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Exploring the effect of disease explanations of chronic pain on stigma

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ABSTRACT

Chronic pain is a subjective experience, and the absence of objective medical evidence can contribute to stigma. Despite being classified as a disease in the ICD-11 and research findings showing brain dysfunction associated with chronic pain, the framing of chronic pain can shape public perceptions and influence stigma. In this study, we investigated whether framing chronic pain as a brain disease reduces the stigma that adults without chronic pain place on a fictional person with chronic pain. A total of 508 participants without chronic pain from the US and Canada anonymously completed a survey to assess stigma through the proxy measures of social distance and pain-related judgments. Participants were randomly assigned to read 1 of 5 contrastive vignette explanations of the cause of a fictional person's chronic pain: No Physical Cause, Biopsychosocial Model, Disease Model, Brain Disease Model, or Brain Disease Model, Biomarker, and Image. We found a main effect on pain-related judgments, specifically disease explanations compared to the No Physical Cause explanation. However, there was no effect on social distance. Demographic variables showed group-level associations with social distance (age 35–44, Asian, right-leaning political affiliation, not knowing anyone and low familiarity with chronic pain, and Canadian) and pain-related judgments (age 35–44 and 65–74, men, right-leaning political affiliation, and college diplomas or undergraduate degrees). Our findings suggest that framing chronic pain as a disease may reduce negative judgments, but may not influence social distance. This study has implications for public health communication strategies aimed at reducing chronic pain stigma.

Perspective: This study describes five models that explain how adults in Canada and the US who do not have chronic pain may judge or stigmatize people with chronic pain. Our findings suggest that different chronic pain explanations may impact specific dimensions (such as judgments) of pain-related stigma.

1. Introduction

People with chronic pain experience stigma.[1,2] Stigma occurs when "elements of labeling, stereotyping, separation, status loss, and discrimination occur together in a power situation that allows them".[3] Since people can experience chronic pain in the absence of a known cause or objective medical evidence, such as tissue damage, pain assessments rely primarily on self-report.[1,4] In some instances, pain is treated as a secondary symptom of a disease, rather than a disease in itself.[5,6] Accordingly, people are often dismissed with statements such as

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"pain is all in your head".[1] These factors contribute to public, structural, and internalized stigma, which can lead to worse health outcomes.[1,2,7] People with chronic pain encounter stigma in close relationships, from peers, colleagues and healthcare professionals,[8,9] and the experience of racism often intensifies stigma.[10] Chronic pain-related stigma has also been reported as more common than stigma associated with other conditions (e.g. epilepsy).[8] Addressing chronic pain stigma remains challenging, as it often intersects with opioid stigma and mental health stigma.[7,9,11]

Framing chronic pain as a disease has gained traction over the last couple of decades. The European Pain Federation's 2001 declaration stated that chronic pain is "…a disease in its own right"[12] and the International Classification of Diseases 11 (ICD-11) amendment classified chronic primary pain as a disease.[12] The term "disease" is often used with the implicit assumption that its meaning is widely understood, however there is no clear consensus on how to define disease.[5,13] The increasing emphasis on the biomedical aspects of chronic pain as a disease[14,15] may be in tension with the biopsychosocial model, which has provided an overarching lens to pain management since the 1980s.[16] This shift is important to question, considering the social, policy, and economic implications that classifying chronic pain as a disease can have.[13,17]

Adding to the complexity is whether chronic pain should be classified specifically as a *brain* disease, a view advocated by some neuroscientists.[18] Describing chronic pain as a brain disease may produce unintended consequences. For instance, the brain disease model of addiction (BDMA) reframes substance use disorders as a pathological neurobiological process.[19] A BDMA is intended to convey that substance use is largely beyond one's control, which some assumed would decrease stigma and lessen personal responsibility.[20] However, the BDMA may have the unintended effect of entrenching an othering process,[21,22] for example, it could suggest that a person is "no more than a diseased brain and consequently become an other".[23] Also, a systematic review found that clinicians who endorse a BDMA report stronger beliefs that the condition is intractable,[24] which may negatively impact care.

How chronic pain is framed can impact the lives of those who experience it[21,22] and, in turn, have negative impacts on health outcomes.[7,25] Therefore, it is critical to examine if the framing of chronic pain as a disease influences others' stigmatizing attitudes.

This study aimed to investigate the effects of a brain disease explanation of chronic pain on the degree to which US and Canadian adults without chronic pain stigmatize people with chronic pain. To test the hypothesis that exposure to the Brain Disease Model vignette would be associated with less stigma compared to other explanations, this study explored the effects of brain disease explanations of chronic pain on social distance and pain-related judgments. Our secondary aim was to determine if there is a moderating effect of demographic variables on the relationship between vignette and social distance and pain-related judgments.

2. Methods

2.1. Participants

Eligible participants were adults (> 18 years) living in Canada or the US who had never lived with chronic pain (recurring pain for more than three months). There were no other exclusion criteria. We used Prolific, a UK web-based platform, to recruit participants and administer the survey. People must self-enroll on Prolific. This platform helps identify research studies for which people may be eligible, based on pre-screening filters (geographical, age, and chronic pain). Prolific is a convenient and cost-effective option to gather high-quality data while participants remain anonymous (IP addresses were not collected) throughout the study process, and has been used to recruit for stigma research studies.[26] A total of 520 adults who have never lived with chronic pain were recruited for this study between March 24–26, 2023, and May 8–11, 2023. Eleven people did not meet the inclusion criteria (they had chronic pain), and one person did not pass the manipulation check. The final sample size included in the analyses was n = 508.

The study was approved by the Research Ethics Board at the Centre for Addiction and Mental Health (CAMH) in Toronto, Canada (REB 156/2021). The authorship team declares that all study procedures comply with national and international ethical standards, including the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans 2022 and the Declaration of Helsinki.

2.2. Design

This study used a contrastive vignette technique (CVT) design informed by a study exploring social exclusion and pain.[27] We used a 5×1 between-subjects design wherein participants were randomized to read one of five contrastive vignettes about a person with chronic pain named Sam (see Figure 1). The contrastive manipulation was one of five explanations of the cause of Sam's chronic pain within the vignette (No Physical Cause, Biopsychosocial Model, Disease Model, Brain Disease Model, or Brain Disease Model, Biomarkers and Image), while the remaining text in the vignette remained constant. The five explanations were chosen in consultation with lived experience advisors. No Physical Cause represents chronic pain that occurs without a known etiology or is medically unexplained, such as chronic primary pain. Pain without a known cause can have more stigma.[28] The Biopsychosocial Model explanation reflects the dominant lens for understanding chronic pain since the 1980s. The Disease Model explanation reflects the ICD-11 classification of chronic pain as a disease. The Brain Disease Model represents recent developments in neuroscience and statements by leading neuroscientists. Lastly, the Brain Disease Model, Biomarkers and Image explanation extends the previous model by integrating recent advancements in chronic pain biomarkers and the pivotal role biomarkers can have on pain. The overall purpose was to capture a spectrum of chronic pain explanations from less biomedical to increasingly more biomedical.

The CVT was used to suggest how the contrastive manipulation (i.e., the explanation of the cause of Sam's chronic pain) in the vignette affects survey responses, revealing the participants' attitudes about chronic pain. The CVT design has been used as a measure of public attitudes in social psychology and empirical neuroethics.[29,30] We applied the Flesh-Kincaid Reading Ease and Grade Level readability tests to the vignette for lay understanding. The gender variable in the vignette was not manipulated, so we used the gender-neutral name "Sam". We selected the name Sam through a pre-testing process that involved two rounds of internal team member input. In each round, participants ranked a list of names based on how gender-neutral they perceived them to be, and Sam was ranked the most gender neutral. We chose store supervisor as Sam's occupation since it has a nearly proportional representation of both men (51.8%) and women (48.2%) in that role in Canada.[31]

2.3. Procedure

Participants accessed the survey through Prolific, and informed consent was documented by selecting I agree on the consent form. Afterwards, participants were redirected to complete a 15-minute anonymous survey, which included three parts. In the first part, participants completed a 10-item demographic questionnaire, followed by the Familiarity with Chronic Pain scale (7-item).[32] For the second part, participants were randomized to read 1 of the 5 vignettes about Sam, as described earlier. For the third part, after reading the vignette, participants were invited to answer questions regarding their attitudes toward the vignette. This questionnaire consisted of an adapted 6-item Social Distance Scale (SDS), items measuring pain-related judgments, a question about Sam's gender, and two instructional manipulation checks. The question regarding Sam's gender was included to examine

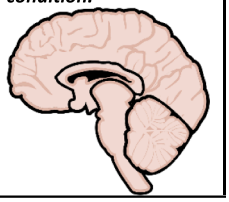
Explanations of Chronic Pain				
No Physical Cause	**Biopsychosocial Model**	**Disease Model**	**Brain Disease Model**	**Brain Disease Model, Biomarker and Image**
Sam is 48 years old and is a store supervisor. Sam has been living with chronic pain for a while and sighs and winces throughout the day. Sam's physician orders a few medical tests for further investigation. Based on the findings of the tests, the physician suggests that Sam's chronic pain ***is not due to an underlying physical cause.***	Sam is 48 years old and is a store supervisor. Sam has been living with chronic pain for a while and sighs and winces throughout the day. Sam's physician orders a few medical tests for further investigation. Based on the findings of the tests, the physician suggests that Sam's chronic pain ***is an interaction of biology, such as Sam's genetics, psychological factors, such as Sam's mental health condition and social factors, such as Sam's work environment.***	Sam is 48 years old and is a store supervisor. Sam has been living with chronic pain for a while and sighs and winces throughout the day. Sam's physician orders a few medical tests for further investigation. Based on the findings of the tests, the physician suggests that Sam's chronic pain ***is a disease in itself, and not merely a symptom of another medical condition.***	Sam is 48 years old and is a store supervisor. Sam has been living with chronic pain for a while and sighs and winces throughout the day. Sam's physician orders a few medical tests for further investigation. Based on the findings of the tests, the physician suggests that Sam's chronic pain ***is a disease of the brain and not merely a symptom of another medical condition.***	Sam is 48 years old and is a store supervisor. Sam has been living with chronic pain for a while and sighs and winces throughout the day. Sam's physician orders a few medical tests for further investigation. Based on the findings of the tests, the physician suggests that Sam's chronic pain is ***a disease of the brain as indicated by brain biomarkers (biological markers) and not merely a symptom of another medical condition.*** 

Fig. 1. Vignettes. Participants were randomized to read 1 of 5 contrasting vignette explanations of the cause of a fictional person's chronic pain. The variables subject to experimental manipulation are identified in ***bold italics.*** Adapted from De Ruddere et al. (2016)[27].

participants' perceived gender of Sam in the context of the vignette. The manipulation checks instructed participants to select 'Never' for one question and 'Agree' for another, and they were placed between the SDS and items measuring pain-related judgment. Manipulation checks help improve data quality and can exclude participants who may have rushed through the survey.[33] After completing the survey, participants were compensated through Prolific on behalf of the study team at a prorated rate of USD 3.00 for 15 min. Our compensation rate was determined using Prolific's fair pay principles and was in line with the study team's provincial minimum wage guidelines. All data were collected using a secure online survey platform, REDCap, hosted at CAMH.

The survey went through an iterative development process, involving pilot-testing with internal team members (lived experience advisors and lab members), receiving feedback, revising, and administering a mock survey on Prolific before execution to ensure readability and usability.

3. Measures

3.1. Demographics

Demographic characteristics such as age, gender, race, political affiliation, area type, and whether participants know anyone with chronic pain were collected. In addition, a question requesting participants' Prolific IDs to link survey answers to participants, as recommended by Prolific to reference demographic data, prevent multiple participation, and/or reject poor quality responses. Prolific users voluntarily provide demographic data as part of account signup. This demographic data is linked to a user's Prolific ID and is provided to researchers after a Prolific user has consented. We collected the 'Current country of residence' item from Prolific's demographic table to compare group differences between the US and Canadian populations. The research team could not access direct personal identifiers (e.g. name, email address) from a participant's Prolific ID.

3.2. Familiarity with chronic pain

The Familiarity with Chronic Pain (FCP) scale is a 7-item measure that assesses familiarity with chronic pain (see Supplemental File 1). Adapted from Corrigan et al.'s scale for familiarity with mental illness,[32] we replaced the term "mental illness" from the original version with "chronic pain" (e.g., "I have observed, in passing, a person I believe may have had chronic pain; I live with a person who has chronic pain"). Items are rated as Yes (1) or No (0), and scores are averaged to create a composite score. Familiarity with a stigmatized condition (e.g., schizophrenia) is correlated with reduced attributions of stigma.[32]

3.3. Primary outcome: social distance composite score

We measured social distance using the 6-item scale based on De Ruddere et al.'s[27] adaptation from Link et al.'s original 7-item SDS (see Supplemental File 2).[34] Social distance "involves the desire to avoid contact with a particular group of people" and is a fundamental dimension of stigma.[35,36] The SDS is frequently used in stigma research as a proxy for behavioral indicators of discrimination towards people with mental illness[34] but has also demonstrated high reliability and validity in chronic pain stigma research (Cronbach's α =.92 [27] and .83[28]). Each item assessed participants' willingness to interact with the fictitious person from the vignette, Sam, in a variety of interpersonal situations. Example statements included: "How would you feel about having someone like Sam as your neighbour?", "How would you feel about having someone like Sam marry into your family?". Items were scored on a 0–7 Likert scale, where 0 = "Definitely unwilling" and 7 = "Definitely willing". A higher score indicated less likelihood of a desire for social distance from Sam. This adapted SDS is a measure consisting of 6 items rather than 7 items. For similar reasons to De Ruddere et al. (2016)[27] the item, "How would you feel if one of your children would marry this person?" was considered not relevant to our population because of the variability of age of our adult participants (as young as

18) and Sam's age of 48 years. In our study, the social distance composite score showed high internal consistency (Cronbach's α =.91).

3.4. Secondary outcome: pain-related judgments composite score

The pain-related judgments composite score was adapted for this study based on individual item questions[27,37] and created using the average score approach. The intention was to create an approximately normally distributed variable to increase the power of the analysis and potentially identify a meaningful trend across related items. This score measures 8 aspects of judgments related to Sam's pain: 1) estimate of pain, 2) sympathy felt, 3) willingness to help, 4) pain exaggeration, 5) minimizing pain, 6) hiding of pain, 7) truthfulness, and 8) lying. Items in the composite score were self-reported on a 0–7 Likert Scale (see Supplemental File 3) with a higher score indicating more positive, less negative judgments towards Sam. The eight dimensions included mixed valence of wording; therefore, we reverse-scored negatively worded items during analysis. These questions were selected because of their fit with the central research question, and items were used in studies assessing a person's chronic pain trustworthiness and judgments on their authenticity.[27,37] The goal of this composite score is to understand participants' judgments about pain expression and their perception of trustworthiness. The internal consistency of the pain-related judgments composite score was .71 (Cronbach's α).

3.5. Data analysis

Graphs and data manipulations were conducted with R 4.3.1[38] and the *tidyverse* package.[39] First, we conducted a descriptive analysis using central tendency, frequency, and percent to describe the sample. Demographic variables were grouped when the sample size was fewer than 20. Gender "Other" was removed from the main analysis due to the small sample size. We conducted statistical tests for demographic differences across randomized groups.

The distribution of social distance and the pain-related judgments composite scores showed substantial non-normality, exhibiting negative skewness as well as truncation at the scale's maximum value (see Figures 2 and 3).

To assess the impact of this departure from normality, we applied a simple transformation to limit the composite scores to the interval (0,1) by dividing each score by the maximum possible value (7), thereby rendering the maximum score to be 1. We estimated a beta regression model using the betareg package and then back-transformed to the original scores after model fitting.[40] The betareg package is widely used to apply statistical techniques for continuous variables that are restricted to the (0,1) interval. Comparison of AIC values showed that a beta regression model described the data better than a linear regression model and that allowing the precision parameter of the beta model to vary across randomization groups further improved fit. Accordingly, we used beta regression models with variable precision parameters for all

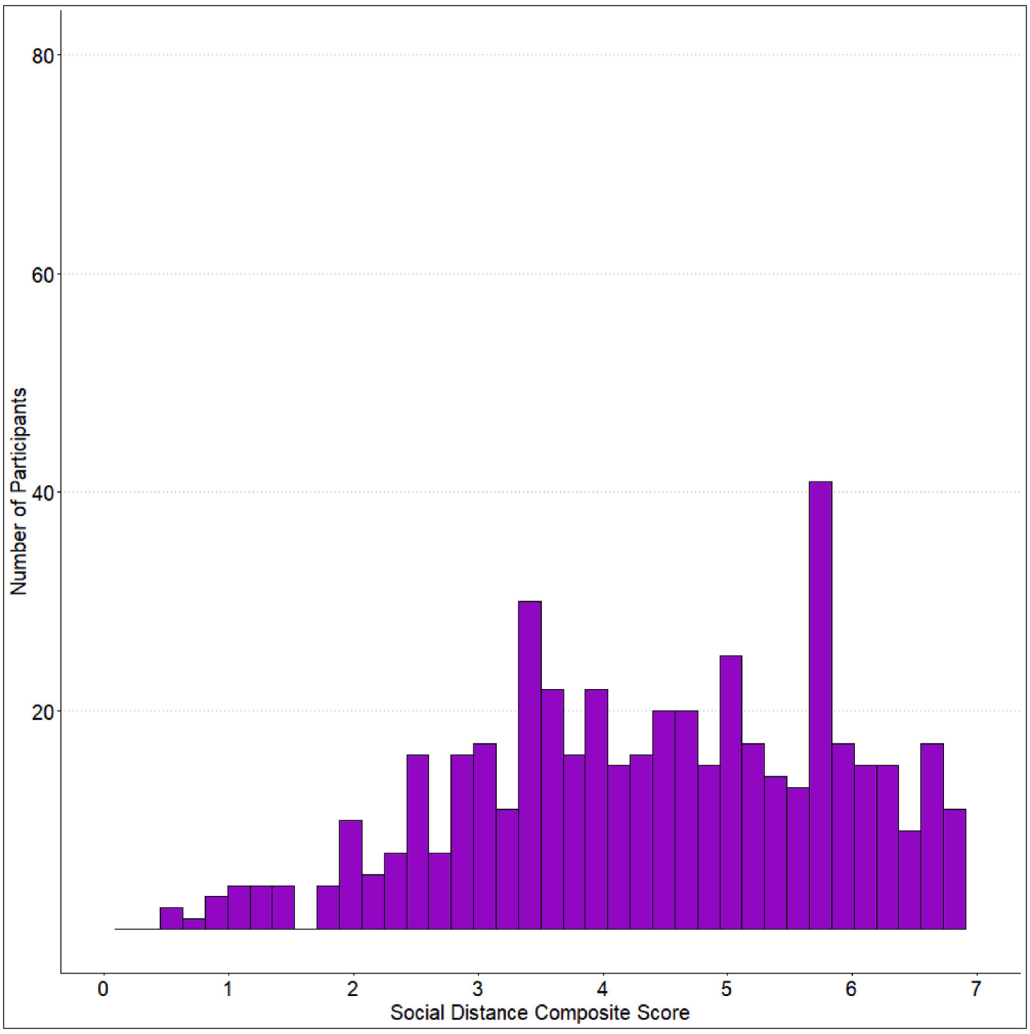


Fig. 2. Distribution of Social Distance Composite Score. Scores range from 0 (high social distance) to 7 (low social distance). The distribution is non-normal, indicating a positive skew (low social distance).

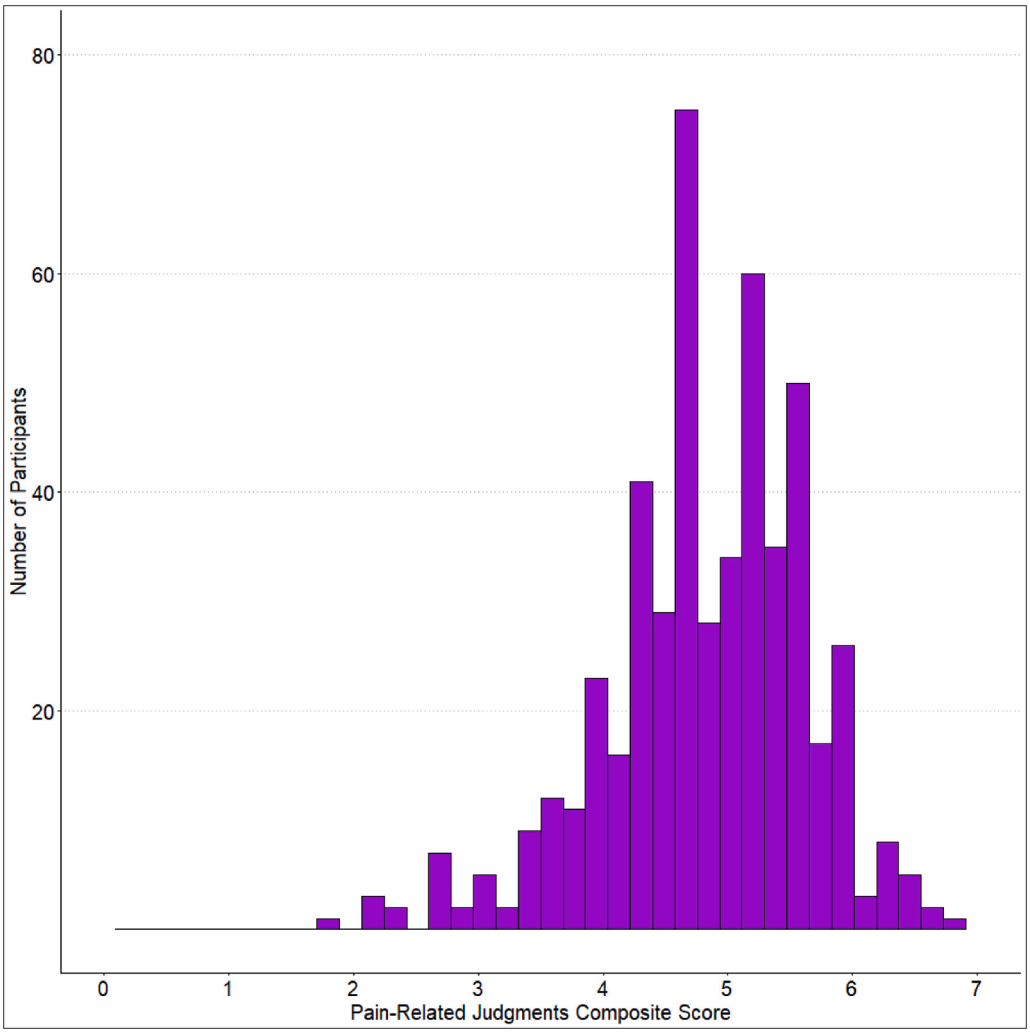


Fig. 3. Distribution of Pain-Related Judgments Composite Score. Scores range from 0 (negative judgments) to 7 (positive judgments). The distribution is non-normal, indicating a positive skew (positive judgments).

analyses of social distance and pain-related judgments composite scores, with a log link function chosen to allow multiplicative interpretation of the coefficients. We used likelihood ratio tests to test for a main effect of vignette and of each demographic variable. A pseudo R^2 was reported for the effect size. Post hoc pairwise comparisons using the *emmeans* R package 1.8.6.[41] Effect sizes were calculated and reported using Cohen's d.

4. Results

4.1. Demographics

Table 1 presents demographic results across the sample and between vignettes.

4.2. Primary outcome: social distance composite score

We found no significant effect of vignette on social distance composite scores, X^2 (4) = 2.71, p =.624, pseudo R^2 =.003 (See Figures 1 and 4). There was low to moderate within-participant variability in responses across items (SD = 1.19). An outcome summary is reported in Table 2. We did, however, find significant main effects for most demographic variables, suggesting group-level differences in responses. Significant group-level differences associated with a higher likelihood of social distancing from Sam included age, p <.001, education (college diploma or undergraduate degree), p =.035, race, p =.001 (Asian), political affiliation, p <.001 (right-leaning), not knowing anyone with chronic pain, p =.007, having no or minimal familiarity with chronic pain, p =.039, and country, p =.005, (Canada). Lastly, participants who perceived the fictional person Sam as a man reported a greater likelihood of social distancing from them, p =.049. Results of the likelihood ratio tests of all main effects are presented in Table 3.

4.3. Secondary outcome: pain-related judgments composite score

We found a significant effect of vignette on the pain-related judgments composite scores, $X^2(4) = 26.20$, p <.001, pseudo R^2 =.044 (See Figures 2 and 5). The within-participant SD indicated moderate variability across items (SD = 2.15). An outcome summary is reported in Table 2. Pairwise comparisons revealed that the No Physical Cause vignette (M = 4.51, SD = 0.90) differed significantly from the Biopsychosocial Model (M = 4.87, SD = 0.74), p =.009, d = −0.46, Disease Model (M = 5.05, SD = 0.75), p <.001, d = −0.69, Brain Disease Model (M = 4.83, SD = 0.73), p =.029, d = −0.41, and Brain Disease Model, Biomarkers and Image (M = 4.89, SD = 0.83), p =.005, d = −0.48. This indicated more negative pain-related judgments for the No Physical Cause vignette compared to all remaining vignettes. Pairwise comparisons are summarized in Table 4. All other pairwise comparisons between vignettes were not significant (all p >.268).

We found significant main effects of age, p =.001, (35–44 and

Table 1
Sample Characteristics.

Variables	No Physical Cause (N=106)	Biopsychosocial Model (N=100)	Disease Model (N=99)	Brain Disease Model(N=102)	Brain Disease Model, Biomarkers and Image(N=101)	Overall (N=508)
Age Range						
18–24	26 (24.5%)	21 (21.0%)	27 (27.3%)	21 (20.6%)	18 (17.8%)	113 (22.2%)
25–34	36 (34.0%)	34 (34.0%)	35 (35.4%)	36 (35.3%)	30 (29.7%)	171 (33.7%)
35–44	20 (18.9%)	25 (25.0%)	22 (22.2%)	26 (25.5%)	31 (30.7%)	124 (24.4%)
45–54	14 (13.2%)	11 (11.0%)	10 (10.1%)	6 (5.9%)	14 (13.9%)	55 (10.8%)
55+	10 (9.4%)	9 (9.0%)	5 (5.1%)	13 (12.7%)	7 (6.9%)	44 (8.7%)
Prefer not to answer	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.0%)	1 (0.2%)
Gender Identity*						
Man	49 (46.2%)	47 (47.0%)	52 (52.5%)	51 (50.0%)	49 (48.5%)	248 (48.8%)
Other	2 (1.9%)	0 (0%)	3 (3.0%)	1 (1.0%)	5 (5.0%)	11 (2.2%)
Woman	55 (51.9%)	53 (53.0%)	44 (44.4%)	50 (49.0%)	46 (45.5%)	248 (48.8%)
Prefer not to answer	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (1.0%)	1 (0.2%)
Highest Level of Education						
High School Diploma or Less	8 (7.5%)	10 (10.0%)	9 (9.1%)	11 (10.8%)	10 (9.9%)	48 (9.4%)
Some College/University	23 (21.7%)	18 (18.0%)	20 (20.2%)	20 (19.6%)	20 (19.8%)	101 (19.9%)
College Diploma	9 (8.5%)	7 (7.0%)	10 (10.1%)	12 (11.8%)	9 (8.9%)	47 (9.3%)
Undergraduate Degree	47 (44.3%)	40 (40.0%)	36 (36.4%)	39 (38.2%)	39 (38.6%)	201 (39.6%)
Master's Degree or equivalent	14 (13.2%)	21 (21.0%)	17 (17.2%)	15 (14.7%)	17 (16.8%)	84 (16.5%)
Professional Training or Doctoral Degree	5 (4.7%)	4 (4.0%)	7 (7.1%)	5 (4.9%)	4 (4.0%)	25 (4.9%)
Prefer not to answer	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.0%)	2 (0.4%)
Race/Ethnicity						
Another race, ethnicity, and/or origin	5 (4.7%)	5 (5.0%)	7 (7.1%)	4 (3.9%)	2 (2.0%)	23 (4.5%)
Asian	21 (19.8%)	19 (19.0%)	24 (24.2%)	20 (19.6%)	22 (21.8%)	106 (20.9%)
Black	5 (4.7%)	5 (5.0%)	2 (2.0%)	6 (5.9%)	6 (5.9%)	24 (4.7%)
Latin American	6 (5.7%)	5 (5.0%)	11 (11.1%)	4 (3.9%)	3 (3.0%)	29 (5.7%)
Mixed Heritage	3 (2.8%)	5 (5.0%)	3 (3.0%)	6 (5.9%)	4 (4.0%)	21 (4.1%)
White	66 (62.3%)	61 (61.0%)	51 (51.5%)	60 (58.8%)	63 (62.4%)	301 (59.3%)
Prefer not to answer	0 (0%)	0 (0%)	1 (1.0%)	2 (2.0%)	1 (1.0%)	4 (0.8%)
Political Affiliation**						
Mean (SD)	3.48 (2.42)	3.90 (2.75)	3.36 (2.74)	3.80 (2.65)	3.46 (2.54)	3.60 (2.62)
Median [Min, Max]	4.00 [0, 10.0]	4.00 [0, 10.0]	3.00 [0, 10.0]	4.00 [0, 10.0]	3.00 [0, 10.0]	3.00 [0, 10.0]
Know anyone with chronic pain						
Don't know	13 (12.3%)	11 (11.0%)	9 (9.1%)	10 (9.8%)	7 (6.9%)	50 (9.8%)
No	42 (39.6%)	36 (36.0%)	33 (33.3%)	33 (32.4%)	38 (37.6%)	182 (35.8%)
Yes	51 (48.1%)	53 (53.0%)	57 (57.6%)	55 (53.9%)	53 (52.5%)	269 (53.0%)
Prefer not to answer	0 (0%)	0 (0%)	0 (0%)	4 (3.9%)	3 (3.0%)	7 (1.4%)
Country of Residence						
Canada	32 (30.2%)	42 (42.0%)	27 (27.3%)	30 (29.4%)	33 (32.7%)	164 (32.3%)
United States	74 (69.8%)	58 (58.0%)	72 (72.7%)	72 (70.6%)	68 (67.3%)	344 (67.7%)
Area Type						
Rural	7 (6.6%)	4 (4.0%)	2 (2.0%)	4 (3.9%)	4 (4.0%)	21 (4.1%)
Small	15 (14.2%)	9 (9.0%)	15 (15.2%)	15 (14.7%)	15 (14.9%)	69 (13.6%)
Medium	37 (34.9%)	32 (32.0%)	23 (23.2%)	36 (35.3%)	32 (31.7%)	160 (31.5%)
Large	47 (44.3%)	55 (55.0%)	59 (59.6%)	46 (45.1%)	50 (49.5%)	257 (50.6%)
Prefer not to answer	0 (0%)	0 (0%)	0 (0%)	1 (1.0%)	0 (0%)	1 (0.2%)
Sam's Gender						
I do not know	11 (10.4%)	13 (13.0%)	9 (9.1%)	11 (10.8%)	10 (9.9%)	54 (10.6%)
Man	81 (76.4%)	77 (77.0%)	81 (81.8%)	86 (84.3%)	80 (79.2%)	405 (79.7%)
Non-binary	2 (1.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (0.4%)
Woman	12 (11.3%)	10 (10.0%)	9 (9.1%)	5 (4.9%)	11 (10.9%)	47 (9.3%)
Familiarity with Chronic Pain						
Mean (SD)	0.317 (0.252)	0.344 (0.239)	0.358 (0.244)	0.357 (0.281)	0.310 (0.250)	0.337 (0.254)
Median [Min, Max]	0.286 [0, 0.857]	0.286 [0, 1.00]	0.429 [0, 0.857]	0.429 [0, 1.00]	0.286 [0, 0.857]	0.286 [0, 1.00]

*Gender identity was fairly balanced as we intentionally recruited a gender-balanced sample
**Political Affiliation was self-reported on a visual analog scale from 0 to 10. Participants were asked, "Where would you place yourself on the 'left-right' political spectrum on a scale from 0 to 10? (Where 0 is left and 10 means right)?"

65–74), gender, $p < .001$, (men), education, $p = .050$ (college diploma or undergraduate degree) and political affiliation, $p < .001$ (right-leaning), indicating group-level differences associated with a higher likelihood of having negative pain-related judgments towards Sam. The results of all likelihood ratio tests are presented in Table 5.

5. Discussion

This novel study sought to understand the effects of a brain disease explanation of chronic pain on the degree to which adults without chronic pain stigmatize a person with chronic pain. We presented the fictional case of "Sam", a person living with chronic pain. Sam was described through five different vignettes to examine the impact of Sam with either No Physical Cause of their chronic pain, or in the context of an associated/underlying Biopsychosocial Model, Disease Model, Brain Disease Model, or Brain Disease Model, Biomarkers, and Image. Contrary to our expectations, the explanation of the underlying cause of the chronic pain did not affect the stigma (as reflected by measures of social

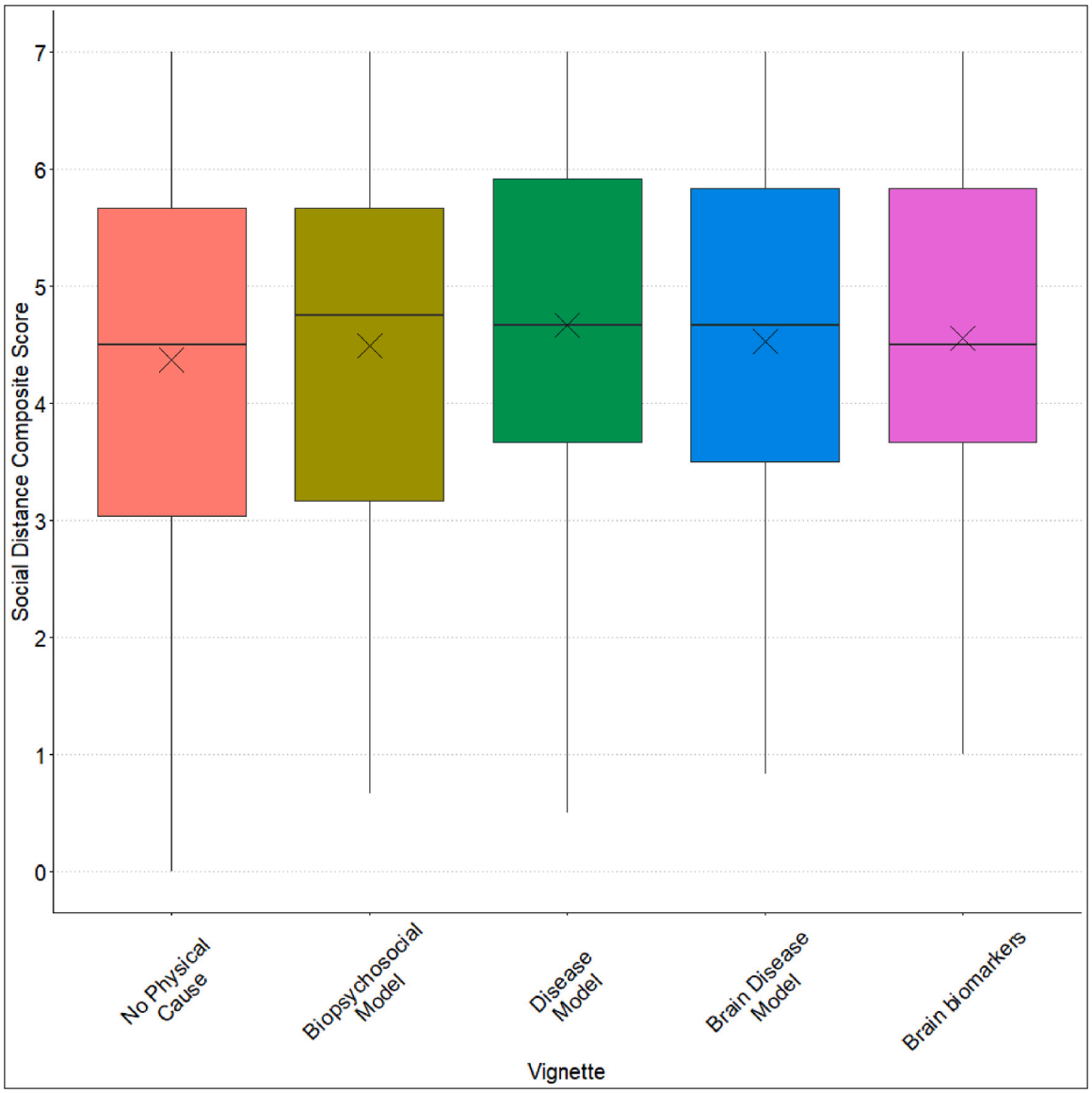


Fig. 4. Distribution of Social Distance Composite Score between Vignettes. Scores range from 0 (high social distance) to 7 (low social distance). Within each box, horizontal black lines denote the median; an X denotes the mean; no outliers were observed. The interquartile range indicates high variability, and long upper and lower adjacent values suggest potential skewness. The No Physical Cause vignette had the lowest mean. The Disease Model vignette had the highest mean.

distance) felt towards people with chronic pain by those without chronic pain. However, pain-related judgments were impacted by the different vignettes, with greater negative judgments towards Sam associated with the No Physical Cause vignette compared to the biomedical explanations of chronic pain (notably the Disease Model). Thus, biomedical explanations of chronic pain seem to have the effect of dampening negative judgments of those with chronic pain.

Although the effect was small, our finding of a possible beneficial effect of a biomedical explanation decreasing negative judgments is consistent with previous studies showing that using medicalized labels for conditions can heighten perceptions of severity and impact.[42,43] Also, if a person's chronic pain cannot be validated through imaging or other measures, it implies a lack of physical cause, and the pain may be dismissed.[15,44] A previous study conducted by members of our team found that Canadian adults with chronic pain showed high receptivity to brain scans for diagnosis and treatment, anticipating that their healthcare professional would be more likely to believe them.[45] In the absence of such physical manifestations of illness, in Western biomedical contexts, the sense of medical certainty imbued by labelling a condition a brain disease could negate or reverse this dismissal. Similar to a past study, we observed that there is evidence that people with chronic pain may experience negative judgments if their condition is more difficult to detect with a less defined biomedical explanation.[7] Notably, our study found a small effect size for pain-related judgments, indicating that participant responses to the judgment-related questions varied widely for reasons other than the explanation of Sam's pain.

We found that some demographic features (e.g., knowing someone with chronic pain, political leanings, gender, and age) may have contributed to public stigma (social distance) and judgment towards a person with chronic pain. However, these associations were minimal, so we interpret them with caution, as these results suggest that participant responses varied for other reasons. Our data suggests that participants who knew someone and have increased familiarity with chronic pain have less desire to distance themselves from someone with chronic pain. This effect resonates with existing stigma reduction strategies, as increased contact with a group associated with the stigmatized condition helps reduce stigma.[46] We interpret this conservatively, as familiarity may have a U-shaped relationship in which greater familiarity in

Table 2
Outcome Summary: Means and Medians.

Vignette	No Physical Cause	Biopsychosocial Model	Disease Model	Brain Disease Model	Brain Disease Model, Biomarker and Image
Mean (SD)	4.37 (1.69)	4.49 (1.48)	4.67 (1.55)	4.53 (1.52)	4.55 (1.48)
Median [Min, Max]	4.50 [0.00, 7.00]	4.75 [0.67, 7.00]	4.67 [0.50, 7.00]	4.67 [0.83, 7.00]	4.50 [1.00, 7.00]
Pain-Related Judgments Composite Score					
Vignette	No Physical Cause	Biopsychosocial Model	Disease Model	Brain Disease Model	Brain Disease Model, Biomarker and Image
Mean (SD)	4.51 (0.90)	4.87 (0.74)	5.05 (0.75)	4.83 (0.73)	4.89 (0.83)
Median [Min, Max]	4.63 [2.13, 6.38]	4.88 [1.88, 6.63]	5.13 [2.75, 6.75]	4.88 [2.75, 6.38]	5.00 [2.13, 7.00]

Table 3
Main Effects Likelihood Ratio Tests: Social Distance Composite Score.

Effect	df	X^2	p	Pseudo R^2
Vignette	4	2.71	.624	.003
Age	5	23.44	<.001 *	.079
Gender	1	0.86	.354	.011
Education	3	8.59	.035 *	.006
Race	5	20.14	.001 *	.020
Area type	3	3.48	.324	<.001
Country	1	7.91	.005 *	.004
Know anyone with chronic pain	2	9.97	.007 *	.017
Familiarity with chronic pain	3	8.35	.039 *	.006
Political affiliation	3	47.30	<.001 *	.039
Sam's gender	2	6.02	.049 *	.011

*Significant at the alpha (α) =.05 level

some groups may lead to increased stigma.[47] One study, for example, showed that stigma towards people with chronic migraines was greater among people closest to them, such as family and friends.[8] Additionally, participants who self-identified as having more right-wing than left-wing political leanings reported a greater desire to social distance and increased negative pain-related judgments. These findings are consistent with some literature, in which people who lean right-wing tend to express greater prejudice and stereotyping towards stigmatized populations.[48–51] One mental health stigma study found that a potential way to reduce stigmatizing behavior amongst people with right-wing political orientations is to create intervention programs that specifically target the perceived danger, threat, and unconventionality associated with that stigmatized group.[52] We also found demographic feature differences between 1) Asian, 2) people aged 35–44, and 3) people with college diploma or undergraduate degree who reported desiring higher levels of social distance from Sam, and 4) people aged 35–44 and 65–74, 5) men 6) people with college diploma or undergraduate degree having negative pain-related judgments. Given these findings, it is important for future research to explore age, racial, education, and gender-related differences and examine the potential influence on pain stigma.

Given the pervasiveness and harms of chronic pain stigma, creating an effective anti-stigma strategy is of ethical importance. Since our results did not indicate a significant difference between explanations of chronic pain on social distance as a proxy measure for public chronic pain stigma, we are left with the normative question as to *whether disease-based explanations of chronic pain should guide anti-stigma interventions.* This is critical given research on the potential negative unintended effects of anti-stigma campaigns.[53]

As discussed earlier, the BDMA continues to be controversial[54] and can serve as a cautionary tale for our study. The BDMA had a minimal impact on improving treatment and influencing public health policies.[54,55] A potential consequence of examining chronic pain as a brain disease is shifting the attention to brain changes, resulting in the brain becoming the focus of attention.[5] This shift could impact research agendas (e.g., increased funding for biomedical research with less emphasis on social sciences).[15] A brain disease model may privilege discussions of medicalization and curing, overlook social determinants of health, and potentially leave the person out of their recovery process.[9] This has implications for self-efficacy and pain management, as it may inadvertently limit individual behavior changes, shape self-thought (e.g. pain-related distress) and disincentivize engagement in one's care.[5]

Similar to the BDMA, genetic explanations of mental illness and stigma have been discussed in context of a mixed-blessing model, where some aspects of stigma increase and some aspects of stigma decrease.[56] In biological explanations, people tend to blame people with mental illnesses less for their condition because they cannot be at fault for their biology.[56] In our study, the Biopsychosocial Model vignette described Sam's chronic pain as a result of an interaction of factors, including genetics, which may have led participants to form less negative judgments towards Sam. However, biological explanations can increase other forms of stigma, such as the desire for social distance, perceived dangerousness, and a negative outlook on prognosis.[56]

There continues to be debate on whether chronic pain should be considered a disease or a brain disease,[12,15,57,58] and some argue that chronic pain is a dysfunction in the peripheral nervous system, which may secondarily impact the brain. Earlier critiques suggested that this presents a dilemma: a dysfunction in the central nervous system may be an adaptive response to consistent nociceptive input rather than a disease process.[58]

Finally, despite constructing our vignette to feature a fictitious person without an identified gender, most participants (79.7%) perceived Sam to be a man. If participants perceived Sam as a man, they were more likely to report greater social distance. This is noteworthy, given that chronic pain affects more women than men worldwide,[1,59] and women tend to report pain more frequently than men.[1,60]

6. Limitations

First, our results may be influenced by social desirability bias, as participants may answer questions that would be perceived favorably and underreport undesirable behavior. This could lead participants to report less social distance and more positive attitudes toward Sam, concealing their actions in a real-world context. Second, a (brain) disease explanation of chronic pain and biomarkers are not commonly discussed in the general population, which may have increased survey error. This is expected, considering the aforementioned concerns around the lack of consensus on how to define (brain) disease or what qualifies as one. Third, using a social distance measure designed for mental illness may reduce its comprehensiveness (as it measures a single dimension of stigma) and applicability for chronic pain. Fourth, recruitment through an online platform limits representation (e.g., adults without internet). However, online platforms may increase access for people who do not have traditional means of being involved in studies. Fifth, despite rigorous pre-testing, some participants may have interpreted the vignettes in ways we did not intend, engaged in valid or invalid straightlining (n=60 for social distance and n=0 for pain-related judgments), possibly affecting responses. The ad-hoc Pain-Related Judgments Composite Score may have limited validity and reliability, as it has not been validated in other studies.

Lastly, our results may be influenced by the 'male-unless-otherwise-indicated phenomenon',[61] where English-language readers default to assuming people as male unless identified as a woman or gender diverse.[62] It is unclear how the impacts of Sam's perceived gender may

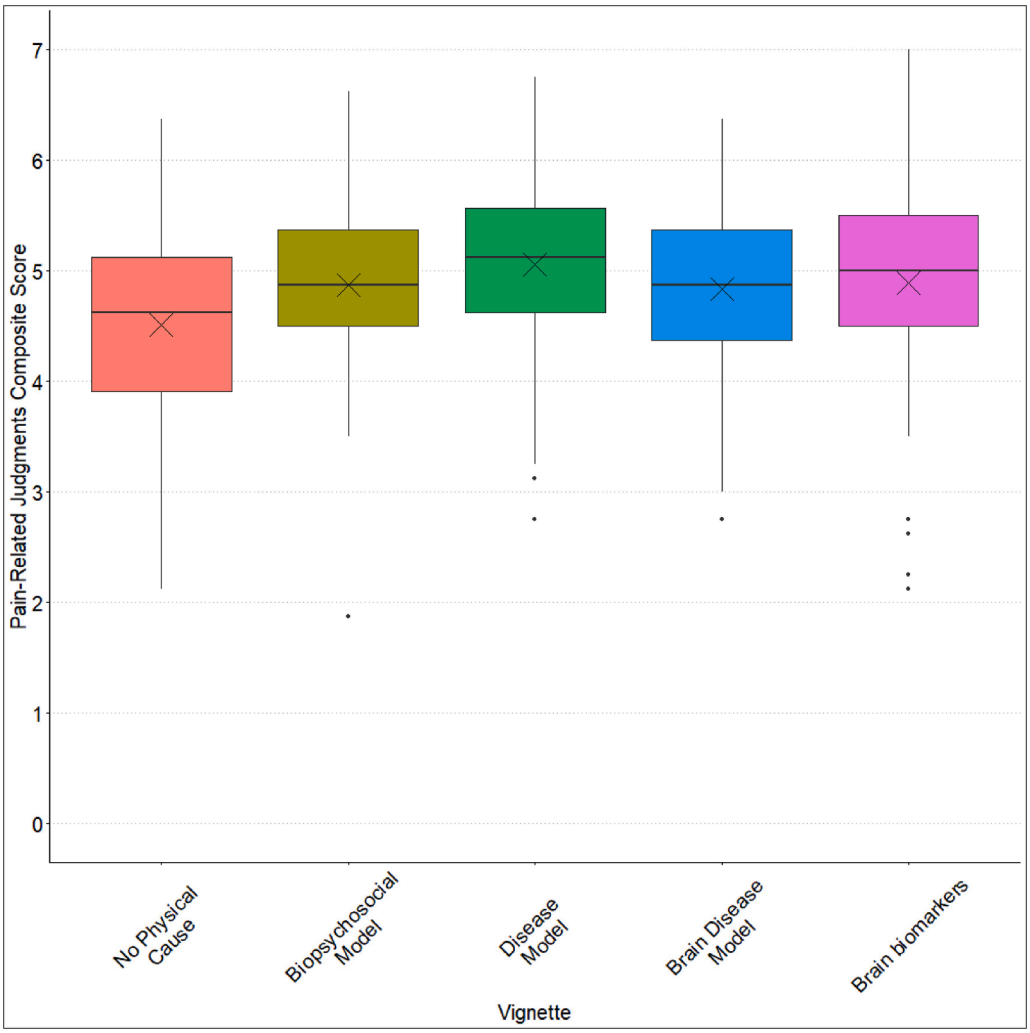


Fig. 5. Distribution of Pain-Related Judgments Composite Score between Vignettes. Scores range from 0 (negative judgments) to 7 (positive judgments). Within each box, horizontal black lines denote the median; an X denotes the mean. The Disease Model vignette had the highest median and mean. The No Physical Cause vignette had the lowest median and mean. All vignettes but the No Physical Cause had outliers.

Table 4
Pair Wise Comparison: Pain-Related Judgments Composite Score.

No Physical Cause - Biopsychosocial Model	-0.37	0.11	503	-3.31	.009 *	-0.46
No Physical Cause - Disease Model	-0.55	0.11	503	-4.93	<.001 *	-0.69
No Physical Cause - Brain Disease Model	-0.32	0.11	503	-2.94	.029 *	-0.41
No Physical Cause - Brain Disease Model, Biomarkers and Image	-0.38	0.11	503	-3.46	.005 *	-0.48
Biopsychosocial Model - Disease Model	-0.18	0.11	503	-1.61	.494	-0.23
Biopsychosocial Model - Brain Disease Model	0.04	0.11	503	0.38	.995	0.05
Biopsychosocial Model - Brain Disease Model, Biomarkers and Image	-0.02	0.11	503	-0.14	>.999	-0.02
Disease Model - Brain Disease Model	0.22	0.11	503	2.00	.268	0.28
Disease Model - Brain Disease Model, Biomarkers and Image	0.16	0.11	503	1.47	.584	0.21
Brain Disease Model - Brain Disease Model, Biomarkers and Image	-0.06	0.11	503	-0.53	.984	-0.35

*Significant at the alpha (α) =.05 level

Table 5
Main Effects Likelihood Ratio Tests: Pain-Related Judgments Composite Score.

Effect	df	X^2	*p*	Pseudo R^2
Vignette	4	26.20	<.001 *	.044
Age	5	19.83	.001 *	.033
Gender	1	11.68	<.001 *	.021
Education	3	7.80	.050 *	.018
Race	5	3.56	.614	.007
Area type	3	1.58	.664	.003
Country	1	0.12	.730	<.001
Know anyone with chronic pain	2	2.09	.351	.004
Familiarity with chronic pain	3	4.48	.214	.008
Political affiliation	3	19.86	<.001 *	.035
Sam's gender	2	3.79	.150	.007

*Significant at the alpha (α) =.05 level

have influenced our study, and to what extent our findings can be extrapolated. Our research suggests that gender should be a variable embedded in vignette development to enhance robustness.

7. Conclusion

In conclusion, our study underscores the importance of how the framing of the underlying cause of chronic pain can influence pain-

related judgments. Future studies should include additional populations, such as healthcare professionals and people with chronic pain, to examine multiple dimensions of stigma, such as structural and internalized stigma, to gain a more nuanced understanding of the effects of (brain) disease model explanations on chronic pain stigma.

Statement

All authors that are listed have contributed substantially to the content of this manuscript. No other manuscripts from the same study were submitted for publication or publicized.

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Declaration of Competing Interest

All authors report no conflict of interest.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jpain.2026.106299.

Data availability

The research data is confidential.

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