 | |
| Sullivan 2009, Canada (15) | C | | 112 | | 35.8 | | Whiplash injury | | MPQ-PRI: 21.4 \pm 13.5 | |
| Trost 2019, United States (53) | CS | | 137 | | 41.86 | | CLBP | | MPQ-SF-PRI [0/45]: 21.58 \pm 13.05 | |
| Yakovov 2014, Canada (75) | C | | 116 | | 67.0 | | Knee OA scheduled for TKA | | WOPAIN [0/100]: - Presurgery: 53.0 \pm 17.7 - Postsurgery: 17.0 \pm 17.2 | |
| Yamada 2019 Japan (67) | CS | | 130 | | 33 | | Menstrual pain | | NRS [0/10]: 5.7 \pm 2.2 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome measure | Predictor outcome measure | Measure of association |
|-------------------------------------|--------|-----------------|--------------------------|------------------------------|-----------------------------------------------------------|-----------------------------|---------------------------------------------------------|----------------------------|-------------------------------------------------------|------------------------|
| Ziadni 2020, Seattle (59) | CS | | 137 | | 41.9 | | CLBP | | MPQ-SF-PRI [0/45]: 21.96 ± 13.02 | |
| Daenen 2020, United Kingdom (61) | CS | | 146 | | 15.03 | | Paediatric chronic pain | | NRS [0/10]: 5.39 ± 2.39 | |
| Miller 2016, United States (36) | CS | | 139 | | 15 | | Children & adolescents with chronic pain | | NPRS [0/10]: 4.51 ± 2.81 | |
| Miller 2021, United States (35) | CS | | 30 | | 11.3 | | Youth with SCD | | PedsQL [0/100]: 68.43 ± 19.11 | |
| Pain duration ^{MA} | | | | | | | | | | |
| Bults 2020, the Netherlands (74) | CS | | 53 (PR-UMCG) 228 (TC) | | 42.2 | | Chronic pain | | NRS [0/10]: 7.0 ± 1.7 | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 ± 25.5 | |
| Margiotta 2017, Ireland (48) | CS | | 80 | | 49 | | Chronic pain | | NRPS [0/10]: median 6 ± IQR 2 | |
| McParland 2010, United Kingdom (47) | CS | | 95 | | 66.23 | | Arthritis and FM | | 7-item Chronic Pain Grade [0/100]: 69.06 ± 20.35 | |
| Monden 2019, United States (50) | CS | | 74 | | 47.6 | | SCI | | MPQ-SF-PPI: NM | |
| Rodero 2012, Spain (9) | CS | | 250 | | 52.4 | | FM | | PVAS [0/100]: 52.5 ± 16.8 | |
| Scott 2012, Canada (7) | CS | | 107 | | 41 | | Chronic MSK pain | | NRS [0/10]: - Women: 4.9 ± 1.9 - Men: 4.1 ± 2.2 | |
| Sullivan 2009, Canada (15) | C | | 112 | | 35.8 | | Whiplash injury | | MPQ-PRI: 21.4 ± 13.5 | |
| Trost 2016 (a), United Kingdom (79) | C | | 53 | | 39.13 | | CLBP | | NRS [0/10]: 2.39 ± 2.30 | |
| Trost 2016 (b), United States (55) | CS | | 45 | | 48.80 | | SCI | | MPQ-SF-PPI [0/5]: 3.35 ± 2.5 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-----------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------|------------------------|
| Trost 2017, United States (72) | CS | | 53 | | 47.62 | | SCI | | MPQ-PRI-PPI [0/5]: 1.49 \pm 0.91 | |
| Trost 2019, United States (53) | CS | | 137 | | 41.86 | | CLBP | | MPQ-SF-PRI [0/45]: 21.58 \pm 13.05 | |
| Yakobov 2014, Canada (75) | C | | 116 | | 67.0 | | Knee OA scheduled for TKA | | WOPAIN [0/100]: - Presurgery: 53.0 \pm 17.7 - Postsurgery: 17.0 \pm 17.2 | |
| Pain interference ^{MA} | | | | | | | | | | |
| Ioannou 2016, Australia (42) | CS | | 160 | | 43.01 | | Traumatic injury | | BPI, pain severity [0/10]: 2.94 \pm 2.19 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 \pm 2.05 | |
| Scott 2019, United Kingdom (78) | C | | 303 | | 45.22 | | Chronic pain | | NRS [0/10]: 7.63 \pm 1.60 | |
| Yamada 2019, Japan (67) | CS | | 130 | | 33 | | Menstrual pain | | NRS [0/10]: 5.7 \pm 2.2 | |
| Sturgeon 2016, Canada (68) | CS | | 302 | | 47.6 | | Chronic pain | | NRS [0/10]: 5.66 \pm 2.25 | |
| Sturgeon 2017, United States (69) | CS | | 330 | | NM | | Chronic pain | | NRS [0/10]: 6.42 \pm 1.53 | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 \pm 25.5 | |
| Penn 2019, United States (70) | CS | | 60 | | 47.6 | | Chronic pain among PLWH | | Rate [0/5]: NM | |
| Pain perceptions ^{MA} | | | | | | | | | | |
| Bults 2020, the Netherlands (74) | CS | | 228 (TC) | | 42.2 | | Chronic pain | | NRS [0/10]: 7.0 \pm 1.7 | |
| Iverson 2018, Canada (44) | CS | | 102 | | 41.2 | | mTBI | | BPQ [0/15]: NM | |
| Penn 2020, United States (77) | C | | 105 | | 45.79 | | CLBP | | SPPB-Pain [0/100]: 27.37 \pm 27.41 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-------------------------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------------------------|------------------------|
| Symptoms of central sensitization ^{MA} | | | | | | | | | | |
| Bults 2020, the Netherlands (74) | CS | | 228 (TC) | | 42.2 | | Chronic pain | | NRS [0/10]: 7.0 \pm 1.7 | |
| Leysen 2021, Belgium (60) | CS | | 110 | | 59.6 | | BCS | | VAS [0/100]: 24.3 \pm 27.0 | |
| Number of pain sites ^{MA} | | | | | | | | | | |
| Bults 2020, the Netherlands (74) | CS | | 228 (TC) | | 42.2 | | Chronic pain | | NRS [0/10]: 7.0 \pm 1.7 | |
| Sullivan 2009, Canada (15) | C | | 112 | | 35.8 | | Whiplash injury | | MPQ-PRI: 21.4 \pm 13.5 | |
| Pain self-efficacy | | | | | | | | | | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 \pm 2.05 | |
| Neuropathic pain | | | | | | | | | | |
| Leysen 2021, Belgium (60) | CS | | 110 | | 59.6 | | BCS | | VAS [0/100]: 24.3 \pm 27.0 | |
| Pain as main outcome | | | | | | | | | | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 \pm 25.5 | |
| Pain behaviour | | | | | | | | | | |
| Carrierre 2017 (a), California (16) | CS | | 344 | | 48 | | Chronic pain | | NRS [0/10]: - No active opioid prescription: 4.44 \pm 2.78 - Active opioid prescription: 5.68 \pm 2.37 | |
| QUALITY OF LIFE CHARACTERISTICS | | | | | | | | | | |
| Disability ^{MA} | | | | | | | | | | |
| Ioannou 2016, Australia (42) | CS | | 160 | | 43.01 | | Traumatic injury | | BPI [0/10]: 2.94 \pm 2.19 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 \pm 2.05 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|-----------------|--------------------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------|------------------------|
| | | | | | | | | | | |
| Trost 2019, United States (53) | CS | | 137 | | 41.86 | | CLBP | | MPQ-SF-PRI [0/45]: 21.58 \pm 13.05 | |
| Ziadini 2020, Seattle (59) | CS | | 137 | | 41.9 | | CLBP | | MPQ-SF-PRI [0/45]: 21.96 \pm 13.02 | |
| Sullivan 2009, Canada (15) | C | | 112 | | 35.8 | | Whiplash injury | | MPQ-PRI: 21.4 \pm 13.5 | |
| Yakobov 2016, Canada (56) | CS | | 71 | | 35.8 | | Whiplash injury | | NPRS [0/10]: - Pretreatment: 5.2 \pm 1.8 - Posttreatment: 4.2 \pm 1.8 | |
| Yakobov 2018 (b), Canada (73) | CS | | 146 | | 36.5 | | Whiplash injury | | MPQ-PRI: 22.0 \pm 12.5 | |
| Bults 2020, the Netherlands (74) | CS | | 53 (PR-UMCG) 228 (TC) | | 42.2 | | Chronic pain | | NRS [0/10]: 7.0 \pm 1.7 | |
| Monden 2019, United States (50) | CS | | 74 | | 47.6 | | SCI | | MPQ-SF-PPI: NM | |
| Rahbari 2019, Iran (64) | CS | | 230 | | 41.57 | | Chronic MSK pain | | MPQ [0/78]: NM | |
| Scott 2013, Canada (83) | CS | | 183 | | 49.67 | | Chronic MSK pain | | NRS [0/10]: 5.82 \pm 2.09 | |
| Scott 2016, Canada (52) | CS | | 66 | | 40.03 | | Chronic MSK pain | | MPQ-PRI [0/78]: 34.21 \pm 14.16 | |
| Sullivan 2008, Canada (22) | C | | 226 | | 37.7 | | Chronic MSK pain | | MPQ-PRI: - Work accident: 24.3 \pm 15.6 - Motor accident: 26.6 \pm 15.7 | |
| Trost 2016 (b), United States (55) | CS | | 45 | | 48.80 | | SCI | | MPQ-SF-PPI [0/5]: 3.35 \pm 2.5 | |
| Trost 2019, United States (53) | CS | | 137 | | 41.86 | | CLBP | | MPQ-SF-PRI [0/45]: 21.58 \pm 13.05 | |
| Daenen 2020, United Kingdom (61) | CS | | 146 | | 15.03 | | Paediatric chronic pain | | NRS [0/10]: 5.39 \pm 2.39 | |
| Miller 2016, United States (36) | CS | | 139 | | 15 | | Children & adolescents with chronic pain | | NPRS [0/10]: 4.51 \pm 2.81 | |
| Miller 2018, United States (71) | CS | | 253 | | 14.1 | | Paediatric chronic pain | | NRS [0/10]: 4.46 \pm 2.82 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|--------------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------|------------------------|
| Miller 2021, United States (35) | CS | | 30 | | 11.3 | | Youth with SCD | | PedsQL [0/100]: 68.43 \pm 19.11 | |
| Yakovov 2018 (a), Canada (76) | C | | 110 | | 66.9 | | Knee OA scheduled for TKA | | WOMAC [0/20]: - Pretreatment: 10.6 \pm 3.3 - Posttreatment: 3.4 \pm 3.4 | |
| McParland 2010, United Kingdom (47) | CS | | 95 | | 66.23 | | Arthritis and FM | | 7-item Chronic Pain Grade [0/100]: 69.06 \pm 20.35 | |
| Martel 2017, Canada (49) | CS | | 475 | | 51 | | Chronic pain | | NRS [0/10]: 5.93 \pm 1.51 | |
| Trost 2016 (a), United Kingdom (79) | C | | 53 | | 39.13 | | CLBP | | NRS [0/10]: 2.39 \pm 2.30 | |
| Physical functioning ^{MA} | | | | | | | | | | |
| Agarap 2016, United States (62) | CS | | 206 | | 47.48 | | Traumatic injury | | NRS [0/20]: NM | |
| Carriere 2018, United States (38) | CS | | 354 | | 47.5 | | Chronic pain | | NRS [0/10]: 4.72 \pm 2.74 | |
| Van Leeuwen 2016, United States (57) | CS | | 124 | | 54 | | Orthopaedic trauma patients | | PROMIS-Pain Intensity [3/15]: 49 \pm 8.4 | |
| Ysidron 2020, Greece (80) | C | | 343 | | NM | | LBP | | NRS [0/10]: 6.0 \pm 1.8 | |
| Daenen 2020, United Kingdom (61) | CS | | 146 | | 15.03 | | Paediatric chronic pain | | NRS [0/10]: 5.39 \pm 2.39 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 \pm 2.05 | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 \pm 25.5 | |
| Penn 2020, United States (77) | C | | 105 | | 45.79 | | CLBP | | SPPB-Pain [0/100]: 27.37 \pm 27.41 | |
| Trost 2015, United States (54) | CS | | 155 | | 47.5 | | Traumatic injury | | NRS [0/10]: 4.01 \pm 3.00 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|--------------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------|------------------------|
| Yakovov 2014, Canada (75) | C | | 116 | | 67.0 | | Knee OA scheduled for TKA | | WOPAIN [0/100]: - Presurgery: 53.0 \pm 17.7 - Postsurgery: 17.0 \pm 17.2 | |
| Other types of Quality of Life (QoL) | | | | | | | | | | |
| Ferrari 2015, Canada (39) | CS | | 46 | | 62.7 | | Hip OA | | HOOS, subscale Pain [0/100]: 62.3 \pm 9.4 | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 \pm 25.5 | |
| Leyssen 2021, Belgium (60) | CS | | 110 | | 59.6 | | BCS | | VAS [0/100]: 24.3 \pm 27.0 | |
| Rodero 2012, Spain (9) | CS | | 250 | | 52.4 | | FM | | PVAS [0/100]: 52.5 \pm 16.8 | |
| Social functioning ^{MA} | | | | | | | | | | |
| Daenen 2020, United Kingdom (61) | CS | | 146 | | 15.03 | | Paediatric chronic pain | | NRS [0/10]: 5.39 \pm 2.39 | |
| Miller 2016, United States (36) | CS | | 139 | | 15 | | Children & adolescents with chronic pain | | NPRS [0/10]: 4.51 \pm 2.81 | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 \pm 25.5 | |
| Miller 2021, United States (35) | CS | | 30 | | 11.3 | | Youth with SCD | | PedsQL [0/100]: 68.43 \pm 19.11 | |
| Emotional functioning ^{MA} | | | | | | | | | | |
| Daenen 2020, United Kingdom (61) | CS | | 146 | | 15.03 | | Paediatric chronic pain | | NRS [0/10]: 5.39 \pm 2.39 | |
| Miller 2016, United States (36) | CS | | 139 | | 15 | | Children & adolescents with chronic pain | | NPRS [0/10]: 4.51 \pm 2.81 | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 \pm 25.5 | |
| Mental functioning ^{MA} | | | | | | | | | | |
| Agarap 2016, United States (62) | CS | | 206 | | 47.48 | | Traumatic injury | | NRS [0/20]: NM | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 \pm 2.05 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|--------------------------------------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|------------------------------------------------------|------------------------|
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain \pm 25.5 | [0/100]: 31.8 |
| Trost 2015, United States (54) | CS | | 155 | | 47.5 | | Traumatic injury | | NRS [0/10]: 4.01 \pm 3.00 | |
| Academic functioning ^{MA} | | | | | | | | | | |
| Daenen 2020, United Kingdom (61) | CS | | 146 | | 15.03 | | Paediatric chronic pain | | NRS [0/10]: 5.39 \pm 2.39 | |
| Miller 2016, United States (36) | CS | | 139 | | 15 | | Children & adolescents with chronic pain | | NPRS [0/10]: 4.51 \pm 2.81 | |
| Functional impairment in terms of work and social adjustment | | | | | | | | | | |
| Scott 2019, United Kingdom (78) | C | | 303 | | 45.22 | | Chronic pain | | NRS [0/10]: 7.63 \pm 1.60 | |
| PERSONAL CHARACTERISTICS | | | | | | | | | | |
| Age ^{MA} | | | | | | | | | | |
| Agtrarp 2016, United States (62) | CS | | 206 | | 47.48 | | Traumatic injury | | NRS [0/20]: NM | |
| Daenen 2020, United Kingdom (61) | CS | | 146 | | 15.03 | | Paediatric chronic pain | | NRS [0/10]: 5.39 \pm 2.39 | |
| Iverson 2018, Canada (44) | CS | | 102 | | 41.2 | | mTBI | | BPQ [0/15]: NM | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain \pm 25.5 | [0/100]: 31.8 |
| McParland 2010, United Kingdom (47) | CS | | 95 | | 66.23 | | Arthritis and FM | | 7-item Chronic Pain Grade [0/100]: 69.06 \pm 20.35 | |
| Monden 2019, United States (50) | CS | | 74 | | 47.6 | | SCI | | MPQ-SF-PPI [0/5]: NM | |
| Penn 2019, United States (70) | CS | | 60 | | 47.6 | | Chronic pain among PLWH | | Rate [0/5]: NM | |
| Penn 2020, United States (77) | C | | 105 | | 45.79 | | CLBP | | SPPB-Pain [0/100]: 27.37 \pm 27.41 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-------------------------------------|--------|-----------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|---------------------------------------------------------|--------------------|---------------------------------------------------------------------------|------------------------|
| Rodero 2012, Spain (9) | CS | | 250 | | 52.4 | | FM | | PVAS [0/100]: 52.5 ± 16.8 | |
| Scott 2012, Canada (7) | CS | | 107 | | 41 | | Chronic MSK pain | | NRS [0/10]: - Women: 4.9 ± 1.9 - Men: 4.1 ± 2.2 | |
| Scott 2016, Canada (52) | CS | | 66 | | 40.03 | | Chronic MSK pain | | MPQ-PRI [0/78]: 34.21 ± 14.16 | |
| Trost 2015, United States (54) | CS | | 155 | | 47.5 | | Traumatic injury | | NRS [0/10]: 4.01 ± 3.00 | |
| Trost 2016 (a), United Kingdom (79) | C | | 53 | | 39.13 | | CLBP | | NRS [0/10]: 2.39 ± 2.30 | |
| Trost 2017, United States (72) | CS | | 53 | | 47.62 | | SCI | | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | |
| Trost 2019, United States (53) | CS | | 137 | | 41.86 | | CLBP | | MPQ-SF-PRI [0/45]: 21.58 ± 13.05 | |
| Yakobov 2016, Canada (56) | CS | | 71 | | 35.8 | | Whiplash injury | | NPRS [0/10]: - Pretreatment: 5.2 ± 1.8 - Posttreatment: 4.2 ± 1.8 | |
| Yakobov 2018 (a), Canada (76) | C | | 110 | | 66.9 | | Knee OA scheduled for TKA | | WOMAC [0/20]: - Pretreatment: 10.6 ± 3.3 - Posttreatment: 3.4 ± 3.4 | |
| Responsibility and forgiveness | | | | | | | | | | |
| Trost 2016 (b), United States (55) | CS | | 45 | | 48.80 | | SCI | | MPQ-SF-PPI [0/5]: 3.35 ± 2.5 | |
| Educational level ^{MA} | | | | | | | | | | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 ± 2.05 | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 ± 25.5 | |
| Rodero 2012, Spain (9) | CS | | 250 | | 52.4 | | FM | | PVAS [0/100]: 52.5 ± 16.8 | |
| Trost 2017, United States (72) | CS | | 53 | | 47.62 | | SCI | | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-------------------------------------|--------|-----------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|---------------------------------------------------------|--------------------|---------------------------------------------------------------------------|------------------------|
| Gender ^{MA} | | | | | | | | | | |
| Ioannou 2017, Australia (43) | CS | 433 | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 ± 2.05 | |
| La Cour 2017, Denmark (66) | CS | 358 | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 ± 25.5 | |
| Rodero 2012, Spain (9) | CS | 250 | 250 | | 52.4 | | FM | | PVAS [0/100]: 52.5 ± 16.8 | |
| Yakobov 2016, Canada (56) | CS | 71 | 71 | | 35.8 | | Whiplash injury | | NPRS [0/10]: - Pretreatment: 5.2 ± 1.8 - Posttreatment: 4.2 ± 1.8 | |
| Yakobov 2018 (a), Canada (76) | C | 110 | 110 | | 66.9 | | Knee OA scheduled for TKA | | WOMAC [0/20]: - Pretreatment: 10.6 ± 3.3 - Posttreatment: 3.4 ± 3.4 | |
| Income ^{MA} | | | | | | | | | | |
| Penn 2020, United States (77) | C | 105 | 105 | | 45.79 | | CLBP | | SPPB-Pain [0/100]: 27.37 ± 27.41 | |
| Trost 2017, United States (72) | CS | 53 | 53 | | 47.62 | | SCI | | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | |
| Trost 2019, United States (53) | CS | 137 | 137 | | 41.86 | | CLBP | | MPQ-SF-PRI [0/45]: 21.58 ± 13.05 | |
| Body Mass Index (BMI) ^{MA} | | | | | | | | | | |
| Trost 2019, United States (53) | CS | 137 | 137 | | 41.86 | | CLBP | | MPQ-SF-PRI [0/45]: 21.58 ± 13.05 | |
| Yakobov 2018 (a), Canada (76) | C | 110 | 110 | | 66.9 | | Knee OA scheduled for TKA | | WOMAC [0/20]: - Pretreatment: 10.6 ± 3.3 - Posttreatment: 3.4 ± 3.4 | |
| Resilience ^{MA} | | | | | | | | | | |
| Agtarap 2016, United States (62) | CS | 206 | 206 | | 47.48 | | Traumatic injury | | NRS [0/20]: NM | |
| Iverson 2018, Canada (44) | CS | 102 | 102 | | 41.2 | | mTBI | | BPQ [0/15]: NM | |
| Marital status | | | | | | | | | | |
| La Cour 2017, Denmark (66) | CS | 358 | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 ± 25.5 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-----------------------------------------------|--------|-----------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|---------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------|------------------------|
| Rodero 2012, Spain (9) | CS | | 250 | | 52.4 | | FM | | PVAS [0/100]: 52.5 ± 16.8 | |
| Religiosity | | | | | | | | | | |
| McParland 2010, United Kingdom (47) | CS | | 95 | | 66.23 | | Arthritis and FM | | 7-item Chronic Pain Grade [0/100]: 9.06 ± 20.35 | |
| Sexual | | | | | | | | | | |
| Pâquet 2016, Canada (51) | CS | | 100 | | 25.50 | | Women with PVD and their partners | | MPQ [0/78]: 27.22 ± 11.29 | |
| Comorbidities | | | | | | | | | | |
| Giummarra 2017 (b), Australia (41) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: - Compensable: 2.94 ± 2.19 - Not compensable: 2.30 ± 1.94 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain interference [0/10]: - Compensable: 3.39 ± 2.78 - Not compensable: 2.16 ± 2.28 | |
| Immune status | | | | | | | | | | |
| Penn 2019, United States (70) | CS | | 60 | | 47.6 | | Chronic pain among PLWH | | Rate [0/5]: NM | |
| Satisfaction with social roles and activities | | | | | | | | | | |
| Sturgeon 2016, Canada (68) | CS | | 302 | | 47.6 | | Chronic pain | | NRS [0/10]: 5.66 ± 2.25 | |
| Well-being | | | | | | | | | | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 ± 25.5 | |
| INJURY CHARACTERISTICS | | | | | | | | | | |
| Cervical range of motion (cROM) ^{MA} | | | | | | | | | | |
| Sullivan 2009, Canada (15) | C | | 112 | | 35.8 | | Whiplash injury | | MPQ-PRI: 21.4 ± 13.5 | |
| Yakobov 2018 (b), Canada (73) | CS | | 146 | | 36.5 | | Whiplash injury | | MPQ-PRI: 22.0 ± 12.5 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------|------------------------|
| Ferrari 2015, Canada (39) | CS | | 46 | | 62.7 | | Hip OA | | HOOS, subscale Pain [0/100]: 62.3 \pm 9.4 | |
| Injury severity ^{MA} | | | | | | | | | | |
| Boals 2020, United States (81) | C | | 176 | | 44.47 | | Traumatic injury | | NM | |
| Ioannou 2016, Australia (42) | CS | | 160 | | 43.01 | | Traumatic injury | | BPI [0/10]: 2.94 \pm 2.19 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 \pm 2.05 | |
| Giummarra 2017 (b), Australia (41) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: - Compensable: 2.94 \pm 2.19 - Not compensable: 2.30 \pm 1.94 | |
| Age at injury | | | | | | | | | | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 \pm 2.05 | |
| Place of injury | | | | | | | | | | |
| Giummarra 2017 (b), Australia (41) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: - Compensable: 2.94 \pm 2.19 - Not compensable: 2.30 \pm 1.94 | |
| Trauma type | | | | | | | | | | |
| Boals 2020, United States (81) | C | | 176 | | 44.47 | | Traumatic injury | | NM | |
| Crash related characteristics | | | | | | | | | | |
| Sullivan 2009, Canada (15) | C | | 112 | | 35.8 | | Whiplash injury | | MPQ-PRI: 21.4 \pm 13.5 | |
| Post-concussion symptoms | | | | | | | | | | |
| Iverson 2018, Canada (44) | CS | | 102 | | 41.2 | | mTBI | | BPQ [0/15]: NM | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|---------------------------------------|--------|-----------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|---------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------|------------------------|
| Osteoarthritis scores | | | | | | | | | | |
| Ferrari 2015, Canada (39) | CS | | 46 | | 62.7 | | Hip OA | | HOOS, subscale Pain [0/100]: 62.3 ± 9.4 | |
| RECOVERY CHARACTERISTICS | | | | | | | | | | |
| Length of hospital stay ^{NA} | | | | | | | | | | |
| Giummarra 2017 (b), Australia (41) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: - Compensable: 2.94 ± 2.19 - Not compensable: 2.30 ± 1.94 | |
| Monden 2019, United States (50) | CS | | 74 | | 47.6 | | SCI | | BPI, pain interference [0/10]: - Compensable: 3.39 ± 2.78 - Not compensable: 2.16 ± 2.28 | |
| Trost 2015, United States (54) | CS | | 155 | | 47.5 | | Traumatic injury | | NRS [0/10]: 4.01 ± 3.00 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: 2.60 ± 2.05 | |
| Trost 2017, United States (72) | CS | | 53 | | 47.62 | | SCI | | MPQ-PRI-PPI [0/5]: 1.49 ± 0.91 | |
| Number of treatment visits | | | | | | | | | | |
| Hayashi 2020, Japan (58) | CS | | 85 | | 46 | | WAD | | NRS [0/10]: NM | |
| Type of discharge | | | | | | | | | | |
| Giummarra 2017 (b), Australia (41) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: - Compensable: 2.94 ± 2.19 - Not compensable: 2.30 ± 1.94 | |
| Duration of opioid use | | | | | | | | | | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 ± 25.5 | |
| Weeks in treatment | | | | | | | | | | |
| Scott 2016, Canada (52) | CS | | 66 | | 40.03 | | Chronic MSK pain | | MPQ-PRI [0/78]: 34.21 ± 14.16 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|--------------------------------------------------|--------|-----------------|--------------|-----------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|---------------------------|------------------------|
| Duration of time in the rehabilitation programme | | | | | | | | | | |
| Scott 2016, Canada (52) | CS | 66 | 40.03 | Chronic MSK pain | MPQ-PRI [0/78]: 34.21 \pm 14.16 | | | | | |
| ENVIRONMENTAL CHARACTERISTICS | | | | | | | | | | |
| Personal factors of the partner | | | | | | | | | | |
| Miller 2018, United States (71) | CS | 253 | 14.1 | Paediatric chronic pain | NRS [0/10]: 4.46 \pm 2.82 | | | | | |
| Miller 2018, United States (71) | CS | 253 | 14.1 | Paediatric chronic pain | NRS [0/10]: 4.46 \pm 2.82 | | | | | |
| Pâquet 2016, Canada (51) | CS | 100 | 25.50 | Women with PVD and their partners | MPQ [0/78]: 27.22 \pm 11.29 | | | | | |
| Pâquet 2016, Canada (51) | CS | 100 | 25.50 | Women with PVD and their partners | MPQ [0/78]: 27.22 \pm 11.29 | | | | | |
| Pâquet 2016, Canada (51) | CS | 100 | 25.50 | Women with PVD and their partners | MPQ [0/78]: 27.22 \pm 11.29 | | | | | |
| Pâquet 2016, Canada (51) | CS | 100 | 25.50 | Women with PVD and their partners | MPQ [0/78]: 27.22 \pm 11.29 | | | | | |
| Court proceedings | | | | | | | | | | |
| Ioannou 2016, Australia (42) | CS | 160 | 43.01 | Traumatic injury | BPI, pain severity [0/10]: 2.94 \pm 2.19 | | | | | |
| Ioannou 2017, Australia (43) | CS | 433 | 44.8 | Traumatic injury | BPI, pain severity [0/10]: 2.60 \pm 2.05 | | | | | |
| Trost 2016 (b), United States (55) | CS | 45 | 48.80 | SCI | MPQ-SF-PPI [0/5]: 3.35 \pm 2.5 | | | | | |
| Social support | | | | | | | | | | |
| Iverson 2018, Canada (44) | CS | 102 | 41.2 | mTBI | BPQ [0/15]: NM | | | | | |
| Penn 2019, United States (70) | CS | 60 | 47.6 | Chronic pain among PLWH | Rate [0/5]: NM | | | | | |
| Injury compensation claim | | | | | | | | | | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean ± SD or median ± IQR | Disease duration: mean ± SD | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|------------------------------------|--------|-----------------|--------------|------------------------------|-----------------------------------------------------------|-----------------------------|---------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------|------------------------|
| Giummarra 2017 (b), Australia (41) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: - Compensable: 2.94 ± 2.19 - Not compensable: 2.30 ± 1.94 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain interference [0/10]: - Compensable: 3.39 ± 2.78 - Not compensable: 2.16 ± 2.28 | |
| Hayashi 2020, Japan (58) | CS | | 85 | | 46 | | WAD | | NRS [0/10]: NM | |
| Fault attribution | | | | | | | | | | |
| Giummarra 2017 (b), Australia (41) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: - Compensable: 2.94 ± 2.19 - Not compensable: 2.30 ± 1.94 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain interference [0/10]: - Compensable: 3.39 ± 2.78 - Not compensable: 2.16 ± 2.28 | |
| WORK RELATED FACTORS | | | | | | | | | | |
| Work status | | | | | | | | | | |
| Giummarra 2017 (b), Australia (41) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain severity [0/10]: - Compensable: 2.94 ± 2.19 - Not compensable: 2.30 ± 1.94 | |
| Ioannou 2017, Australia (43) | CS | | 433 | | 44.8 | | Traumatic injury | | BPI, pain interference [0/10]: - Compensable: 3.39 ± 2.78 - Not compensable: 2.16 ± 2.28 | |
| La Cour 2017, Denmark (66) | CS | | 358 | | 45.5 | | Chronic benign pain or a "somatoform" diagnosis | | SF-36 Bodily pain [0/100]: 31.8 ± 25.5 | |
| Working alliance | | | | | | | | | | |
| Scott 2016, Canada (52) | CS | | 66 | | 40.03 | | Chronic MSK pain | | MPQ-PRI [0/78]: 34.21 ± 14.16 | |

Table 2 (cont.). Association measures of perceived injustice in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Pain outcome measure [min/max]: mean \pm SD or median \pm IQR | Disease duration: mean \pm SD | PI outcome measure [min/max]: mean \pm SD or median \pm IQR | Cut-off PI outcome | Predictor outcome measure | Measure of association |
|-----------------------------------|--------|-----------------|--------------|------------------------------|-------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------|--------------------|-----------------------------------|------------------------|
| Length of work disability | | | | | | | | | | |
| Carriere 2017 (b), Montreal (106) | C | | 152 | | 36.4 | | Whiplash injury | | MPQ-PRI [0/78]: 15.29 \pm 12.12 | |
| Return to work expectancies | | | | | | | | | | |
| Carriere 2017 (b), Montreal (106) | C | | 152 | | 36.4 | | Whiplash injury | | MPQ-PRI [0/78]: 15.29 \pm 12.12 | |

Significance level was shown with an asterisk: *P < 0.05; **P < 0.01; ***P < 0.001

Abbreviations: a. Adjusted for age, marital status and work or life situation; b. Adjusted for age, sex, pain intensity and injury severity; c. Time since injury to follow-up; d. Pain duration; e. Time since injury; MA: meta-analysis performed/included in meta-analysis

AAQ-II, Acceptance and Action Questionnaire-II; AIS, Abbreviated Injury Severity; BC-PSI, British Columbia Post-concussion Symptom Inventory; BCS, Breast Cancer Survivors; BDI-II, Beck Depression Inventory II; BMI, Body Mass Index; BPI, Brief Pain Inventory; BPI-SF, Brief Pain Inventory-Short Form; BQ, Brief Pain Questionnaire; C, Cohort study; CD-RISC, Connor-Davidson Resilience Scale; CD-RISC-2, Connor-Davidson Resilience Scale-2; CES-D, Center for Epidemiologic Studies – Depression scale; CLBP, Chronic Low Back Pain; CPAQ-8, 8-item version of the Chronic Pain Acceptance Questionnaire; CS, Cross-sectional study; CSI, Central Sensitization Inventory; d, days; DN-4, The 10-item Douleur Neuropathique Questionnaire; DRI, Disability Rating Index; EORTC QLQ-C30, European Organisation for Research and Treatment of Cancer Core Quality of Life Questionnaire; FDI, Functional Disability Index; FIQ, Fibromyalgia Impact Questionnaire; FM, Fibromyalgia; FSDS, Female Sexual Distress Scale; FU, Follow-Up; GHQ-28, The 28-item General Health Questionnaire; GJWB, General Belief in a Just World Scale; GLM, general linear models; GMSEX, Global Measure of Sexual Satisfaction Scale; HADS, Hospital Anxiety and Depression Scale; HFS, 18-item Heartland Forgiveness Scale; HRQoL, Health Related Quality of Life; IEQ, Injustice Experiences Questionnaire; IEQ-C, Injustice Experiences Questionnaire Child; IEQ-chr, Injustice Experiences Questionnaire adapted for use in patients with chronic conditions; IEQ-chr-J, Japanese version of Injustice Experience Questionnaire-chronic; IEQ-P, Injustice Experience Questionnaire, Persian version; IEQ-PC, Injustice Experiences Questionnaire-Parent about Child; IES-R, Impact of Events Scale – Revised; IPO-B, The Brief Illness Perception Questionnaire; IPQ-R, Illness Perception Questionnaire-Revised; ISCP, Internalized Stigma of Chronic Pain scale; m, month(s); LBP, Low Back Pain; MPQ, McGill-Melzack Pain Questionnaire; MPQ-PRI, Pain Rating Index of the McGill Pain Questionnaire; MPQ-SF-PPI, Present index of the McGill Pain Questionnaire – Short Form; MPQ-SF-PRI, Pain Rating Index of the McGill Pain Questionnaire – Short Form; MSK, Musculoskeletal, MSPSS, Multidimensional Scale of Perceived Social Support; mTBI, mild Traumatic Brain Injury; n, number; NDI, Neck Disability Index; NM, Not mentioned; NPRS, Numeric Pain Rating Scale; NRS, Numeric Rating Scale; NS, not significant; OA, osteoarthritis; PCA, Principal Component Analysis; PC-PTSD, Primary Care PTSD Screen; PCS, Pain Catastrophizing Scale; PCS-C, Pain Catastrophizing Scale for Children; PCL-C, PTSD Checklist – general civilian version; PCL-5, PTSS Checklist for DSM-5; PDI, Pain Disability Index; PEDQ-CV, Brief Perceived Ethnic Discrimination Questionnaire; PedsQL, Pediatric Quality of Life Inventory; PedsQL-C, Pediatric Quality of Life-Child; PHQ-8, The eight-item Patient Health Questionnaire depression scale; PHQ-9, Patient Health Questionnaire-9; PI, Perceived injustice; PJWB, Personal Belief in a Just World Scale; PLWH, Persons Living with HIV; PROMIS, Patient-Reported Outcomes Measurement Information System; PR-UMCG, Rehabilitation Department University Medical Center Groningen; PSEQ, The Pain Self Efficacy Questionnaire; PTSD, Post-traumatic Stress Disorder; PTSS, Posttraumatic Stress Symptoms; PVAS, Pain Visual Analog Scale; PVD, Provoked Vestibulodynia; QoL, Quality of Life; RMDQ, Roland and Morris Disability Questionnaire; ROM, Range of Motion; SCD, Sickle Cell Disease; SCI, Spinal Cord Injury; SCL-90, Symptom Checklist-90; SF-12, Short Form Health Survey; SF-36, The Short Form Health Survey-36; SPPB, Short Physical Performance Battery – Pain; SSC1-8, Stigma Scale for Chronic Illnesses-Eight Item version; SSQ, Study Specific Questionnaire; SSQS, Social Support Questionnaire Short Form Satisfaction Scale; STAXI, State-Trait Anger Expression Inventory; STAXI-II, State-Trait Anger Expression Inventory – II; STAEI-II, The State-Trait Anger Expression Inventory-II; TAC, Transport Accident Commission; TC, Transcare Pain Rehabilitation Center; TKA, Total Knee Arthroplasty; TSK, Tampa Scale for Kinesiophobia; TSK-13, Tampa Scale for Kinesiophobia-13; SWLS, The 5-item Satisfaction with Life Questionnaire; VAS, Visual Analog Scale; VR-12, Veterans RAND 12-Item Health Survey; VR-PCS, Veterans RAND 12-Item Survey Physical Composite Score; VR-MCS, Veterans RAND 12-Item Survey Mental Composite Score; WAD, Whiplash-associated disorders; WOMAC, Western Ontario and McMaster University Osteoarthritis Index; WOPAIN, Western Ontario and McMaster Universities Arthritis Index – Pain score; WPI, Widespread Pain Index; WSAS, Work and Social Adjustment Scale; y, years; ZTIP, Zimbardo Time Perspective Inventory

38,40-44,46,48-60,62-83), one used both the Personal Belief in a Just World Scale (PJWB) and the General Belief in a Just World Scale (GJWB) (47) and one used the IEQ as well as the PJWB and GJWB (61) (Tables 2 and 3). Additional data to complete the results table were requested for 17 articles (7,36-39,45,47,49,50,52-55,57,75,77,84). However, none of the contacted authors were able to provide us with the requested additional data.

Study Quality Assessment

The quality of the included studies was medium for the cross-sectional studies as well as for the cohort studies. Quality scores ranged from 5 to 9 with a mean of 7.75 ± 0.99 out of 10 for cross-sectional studies, while quality scores ranged from 8 to 10 with a mean of 9.10 ± 0.88 out of 14 for cohort studies (Table 1). The main weaknesses of the included studies were the lack of reporting the participation rate of eligible persons and repeated exposure assessment.

Study Findings

Prevalence of PI

Eleven studies discussed the prevalence of PI (9,40,41,43-45,48,58,63,65,74) ranging from 23% (95% confidence interval [CI] = [0.18, 0.27]) (40) to 77% (95% CI = [0.76, 0.78]) (45) with a pooled estimate of 39% (95% CI = [0.23, 0.55], $I^2 = 99\%$, $P < 0.001$) (Supplementary Fig. 1). No improvement in heterogeneity could be obtained by performing a subgroup analysis based on methodological quality (Supplementary Fig. 2). All studies used the IEQ to measure levels of PI; however, different cutoff values for PI were used across those studies. The sensitivity analyses were done with the cutoff values of > 19 , > 30 , and ≥ 30 since there were more than 2 studies available using those cutoffs. All prevalence rates were significant ($P < 0.001$), and homogeneity could only be retrieved in the analysis with a cutoff of ≥ 30 ($I^2 = 2\%$, $P = 0.36$) (Supplementary Fig. 3). Looking at the different subgroups of the chronic pain sample investigated by Margiotta et al (48), a lower prevalence (25%) of unfairness is found in the group of retired people and a higher prevalence (50%) of unfairness for those on home duties compared to the

prevalence of the overall chronic pain sample (33%). Also, the cause of pain seems to play a role, given that a trauma (53%) or road traffic accident (41%) resulted in higher PI prevalence rates as compared to the general prevalence rate (33%).

Factors Associated With PI

A total of 51 articles reported factors associated with PI in people with pain. Meta-analyses were performed for the factors described in more than one article and were subdivided into environmental, functioning, injury, pain, personal, psychological, and recovery characteristics. Findings of all conducted meta-analyses can be found in Table 5, but only low to highly associated factors with PI are further described in detail. Results of the negligible associations can be found in Supplementary Figs. 4-28. Further details on factors associated with PI that could not be pooled due to insufficient data are reported in Table 2.

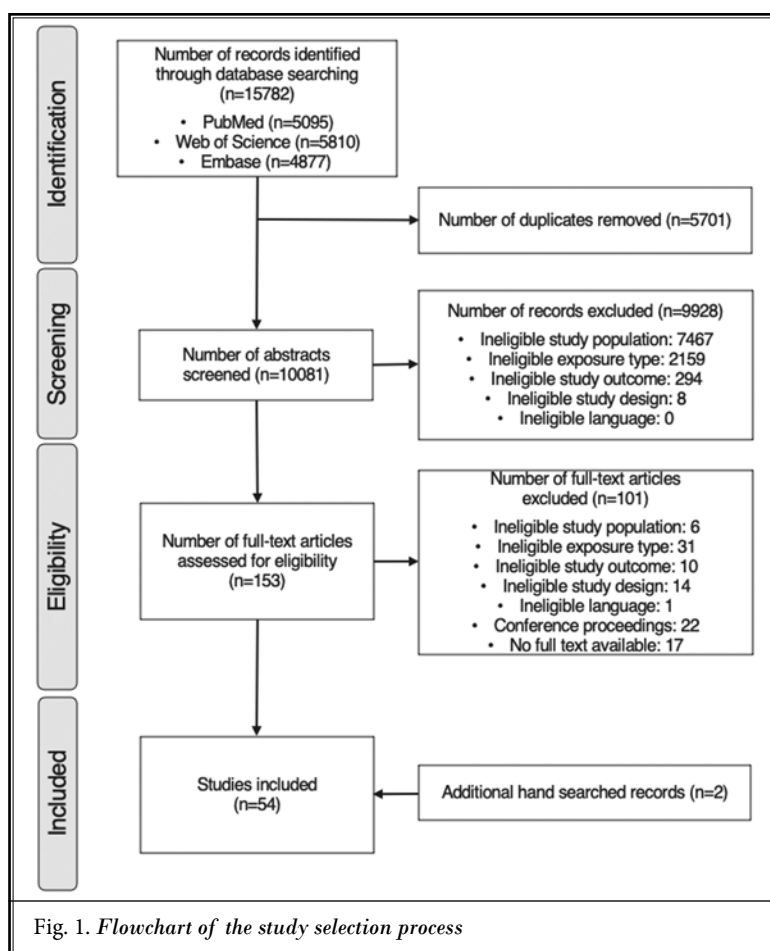


Table 3. Prevalence numbers of PI in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Disease duration: mean ± SD or median ± IQR | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Prevalence PI (% (n)) | Standard error (SE) |
|------------------------------------|--------|-----------------------|--------------|------------------------------|---------------------------------------------|---------------------------------------------------------------------------------|--------------------|----------------------------------|---------------------|
| Bhalang 2020, Switzerland (63) | CS | 799 | NM | Chronic orofacial pain | NM | IEQ [0/48]: 14.1 ± 11.3 | ≥ 18 | 35.8% (n = 108) | 0.017 |
| Bults 2020, the Netherlands (74) | CS | 53 (PR-UMCG) 228 (TC) | 42.2 | Chronic pain | 69.3 ± 81.5 ma | IEQ [0/48]: 21.0 ± 11.5 | ≥ 30 | 24.5% (n = 13) | 0.059 |
| Giummarra 2017 (a), Australia (40) | CS | 354 | 42.97 | Traumatic injury | NM | IEQ [0/48]: - Compensable: 20.26 ± 14.20 - Non compensable: 11.79 ± 11.24 | > 30 | 24.6% (n = 56) | 0.029 |
| Giummarra 2017 (b), Australia (41) | CS | 433 | 44.8 | Traumatic injury | 13.50 ± 1.60 mb | IEQ [0/48]: - Compensable: 20.52 ± 14.61 - Not compensable: 13.73 ± 12.40 | > 20 | 36.9% (n = 159) | 0.023 |
| Hayashi 2020, Japan (58) | CS | 85 | 46 | WAD | NM | IEQ [0/48]: 17 ± 15 | > 22 | 45.9% (n = 39) | 0.054 |
| Ioannou 2017, Australia (43) | CS | 433 | 44.8 | Traumatic injury | 13.5 ± 1.6 mb | IEQ [0/48]: 16.26 ± 13.79 | ≥ 20 | 36.7% (n = 159) | 0.023 |
| Iverson 2018, Canada (44) | CS | 102 | 41.2 | mTBI | 12.1 ± 6.3 wb | IEQ [0/48]: 20.79 ± 10.94 | > 30 > 19 | 23.5% (n = 23) 53.9% (n = 55) | 0.042 0.049 |
| Laroche 2019, France (45) | CS | 4,516 | 48.1 | FM | NM | IEQ [0/48]: NM | NM | 77% (n = 3,467) | 0.006 |

Psychological Characteristics and Cognitions

Depressive Symptoms

For the association between depressive symptoms and PI, 30 studies (n = 5,214) reported a correlation coefficient (7, 9, 16,21,22,35,40,42,44,50-55, 59, 62, 64, 66, 67, 69, 70, 72, 74, 76-78, 80, 81, 83). A significant moderate positive correlation was found (pooled Pearson's r [r_p] 0.57, 95% CI = [0.52, 0.60], P < 0.00001) (Supplementary Fig. 29). Heterogeneity was high (I² = 77%, P < 0.00001), which could not be reduced by performing a subgroup analysis based on methodological quality (Supplementary Fig. 30). Executing a subgroup analysis based on the outcome measures was not possible as all studies used a valid instrument.

Posttraumatic Stress

Posttraumatic stress was approached in 11 studies (n = 1,790) (21,40,42,44,54,55,62,72-74,81). After pooling, a significant high positive correlation was found (r_p 0.63, 95% CI = [0.59, 0.67], P < 0.00001), with low heterogeneity (I² = 44%, P = 0.05) (Supplementary Fig. 31).

Pain Acceptance

Six studies reported data about pain acceptance (n = 1,371) (9,38,49,74,78,80), for which a significant moderate negative correlation was found (r_p -0.59, 95% CI = [-0.66, -0.49], P < 0.00001) (Supplementary Fig. 32). Due to high heterogeneity (I² = 86%, P < 0.00001), subgroup analyses were performed, in which heterogeneity dropped to zero in the high methodological quality subgroup (I² = 0%, P = 0.45) (Supplementary Fig. 33). No subgroup analysis on outcome measure was performed as all instruments were valid.

Anxiety

Nine studies explored the as-

Table 3 (cont.). Prevalence numbers of PI in pain populations.

| Study | Design | Sample size (n) | Mean age (y) | Type of population with pain | Disease duration: mean ± SD or median ± IQR | PI outcome measure [min/max]: mean ± SD or median ± IQR | Cut-off PI outcome | Prevalence PI (% (n)) | Standard error (SE) |
|------------------------------|--------|------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Margiotta 2017, Ireland (48) | CS | 80 - 44 - 12 - 8 - 8 - 8 - 51 - 14 - 12 - 3 | 49 | Chronic pain employment status: - employed - retired - home duties - unemployed marital status: - married - single - divorced/widowed - missing pain category - back pain - neuropathy - neck pain - back and neck pain - back and leg pain - joint pain - unknown/missing cause of pain - degenerative changes - dysfunctions - missing/unknown - trauma - RTA | median 24 ± IQR 51 ma | IEQ [0/48]: median 22.5 ± IQR 16.75 | ≥ 30 | 33% (n = 26) 29.54% (n = 13) 25% (n = 3) 50% (n = 4) 37.5% (n = 3) 33.33% (n = 17) 28.57% (n = 4) 33.33% (n = 4) 33.33% (n = 1) 30.30% (n = 10) 25% (n = 3) 30% (n = 3) 55.55% (n = 5) 14.28% (n = 1) 42.85% (n = 3) 50% (n = 1) 28% (n = 7) 22.22% (n = 2) 28.57% (n = 2) 53% (n = 8) 41% (n = 7) | 0.053 0.069 0.125 0.177 0.171 0.066 0.121 0.136 0.272 0.080 0.125 0.145 0.165 0.132 0.187 0.353 0.090 0.139 0.171 0.129 0.119 |
| Rodero 2012, Spain (9) | CS | 250 | 52.4 | FM | 18.5 ± 11.3 ya | IEQ [0/48]: 30.1 ± 12.2 | > 30 | 47.2% (n = 118) | 0.032 |
| Steiger 2019, Germany (65) | CS | 134 | 46.3 | Pain with mixed causes: no apparent cause, disease, physical strain, medical treatment, surgery, accident, physical stress | NM | IEQ [0/48]: 16.76 ± 11.05 | > 19 | 35.1% (n = 47) | 0.041 |

Abbreviations: a: Pain duration; b: Time since injury

CS = Cross-sectional Study, FM = Fibromyalgia, IEQ = Injustice Experience Questionnaire, IQR = Interquartile Range, m = month(s), mTBI = mild Traumatic Brain Injury, n = number, NM = Not Mentioned, PI = Perceived Injustice, PR-UMCG = Rehabilitation Department University Medical Center Groningen, RTA = Road Traffic Accident, SD = Standard Deviation, SE = Standard Error, TC = Transcure Pain Rehabilitation Center, w = week(s), WAD = Whiplash-Associated Disorders, y = years.

Table 4. Quality assessment by the quality assessment tool for observational cohort and cross-sectional studies.

| | Design | 1. Research question | 2. Study population | 3. Participation rate | 4. Population selection | 5. Sample size justification | 6. Exposure assessment | 7. Timeframe | 8. Different levels of exposure | 9. Exposure measures | 10. Repeated exposure assessment | 11. Outcome measures | 12. Blinding of outcome assessors | 13. Follow-up rate | 14. Statistical analyses | mean = 8.00 ± 1.10 median = 8 | | Quality |
|-------------------------|--------|----------------------|---------------------|-----------------------|-------------------------|------------------------------|------------------------|--------------|---------------------------------|----------------------|----------------------------------|----------------------|-----------------------------------|--------------------|--------------------------|----------------------------------|--------|---------|
| | | | | | | | | | | | | | | | | Total YES | | |
| Agtarap 2016 (62) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | N | Y | 9 | High | |
| Alizadeh-Fard 2020 (37) | CS | Y | Y | Y | Y | Y | NA | NA | N | Y | N | Y | NA | NA | Y | 8 | High | |
| Bhalang 2020 (63) | CS | Y | Y | NR | Y | NR | NA | NA | Y | Y | N | Y | NA | NA | Y | 7 | Medium | |
| Boals 2020 (81) | C | Y | Y | NR | Y | Y | Y | Y | Y | Y | N | Y | NR | NR | Y | 10 | High | |
| Bults 2020 (74) | CS | Y | y | NR | N | N | NA | NA | Y | Y | N | Y | NA | NA | Y | 6 | Medium | |
| Carriere 2017 (a) (16) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Carriere 2017 (b) (106) | C | Y | Y | Y | Y | Y | Y | NM | N | Y | N | Y | NR | N | Y | 9 | Medium | |
| Carriere 2018 (38) | CS | Y | Y | NR | Y | N | NA | NA | Y | Y | N | Y | NA | NA | Y | 7 | Medium | |
| Daenen 2020 (61) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High | |
| Ferrari 2015 (39) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High | |
| Giummarra 2017 (a) (40) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High | |
| Giummarra 2017 (b) (41) | CS | Y | Y | Y | Y | Y | NA | NA | N | Y | N | Y | NA | NA | Y | 8 | High | |
| Hayashi 2020 (58) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High | |
| Ioannou 2016 (42) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Ioannou 2017 (43) | CS | Y | Y | N | NR | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 7 | Medium | |
| Iverson 2018 (44) | CS | Y | Y | N | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| La Cour 2017 (66) | CS | Y | Y | NR | Y | Y | NA | NA | N | Y | N | Y | NA | NA | Y | 7 | Medium | |
| Laroche 2019 (45) | CS | Y | N | NR | CD | NR | NA | NA | Y | Y | N | Y | NA | NA | Y | 5 | Medium | |
| Leysen 2021 (60) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Linnemørken 2020 (46) | CS | Y | Y | Y | Y | NR | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Margiotta 2017 (48) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High | |
| Martel 2017 (49) | CS | Y | Y | Y | Y | CD | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| McParland 2010 (47) | CS | Y | Y | Y | Y | Y | NA | NA | N | Y | N | Y | NA | NA | N | 7 | Medium | |
| Miller 2016 (36) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Miller 2018 (71) | CS | Y | Y | Y | Y | N | NA | NA | Y | Y | N | Y | NA | N | Y | 8 | High | |
| Miller 2021 (35) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Monden 2019 (50) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Pâquet 2016 (51) | CS | Y | Y | N | Y | NR | NA | NA | Y | Y | N | Y | NA | NA | Y | 7 | Medium | |
| Penn 2019 (70) | CS | Y | Y | Y | Y | N | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Penn 2020 (77) | C | Y | Y | NR | Y | CD | Y | NR | Y | Y | N | Y | NR | CD | Y | 8 | Medium | |
| Rahbari 2019 (64) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High | |
| Rodero 2012 (9) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High | |
| Scott 2012 (7) | CS | Y | N | NR | N | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 6 | Medium | |
| Scott 2013 (83) | CS | Y | Y | NR | Y | NR | NA | NA | Y | Y | N | Y | NA | NA | Y | 7 | Medium | |

Table 4 (cont). Quality assessment by the quality assessment tool for observational cohort and cross-sectional studies.

| | Design | 1. Research question | 2. Study population | 3. Participation rate | 4. Population selection | 5. Sample size justification | 6. Exposure assessment | 7. Timeframe | 8. Different levels of exposure | 9. Exposure measures | 10. Repeated exposure assessment | 11. Outcome measures | 12. Blinding of outcome assessors | 13. Follow-up rate | 14. Statistical analyses | Total YES | Quality |
|-----------------------|--------|----------------------|---------------------|-----------------------|-------------------------|------------------------------|------------------------|--------------|---------------------------------|----------------------|----------------------------------|----------------------|-----------------------------------|--------------------|--------------------------|-----------|---------|
| Scott 2016 (52) | CS | Y | Y | NR | Y | N | NA | NA | Y | Y | N | Y | NA | NA | Y | 7 | Medium |
| Scott 2019 (78) | C | Y | Y | Y | Y | CD | Y | NR | Y | Y | NR | Y | NR | NR | Y | 9 | Medium |
| Steiger 2019 (65) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High |
| Sturgeon 2016 (68) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High |
| Sturgeon 2017 (69) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High |
| Sullivan 2008 (22) | C | Y | Y | NR | Y | NR | Y | Y | Y | Y | Y | Y | NR | NM | Y | 10 | High |
| Sullivan 2009 (15) | C | Y | N | NR | Y | Y | Y | NR | N | Y | Y | Y | NR | NM | Y | 8 | Medium |
| Trost 2015 (54) | CS | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High |
| Trost 2016 (a) (79) | C | Y | Y | Y | Y | NR | Y | NR | Y | Y | N | Y | NR | NR | Y | 9 | Medium |
| Trost 2016 (b) (55) | CS | Y | N | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 7 | Medium |
| Trost 2017 (72) | CS | Y | Y | N | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High |
| Trost 2019 (53) | CS | Y | N | NR | Y | NR | NA | NA | Y | Y | N | Y | NA | NA | Y | 6 | Medium |
| Van Leeuwen 2016 (57) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | N | NA | NA | Y | 8 | High |
| Yakovov 2014 (75) | C | Y | N | NR | Y | Y | Y | NR | N | Y | Y | Y | NR | NR | Y | 8 | Medium |
| Yakovov 2016 (56) | CS | Y | N | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 7 | Medium |
| Yakovov 2018 (a) (76) | C | Y | N | NR | Y | Y | Y | Y | N | Y | Y | Y | NR | Y | Y | 10 | High |
| Yakovov 2018 (b) (73) | C | Y | Y | NR | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 8 | High |
| Yamada 2019 (67) | CS | Y | Y | Y | Y | Y | NA | NA | Y | Y | N | Y | NA | NA | Y | 9 | High |
| Ysidron 2020 (80) | C | Y | Y | N | Y | Y | Y | Y | N | Y | Y | Y | NR | N | Y | 10 | High |
| Ziadni 2020 (59) | CS | Y | Y | NR | Y | Y | NA | NA | NR | Y | N | Y | NA | NA | N | 6 | Medium |
| Total YES | | 53 | 45 | 21 | 50 | 38 | 10 | 4 | 44 | 54 | 5 | 53 | 0 | 1 | 52 | | |

Abbreviations: C = cohort, CS = cross-sectional, CD = cannot determine, N = no, NA = not applicable, NR = not reported, Y = yes

sociation between PI and anxiety (n = 1,563) (9,35,40,42,66,67,74,84,85). A significant moderate positive correlation coefficient was observed in the meta-analysis (r_p 0.59, 95% CI = [0.52, 0.64], $P < 0.00001$), with high heterogeneity ($I^2 = 66\%$, $P = 0.005$) (Supplementary Fig. 34). After executing a subgroup analysis based on methodological quality, heterogeneity remained high (Supplementary Fig. 35). Subgroup analysis based on outcome measure could not be performed as all instruments used were valid.

Kinesiophobia

The association between PI and kinesiophobia was

investigated in 6 studies (n = 1,323) (21,22,43,62,64,75). After pooling the data, a significant moderate positive correlation was found between kinesiophobia and PI (r_p 0.57, 95% CI = [0.50, 0.64], $P < 0.00001$), with high heterogeneity ($I^2 = 70\%$, $P = 0.005$) (Supplementary Fig. 36). Subgroup analysis based on methodological quality showed zero heterogeneity in the medium methodological quality subgroup ($I^2 = 0\%$, $P = 0.46$); however, in the high methodological quality group, heterogeneity remained high (Supplementary Fig. 37). All studies used a valid measurement tool, wherefor no subgroup analysis based on outcome measure was performed.

State Anger

Six studies examined state anger ($n = 558$) (50,52,53,55,72,83). Combining these articles led to a significant low positive correlation between state anger and PI (r_p 0.48, 95% CI = [0.41, 0.54], $P < 0.00001$) (Supplementary Fig. 38). No heterogeneity was observed ($I^2 = 0\%$, $P = 0.47$).

Trait Anger

Trait anger was addressed by 6 studies ($n = 558$) (50,52,53,55,72,83). A significant low positive pooled correlation between PI and trait anger was observed (r_p 0.40, 95% CI = [0.29, 0.49], $P < 0.00001$) (Supplementary Fig. 39). Heterogeneity was not significant ($I^2 = 44\%$, $P = 0.11$).

Anger Inhibition

Combining 4 studies ($n = 439$) (52,53,72,83), a significant low positive correlation was found between anger inhibition and PI (r_p 0.35, 95% CI = [0.26,0.43], $P < 0.00001$) (Supplementary Fig. 40). No heterogeneity was observed ($I^2 = 0\%$, $P = 0.87$).

Anger

Three studies ($n = 709$) (38,68,74) investigated the association between anger and PI. The meta-analysis showed a significant moderate positive correlation (r_p 0.59, 95% CI = [0.49, 0.67], $P < 0.00001$) (Supplementary Fig. 41). Sensitivity analyses were performed as heterogeneity was high ($I^2 = 62\%$, $P = 0.07$). Heterogeneity decreased down to zero ($I^2 = 0\%$, $P = 0.90$) when excluding the invalid outcome measure and resulted in a significant moderate positive correlation (r_p 0.54, 95% CI = [0.49, 0.60], $P < 0.00001$) (Supplementary Fig. 42).

Pain Characteristics**Pain Intensity**

Data from 39 studies ($n = 6,646$) (7,9,16,21,22,35,36,38,42-44,48-54,57,59-62,64,68-80,83,86) were combined to investigate the correlation between pain intensity and PI measured with the IEQ. This resulted in a significant low positive correlation (r_p 0.37, 95% CI = [0.33, 0.42], $P < 0.00001$) (Supplementary Fig. 43). Subgroup analyses based on methodological quality and outcome measures were performed as heterogeneity was high ($I^2 = 81\%$, $P < 0.00001$). None of the subgroup analyses explained the high heterogeneity (Supplementary Figs. 44-45).

Pain Catastrophizing

Data of 16 studies investigating the association between pain catastrophizing and PI were pooled ($n = 3,502$) (7,9,21,22,37,42,43,48,53,59,60,62,64,67,69,75). A significant moderate positive correlation was found between pain catastrophizing and PI (r_p 0.66, 95% CI = [0.64, 0.69], $P < 0.00001$) (Supplementary Fig. 46). A subgroup analysis based on methodological quality was performed as heterogeneity was significant ($I^2 = 48\%$, $P = 0.009$). Heterogeneity decreased in the medium methodological quality subgroup ($I^2 = 44\%$, $P = 0.07$) (Supplementary Fig. 47). No further subgroups could be formed since all instruments used in the studies were valid.

Pain Interference

Eight studies reported correlations between pain interference and PI ($n = 2,067$) (42, 43,66-70,78). A significant low positive correlation was found (r_p 0.49, 95% CI = [0.35, 0.60], $P < 0.00001$) (Supplementary Fig. 48). Heterogeneity was high ($I^2 = 92\%$, $P < 0.00001$), and remained high in the subgroup analysis based on methodological quality (Supplementary Fig. 49). No subgroup analysis was performed on outcome measure as all outcomes were valid.

Pain Perceptions

Pain perceptions were studied in 3 studies ($n = 435$) (44,74,77). A significant low positive correlation was found (r_p 0.52, 95% CI = [0.40, 0.64], $P < 0.00001$) (Supplementary Fig. 50). No significant heterogeneity was observed ($I^2 = 65\%$, $P = 0.06$).

Symptoms of Central Sensitization

A significant low positive correlation was found between central sensitization pain and PI (r_p 0.47, 95% CI = [0.39, 0.55], $P < 0.00001$) based on results out of 2 studies ($n = 338$) (60,74) (Supplementary Fig. 51). No heterogeneity was observed ($I^2 = 0\%$, $P = 0.66$).

Quality of Life (QoL) Characteristics**Disability**

For the association between PI measured with the IEQ and disability, 20 studies in total were pooled ($n = 3,383$) (21,22,35,36,42,43,49,50,52,53,55,59,61,64,71,73,74,76,79,83). A significant moderate positive correlation was found ($r_p = 0.53$, 95% CI = [0.47, 0.59], $P < 0.00001$) (Supplementary Fig. 52). The overall heterogeneity was significant ($I^2 = 80\%$, $P < 0.00001$), but

Prevalence of Perceived Injustice and Factors Associated With Perceived Injustice in People With Pain

Table 5. Summary of the meta-analyses.

| Factor | Number of studies (total sample size) | Pooled estimate | Description association outcome | |
|-----------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------|
| PSYCHOLOGICAL CHARACTERISTICS AND COGNITIONS | | | | |
| Depressive symptoms | 30 (n = 5,214) | r_p 0.57 (95% CI = [0.52, 0.60]), $P < 0.00001$, $I^2 = 77$, $P < 0.00001$ | Significant moderate positive correlation | |
| Posttraumatic stress | 11 (n = 1,790) | r_p 0.63 (95% CI = [0.59, 0.67]), $P < 0.00001$, $I^2 = 44$, $P = 0.05$ | Significant moderate positive correlation | |
| Pain acceptance | 6 (n = 1,371) | r_p -0.59 (95% CI = [-0.66, -0.49]), $P < 0.00001$, $I^2 = 86$, $P < 0.00001$ | Significant moderate negative correlation | |
| Anxiety | 7 (n = 1,563) | r_p 0.59 (95% CI = [0.52, 0.64]), $P < 0.00001$, $I^2 = 66$, $P = 0.005$ | Significant moderate positive correlation | |
| Kinesiophobia | 6 (n = 1,323) | r_p 0.57 (95% CI = [0.50, 0.64]), $P < 0.00001$, $I^2 = 70$, $P = 0.005$ | Significant moderate positive correlation | |
| State anger | 6 (n = 558) | r_p 0.48 (95% CI = [0.41, 0.54]), $P < 0.00001$, $I^2 = 0$, $P = 0.47$ | Significant low positive correlation | |
| Trait anger | 6 (n = 558) | r_p 0.40 (95% CI = [0.29, 0.49]), $P < 0.00001$, $I^2 = 44$, $P = 0.11$ | Significant low positive correlation | |
| Anger expression | 4 (n = 439) | r_p 0.25 (95% CI = [0.11, 0.39]), $P < 0.00001$, $I^2 = 54$, $P = 0.09$ | Significant negligible positive correlation | |
| Anger inhibition | 4 (n = 439) | r_p 0.35 (95% CI = [0.26, 0.43]), $P < 0.00001$, $I^2 = 0$, $P = 0.87$ | Significant low positive correlation | |
| Anger | 3 (n = 709) | r_p 0.59 (95% CI = [0.49, 0.67]), $P < 0.00001$, $I^2 = 62$, $P = 0.97$ | Significant moderate positive correlation | |
| PAIN CHARACTERISTICS | | | | |
| Pain intensity | PJWB | 2 (n = 241) | r_p -0.22 (95% CI = [0.34, 0.08]), $P = 0.001$, $I^2 = 6$, $P = 0.30$ | Significant negligible negative correlation |
| | GJWB | 2 (n = 241) | r_p -0.04 (95% CI = [-0.17, 0.09]), $P = 0.54$, $I^2 = 0$, $P = 0.71$ | NS correlation |
| | IEQ | 39 (n = 6,646) | r_p 0.37 (95% CI = [0.33, 0.42]), $P < 0.00001$, $I^2 = 81$, $P < 0.00001$ | Significant low positive correlation |
| Pain catastrophizing | 16 (n = 3,502) | r_p 0.66 (95% CI = [0.64, 0.69]), $P < 0.00001$, $I^2 = 44$, $P = 0.07$ | Significant moderate positive correlation | |
| Pain duration | 11 (n = 1,518) | r_p 0.10 (95% CI = [0.03, 0.17]), $P = 0.003$, $I^2 = 36$, $P = 0.10$ | Significant negligible positive correlation | |
| Pain interference | 8 (n = 2,067) | r_p 0.49 (95% CI = [0.35, 0.60]), $P < 0.00001$, $I^2 = 92$, $P < 0.00001$ | Significant low positive correlation | |
| Pain perceptions | 3 (n = 435) | r_p 0.40 (95% CI = [0.40, 0.64]), $P < 0.00001$, $I^2 = 65$, $P = 0.06$ | Significant low positive correlation | |
| Symptoms of central sensitization | 2 (n = 338) | r_p 0.47 (95% CI = [0.39, 0.55]), $P < 0.00001$, $I^2 = 0$, $P = 0.66$ | Significant low positive correlation | |
| Number of pain sites | 2 (n = 340) | r_p 0.17 (95% CI = [0.04, 0.29]), $P = 0.008$, $I^2 = 24$, $P = 0.25$ | Significant negligible positive correlation | |
| QUALITY OF LIFE CHARACTERISTICS | | | | |
| Disability | PJWB | 2 (n = 241) | r_p -0.21 (95% CI = [-0.43, 0.04]), $P = 0.06$, $I^2 = 72$, $P = 0.06$ | NS correlation |
| | GJWB | 2 (n = 241) | r_p -0.09 (95% CI = [-0.22, 0.04]), $P = 0.16$, $I^2 = 0$, $P = 0.54$ | NS correlation |
| | IEQ | 20 (n = 3,383) | r_p 0.53 (95% CI = [0.47, 0.59]), $P < 0.00001$, $I^2 = 80$, $P < 0.00001$ | Significant moderate positive correlation |
| Physical functioning | 10 (n = 2,340) | r_p -0.43 (95% CI = [-0.53, -0.33]), $P < 0.00001$, $I^2 = 89$, $P < 0.00001$ | Significant low negative correlation | |

Table 5 (cont). Summary of the meta-analyses.

| Factor | | Number of studies (total sample size) | Pooled estimate | Description association outcome |
|---------------------------------|-----------------------|---------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------|
| Social functioning | | 4 (n = 673) | r_p -0.47 (95% CI = [-0.60, -0.31]), $P < 0.00001$, $I^2 = 78$, $P = 0.003$ | Significant low negative correlation |
| Emotional functioning | | 3 (n = 643) | r_p -0.52 (95% CI = [-0.64, -0.39]), $P < 0.00001$, $I^2 = 77$, $P = 0.01$ | Significant moderate negative correlation |
| Mental functioning | | 4 (n = 1,152) | r_p -0.48 (95% CI = [-0.57, -0.38]), $P < 0.00001$, $I^2 = 75$, $P = 0.007$ | Significant low negative correlation |
| Academic functioning | | 2 (n = 285) | r_p -0.54 (95% CI = [-0.65, -0.41]), $P < 0.00001$, $I^2 = 50$, $P = 0.16$ | Significant moderate negative correlation |
| PERSONAL CHARACTERISTICS | | | | |
| Age | PJWB | 2 (n = 241) | r_p 0.12 (95% CI = [-0.38, 0.57]), $P = 0.65$, $I^2 = 94$, $P < 0.00001$ | NS correlation |
| | GJWB | 2 (n = 241) | r_p 0.07 (95% CI = [-0.32, 0.44]), $P = 0.74$, $I^2 = 89$, $P = 0.002$ | NS correlation |
| | IEQ | 16 (n = 1,982) | r_p 0.00 (95% CI = [-0.09, 0.08]), $P = 0.65$, $I^2 = 69$, $P < 0.0001$ | NS correlation |
| Educational level | | 3 (n = 661) | r_p 0.07 (95% CI = [-0.18, 0.31]), $P = 0.60$, $I^2 = 87$, $P = 0.0004$ | NS correlation |
| Gender | | 3 (n = 718) | r_p 0.02 (95% CI = [-0.05, 0.09]), $P = 0.61$, $I^2 = 0$, $P = 0.48$ | NS correlation |
| Income | | 3 (n = 295) | r_p -0.31 (95% CI = [-0.47, -0.12]), $P = 0.07$, $I^2 = 63$, $P = 0.002$ | NS correlation |
| BMI | | 2 (n = 247) | r_p 0.12 (95% CI = [-0.14, 0.37]), $P = 0.38$, $I^2 = 76$, $P = 0.04$ | NS correlation |
| Resilience | | 2 (n = 308) | r_p -0.26 (95% CI = [-0.55, 0.11]), $P = 0.16$, $I^2 = 89$, $P = 0.002$ | NS correlation |
| INJURY CHARACTERISTICS | | | | |
| Cervical range of motion | Flexion | 2 (n = 258) | r_p -0.12 (95% CI = [-0.24, 0.00]), $P = 0.06$, $I^2 = 0$, $P = 1.00$ | NS correlation |
| | Extension | 2 (n = 258) | r_p -0.22 (95% CI = [-0.33, -0.10]), $P = 0.0005$, $I^2 = 0$, $P = 0.62$ | Significant negligible negative correlation |
| | Right rotation | 2 (n = 258) | r_p -0.25 (95% CI = [-0.35, -0.13]), $P < 0.0001$, $I^2 = 0$, $P = 0.94$ | Significant negligible negative correlation |
| | Left rotation | 2 (n = 258) | r_p -0.24 (95% CI = [-0.35, -0.11]), $P = 0.0002$, $I^2 = 0$, $P = 0.56$ | Significant negligible negative correlation |
| | Right lateral flexion | 2 (n = 258) | r_p -0.01 (95% CI = [-0.22, 0.20]), $P = 0.92$, $I^2 = 63$, $P = 0.10$ | NS correlation |
| | Left lateral flexion | 2 (n = 258) | r_p -0.08 (95% CI = [-0.20, -0.04]), $P = 0.20$, $I^2 = 0$, $P = 0.58$ | NS correlation |
| Injury severity | | 2 (n = 336) | r_p 0.07 (95% CI = [-0.03, 0.18]), $P = 0.18$, $I^2 = 0$, $P = 0.79$ | NS correlation |
| RECOVERY CHARACTERISTICS | | | | |
| Length of hospital stay | | 3 (n = 282) | r_p 0.13 (95% CI = [0.01, 0.25]), $P = 0.03$, $I^2 = 0$, $P = 0.39$ | Significant negligible positive correlation |

Abbreviations: BMI = Body Mass Index, CI = Confidence Interval, GJWB = Global Just World Beliefs, I = heterogeneity, IEQ = Injustice Experienced Questionnaire, n = number, NS = nonsignificant, P = significance value, PJWB = Personal Just World Beliefs, r_p = Pearson's correlation coefficient.

could not be reduced by any of the subgroup analyses (Supplementary Figs. 53-54).

Physical Functioning

The association between physical functioning and

PI was explored in 10 studies ($n = 2,340$) (38,43,54,57,61,62,66,75,77,80). The pooled estimate showed a significant low negative pooled correlation ($r_p -0.43$, 95% CI = $[-0.53, -0.33]$, $P < 0.00001$) (Supplementary Fig. 55). Due to high heterogeneity ($I^2 = 89\%$, $P < 0.00001$), subgroup analyses were performed. A subgroup analysis based on methodological quality did not explain the high heterogeneity (Supplementary Fig. 56). No subgroup analysis based on outcome measures was executed as all studies used a valid instrument. When excluding the pediatric pain population from the study of Daenen et al (61), heterogeneity remained high as well (Supplementary Fig. 57).

Social Functioning

A total of 4 studies ($n = 673$) (35,36,61,66) examined the correlation between social functioning and PI. A significant low negative correlation ($r_p -0.47$, 95% CI = $[-0.60, -0.31]$, $P < 0.00001$) with a high heterogeneity ($I^2 = 78\%$, $P = 0.003$) was observed (Supplementary Fig. 58). Due to the limited number of studies, no subgroups of more than one study could be formed for a subgroup analysis. When excluding the study by la Cour et al (66), which was the only study with a medium methodological quality (vs high quality studies) and the only one considering an adult population, comparable results were found, nor did the heterogeneity drop ($I^2 = 80\%$, $P = 0.007$) (Supplementary Fig. 59).

Emotional Functioning

Three studies ($n = 643$) (35,61,66) investigated the association between emotional functioning and PI. By pooling these data, a significant moderate negative correlation was found ($r_p -0.52$, 95% CI = $[-0.64, -0.39]$, $P < 0.00001$) (Supplementary Fig. 60). Significant heterogeneity ($I^2 = 77\%$, $P = 0.01$) was observed. Therefore, the study by la Cour et al (66) was excluded from the meta-analysis as this study included adults compared to the 2 other studies, which considered a pediatric population. This resulted in decreased heterogeneity ($I^2 = 47\%$, $P = 0.17$), but the correlation remained non-significant (Supplementary Fig. 61).

Mental Functioning

A meta-analysis for the factor of mental functioning was performed based on 4 studies ($n = 1,152$) (42,54,62,66). This meta-analysis showed a significant low negative correlation ($r_p -0.48$, 95% CI = $[-0.57, -0.38]$, $P < 0.00001$) with significant heterogeneity ($I^2 = 75\%$, $P = 0.007$) (Supplementary Fig. 62). Heterogeneity

remained high in the subgroup analysis based on methodological quality (Supplementary Fig. 63). Because only valid outcome measures were used, no subgroup analysis was performed based on the outcome measures.

Academic Functioning

The association between PI and academic functioning (e.g., school attendance, academic achievement, and social relationships) was retrieved in 2 studies ($n = 285$) (36,61). The meta-analysis resulted in a significant moderate negative correlation ($r_p -0.54$, 95% CI = $[-0.65, -0.41]$, $P < 0.00001$) (Supplementary Fig. 64). Significant heterogeneity was found ($I^2 = 50\%$, $P = 0.16$), but no further subgroup analyses could be done due to insufficient studies.

DISCUSSION

Summary of the Results

This systematic review and meta-analysis aimed to examine the prevalence of PI in people with pain and to enlist factors associated with PI in people with pain. Due to high heterogeneity across studies ($I^2 = 99\%$), it was not possible to define a weighted mean prevalence rate of PI in people with pain. The prevalence numbers ranged from 23% [0.18-0.27] (traumatic injury) to 77% [0.76-0.78] (fibromyalgia).

Based on correlational analyses of all factors found in the literature with PI, which in all cases was measured with the IEQ, a significant association was moderate positive with pain catastrophizing posttraumatic stress, anger, anxiety, depressive symptoms, kinesiphobia, and disability, and moderate negative with pain acceptance, academic functioning, and emotional functioning. A significant low association was found positive with pain interference, state anger, symptoms of central sensitization, pain perceptions, trait anger, pain intensity, anger inhibition, and negative with mental functioning, social functioning, and physical functioning. These results underline the importance of PI in people with pain.

Discussion of the Prevalence

Subgroup analyses were not able to explain the high heterogeneity, wherefor it can be assumed that most of the variability across studies is attributable to heterogeneity rather than chance (31). Unfortunately, it was not possible to conduct the subgroup analyses based on type of population because not all articles clearly defined their population in the same way (e.g.,

acute/chronic). However, subgrouping, based on acute or chronic pain complaints, could be a worthwhile knowing that cognitions, such as beliefs of injustice, play an important part in the chronicity of pain (87). Overall, in 75% of the studies a prevalence of ≥ 33 is seen. The use of different cutoff scores to define clinically relevant levels of PI across studies can possibly result in discrepancies between studies in the classification of people as having clinically relevant levels of PI. Studies applying a higher cutoff score will have classified people as not having a clinically relevant level of PI; whereas, based on a lower cutoff score applied in a different study, those people would have been classified as having PI. After subgroup analysis, based on the cutoff, only one homogeneous ($I^2 = 2\%$, $P = 0.36$) and significant ($P < 0.001$) pooled prevalence rate of 0.26 [0.22-0.31] was found for the cutoff of ≥ 30 on the IEQ. This cutoff value has been validated by Sullivan (88) in chronic pain samples. Future research should define proper population-specific cutoff values to define the correct prevalence of PI across populations with pain. Interestingly, it was also seen that the subgroup of retired people in the chronic pain sample demonstrated a lower prevalence rate of PI (48). This may be due to a lower valuation of the importance of their loss due to the painful condition as they did not lose their job and/or income (88). Also, a trauma or road traffic accident as the cause of pain resulted in higher PI prevalence, which is possibly caused by perceived self-victimization aspects which reflect the severity and irreparability of injury-related loss, blame, and unfairness (14).

Discussion of the Significant Associations

Pain catastrophizing was found as the most strongly associated factor with PI (r_p 0.66 [0.64, 0.69]). Both PI and pain catastrophizing affect cognitive pain experience (59) and represent a maladaptive pattern of cognitive appraisal (89). Therefore, it may be assumed that pain catastrophizing overlaps with the severity/irreparability part of PI assessed by the IEQ. However, the underlying concept of pain catastrophizing is not expressed in the "blame/unfairness" dimension of the IEQ (90). This illustrates that PI and pain catastrophizing are partially different constructs, which can be confirmed with the moderate pooled correlation (r_p 0.66 [0.64, 0.69]) found in this review.

Higher levels of depression and anxiety were found in people with pain experiencing PI (r_p , depression 0.57 [0.52, 0.60]; r_p , anxiety 0.59 [0.52, 0.64]). PI and depression may align with each other through injustice-rel-

evant constructs, such as victimization and unfairness, which play a central role in depressive experiences (91). Moreover, PI augments the relationship between pain severity and depressive symptoms (7). Another mental health outcome that seems importantly associated with PI is posttraumatic stress. Pain complaints are often caused by traumatic experiences, which are often associated with posttraumatic stress disorder (81). Also, anger can arise when a discrepancy between the expected and the actual outcomes is present (89). This corresponds with PI since both are experienced when somehow feel wronged (92). Moreover, state anger and anger inhibition mediate the relationship between PI and pain intensity (83).

Those negative emotions associated with PI and PI itself may possibly contribute to the maintenance or worsening of complaints. Our findings are in accordance with current conceptualizations of injustice assessments, which propose a central role for symptom severity and disability as determinants of perceptions of injustice in people with persistent pain (76). First, higher levels of pain are seen in people with higher levels of PI. Maladaptive illness/pain perceptions, including PI, contribute to the presence of symptoms of central sensitization (93). This could explain why PI is seen with more symptoms of central sensitization (r_p 0.47 [0.39, 0.55]), and thus a greater chronicity of pain. Secondly, disability occurs when a person's ability to perform activities considered normal is impaired as a result of loss (94). Feelings of injustice could possibly arise due to the perception of undeserved loss (95). However, loss and disability do not necessarily have the same meaning, as disabilities in daily life have the potential to be improved in some way, despite the loss (96). This can be extended to the positive correlation found between pain interference, "the degree to which pain limits or interferes with individuals' physical, mental and social activities" (97), and PI as well. Since the number of pain sites predicts disability (98), it is self-evident that the number of pain sites is also associated with PI. Disability features include impaired physical, emotional, social, mental, and academic functioning as well (36,61,66). These factors were found negatively associated with PI in this review.

The relationship between PI and emotional functioning is significantly mediated by pain acceptance (49). It has been suggested by Rodero et al (9) that PI and pain acceptance are opposite constructs since "something unjust is usually unacceptable," and "an event perceived as just may be more easily accepted."

Although, through the negative relationship (r_p -0.59 [-0.66, -0.49]) between PI and pain acceptance found in this review is likely to be much more complex, this seems to be an acceptable simplification.

Overall, PI is associated with negative emotions (i.e., stress, anger, anxiety), which are known to be continuous stressors for people. The biology behind PI could be explained by the essential role of the amygdala in negative emotions, pain memories, and anger (99). The amygdala is seen as the motor for chronic pain and central sensitization (100).

Strengths and Limitations

This is the first systematic review aiming at estimating the prevalence of PI and exploring factors associated with PI in people with pain. For this, qualitative meta-analyses were conducted including only medium-to-high qualitative studies (101), leading to an increase in sample size, and thus power to examine the effects of interest. Three databases were used, from which a high number of studies, considering a broad array of populations with pain emerged. Risk for selection bias was decreased by blinding the screening procedures for both title and abstract, full textual screening, and data extraction.

Despite these methodological strengths, a few limitations should be acknowledged. First, some articles had to be excluded due to the absence of the full text. Second, the findings can largely be applied to developed and high-income countries, as most included studies originated from North America and Europe, but further research is needed in developing countries. Third, because no validated cutoff values were available for the National Institutes of Health to determine the methodological quality of the included studies, quality categories were based on the values arbitrarily chosen by Besora-Moreno et al (26). Lastly, high heterogeneity was observed in many of the performed analyses, even though random effects were used during meta-analyses. Heterogeneity is due to variability in the data: clinically, methodologically, or statistically. Therefore, subgroup analyses were planned and performed when possible. This could decrease heterogeneity in some cases, but not for all. The clinical, methodological, or statistical impact is thus not always important for the overall effect found. However, more research is needed to be able to do more subgroup analyses and to become less heterogeneous results. Although, this also shows the innovative aspect of PI research and the results of this paper open new possible pathways to tackle PI in further research.

Implications for Clinical Practice

The presence of PI in people experiencing pain and a wide variety of factors associated with PI calls for further research. PI is a “perceived” feeling with thoughts and emotions of injustice, which could be maladaptive for the rehabilitation of people with pain (14). Up to now, we do not know the causal associations between PI and other factors. Therefore, it should be examined whether PI in people having pain worsens over time or not. If causal associations are found in future research, PI should be an area of focus to improve the efficacy of interventions in populations with pain (8,14). Since psychological characteristics have the highest correlations with PI, it could be assumed that our current environment is an important factor in the development of PI. First of all, mental disorders (e.g., anxiety, depression, and posttraumatic stress) are seen in 1 out of 8 people worldwide (102). Several studies (103,104) have also highlighted that the COVID-19 pandemic is associated with high levels of psychological distress. The number of people living with anxiety and depressive disorders increased during the COVID-19 pandemic to an estimation of 1 out of 3 people worldwide (105). Knowing this, more attention should be given to psychological well-being in clinical practice.

In clinical practice, these perceptions of injustice can be screened with the IEQ (88). With this, the type of injustice can be defined as well as the level of injustice, which makes PI measurable (88). Further anamnestic questioning is needed to define what the exact perception is. Furthermore, it would be interesting to identify people at risk of developing PI, so that clinicians can immediately initiate targeted therapy options, and thus prevent the potential negative consequences of the development of PI. Treatment strategies for PI do not exist up to now. Literature suggests the use of cognitive-behavioral interventions, pain acceptance (14), and educational interventions comprised of elements of reassurance and encouragement toward activity re-engagement (106). Up to now, a practical guide allowing clinicians to address PI in cancer survivors is already available (107), but requires experimental testing.

CONCLUSIONS

Prevalence numbers for PI in populations with pain ranged from 23% to 77%. Nevertheless, a pooled estimate could not be provided due to high heterogeneity even after performing subgroup analyses. Nonetheless, studies show that PI is significantly associated with psychological, pain, and QoL characteristics. Asso-

ciations with recovery characteristics were negligible. No significant associations were found with personal characteristics (i.e., age, gender, and body mass index).

To draw strong conclusions on causal interactions between PI and related factors in people with pain, further research is warranted.

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PUBMED

Population:

("pain"[MeSH Terms]
OR "causalgia"[MeSH Terms]
OR "central nervous system sensitization"[MeSH Terms] OR "fibromyalgia"[MeSH Terms] OR "hyperalgesia"[MeSH Terms] OR "hyperesthesia"[MeSH Terms] OR "neuralgia"[MeSH Terms] OR "nociceptive pain"[MeSH Terms] OR "paresthesia"[MeSH Terms] OR ("pain"[MeSH Terms] OR "pain"[All Fields] OR "stress, psychological"[MeSH Terms] OR "stress"[All Fields] AND "psychological"[All Fields]) OR "psychological stress"[All Fields] OR "suffer"[All Fields] OR "suffered"[All Fields] OR "suffering"[All Fields] OR "sufferings"[All Fields] OR "suffers"[All Fields] OR "suffereing"[All Fields] OR "sufferer"[All Fields] OR "sufferers"[All Fields] OR "sufferers"[All Fields] OR "suffered"[All Fields]) OR ("pain"[MeSH Terms] OR "pain"[All Fields] OR "ache"[All Fields]) OR ("causalgia"[MeSH Terms] OR "causalgia"[All Fields]) OR ("causalgia"[MeSH Terms] OR "causalgia"[All Fields] OR ("type"[All Fields] AND "ii"[All Fields] AND "complex"[All Fields] AND "regional"[All Fields] AND "pain"[All Fields] AND "syndrome"[All Fields]) OR "type ii complex regional pain syndrome"[All Fields]) OR ("causalgia"[MeSH Terms] OR "causalgia"[All Fields] OR "crps"[All Fields] AND "type"[All Fields] AND "ii"[All Fields]) OR "crps type ii"[All Fields]) OR ("central nervous system sensitization"[MeSH Terms] OR ("central"[All Fields]

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Exposure:

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Appendix 1 (cont). Full search strategy used for PubMed, Web of Science, and Embase.

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Appendix 1 (cont). Full search strategy used for PubMed, Web of Science, and Embase.

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Outcome:

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 "blaming"[All Fields]) OR
 ("patient harm"[MeSH Terms]
 OR ("patient"[All Fields]
 AND "harm"[All Fields]) OR
 "patient harm"[All Fields])

OR (("inequities"[All Fields]
 OR "inequity"[All Fields] OR
 "socioeconomic factors"[MeSH
 Terms] OR ("socioeconomic"[All
 Fields] AND "factors"[All Fields])
 OR "socioeconomic factors"[All
 Fields] OR "inequalities"[All Fields]
 OR "inequality"[All Fields]) NOT
 ("socioeconomic factors"[MeSH
 Terms] OR ("socioeconomic"[All
 Fields] AND "factors"[All Fields])
 OR "socioeconomic factors"[All
 Fields] OR "socioeconomics"[All
 Fields] OR "socioeconomic"[All
 Fields] OR "socioeconomical"[All
 Fields] OR "socioeconomically"[All
 Fields])) OR (("perceivable"[All
 Fields] OR "perceive"[All Fields] OR
 "perceiver"[All Fields] OR "perceiv-
 er s"[All Fields] OR "perceivers"[All
 Fields] OR "perceives"[All Fields]
 OR "perception"[MeSH Terms]
 OR "perception"[All Fields]
 OR "perceived"[All Fields]
 OR "perceiving"[All Fields])
 AND ("justice s"[All Fields] OR
 "social justice"[MeSH Terms]
 OR ("social"[All Fields] AND
 "justice"[All Fields]) OR "social
 justice"[All Fields] OR "justice"[All
 Fields] OR "justices"[All Fields])
 OR (("perceivable"[All Fields]
 OR "perceive"[All Fields] OR
 "perceiver"[All Fields] OR "perceiv-
 er s"[All Fields] OR "perceivers"[All
 Fields] OR "perceives"[All Fields]
 OR "perception"[MeSH Terms]
 OR "perception"[All Fields]
 OR "perceived"[All Fields]
 OR "perceiving"[All Fields])
 AND "fairness"[All Fields])
 OR ("injustice"[All Fields] OR
 "injustices"[All Fields]))

WEB OF SCIENCE

Population:

TS = ("pain" OR "causalgia"
 OR "central nervous system

sensitization" OR "fibromyalgia"
 OR "hyperalgesia" OR "hyperesthesia"
 OR "neuralgia" OR "nociceptive pain"
 OR "paresthesia" OR ("pain" OR "pain")
 OR ("stress, psychological" OR ("stress"
 AND "psychological") OR "psychological
 stress" OR "suffer" OR "suffered"
 OR "suffering" OR "sufferings"
 OR "suffers" OR "suffering" OR
 "sufferer" OR "sufferer s" OR
 "sufferers" OR "suffered") OR
 ("pain" OR "pain" OR "ache") OR
 ("causalgia" OR "causalgia") OR
 ("causalgia" OR "causalgia" OR
 "type" AND "ii" AND "complex"
 AND "regional" AND "pain" AND
 "syndrome") OR "type ii complex
 regional pain syndrome") OR
 ("causalgia" OR "causalgia" OR
 "crps" AND "type" AND "ii") OR
 "crps type ii") OR ("central nervous
 system sensitization" OR ("central"
 AND "nervous" AND "system"
 AND "sensitization") OR "central
 nervous system sensitization")
 OR ("sensitisation"[All Fields] OR
 "sensitisations" OR "sensitise" OR
 "sensitised" OR "sensitiser" OR
 "sensitisers" OR "sensitises" OR
 "sensitising" OR "sensitization"
 OR "sensitizations" OR "sensitize"
 OR "sensitized" OR "sensitizer" OR
 "sensitizers" OR "sensitizes" OR
 "sensitizing") OR ("fibromyalgia"
 OR "fibromyalgia" OR "fibromyal-
 gias") OR ("rheumatic diseases" OR
 ("rheumatic" AND "diseases") OR
 "rheumatic diseases" OR "rheumat-
 ics" OR "rheumatism" OR "rheu-
 matic" OR "rheumatisms") OR
 ("fibromyalgia" OR "fibromyalgia"
 OR "fibrositis") OR ("hyperalgesia"
 OR "hyperalgesia" OR "hyper-
 algesias") OR ("allodynia" OR
 "hyperalgesia" OR "hyperalgesia"
 OR "allodynia") OR ("hyperaesthesia"
 Fields] OR "hyperesthesia"
 OR "hyperesthesia" OR "hyperes-

thesias") OR ("hyperesthesia" OR
 "hyperesthesia") OR ("neuralgia"
 OR "neuralgia" OR "neuralgias")
 OR ("neuralgia" OR "neuralgia"
 OR "neurodynia") OR ("nocicep-
 tion" OR "nociception" OR "no-
 ciceptions" OR "nociceptive" OR
 "nociceptively") OR ("paraesthesia"
 OR "paresthesia" OR "paresthesia"
 OR "paraesthesiae" OR "paraesthe-
 sias" OR "paresthesias" OR "par-
 esthesiae") OR ("paresthesia" OR
 "paresthesia" OR "formication"))

Exposure:

TS = ("probability" OR "mor-
 bidity" OR "epidemiology" OR
 "prognosis" OR "epidemiologic
 factors" OR "survival analysis" OR
 ("risk" OR "risk") OR ("probabil-
 ity" OR "probability" OR "prob-
 abilities") OR ("epidemiology" OR
 "epidemiology" OR "morbidity"
 OR "morbidity" OR "morbid" OR
 "morbidity" OR "morbids") OR
 ("epidemiology" OR "epidemiolo-
 gy" OR "incidence" OR "incidence"
 OR "incidences" OR "incident"
 OR "incidents") OR ("epidemiol-
 ogy" OR "epidemiology" OR
 "prevalence" OR "prevalence" OR
 "prevalance" OR "prevalences" OR
 "prevalence s" OR "prevalent" OR
 "prevalently" OR "prevalents") OR
 ("basic reproduction number" OR
 ("basic" AND "reproduction" AND
 "number") OR "basic reproduction
 number") OR ("reproduction"
 OR "reproduction" OR "reproduc-
 tions" OR "reproductive" OR
 "reproductively" OR "reproduc-
 tives" OR "reproductivity") AND
 ("j rehabil assist technol eng" OR
 "rate") OR ("reproduction" OR
 "reproduction" OR "reproduc-
 tions" OR "reproductive" OR
 "reproductively" OR "reproduc-
 tives" OR "reproductivity") AND
 ("ratio" OR "ratio s" OR "ratios")

OR "ratios") OR ("epidemiologies"
 OR "epidemiology" OR "epide-
 miology" OR "epidemiology" OR
 "epidemiology s") OR ("analysis"
 OR "analysis" OR "determina-
 tion" OR "determinant" OR
 "determinants" OR "determinate"
 OR "determined" OR "deter-
 minates" OR "determinating" OR
 "determinations" OR "determine"
 OR "determined" OR "determines"
 OR "determining") OR ("epide-
 miology" OR "epidemiology" OR
 "frequency" OR "epidemiology"
 OR "frequene" OR "frequences"
 OR "frequencies") OR ("epidemiol-
 ogy" OR "epidemiology" OR
 "occurrence" OR "epidemiology"
 OR "occurrences") OR ("causal"
 OR "causality" OR "causality" OR
 "causalities" OR "causally" OR "eti-
 ology" OR "etiology") OR ("causal-
 ity" OR "causality" OR "causation"
 OR "causations") OR ("causative"
 OR "causatively" OR "causatives"
 OR "cause" OR "caused" OR
 "causing" OR "etiology" OR
 "etiology" OR "causes" OR "causal-
 ity" OR "causality") OR ("factor"
 OR "factor s" OR "factors") OR
 ("aetiologie" OR "aetiologies" OR
 "aetiology" OR "etiologies" OR
 "etiology" OR "etiology" OR "cau-
 sality" OR "causality") OR ("odds
 ratio" OR ("odds" AND "ratio")
 OR "odds ratio") OR ("odds ratio"
 OR ("odds" AND "ratio") OR "odds
 ratio" OR ("cross" AND "product"
 AND "ratio") OR "cross product
 ratio") OR ("family" OR "family"
 OR "relative" OR "relatives" OR
 "relative s" OR "relatively") AND
 "Odd") OR ("hazard" OR "hazard
 s" OR "hazardous" OR "hazard-
 ously" OR "hazardousness" OR
 "hazards") AND ("ratio" OR "ratio
 s" OR "ratios" OR "ratios") OR
 ("prognose" OR "prognosing")
 OR "epidemiologic factors" OR

("epidemiologic" AND "factors")
 OR "epidemiologic factors" OR
 ("epidemiologic" AND "factor")
 OR "epidemiologic factor") OR
 ("epidemiologic factors" OR
 ("epidemiologic" AND "factors")
 OR "epidemiologic factors" OR
 ("epidemiologic" AND "deter-
 minant") OR "epidemiologic
 determinant") OR (("mortality"
 OR "mortality" OR "survival"
 OR "survival" OR "survivability"
 OR "survivable" OR "survivals"
 OR "survive" OR "survived" OR
 "survives" OR "surviving") AND
 ("analyse" OR "analysed" OR
 "analyses" OR "analysing" OR
 "analyze")) OR ("characteristic" OR
 "characteristics") OR ("contribute"
 OR "contributed" OR "contributes"
 OR "contributing" OR "contribu-
 tion" OR "contributions") OR
 ("indicate" OR "indicated" OR
 "indicates" OR "indicating" OR
 "indicative" OR "indicatives" OR
 "indicators and reagents" OR
 "indicators and reagents" OR
 ("indicators" AND "reagents") OR
 "indicators and reagents" OR "indi-
 cator" OR "indicators" OR "indice"
 OR "indices") OR ("outcome" OR
 "outcomes") OR ("phenomenon"
 OR "phenomenon s" OR "phenom-
 enons") OR ("predict" OR "predict-
 abilities" OR "predictability" OR
 "predictable" OR "predictably"
 OR "predicted" OR "predicting"
 OR "prediction" OR "predictions"
 OR "predictive" OR "predictively"
 OR "predictiveness" OR "predic-
 tives" OR "predictivities" OR
 "predictivity" OR "predicts") OR
 ("predictor" OR "predictors") OR
 (("family" OR "family" OR "rela-
 tive" OR "relatives" OR "relative
 s" OR "relatively") AND ("epide-
 miology" OR "epidemiology" OR
 "frequency" OR "epidemiology"
 OR "frequence" OR "frequencies"

OR "frequencies")) OR (("family"
 OR "family" OR "relative" OR
 "relatives" OR "relative s" OR
 "relatively") AND ("epidemiology"
 OR "epidemiology" OR "incidence"
 OR "incidence" OR "incidences"
 OR "incident" OR "incidents")) OR
 ("variabilities" OR "variability"
 OR "variable" OR "variable s"
 OR "variables" OR "variably"))

Outcome:

TS = ("patient harm" OR ("un-
 fair" OR "unfairness") OR "Irrepa-
 rability" OR ("blame" OR "blamed"
 OR "blameful" OR "blames" OR
 "blaming") OR ("patient harm"
 OR ("patient" AND "harm") OR
 "patient harm") OR ("inequities"
 OR "inequity" OR "socioeconomic
 factors" OR ("socioeconomic" AND
 "factors") OR "socioeconomic
 factors" OR "inequalities" OR
 "inequality") NOT ("socioeconomic
 factors" OR ("socioeconomic" AND
 "factors") OR "socioeconomic
 factors" OR "socioeconomics" OR
 "socioeconomic" OR "socioeco-
 nomical" OR "socioeconomically"))
 OR (("perceivable" OR "perceive"
 OR "perceiver" OR "perceiver s"
 OR "perceivers" OR "perceives"
 OR "perception" OR "perception"
 OR "perceived" OR "perceiving")
 AND ("justice s" OR "social justice"
 OR ("social" AND "justice") OR
 "social justice" OR "justice" OR
 "justices")) OR (("perceivable"
 OR "perceive" OR "perceiver"
 OR "perceiver s" OR "perceivers"
 OR "perceives" OR "perception"
 OR "perception" OR "perceived"
 OR "perceiving") AND "fairness")
 OR ("injustice" OR "injustices"))

EMBASE

Population:

("pain" OR "causalgia" OR

"central nervous system sensitiza-
 tion" OR "fibromyalgia" OR
 "hyperalgesia" OR "hyperesthesia"
 OR "neuralgia" OR "nocicep-
 tive pain" OR "paresthesia" OR
 ("pain" OR "pain") OR ("stress,
 psychological" OR ("stress" AND
 "psychological") OR "psychological
 stress" OR "suffer" OR "suffered"
 OR "suffering" OR "sufferings"
 OR "suffers" OR "suffereing" OR
 "sufferer" OR "sufferer s" OR
 "sufferers" OR "suffered") OR
 ("pain" OR "pain" OR "ache") OR
 ("causalgia" OR "causalgia") OR
 ("causalgia" OR "causalgia" OR
 ("type" AND "ii" AND "complex"
 AND "regional" AND "pain" AND
 "syndrome") OR "type ii complex
 regional pain syndrome") OR
 ("causalgia" OR "causalgia" OR
 ("crps" AND "type" AND "ii") OR
 "crps type ii") OR ("central nervous
 system sensitization" OR ("central"
 AND "nervous" AND "system"
 AND "sensitization") OR "central
 nervous system sensitization")
 OR ("sensitisation"[All Fields] OR
 "sensitisations" OR "sensitise" OR
 "sensitised" OR "sensitiser" OR
 "sensitisers" OR "sensitises" OR
 "sensitising" OR "sensitization"
 OR "sensitizations" OR "sensitize"
 OR "sensitized" OR "sensitizer" OR
 "sensitizers" OR "sensitizes" OR
 "sensitizing") OR ("fibromyalgia"
 OR "fibromyalgia" OR "fibromyal-
 gias") OR ("rheumatic diseases" OR
 ("rheumatic" AND "diseases") OR
 "rheumatic diseases" OR "rheumat-
 ics" OR "rheumatism" OR "rheu-
 matic" OR "rheumatisms") OR
 ("fibromyalgia" OR "fibromyalgia"
 OR "fibrositis") OR ("hyperalgesia"
 OR "hyperalgesia" OR "hyper-
 algeias") OR ("allodynia" OR
 "hyperalgesia" OR "hyperalgesia"
 OR "allodynia") OR ("hyperaes-
 thesia" Fields] OR "hyperesthesia"

OR "hyperesthesia" OR "hyperesthesias") OR ("hyperesthesia" OR "hyperesthesia") OR ("neuralgia" OR "neuralgia" OR "neuralgias") OR ("neuralgia" OR "neuralgia" OR "neurodynia") OR ("nociception" OR "nociception" OR "nociceptions" OR "nociceptive" OR "nociceptively") OR ("paraesthesia" OR "paresthesia" OR "paresthesia" OR "paraesthesiae" OR "paraesthesias" OR "paresthesias" OR "paresthesiae") OR ("paresthesia" OR "paresthesia" OR "formication"))

Exposure:

("probability" OR "morbidity" OR "epidemiology" OR "prognosis" OR "epidemiologic factors" OR "survival analysis" OR ("risk" OR "risk") OR ("probability" OR "probability" OR "probabilities") OR ("epidemiology" OR "epidemiology" OR "morbidity" OR "morbidity" OR "morbidity" OR "morbidity" OR "morbidity") OR ("epidemiology" OR "epidemiology" OR "incidence" OR "incidence" OR "incidences" OR "incident" OR "incidents") OR ("epidemiology" OR "epidemiology" OR "prevalence" OR "prevalence" OR "prevalence" OR "prevalences" OR "prevalence s" OR "prevalent" OR "prevalently" OR "prevalents") OR ("basic reproduction number" OR ("basic" AND "reproduction" AND "number") OR "basic reproduction number") OR (("reproduction" OR "reproduction" OR "reproductions" OR "reproductive" OR "reproductively" OR "reproductives" OR "reproductivity") AND ("j rehab assist technol eng" OR "rate")) OR (("reproduction" OR "reproduction" OR "reproductions" OR "reproductive" OR "reproductively" OR "reproductives" OR "reproductivity") AND ("ratio" OR

"ratio s" OR "ratioes" OR "ratios")) OR ("epidemiologies" OR "epidemiology" OR "epidemiology" OR "epidemiology s") OR ("analysis" OR "analysis" OR "determination" OR "determinant" OR "determinants" OR "determinate" OR "determined" OR "determinates" OR "determinating" OR "determinations" OR "determine" OR "determined" OR "determines" OR "determining") OR ("epidemiology" OR "epidemiology" OR "frequency" OR "epidemiology" OR "frequency" OR "frequencies" OR "frequencies") OR ("epidemiology" OR "epidemiology" OR "occurrence" OR "epidemiology" OR "occurrences") OR ("causal" OR "causality" OR "causality" OR "causalities" OR "causally" OR "etiology" OR "etiology") OR ("causality" OR "causality" OR "causation" OR "causations") OR ("causative" OR "causatively" OR "causatives" OR "cause" OR "caused" OR "causing" OR "etiology" OR "etiology" OR "causes" OR "causality" OR "causality") OR ("factor" OR "factor s" OR "factors") OR ("aetiologie" OR "aetiologies" OR "aetiology" OR "etiology" OR "causality" OR "causality") OR ("odds ratio" OR ("odds" AND "ratio") OR "odds ratio") OR ("odds ratio" OR ("odds" AND "ratio") OR "odds ratio" OR ("cross" AND "product" AND "ratio") OR "cross product ratio") OR (("family" OR "family" OR "relative" OR "relatives" OR "relative s" OR "relatively") AND "Odd") OR ("hazard" OR "hazard s" OR "hazardous" OR "hazardously" OR "hazardousness" OR "hazards") AND ("ratio" OR "ratio s" OR "ratioes" OR "ratios")) OR ("prognose" OR "prognosing")

OR ("epidemiologic factors" OR ("epidemiologic" AND "factors") OR "epidemiologic factors" OR ("epidemiologic" AND "factor") OR "epidemiologic factor") OR ("epidemiologic factors" OR ("epidemiologic" AND "factors") OR "epidemiologic factors" OR ("epidemiologic" AND "determinant") OR "epidemiologic determinant") OR ("mortality" OR "mortality" OR "survival" OR "survival" OR "survivability" OR "survivable" OR "survivals" OR "survive" OR "survived" OR "survives" OR "surviving") AND ("analyse" OR "analysed" OR "analyses" OR "analysing" OR "analyze")) OR ("characteristic" OR "characteristics") OR ("contribute" OR "contributed" OR "contributes" OR "contributing" OR "contribution" OR "contributions") OR ("indicate" OR "indicated" OR "indicates" OR "indicating" OR "indicative" OR "indicatives" OR "indicators and reagents" OR "indicators and reagents" OR ("indicators" AND "reagents") OR "indicators and reagents" OR "indicator" OR "indicators" OR "indice" OR "indices") OR ("outcome" OR "outcomes") OR ("phenomenon" OR "phenomenon s" OR "phenomenons") OR ("predict" OR "predictabilities" OR "predictability" OR "predictable" OR "predictably" OR "predicted" OR "predicting" OR "prediction" OR "predictions" OR "predictive" OR "predictively" OR "predictiveness" OR "predictives" OR "predictivities" OR "predictivity" OR "predicts") OR ("predictor" OR "predictors") OR ("family" OR "family" OR "relative" OR "relatives" OR "relative s" OR "relatively") AND ("epidemiology" OR "epidemiology" OR "frequency" OR "epidemiology"

Appendix 1 (cont). Full search strategy used for PubMed, Web of Science, and Embase.

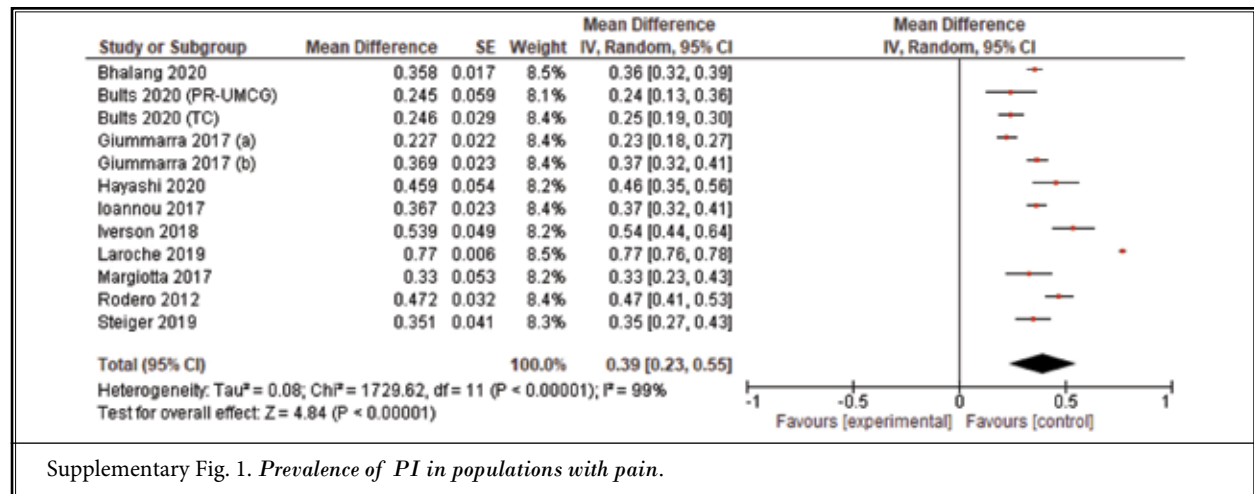
OR "frequence" OR "frequencies"
 OR "frequencies") OR ("family"
 OR "family" OR "relative" OR
 "relatives" OR "relative s" OR
 "relatively") AND ("epidemiology"
 OR "epidemiology" OR "incidence"
 OR "incidence" OR "incidences"
 OR "incident" OR "incidents") OR
 ("variabilities" OR "variability"
 OR "variable" OR "variable s"
 OR "variables" OR "variably"))

ity" OR ("blame" OR "blamed"
 OR "blameful" OR "blames" OR
 "blaming") OR ("patient harm"
 OR ("patient" AND "harm") OR
 "patient harm") OR ("inequities"
 OR "inequity" OR "socioeconomic
 factors" OR ("socioeconomic" AND
 "factors") OR "socioeconomic
 factors" OR "inequalities" OR
 "inequality") NOT ("socioeconomic
 factors" OR ("socioeconomic" AND
 "factors") OR "socioeconomic
 factors" OR "socioeconomics" OR
 "socioeconomic" OR "socioeco-
 nomical" OR "socioeconomically"))

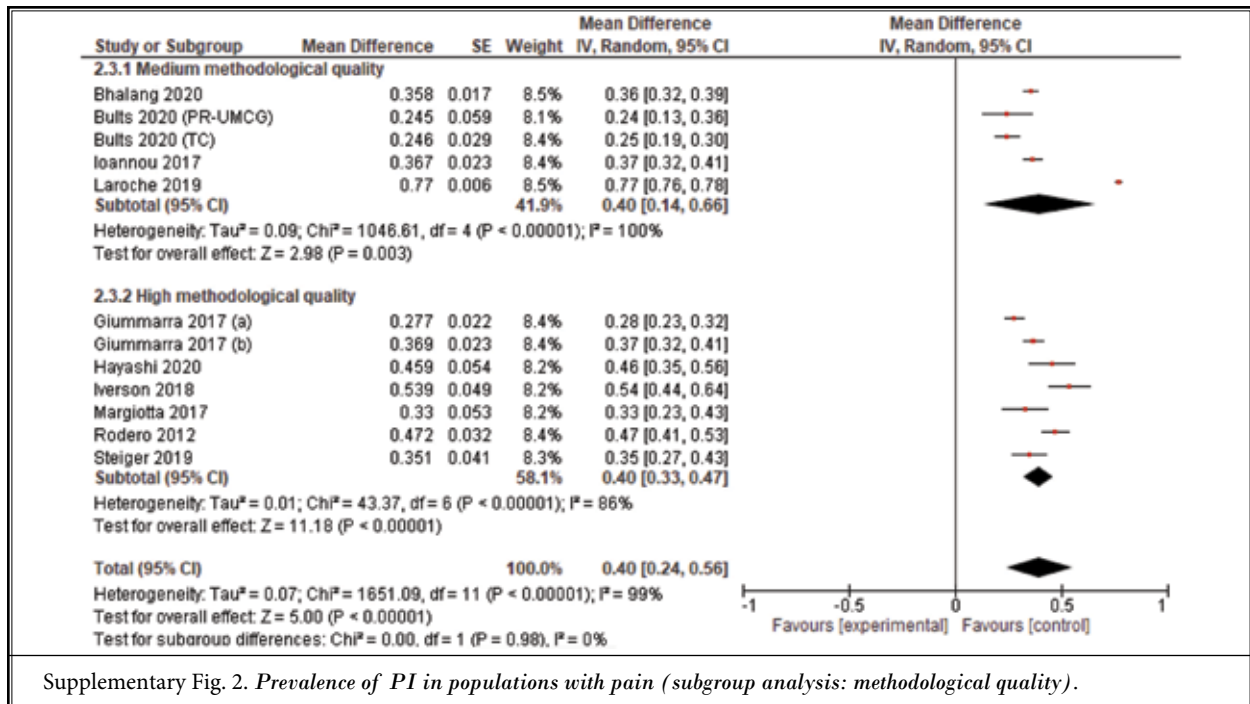
OR ("perceivable" OR "perceive"
 OR "perceiver" OR "perceiver s"
 OR "perceivers" OR "perceives"
 OR "perception" OR "perception"
 OR "perceived" OR "perceiving")
 AND ("justice s" OR "social justice"
 OR ("social" AND "justice") OR
 "social justice" OR "justice" OR
 "justices")) OR ("perceivable"
 OR "perceive" OR "perceiver"
 OR "perceiver s" OR "perceivers"
 OR "perceives" OR "perception"
 OR "perception" OR "perceived"
 OR "perceiving") AND "fairness")
 OR ("injustice" OR "injustices"))

Outcome:

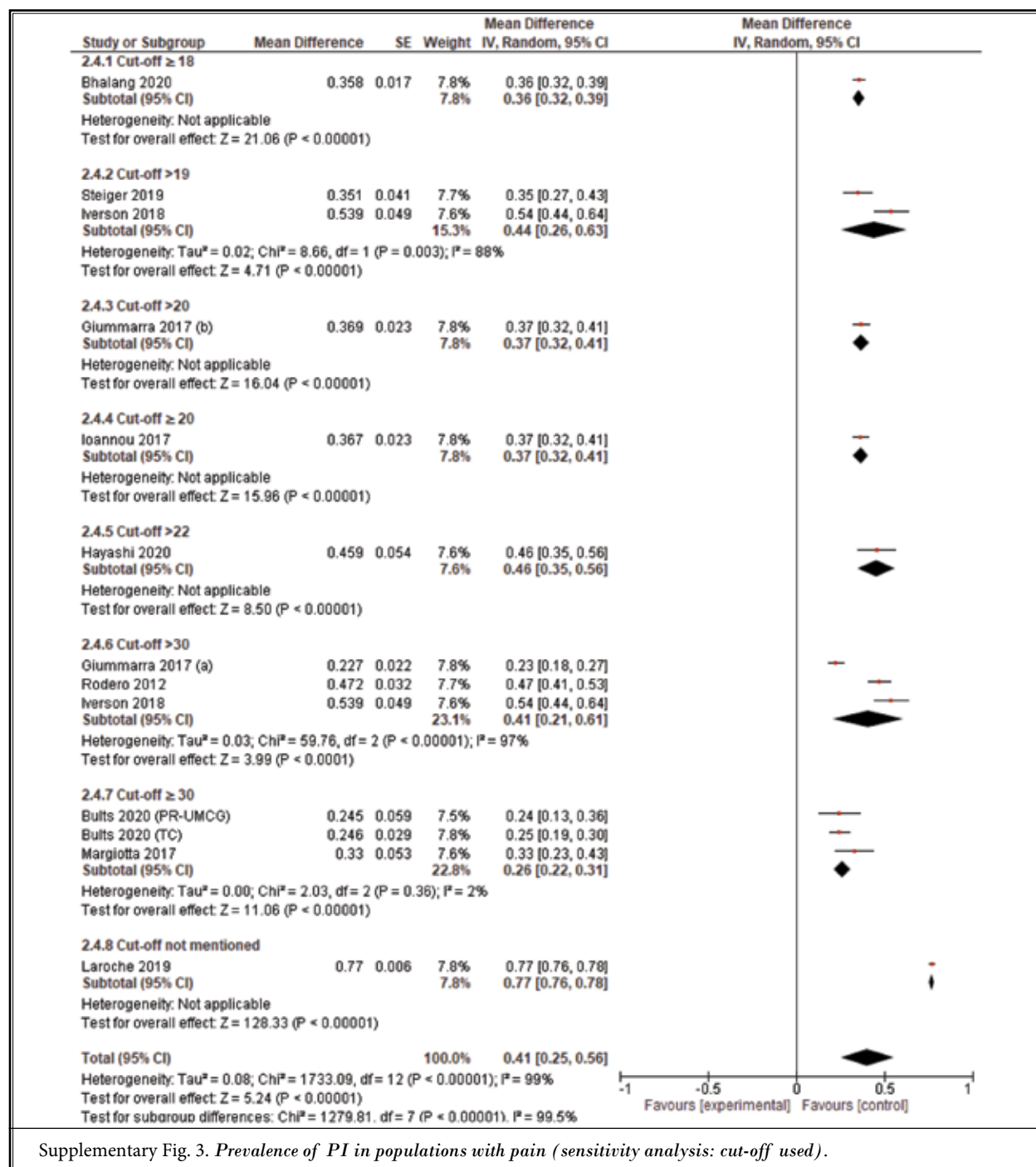
("patient harm" OR ("unfair"
 OR "unfairness") OR "Irreparabil-



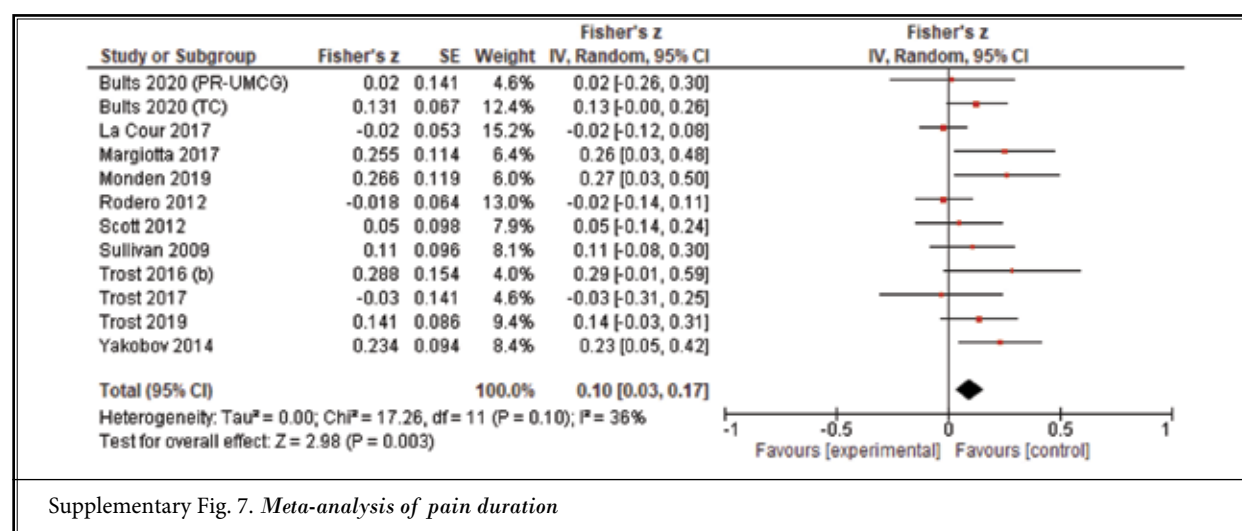
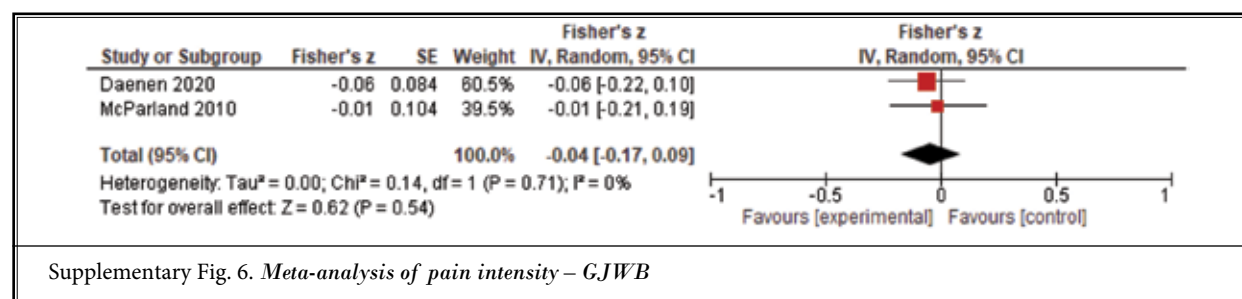
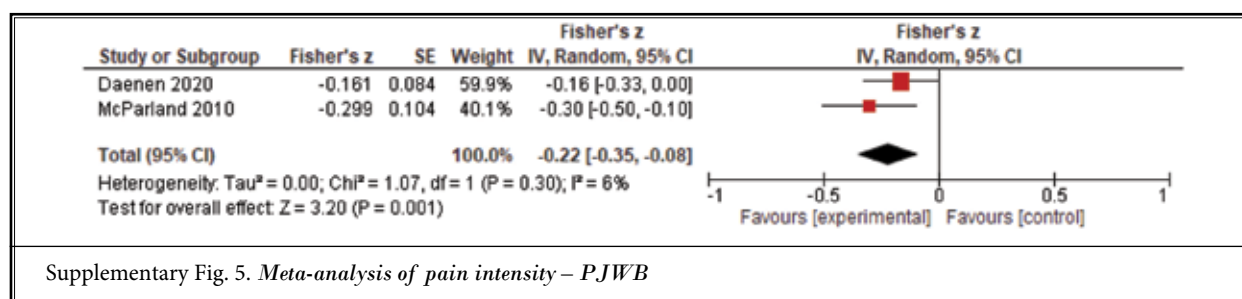
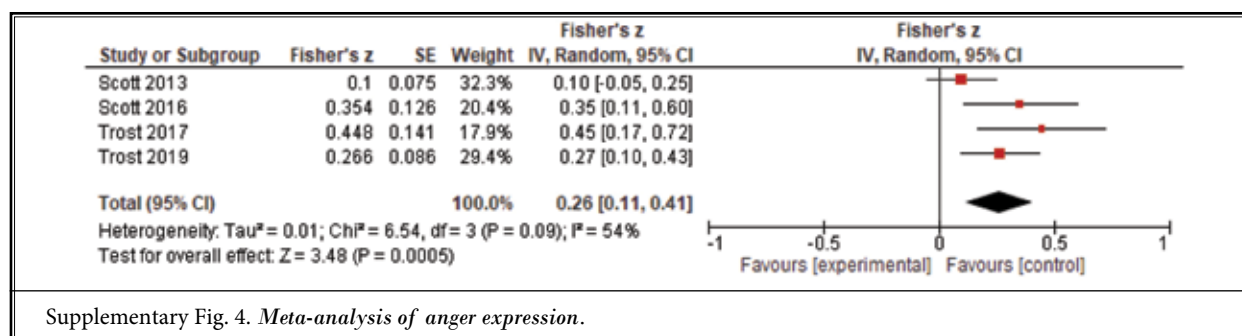
Supplementary Fig. 1. Prevalence of PI in populations with pain.

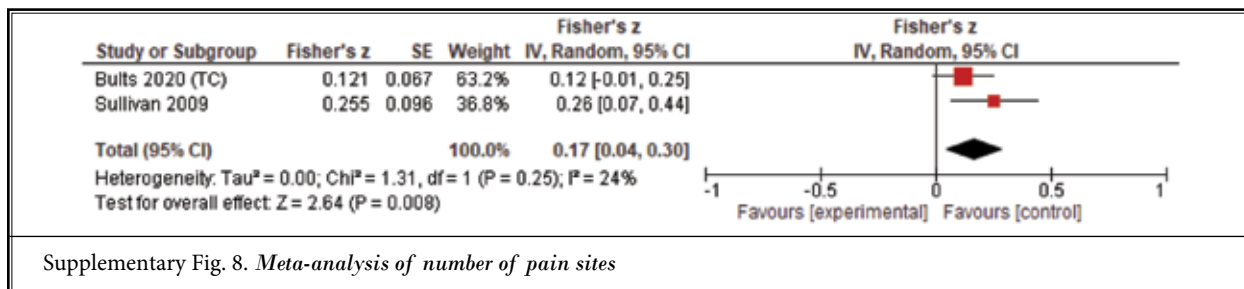


Supplementary Fig. 2. Prevalence of PI in populations with pain (subgroup analysis: methodological quality).

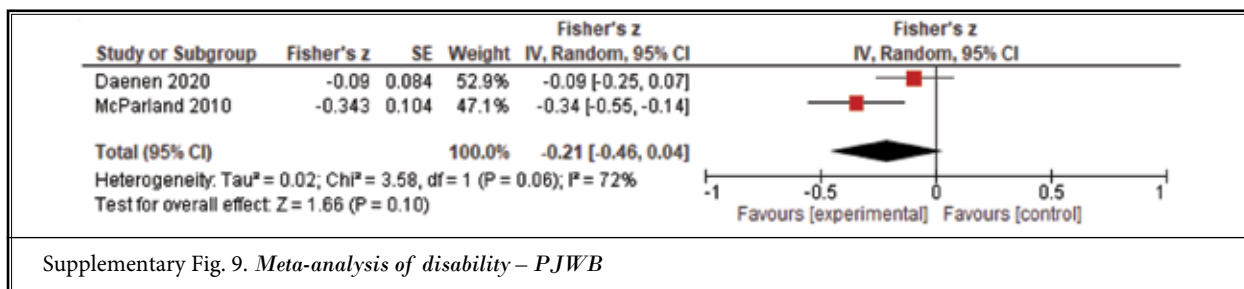


Supplementary Fig. 3. Prevalence of PI in populations with pain (sensitivity analysis: cut-off used).

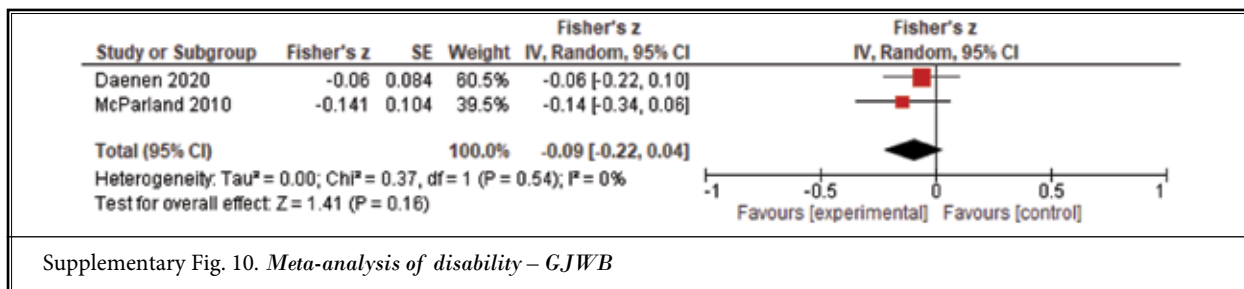




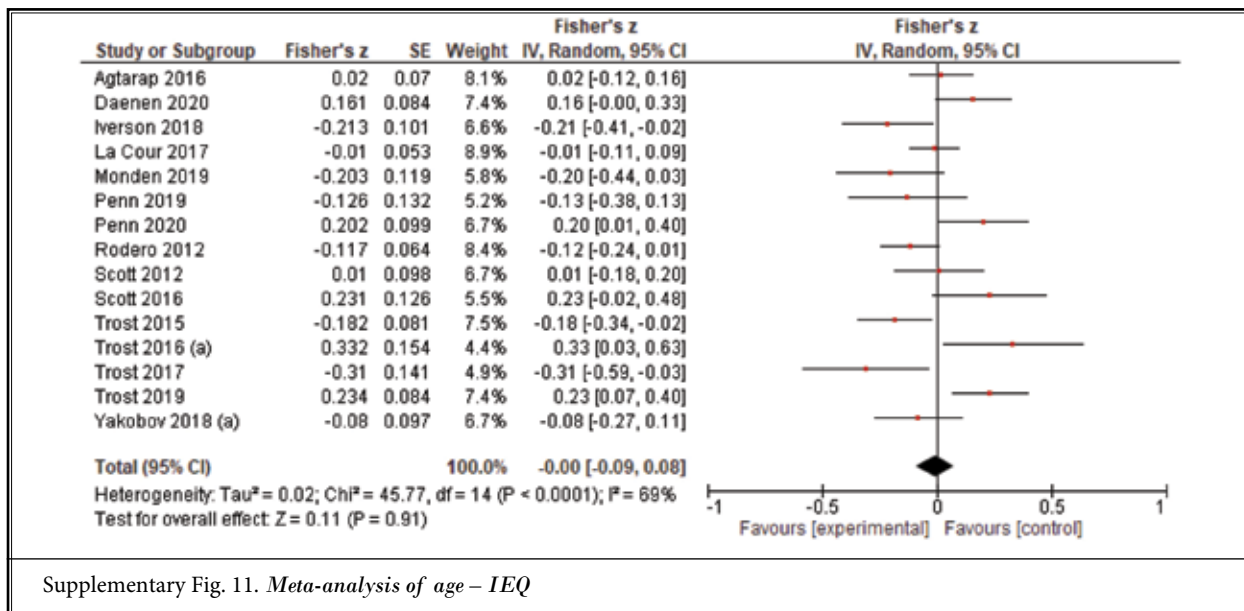
Supplementary Fig. 8. *Meta-analysis of number of pain sites*



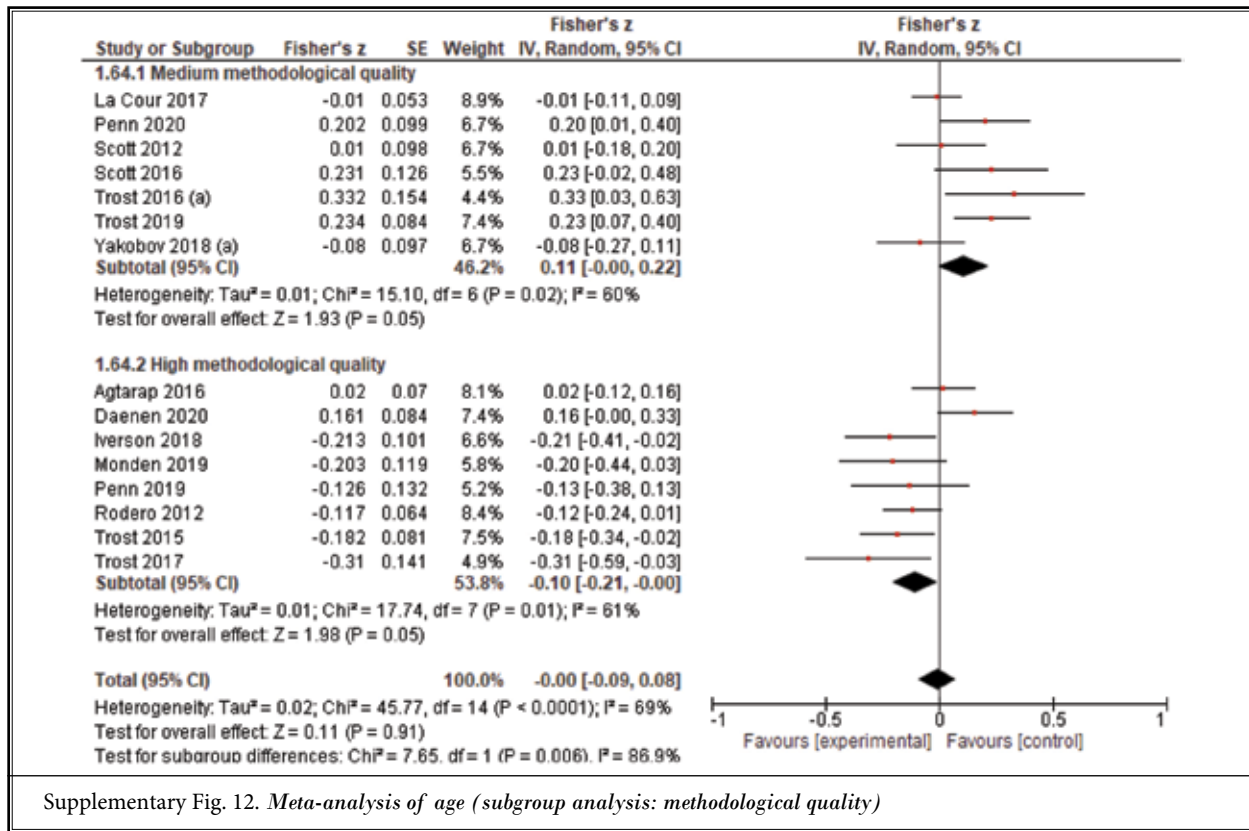
Supplementary Fig. 9. *Meta-analysis of disability – PJWB*



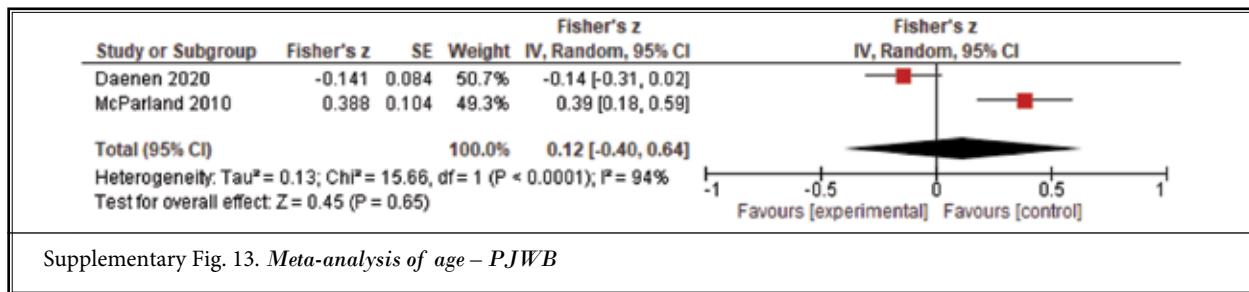
Supplementary Fig. 10. *Meta-analysis of disability – GJWB*



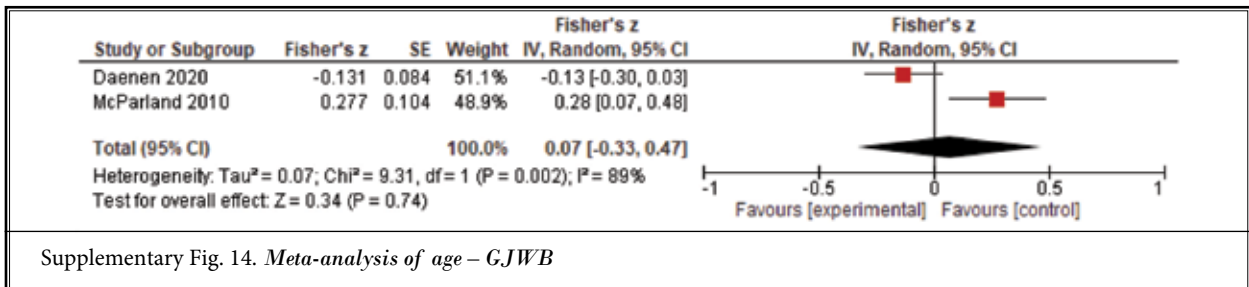
Supplementary Fig. 11. *Meta-analysis of age – IEQ*



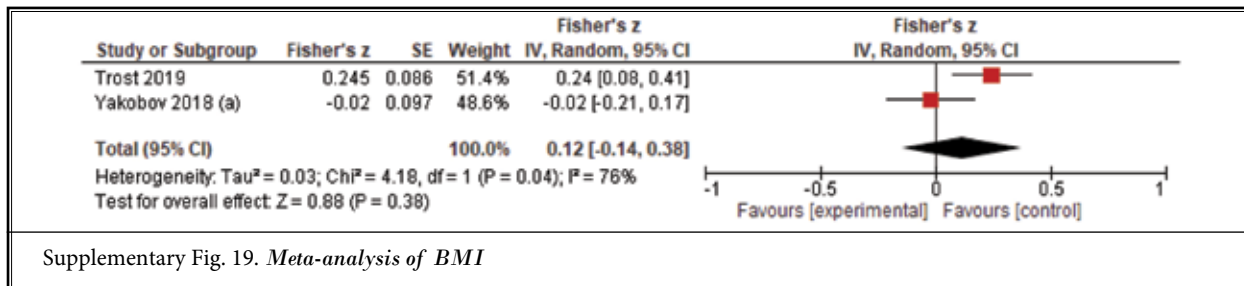
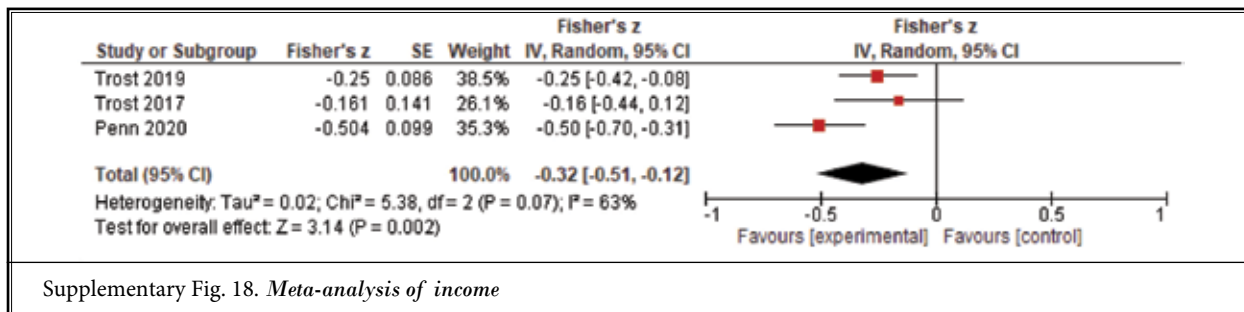
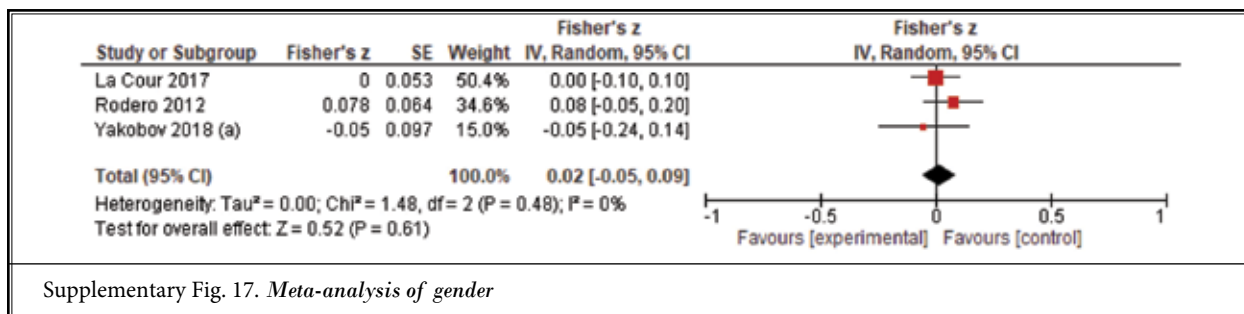
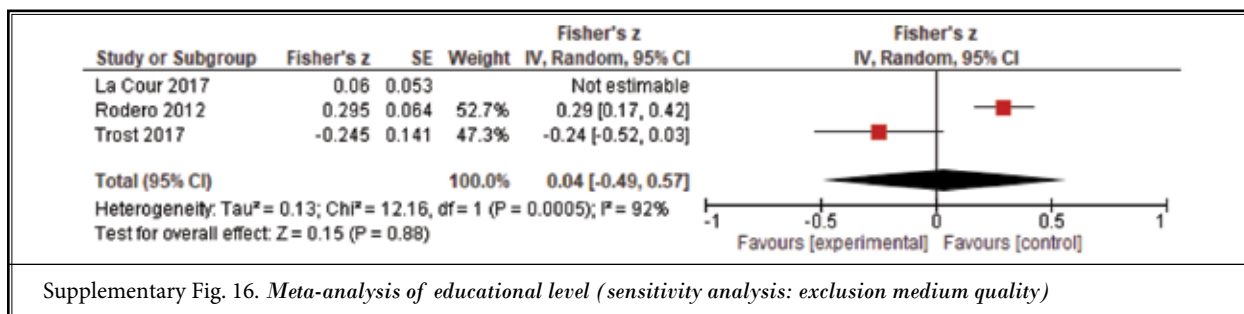
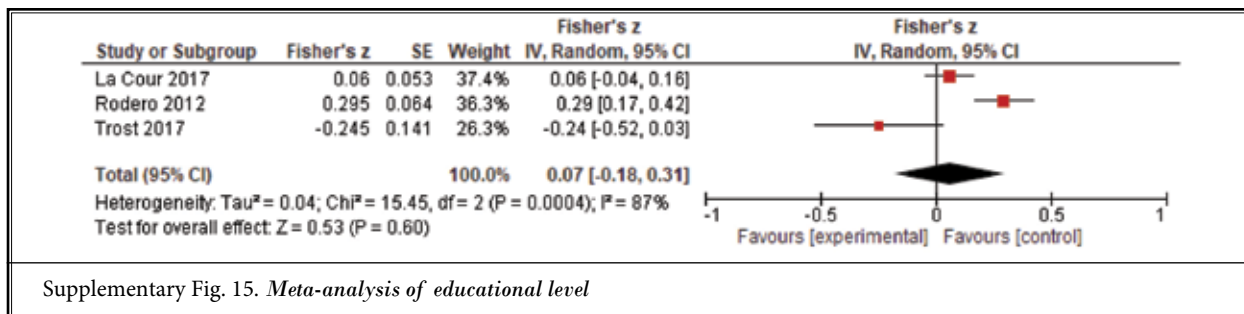
Supplementary Fig. 12. *Meta-analysis of age (subgroup analysis: methodological quality)*

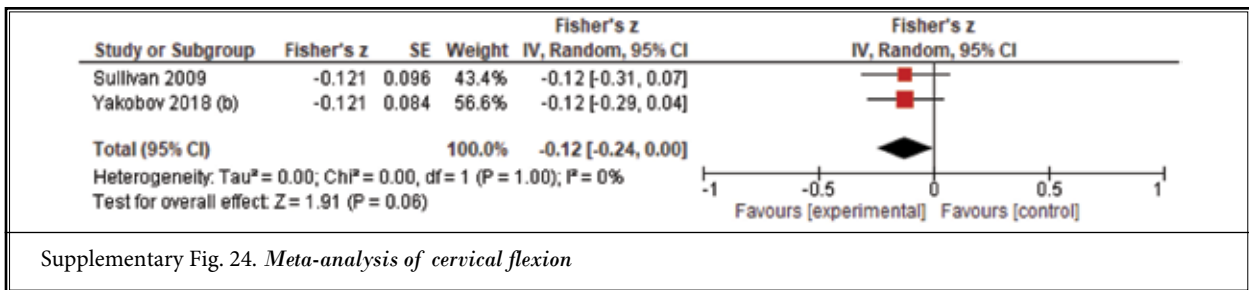
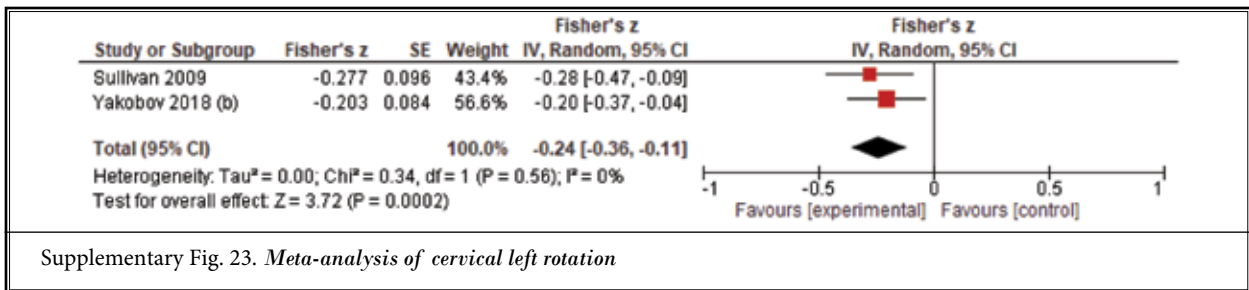
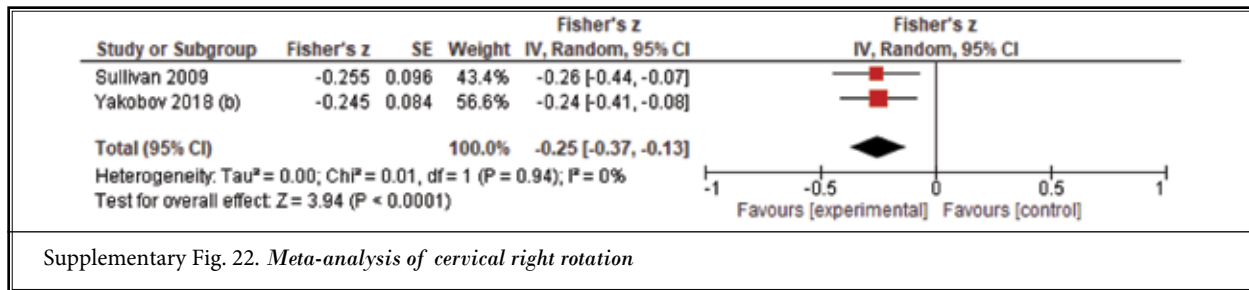
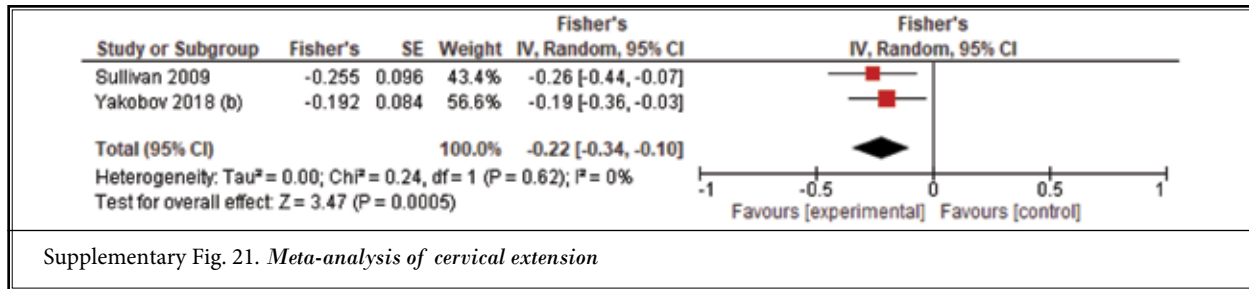
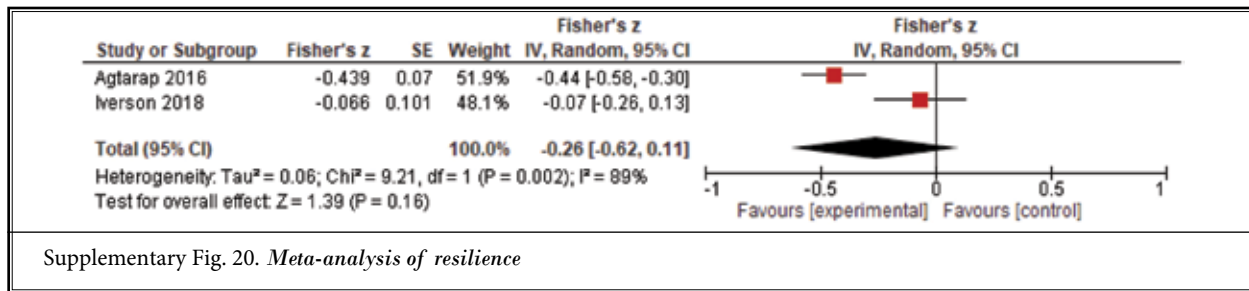


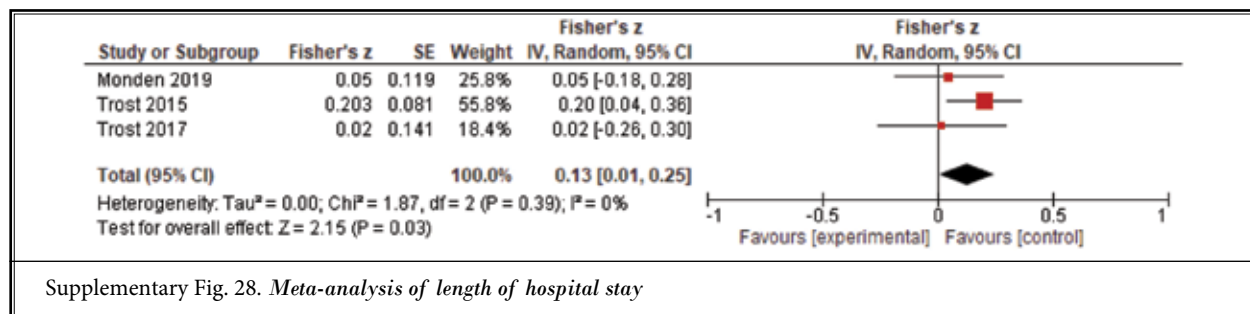
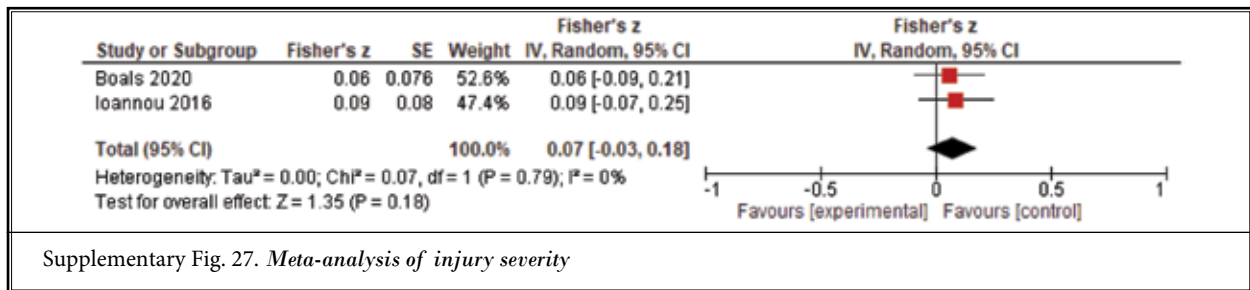
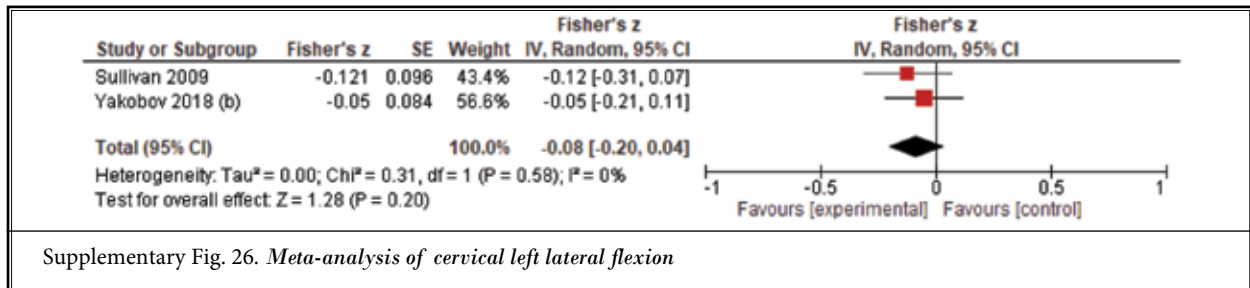
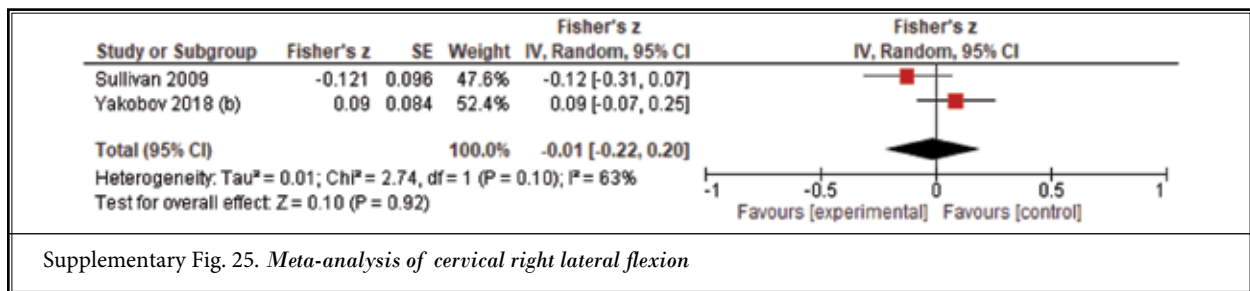
Supplementary Fig. 13. *Meta-analysis of age – PJWB*

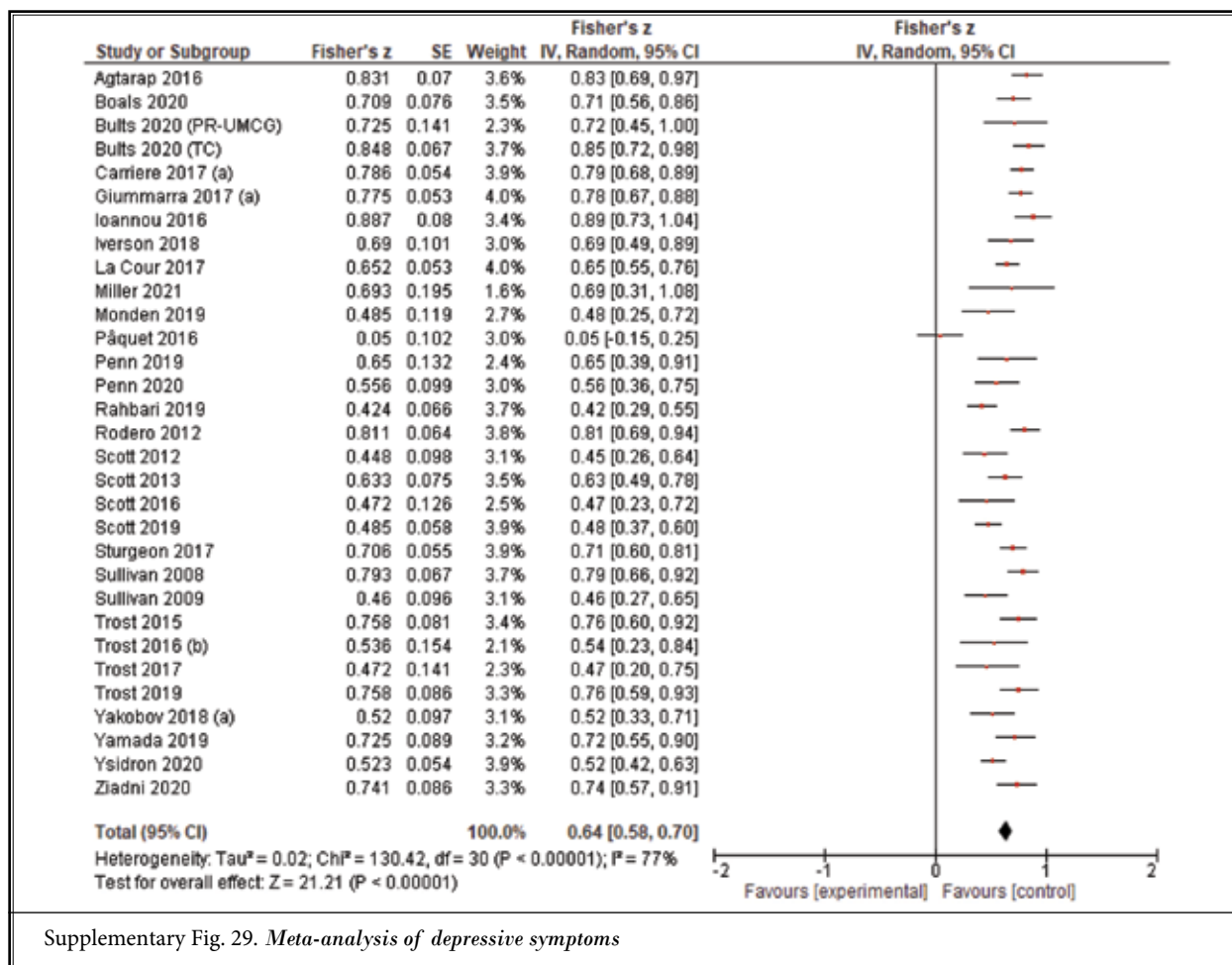


Supplementary Fig. 14. *Meta-analysis of age – GJWB*

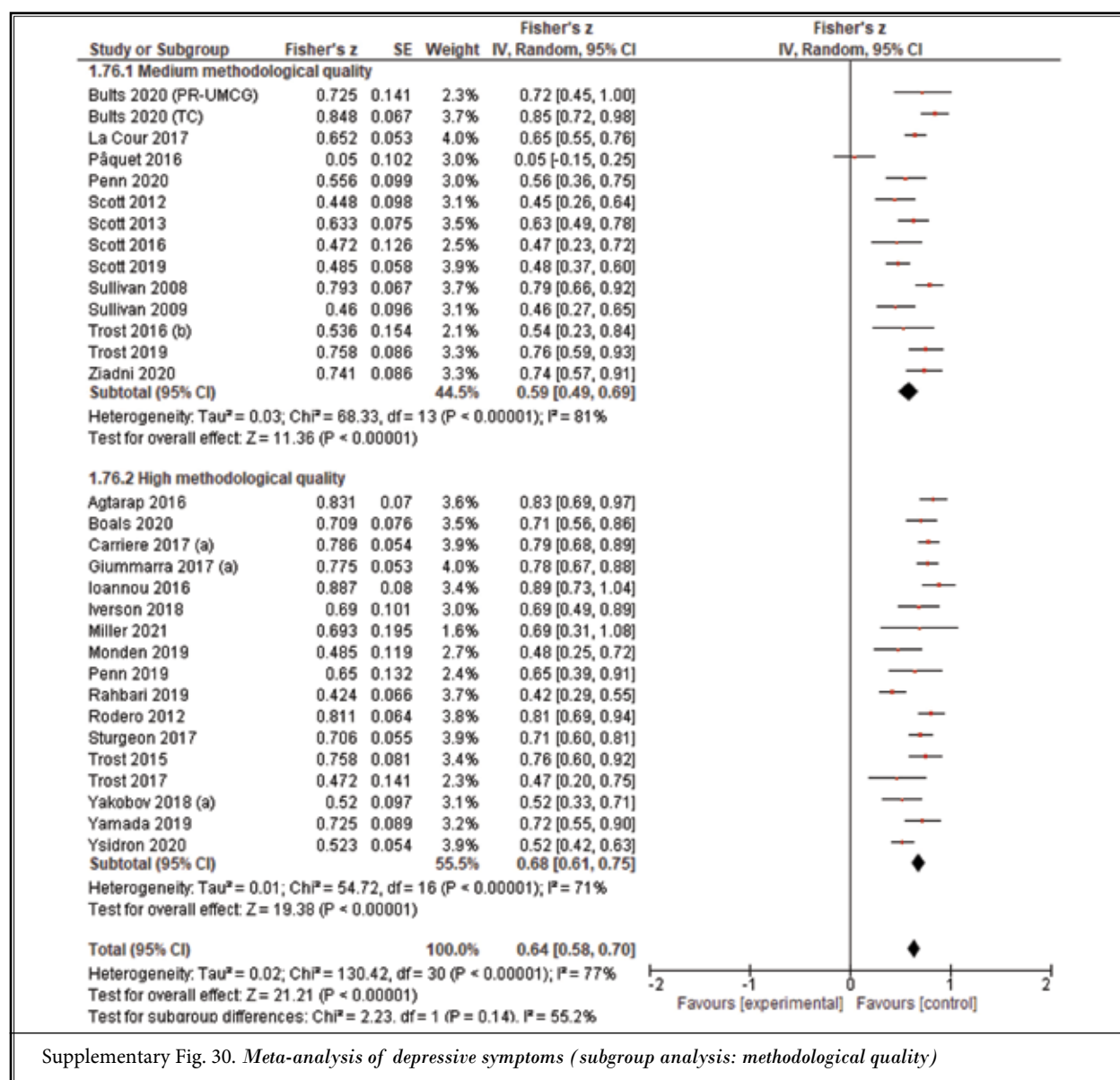




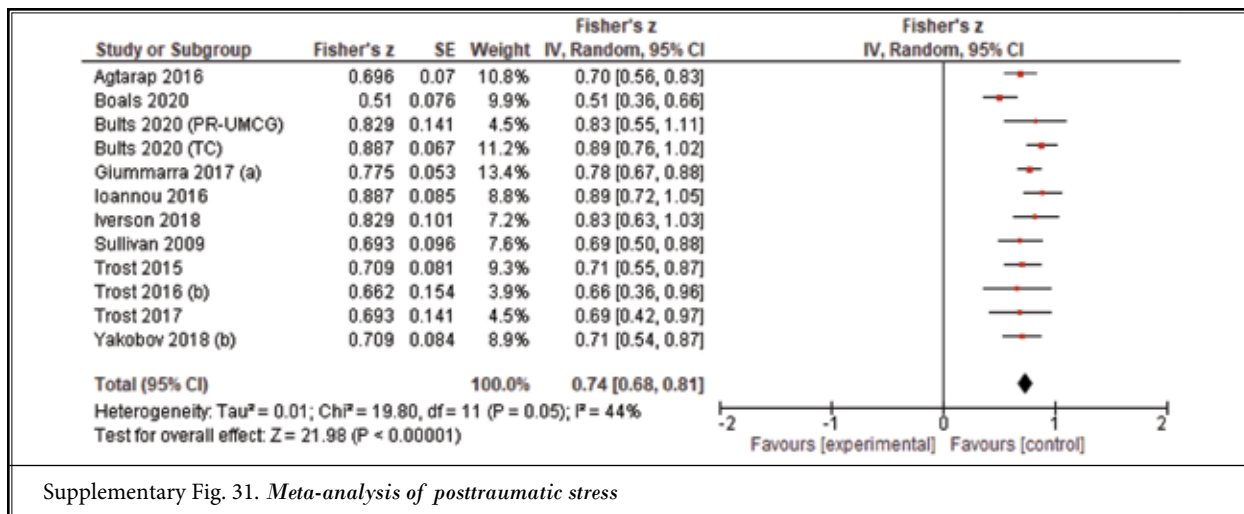




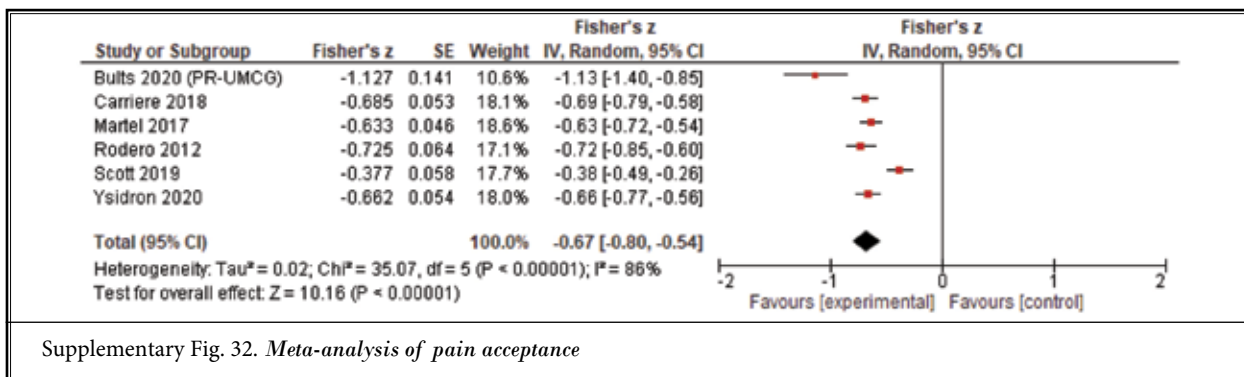
Supplementary Fig. 29. *Meta-analysis of depressive symptoms*



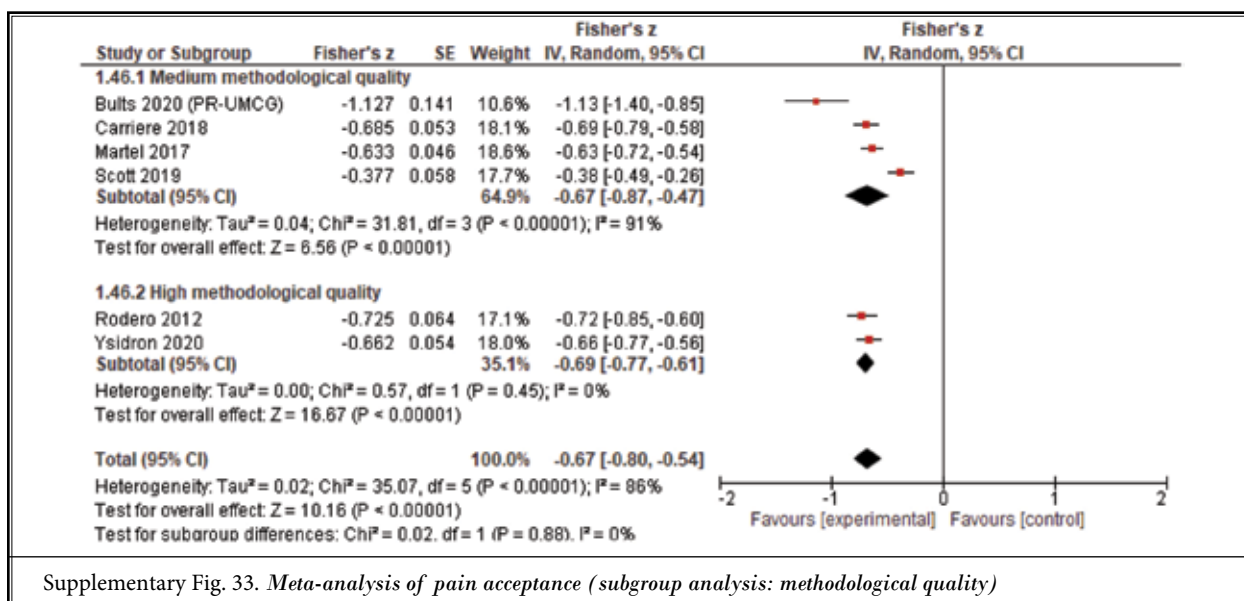
Supplementary Fig. 30. Meta-analysis of depressive symptoms (subgroup analysis: methodological quality)



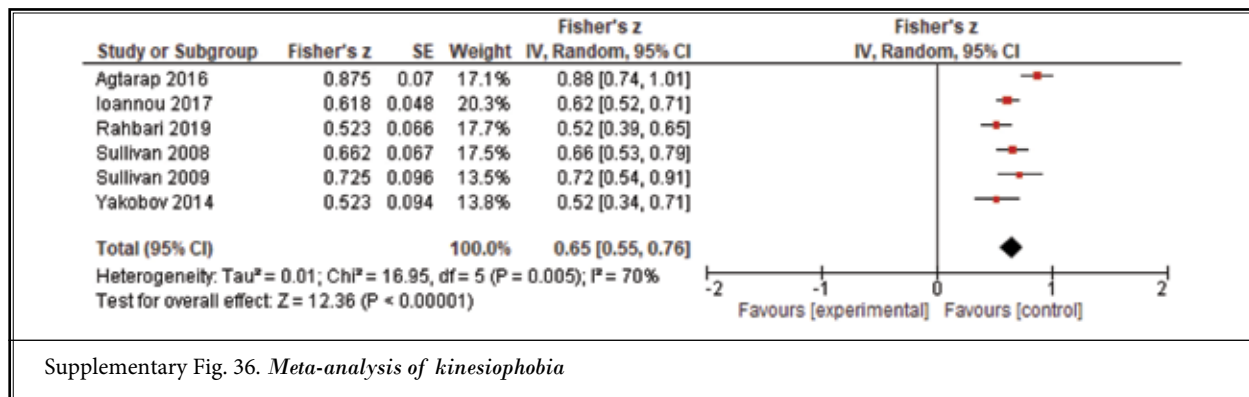
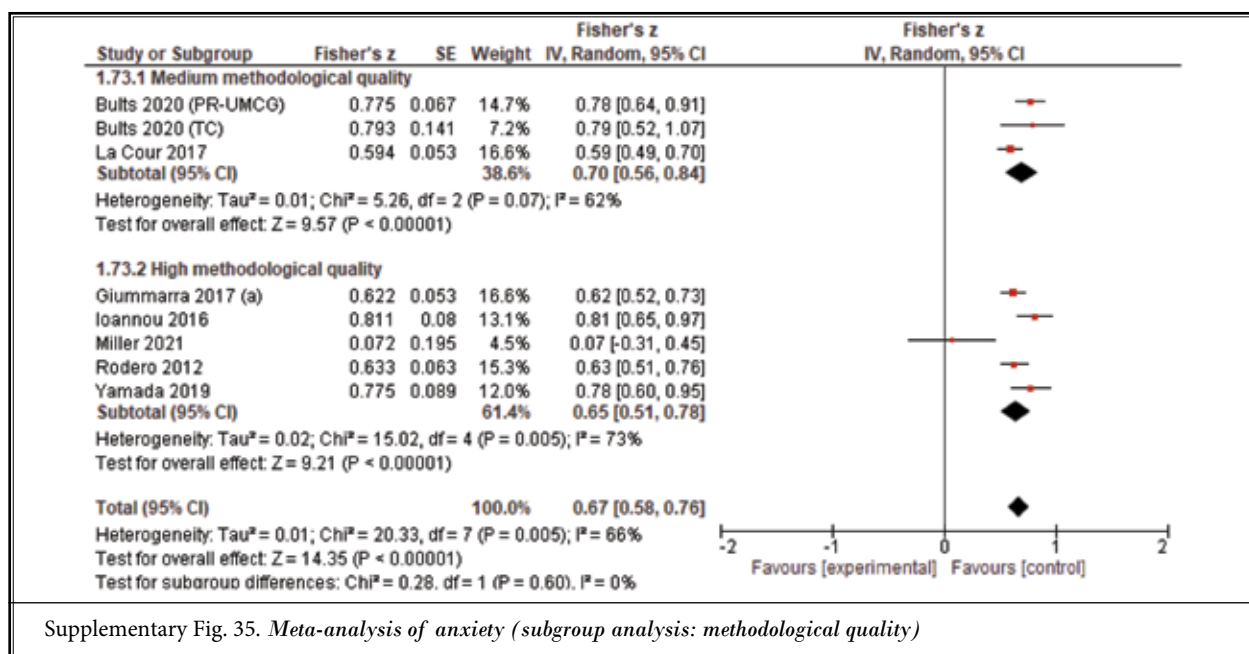
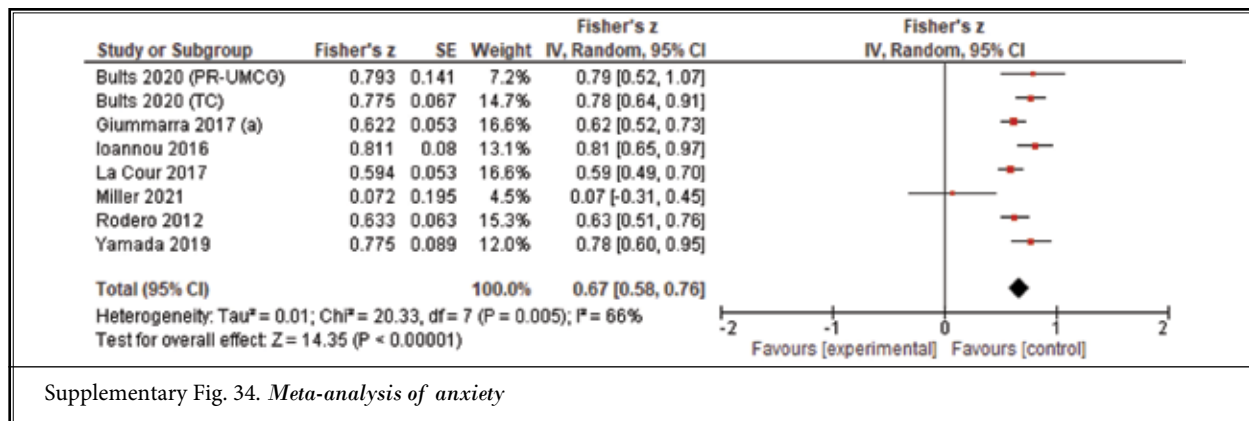
Supplementary Fig. 31. *Meta-analysis of posttraumatic stress*

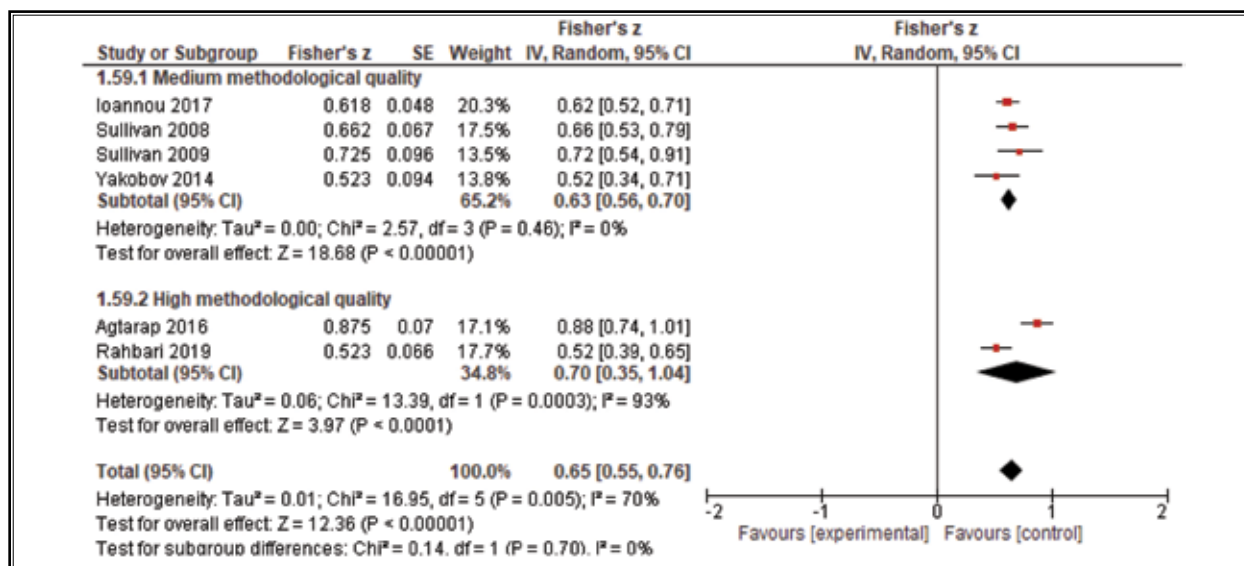


Supplementary Fig. 32. *Meta-analysis of pain acceptance*

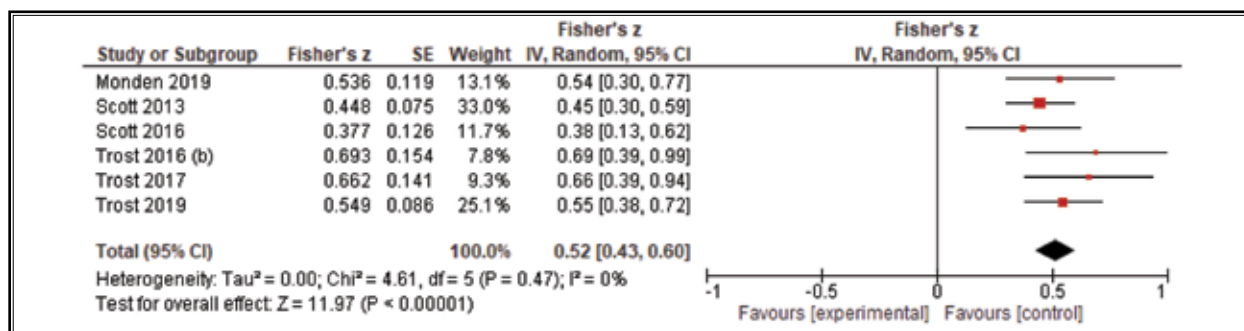


Supplementary Fig. 33. *Meta-analysis of pain acceptance (subgroup analysis: methodological quality)*

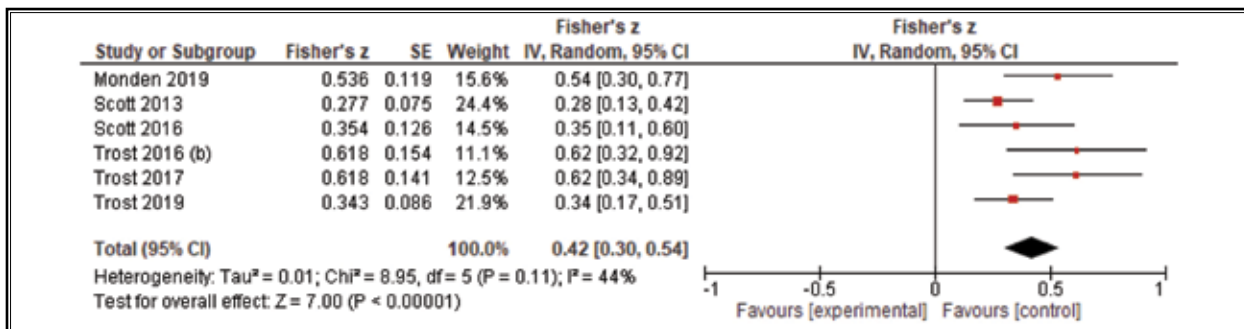




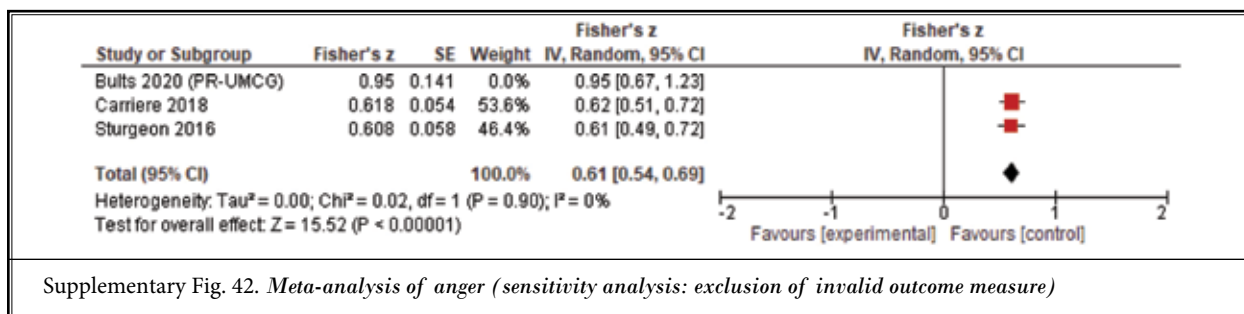
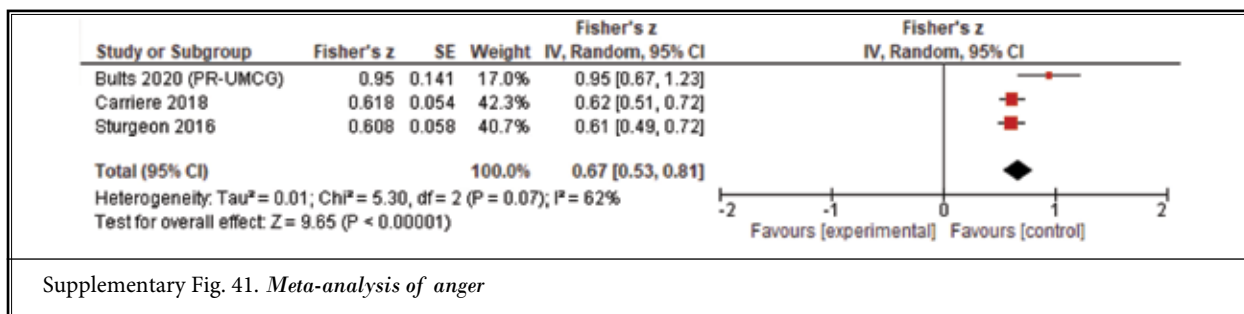
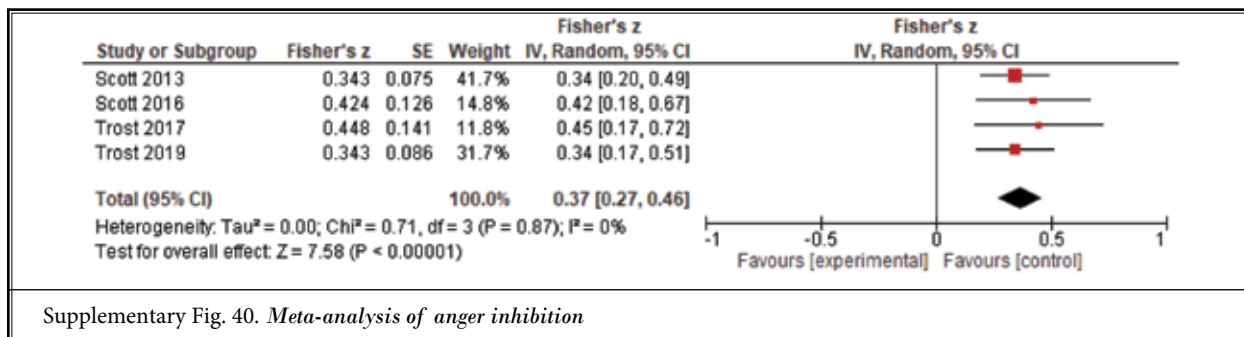
Supplementary Fig. 37. *Meta-analysis of kinesiophobia (subgroup analysis: methodological quality)*

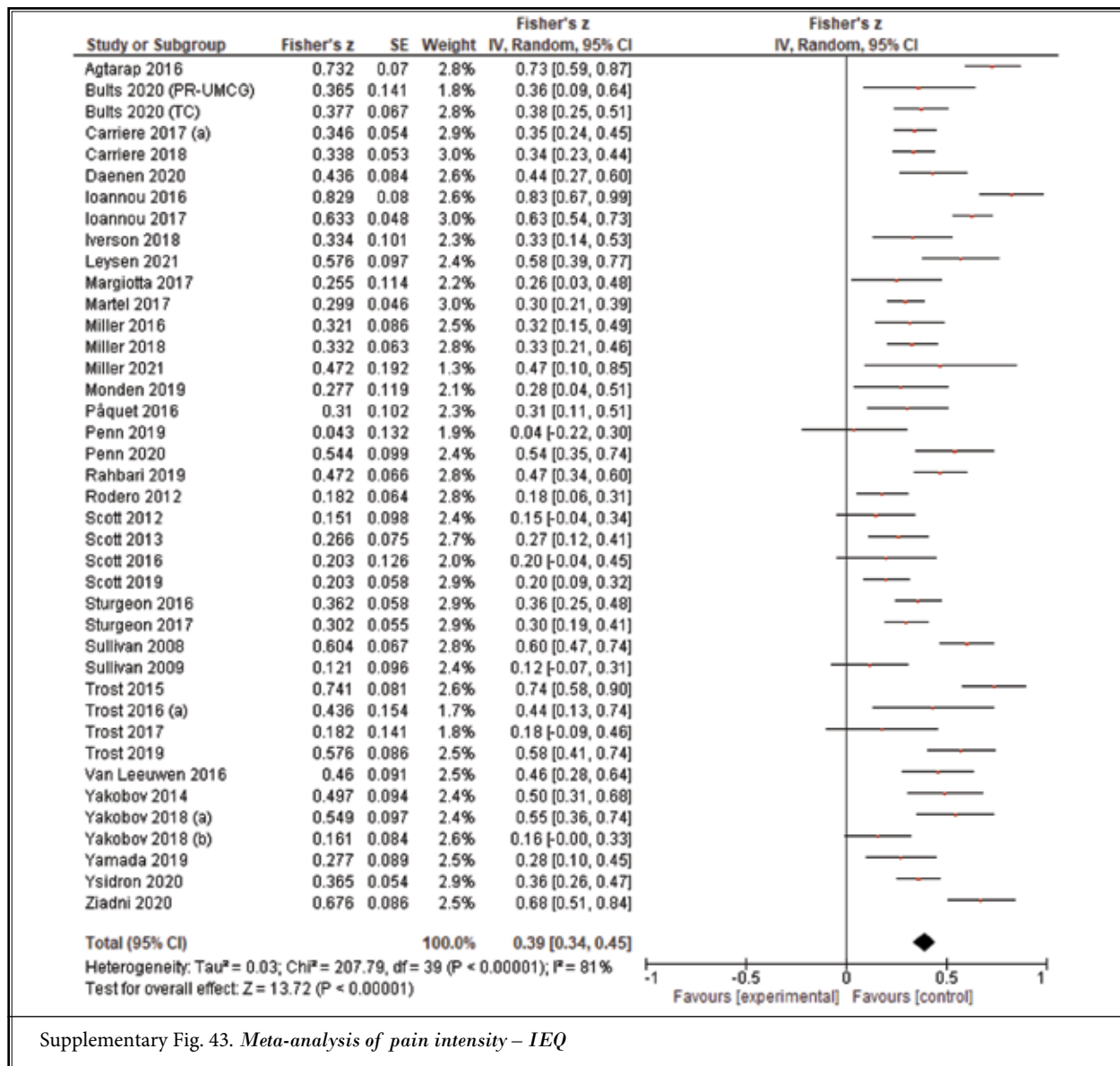


Supplementary Fig. 38. *Meta-analysis of state anger*

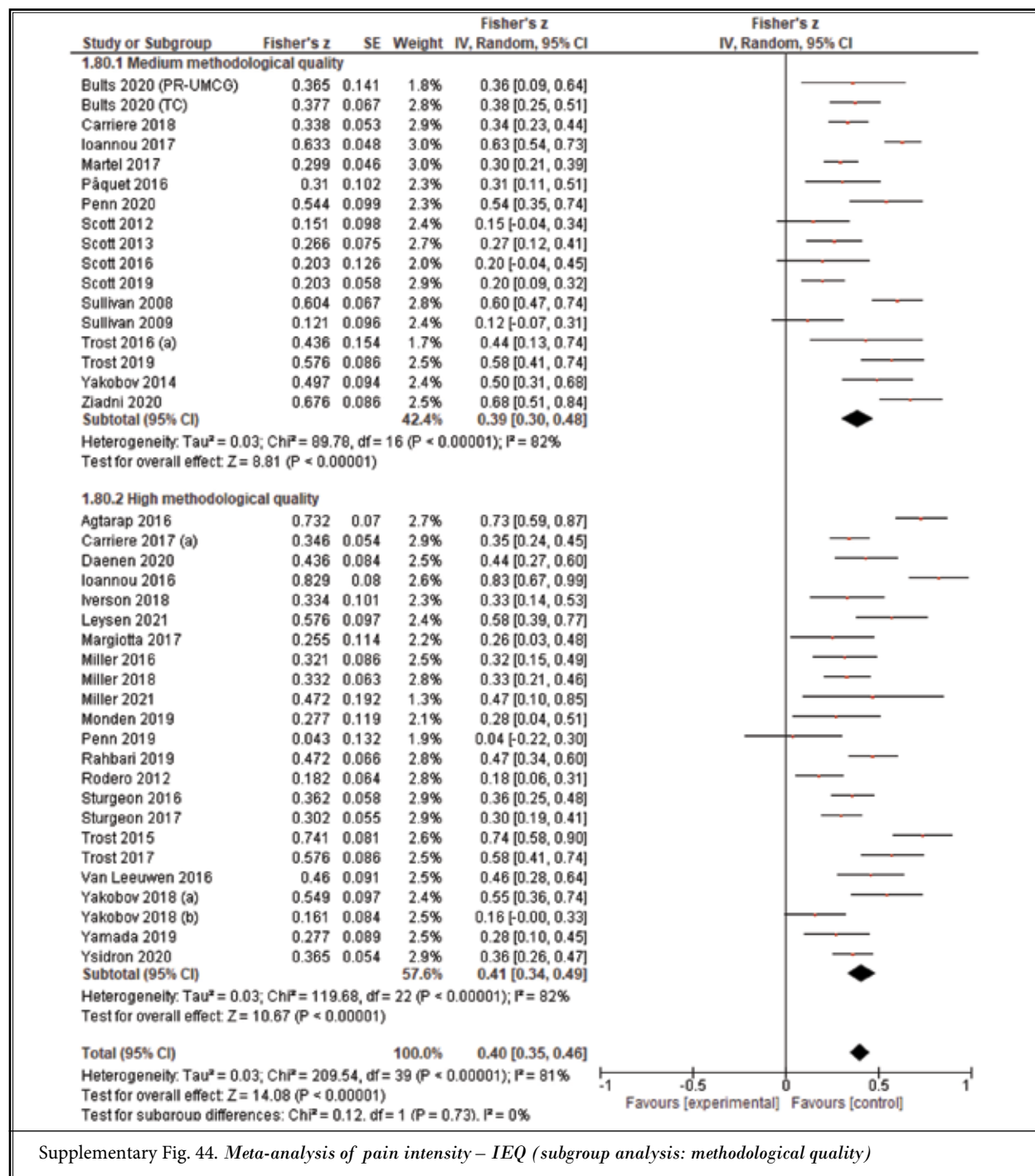


Supplementary Fig. 39. *Meta-analysis of trait anger*

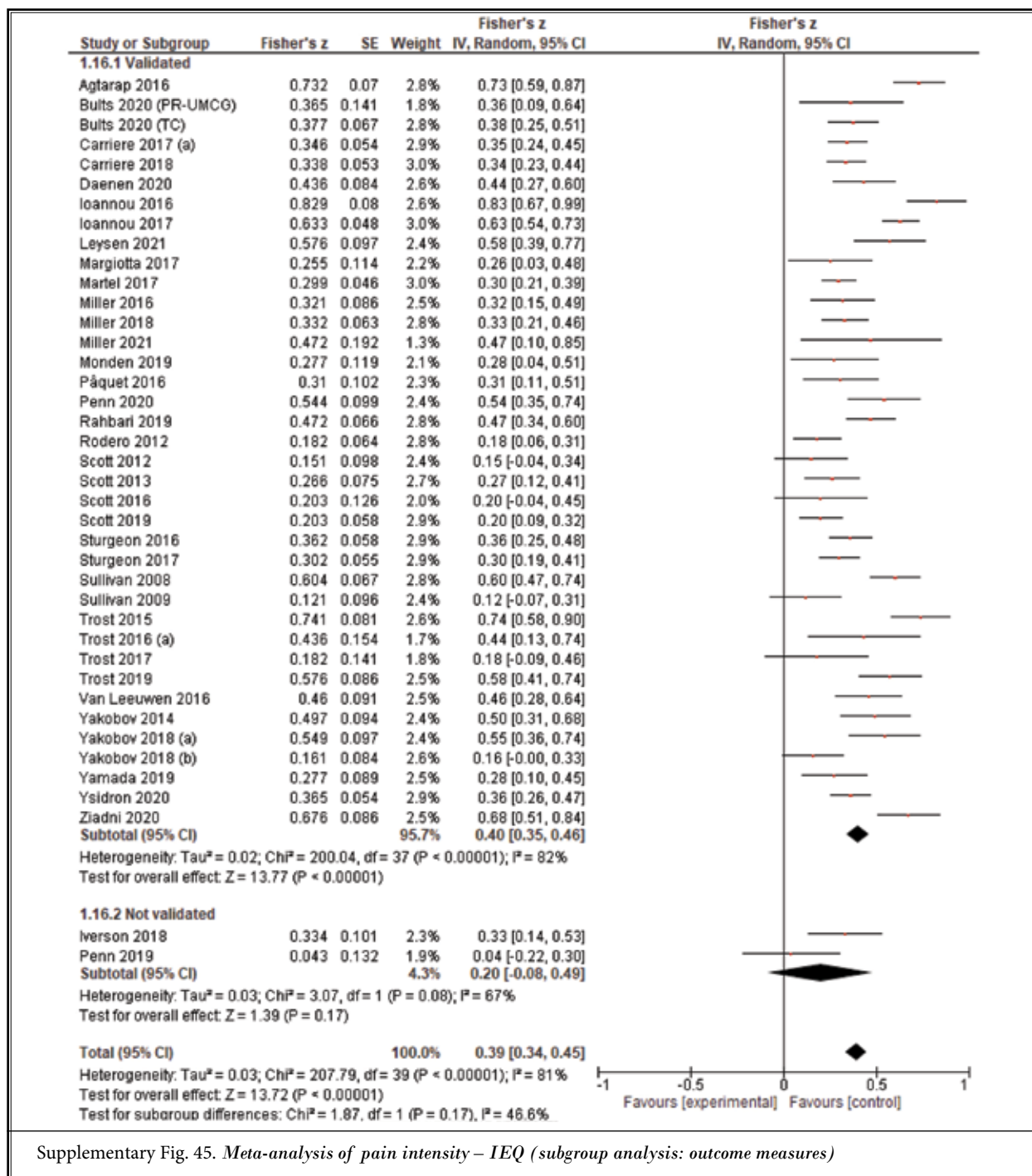




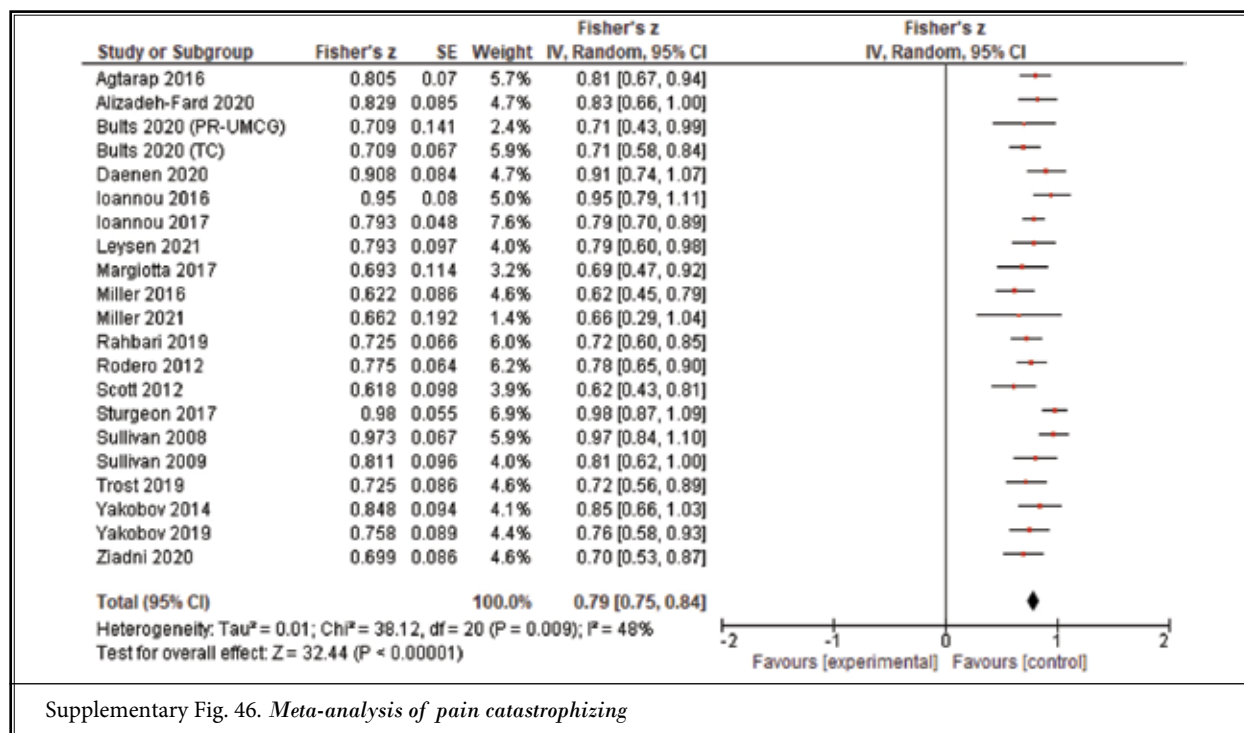
Supplementary Fig. 43. *Meta-analysis of pain intensity – IEQ*



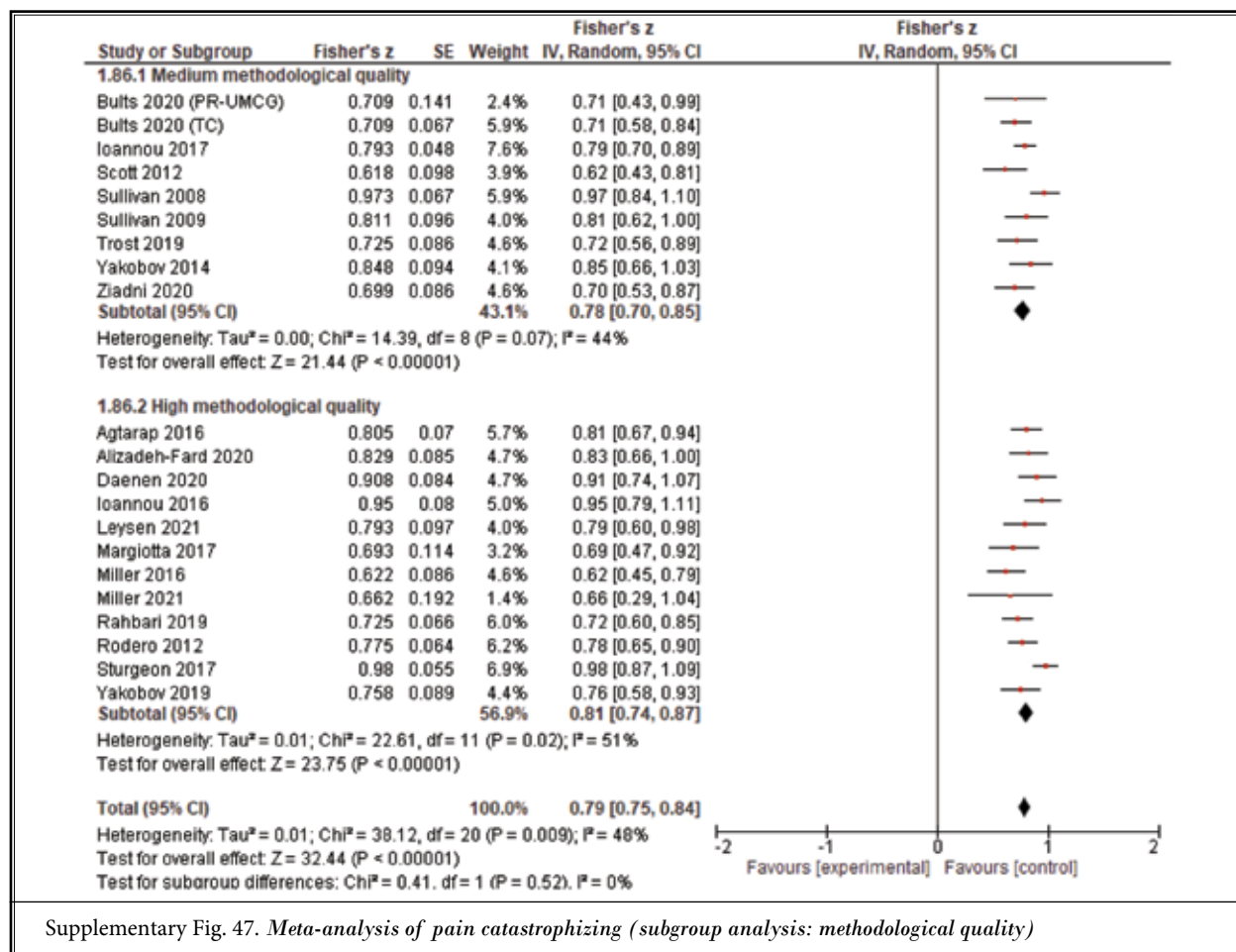
Supplementary Fig. 44. Meta-analysis of pain intensity – IEQ (subgroup analysis: methodological quality)



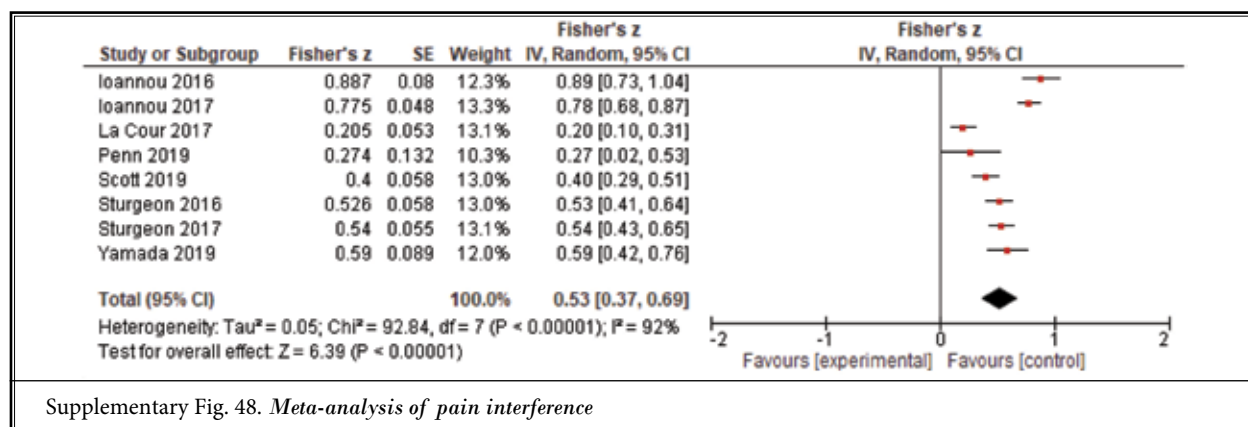
Supplementary Fig. 45. Meta-analysis of pain intensity – IEQ (subgroup analysis: outcome measures)



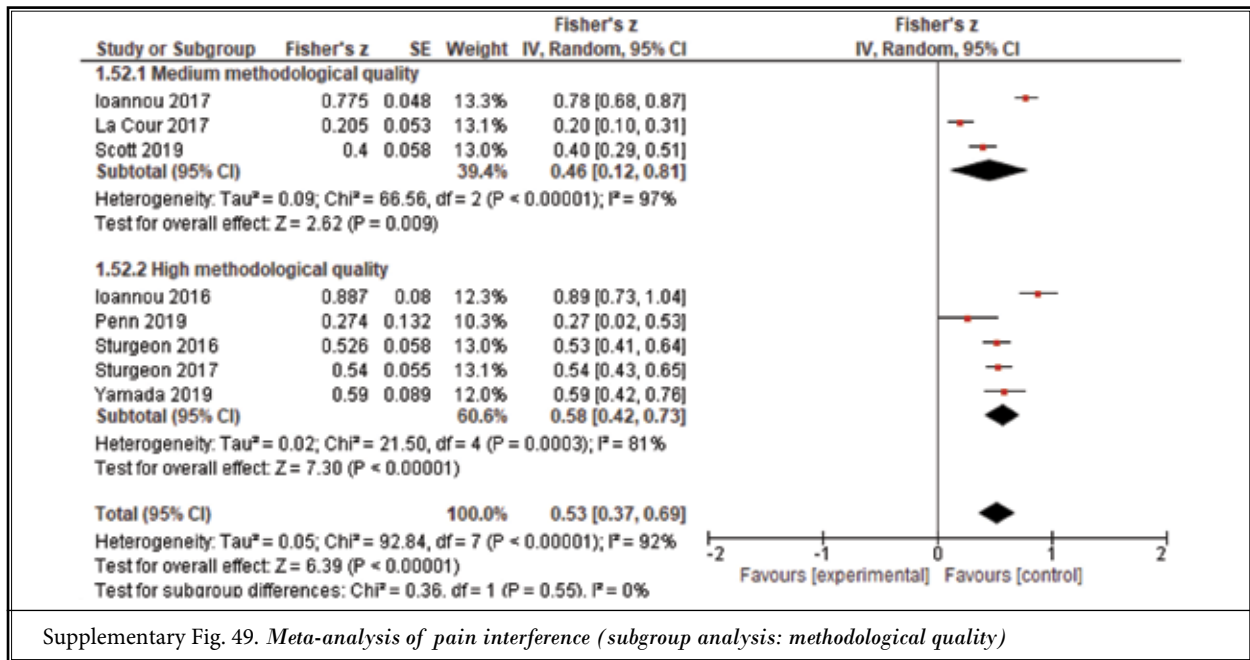
Supplementary Fig. 46. *Meta-analysis of pain catastrophizing*



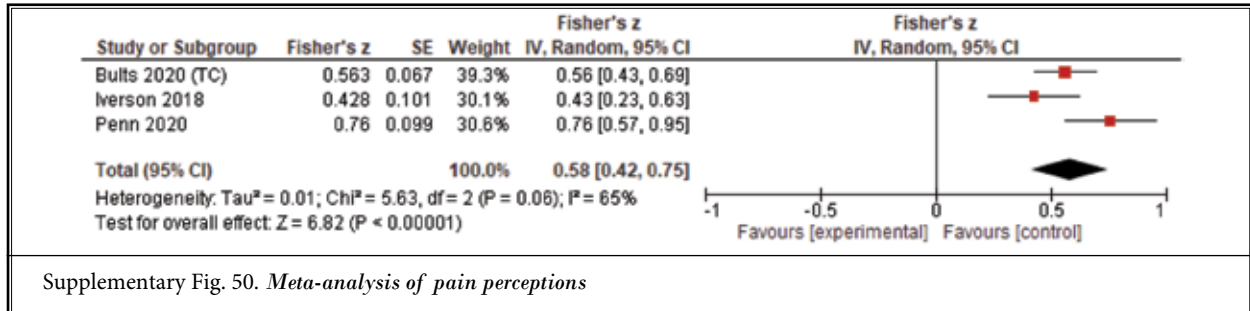
Supplementary Fig. 47. *Meta-analysis of pain catastrophizing (subgroup analysis: methodological quality)*



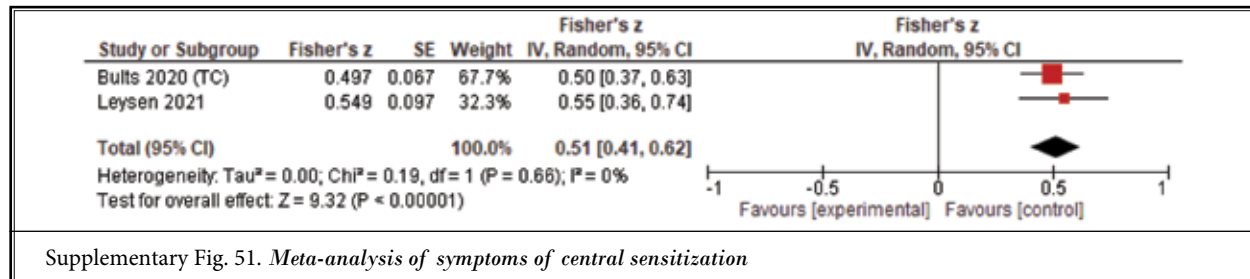
Supplementary Fig. 48. *Meta-analysis of pain interference*



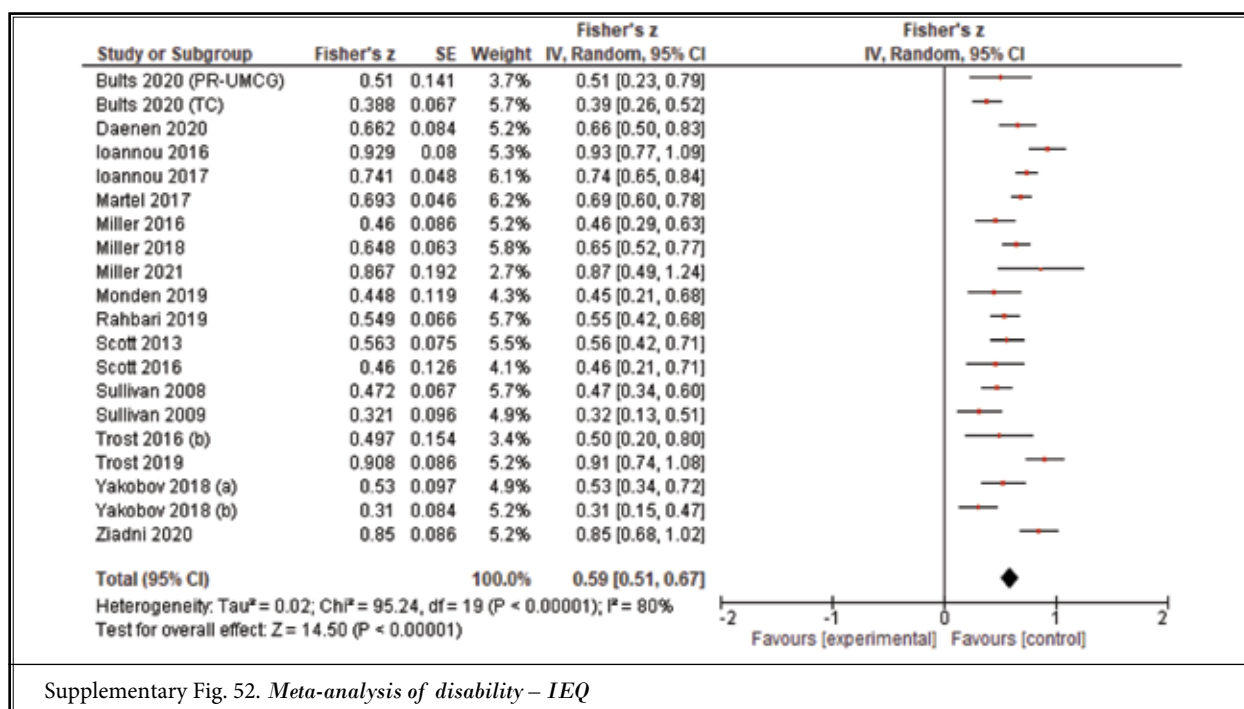
Supplementary Fig. 49. Meta-analysis of pain interference (subgroup analysis: methodological quality)



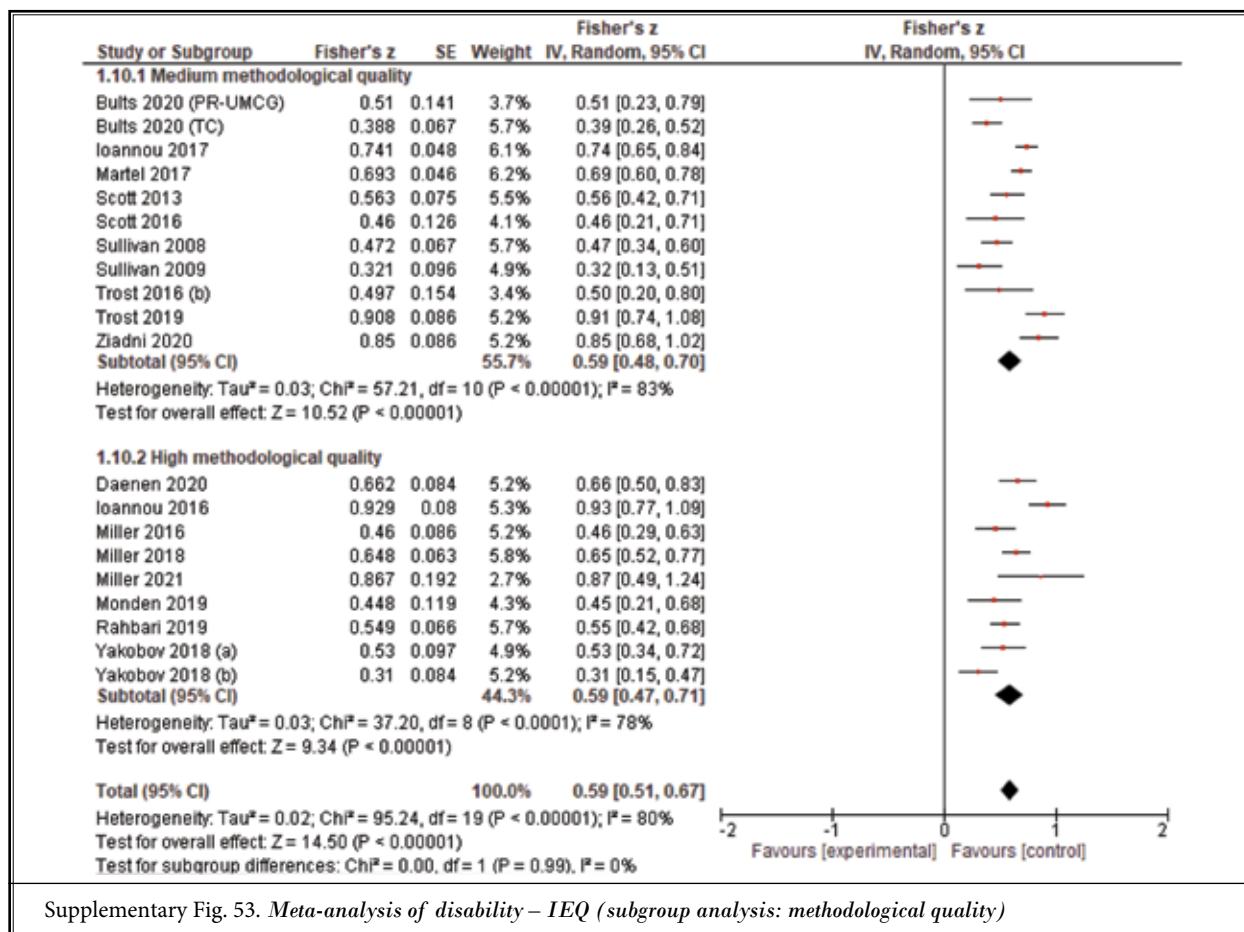
Supplementary Fig. 50. Meta-analysis of pain perceptions



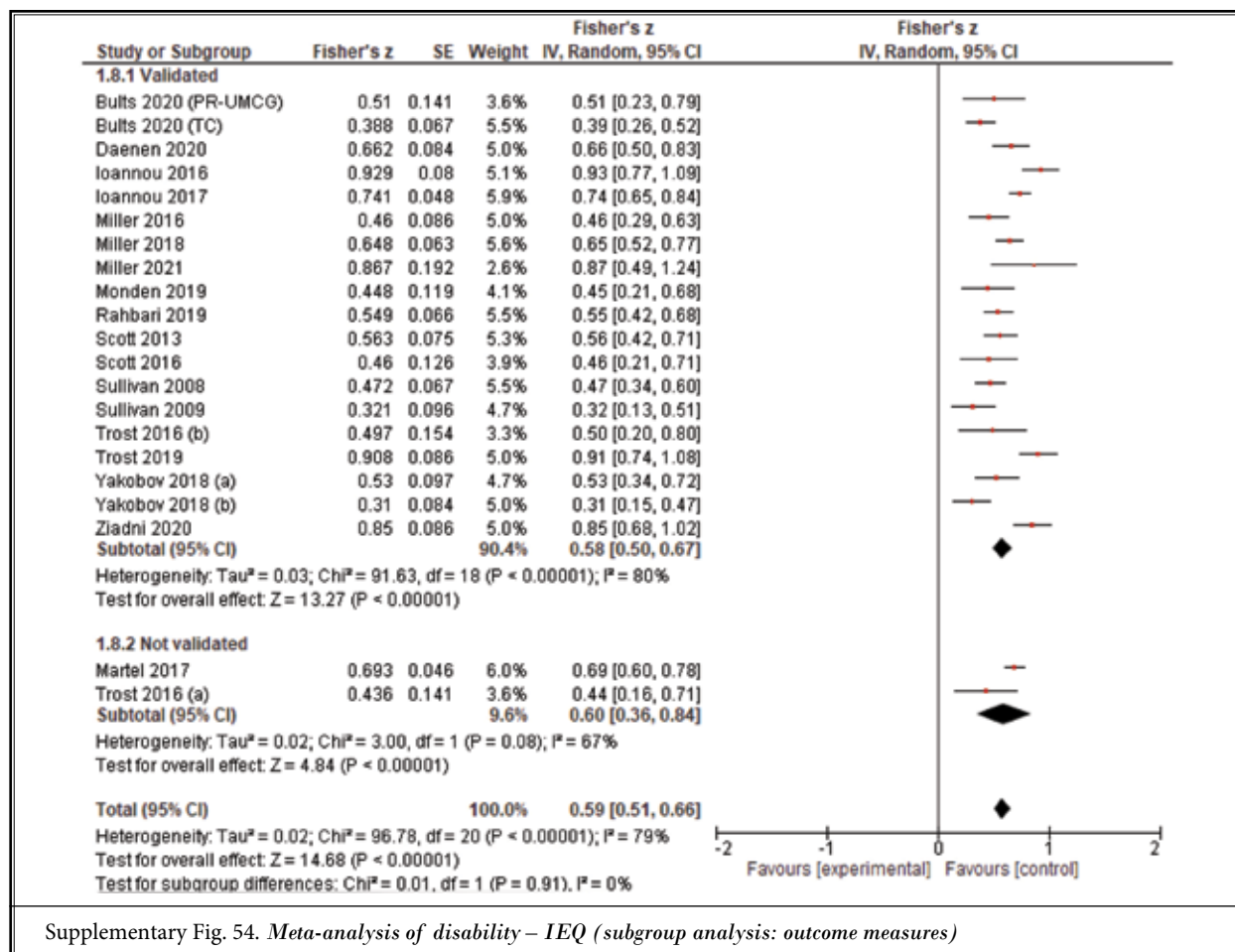
Supplementary Fig. 51. Meta-analysis of symptoms of central sensitization



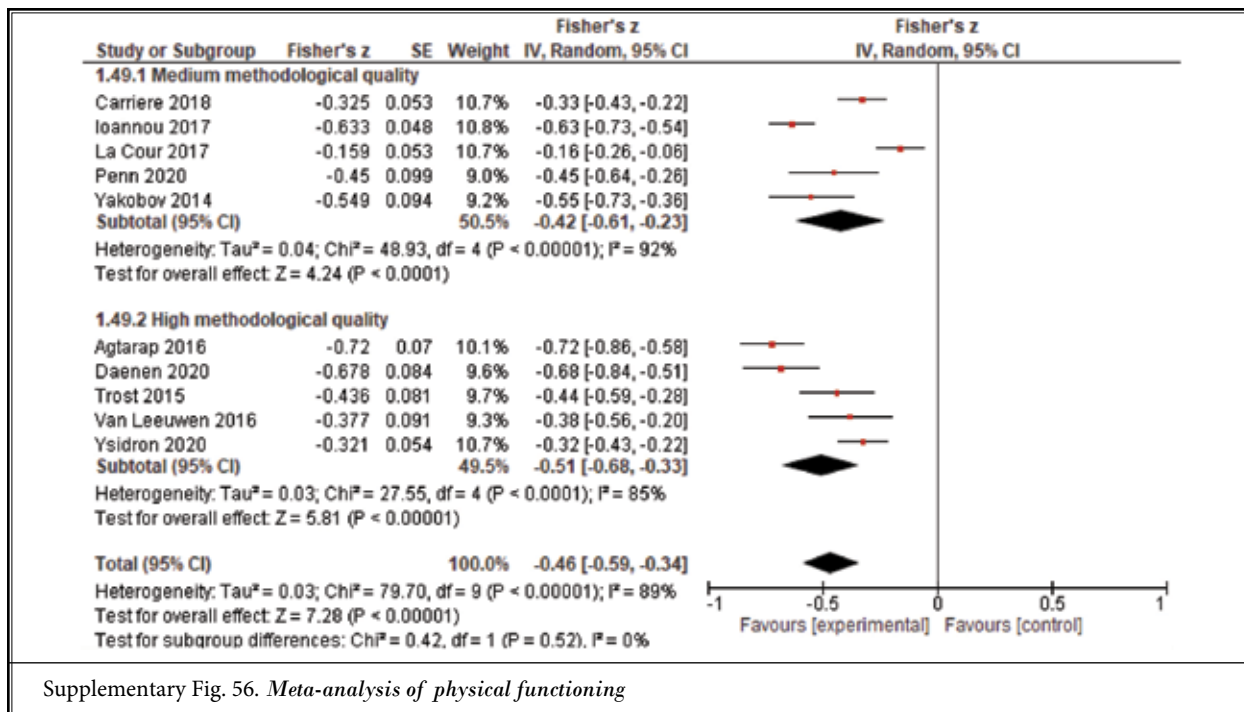
Supplementary Fig. 52. Meta-analysis of disability – IEQ



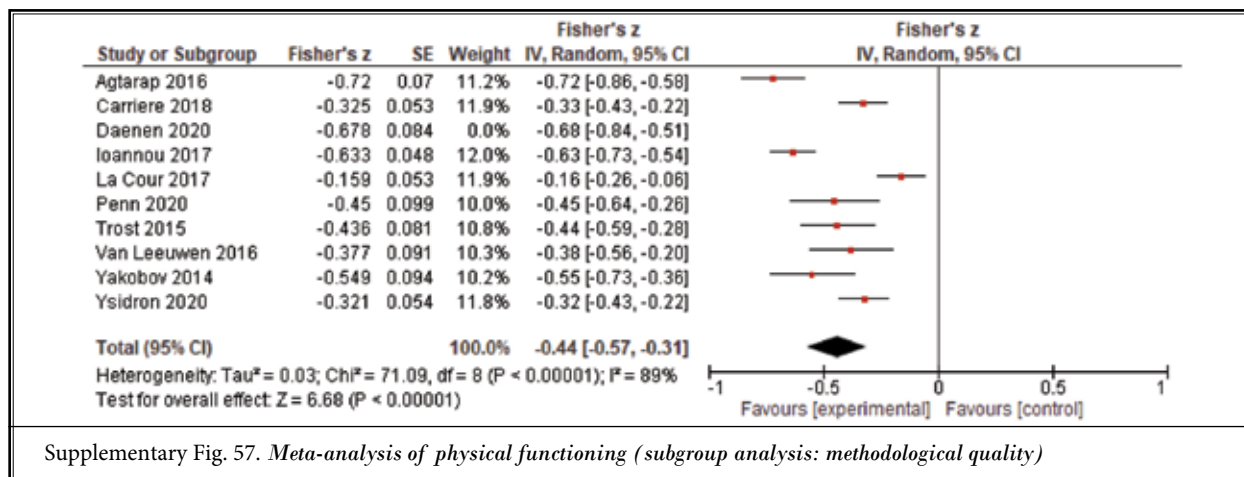
Supplementary Fig. 53. Meta-analysis of disability – IEQ (subgroup analysis: methodological quality)



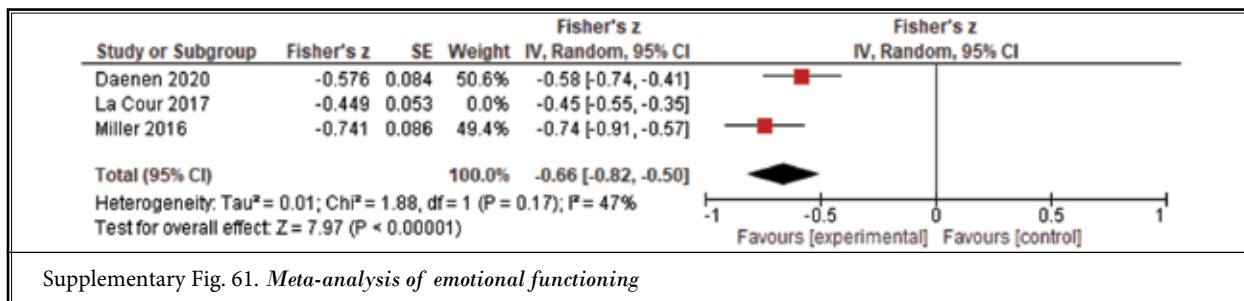
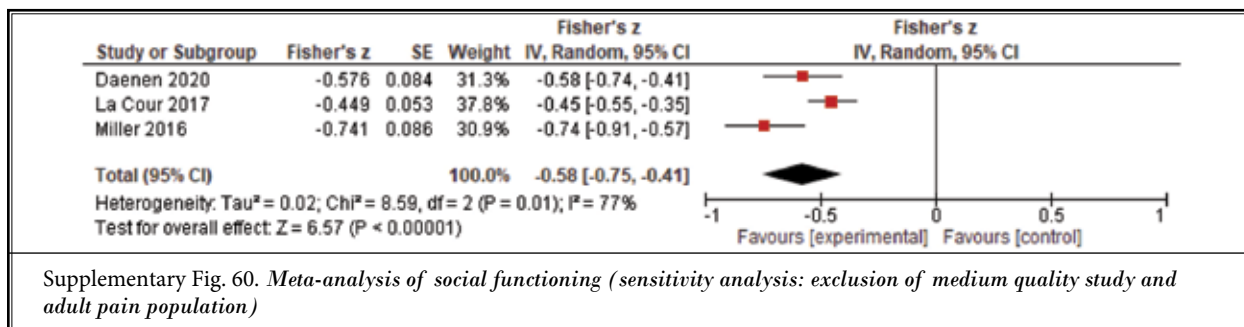
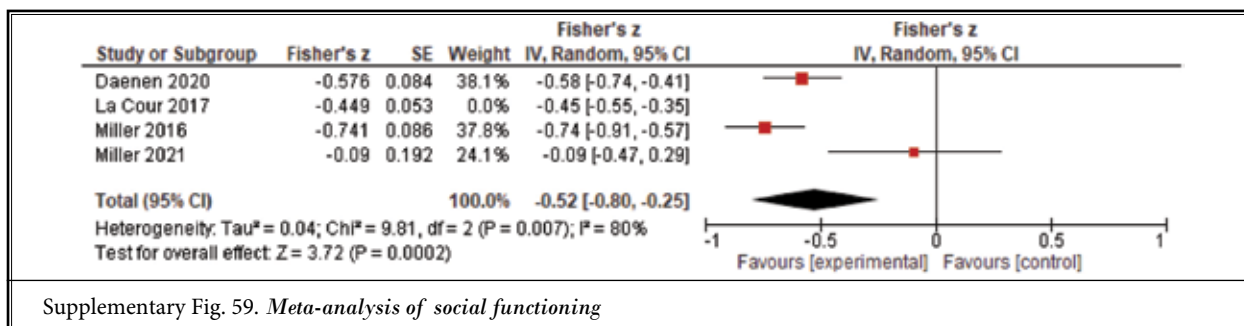
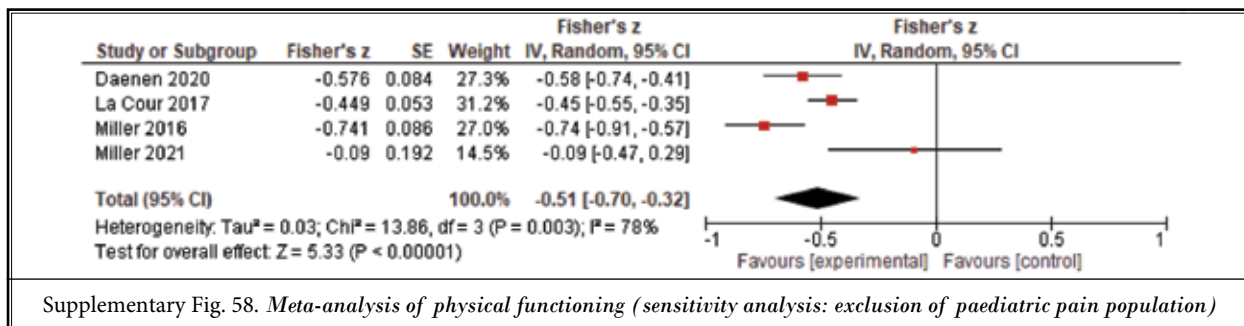
Supplementary Fig. 54. Meta-analysis of disability – IEQ (subgroup analysis: outcome measures)

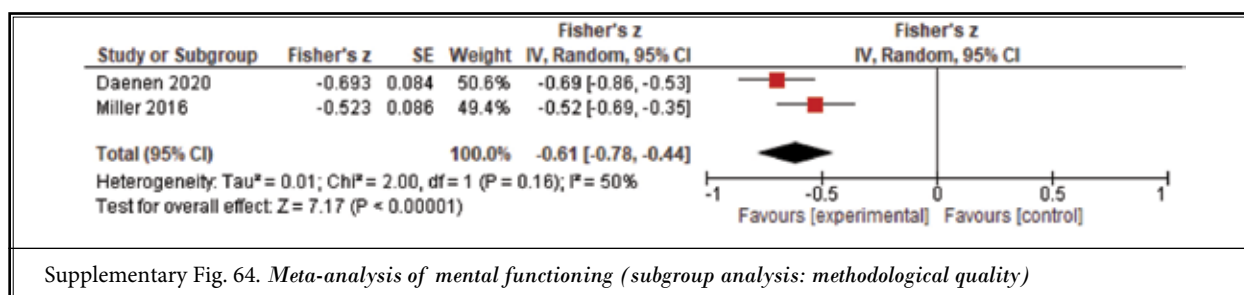
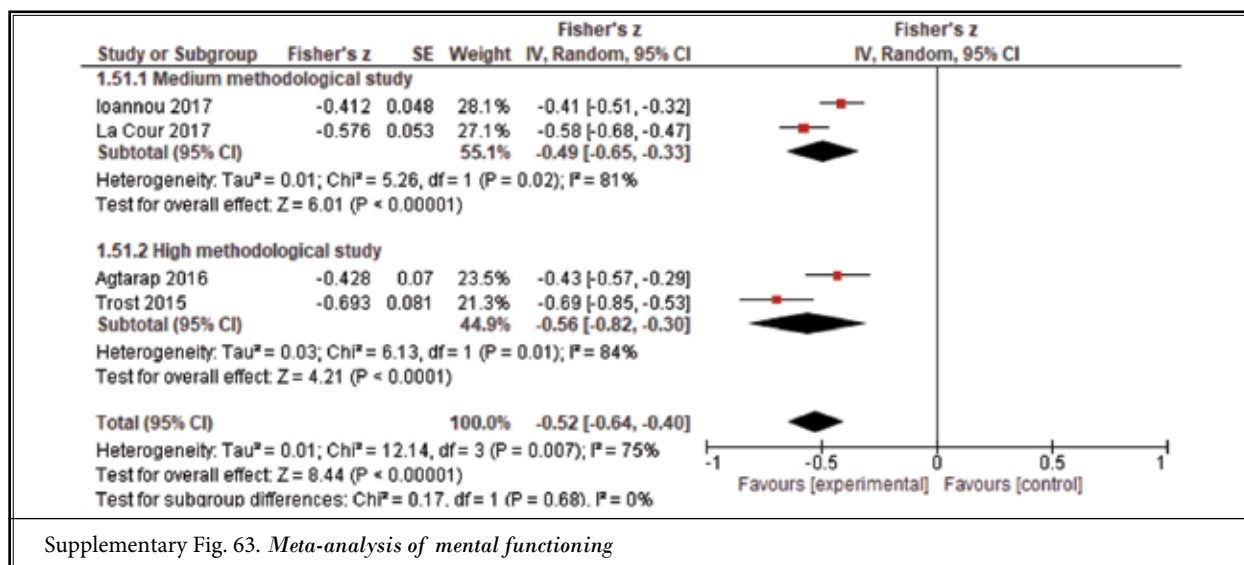
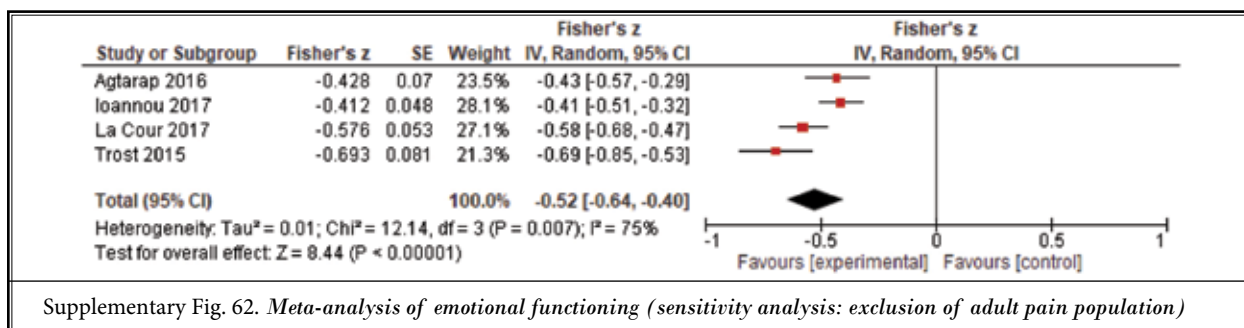


Supplementary Fig. 56. Meta-analysis of physical functioning



Supplementary Fig. 57. Meta-analysis of physical functioning (subgroup analysis: methodological quality)





Supplementary Fig. 65. *Meta-analysis of academic functioning {missing last figure}*

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