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Is Pain in the Uninjured Leg Associated With Unhelpful Thoughts and Distress Regarding Symptoms During Recovery From Lower Extremity Injury?

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Abstract

Background Patients recovering from lower extremity injuries often interpret discomfort associated with increased use of the uninjured leg as a potential indication of harm. If expressed concerns regarding contralateral leg pain are associated with unhelpful thinking regarding symptoms, they can signal orthopaedic surgeons to gently reorient these thoughts to help improve comfort and capability during recovery.

Questions/purposes We asked: (1) Among people recovering from isolated traumatic lower extremity injury, is pain intensity in the uninjured leg associated with unhelpful thoughts and feelings of distress regarding symptoms, accounting for other factors? (2) Are pain intensity in the injured leg, magnitude of capability, and accommodation of pain associated with unhelpful thoughts and feelings of distress regarding symptoms?

Methods Between February 2020 and February 2022, we enrolled 139 patients presenting for an initial evaluation or return visit for any traumatic lower extremity injury at the offices of one of three musculoskeletal specialists. Patients had the option to decline filling out our surveys, but because of the cross-sectional design, required fields on the electronic survey tools, and monitored completion, there were few declines and few incomplete surveys. The median age of participants was 41 years (IQR 32 to 58), and 48% (67 of 139) were women. Fifty percent (70 of 139) injured their right leg. Sixty-five percent (91 of 139) had operative treatment of their fracture. Patients completed measures of pain intensity in the uninjured leg, pain intensity in the injured leg, lower extremity–specific magnitude of capability, symptoms of depression, symptoms of health anxiety, catastrophic thinking, and accommodation of pain. Multivariable analysis sought factors independently associated with pain intensity in the uninjured leg, pain intensity in the injured leg, magnitude of capability, and pain accommodation, controlling for other demographic and injury-related factors.

Results Greater pain intensity in the uninjured leg (regression coefficient [RC] 0.09 [95% CI 0.02 to 0.16]; $p < 0.01$) was moderately associated with more unhelpful thinking regarding symptoms. This indicates that for every one-unit increase in unhelpful thinking regarding symptoms on the 17-point scale we used to measure pain catastrophizing, pain intensity in the uninjured leg increases by 0.94 points on the 11-point scale that we used to measure pain intensity, holding all other independent variables constant. Greater pain intensity in the injured leg (RC 0.18 [95% CI 0.08 to 0.27]; $p < 0.01$) was modestly associated with more unhelpful thinking regarding symptoms. Greater pain accommodation (RC -0.25 [95% CI -0.38 to -0.12];

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$p < 0.01$) was modestly associated with less unhelpful thinking regarding symptoms. Greater magnitude of capability was not independently associated with less unhelpful thinking regarding symptoms.

Conclusion A patient's report of concerns regarding pain in the uninjured limb (such as, "I'm overcompensating for the pain in my other leg") can be considered an indicator of unhelpful thinking regarding symptoms. Orthopaedic surgeons can use such reports to recognize unhelpful thinking and begin guiding patients toward healthier thoughts and behaviors.

Level of Evidence Level II, prognostic study.

Introduction

When patients are recovering from a lower extremity injury, the uninjured leg may be used more. Use of an extremity is typically considered training or exercise with any subsequent discomfort interpreted as healthy, but patients often interpret discomfort associated with increased use after injury as a potential indication of harm. They may interpret it as "overuse." A phrase we often hear in the office is "I've been overcompensating since my injury, and my other leg is hurting now." Although stress fractures and osteoarthritis in a pitcher's elbow are examples of pathology related to use, discomfort in the uninjured leg experienced as "overcompensation" is unlikely to be problematic [7, 9, 25]. On the other hand, the negative mindset regarding altered activities is definitely unhealthy [6, 22].

This unhealthy interpretation of increased demands on the uninjured leg during recovery may be a specific manifestation of general unhelpful thinking regarding symptoms. There is mounting evidence that greater unhelpful thinking (such as catastrophic thinking, health anxiety, and kinesiophobia) are some of the strongest correlates of greater pain intensity and decreased magnitude of capability [10, 12-15, 21]. This can be amplified by concomitant symptoms of depression or anxiety (feelings of distress) [4]. In addition, there is evidence that a patient's expression of certain verbal and nonverbal cues correlates with unhelpful thinking and symptoms of distress [2, 27]. If an association can be established between expressing concerns of "overcompensation" and greater unhelpful thinking, pain intensity, and magnitude of incapability, this phrase and concept could be added to the list of useful cues that can alert musculoskeletal specialists to underlying unhelpful thoughts that may benefit from gentle reorientation.

We asked: (1) Among people recovering from isolated traumatic lower extremity injury, is pain intensity in the uninjured leg associated with unhelpful thoughts and feelings of distress regarding symptoms, accounting for other factors? (2) Are pain intensity in the injured leg, magnitude of capability, and accommodation of pain associated with unhelpful thoughts and feelings of distress regarding symptoms?

Patients and Methods

Study Design and Setting

This was a cross-sectional study of patients presenting for an initial evaluation or return visit for any traumatic lower extremity injury at the offices of one of three musculoskeletal specialists. These specialists included two trauma orthopaedists (DL and AH) and one sports orthopaedist working primarily in an urban setting, receiving referrals from primary care and emergency rooms.

Participants

Between February 2020 and February 2022, we enrolled 139 patients presenting for an initial evaluation or return visit for any traumatic lower extremity injury at the offices of one of three musculoskeletal specialists. We did not track declines because they are uncommon in our cross-sectional studies. Because of the cross-sectional design, required fields on the electronic survey tools, and monitored completion there were few incomplete surveys, and missing data were accounted for using statistical methods. The extended enrollment duration was caused by the Coronavirus-19 pandemic; the study was put aside temporarily, and when enrollment resumed there was competition with other studies. After patients completed their office visit, our questionnaires were administered on the Research Electronic Data Capture (REDCap, Vanderbilt) system, an internet-based Health Insurance Portability and Accountability Act–compliant data collection tool. Adult patients (age 18 and older) with English-language fluency and literacy were included in this study. Patients with bilateral injuries or cognitive deficiencies precluding survey participation were excluded.

Descriptive Data

The median age of participants was 41 years (IQR 32 to 58), and 48% (67 of 139) were women. Fifty percent (70 of 139) injured their right leg. Sixty-five percent (91 of 139) had operative treatment of their fracture (Table 1).

Outcomes Instruments

Participants were asked to complete the following questionnaires: pain intensity in the uninjured leg, pain intensity in the injured leg, Patient-Reported Outcomes Measurement Information System (PROMIS) Depression computer

Table 1. Patient demographics (n = 139)

Variable	Value
Age in years	41 (32 to 58)
Height in inches	67 (64 to 70)
Weight in kg	79 (66 to 88)
Women	48 (67)
% with smoking history	17 (23)
Operative fracture treatment	65 (91)
Right leg injury	50 (70)
Married or with partner	40 (56)
Non-White race[a]	50 (70)
Employed	63 (87)
Education	
High school or less	29 (40)
Some college	30 (41)
College graduate	25 (35)
Master's degree or higher	17 (23)
Insurance status	
County safety net insurance	6 (8)
Medicaid	4 (5)
Medicare	18 (25)
Private	50 (69)
Uninsured	15 (21)
Workers' compensation	8 (11)
Assistive devices	
Crutches	32 (45)
Knee scooter	6 (8)
Walker	17 (24)
Other	17 (24)
None	27% (38)
Weightbearing status	
Full weightbearing	54 (63)
Nonweightbearing	25 (29)
Partial weightbearing	21 (25)
Location of clinic visit	
Office 1	9 (10)
Office 2	25 (29)
Office 3	67 (78)
PROMIS Depression	51 (44 to 59)
Time from injury in weeks	8 (3 to 20)
SHAI	5.0 ± 2.7
PCS	4 (1 to 7)
Outcome variables	
Pain in uninjured side	0 (0 to 2)
Pain in injured side	3 (2 to 5)
PROMIS Physical Function	33 (24 to 39)
PSEQ	9.0 ± 3.0

Data presented as mean ± SD, median (IQR), or % (n).
[a]Race (White or other) was self-reported by participants in a demographics survey. PROMIS = Patient-Reported Outcomes Measurement Information System; SHAI = Short Health Anxiety Inventory; PCS = Pain Catastrophizing Scale; PSEQ = Pain Self-Efficacy Questionnaire.

adaptive test, PROMIS Physical Function computer adaptive test, Short Health Anxiety Inventory, Pain Catastrophizing Scale (PCS), Pain Self-Efficacy Questionnaire, and additional information (side of injury, use of assistive devices, weightbearing status, whether injury was treated with surgery, and clinic site). In addition, patients completed a demographics questionnaire (age, height, weight, gender, self-described race or ethnicity, marital status, highest education level, employment status, insurance status, and smoking status). We grouped self-described Hispanic ethnicity and non-White race as people who are historically marginalized in our region.

Patients rated pain intensity in the uninjured and injured legs on separate validated 11-point ordinal scales from 0 (no pain) to 10 (worst pain ever) [1].

The validated PROMIS Physical Function computer adaptive test assesses magnitude of capability, and the validated PROMIS Depression assesses depression [3]. Scores are reported; the United States population mean and SD is represented by 50 ± 10.

The validated Short Health Anxiety Inventory and PCS assess health anxiety and catastrophic thinking regarding symptoms, respectively [14, 15]. These surveys represent unhelpful thoughts and feelings of distress regarding symptoms.

The validated Pain Self-Efficacy Questionnaire assesses accommodation of pain [18]. This is described in the evidence as resiliency to perform activities while in pain.

Ethical Approval

Ethical approval for this study was obtained from the Office of Research Support and Compliance at the University of Texas at Austin, Austin, TX, USA.

Statistical Analysis

We conducted descriptive statistics for all patients. The factors associated with pain intensity in the uninjured leg, pain intensity in the injured leg, magnitude of capability, and pain accommodation were sought with either Mann-Whitney U tests or Kruskal-Wallis H tests according to the type of variables. Spearman rank correlations were run for the continuous variables. All variables with $p < 0.10$ were moved into the multivariable regression analysis. All p values below 0.05 were considered statistically significant. Our approach to mental health measures is to assume that they are colinear (meaning that the measures being used to assess mental health are highly correlated with each other, which can lead to problems in statistical analysis, such as overestimating the importance of certain measures or producing unstable and inconsistent results), and the Spearman correlation coefficient confirmed this fact. The reason for this is that we have

observed strange results in multivariable models that included several variables measuring thoughts and feelings, even when the correlation coefficients and variance inflation factors were considered acceptable by conventional thresholds. Therefore, our current approach is to enter a single mental health variable, chosen based in part on correlation coefficients in a bivariate analysis, in part on a priori considerations based on collective evidence, and in part on ease of interpreting the results. The PCS was the most suitable variable for placement in the final models because it aligned more closely with the study's goal and made the findings easier to interpret.

Sample Size Calculation

Multivariable analysis was used for calculating sample size. We set the alpha at 0.05 and ran a power analysis. It indicated that a minimum sample size of 136 patients would provide 80% statistical power. This was based on a regression analysis with five predictors and the assumption that our complete model would account for 15% of the overall variability and that pain intensity in the injured leg would account for 5% or more of the variability in pain intensity in the uninjured leg. To account for the incomplete responses, we aimed for a sample of 141 patients.

Results

Is Pain Intensity in the Uninjured Leg Associated With Unhelpful Thoughts?

Controlling for operative treatment of fracture and level of education (Supplemental Table 1; http://links.lww.com/CORR/B118, and Supplemental Table 2; http://links.lww.com/CORR/B119), in the multivariable analysis, greater pain intensity in the uninjured leg was moderately associated with more unhelpful thinking regarding symptoms (PCS) (regression coefficient [RC] 0.09 [95% CI 0.02 to 0.16]; $p < 0.01$). Having some college education (RC -0.87 [95% CI -1.65 to -0.09]; $p = 0.03$) was associated with lower pain intensity in the uninjured leg (Table 2). Because the regression coefficient in negative binomial regression measures the change in the logarithm of the explanatory variable, a regression coefficient of 0.09 indicates that for every one-unit increase in unhelpful thinking regarding symptoms on the 17-point PCS, pain intensity in the uninjured leg increases by 0.94 on the 11-point scale we used to measure pain intensity, holding all other independent variables constant.

Are Pain Intensity in the Injured Leg, Magnitude of Capability, and Accommodation of Pain Associated With Unhelpful Thoughts?

Controlling for operative fracture treatment, insurance status, and weightbearing status (Supplemental Table 1; http://links.lww.com/CORR/B118, and Supplemental Table 2; http://links.lww.com/CORR/B119), in the multivariable analysis, greater pain intensity in the injured leg was modestly associated with more unhelpful thinking regarding symptoms (PCS) (RC 0.18 [95% CI 0.08 to 0.27]; $p < 0.01$). This indicates that for every one-unit increase in unhelpful thinking regarding symptoms on the 17-point PCS, pain intensity in the injured leg increases by 0.18 on the 11-point scale we used to measure pain intensity, holding all other independent variables constant. Greater pain intensity in the injured leg was also associated with having a nonprivate insurance other than Medicare (RC 1.98 [95% CI 0.90 to 3.05]; $p < 0.01$) and nonweightbearing status (RC 1.40 [95%

Table 2. Negative binomial regression of factors associated with pain in uninjured side

	Regression coefficient (95% CI)	p value	Δ-AIC
Pain Catastrophizing Scale	0.09 (0.02 to 0.16)	0.009	5.02
Operative treatment of fracture			
No	Reference value		-0.33
Yes	-0.41 (-1.04 to 0.22)[a]	0.20	
Education			
High school or less	Reference value		-1.31
Some college	-0.87 (-1.65 to -0.09)	0.03	
College graduate	-0.42 (-1.19 to 0.35)	0.28	
Master's degree or higher	-0.44 (-1.31 to 0.42)	0.32	

[a]The coefficient for independent categorical variables such as "operative treatment of fracture" in this model represents the expected change in the logarithm of pain level in the uninjured side of the body for patients who had operative fracture treatment, compared with patients who did not, while holding all other variables in the model constant. Δ AIC = Akaike Information Criterion; AIC of the full model was compared with the model without each variable. Higher values indicate better fit.

CI 0.43 to 2.37]; p < 0.01). Operative fracture treatment (RC -1.06 [95% CI -1.90 to -0.22]; p = 0.01) was associated with lower pain intensity in the injured leg (Table 3).

Controlling for employment status, assistive devices, and weightbearing status (Supplemental Table 1; http://links.lww.com/CORR/B118, and Supplemental Table 2; http://links.lww.com/CORR/B119), in the multivariable analysis, greater magnitude of capability was associated with employment (RC 3.08 [95% CI 0.231 to 5.94]; p = 0.03) and not using an assistive device (RC 7.52 [95% CI 3.66 to 11.38]; p < 0.01). This indicates that being employed, compared with any other employment status, leads to an increase in the magnitude of capability by 3 units on the PROMIS Physical Function CAT, which represents 0.3 standard deviation improvement, holding all other variables constant. Nonweightbearing status (RC -6.30 [95% CI -10.03 to -2.58]; p < 0.01) was associated with a lesser magnitude of capability. Of note, greater magnitude of capability was not associated with less unhelpful thinking (PCS) (RC -0.34 [95% CI -0.68 to 0.00]; p = 0.053) (Table 4). In a sensitivity analysis, we found that including symptoms of depression (PROMIS Depression) rather than catastrophic thinking (PCS) in the model was significant (Supplemental Table 3; http://links.lww.com/CORR/B120).

Controlling for assistive devices and weightbearing status (Supplemental Table 1; http://links.lww.com/CORR/B118, and Supplemental Table 2; http://links.lww.com/CORR/B119), in the multivariable analysis, greater pain accommodation was modestly associated with less unhelpful thinking regarding symptoms (PCS) (RC -0.25 [95% CI -0.38 to -0.12]; p < 0.01). This indicates that for every one-unit increase in unhelpful thinking regarding symptoms on the 17-point PCS, pain accommodation decreases by 0.25 on the 11-point scale we used to measure pain intensity, holding all other independent variables constant (Table 5).

Discussion

Patients recovering from lower extremity injury often interpret discomfort associated with increased use of the uninjured leg as an indication of harm. They may express concerns about such pains. A common expression is to relate the pain to "overcompensation." A growing body of evidence supports a biopsychosocial model of health, in which perceived symptoms represent a combination of pathophysiology, mindset, and circumstances [28]. This is in contrast to the traditional biomedical model, which anticipates a direct correspondence of symptoms and pathophysiology. In support of the biopsychosocial paradigm, regarding musculoskeletal injury, unhelpful thoughts and distress regarding symptoms correlate with variation in pain intensity and magnitude of capability, more so than injury severity [10, 12, 13, 16, 19]. Our study found that during recovery from a lower extremity injury, greater pain intensity in the uninjured leg was associated with modestly greater unhelpful thinking regarding symptoms. This suggests that the expression of concern regarding pain in the uninjured limb might serve as a useful cue to the orthopaedic surgeon to address potential unhelpful thinking.

Limitations

First, we studied the concept of patients experiencing pain in the uninjured extremity during injury recovery as a

Table 3. Multilevel linear regression of factors associated with pain in injured side, accounting for nesting by clinic location

	Regression coefficient (95% CI)	p value	Delta-AIC
Pain Catastrophizing Scale	0.18 (0.08 to 0.27)	< 0.001	9.4
Surgical procedure			3.9
No	Reference value		
Yes	-1.06 (-1.90 to -0.22)	0.01	
Insurance status			6.1
Private	Reference value		
Medicare	1.04 (-0.08 to 2.17)	0.07	
Others	1.98 (0.90 to 3.05)	< 0.001	
Uninsured	1.05 (-0.11 to 2.21)	0.08	
Weightbearing status			3.7
Full weightbearing	Reference value		
Nonweightbearing	1.40 (0.43 to 2.37)	0.005	
Partial weightbearing	0.38 (-0.63 to 1.39)	0.46	

SHAI and PROMIS have been dropped because of multicollinearity with PCS. Week to injury and education have been dropped because of multicollinearity with weightbearing status and insurance status, respectively. Δ AIC = Akaike Information Criterion; AIC of the full model was compared with the model without each variable. Higher values indicate better fit.

Table 4. Multilevel linear regression of factors associated with PROMIS Physical Function including PCS, accounting for nesting by clinic location

	Regression coefficient (95% CI)	p value	Δ-AIC
Pain Catastrophizing Scale	-0.34 (-0.68 to 0.00)	0.053	1.7
Employment status			
Unemployed, student, or retired	Reference value		
Employed	3.08 (0.23 to 5.94)	0.03	2.4
Assistive devices			
Crutches	Reference value		12.5
Knee scooter	1.44 (-4.24 to 7.11)	0.62	
Walker	-2.64 (-6.75 to 1.46)	0.21	
Other	1.82 (-2.41 to 6.05)	0.40	
None	7.52 (3.66 to 11.38)	< 0.001	
Weightbearing status			6.5
Full weightbearing	Reference value		
Nonweightbearing	-6.30 (-10.03 to -2.58)	0.001	
Partial weightbearing	-2.64 (-6.31 to 1.03)	0.16	

SHAI and PROMIS Depression have been dropped because of multicollinearity with PCS. Week to injury and insurance status have been dropped due to multicollinearity with weightbearing status and employment status, respectively. Δ AIC = Akaike Information Criterion; AIC of the full model was compared to the model without each variable. Higher values indicate better fit.

marker of concerns regarding pain, rather than any specific verbalization of the experience. Future studies can address whether specific phrases (such as "overcompensation") signal greater unhelpful thinking. Second, as is common with cross-sectional studies, these data might apply best to people presenting in our community, a relatively White and wealthy, large, urban setting. Our analysis, however, depends on relative variation rather than absolute rates, and the concepts measured are common to humans in all contexts. Therefore, we feel that similar associations are likely

Table 5. Linear regression of factors associated with the Pain Self-Efficacy Questionnaire

	Regression Coefficient (95% CI)	p value	Semi-partial R-squared[a]
Pain Catastrophizing Scale	-0.25 (-0.38 to -0.12)	< 0.001	0.12
Assistive devices			0.02
Crutches	Reference value		
Knee scooter	-0.07 (-2.30 to 2.15)	0.95	
Walker	-0.39 (-1.98 to 1.20)	0.63	
Other	0.16 (-1.50 to 1.81)	0.85	
None	0.75 (-0.75 to 2.26)	0.32	
Weightbearing status			0.02
Full weightbearing	Reference value		
Nonweightbearing	-0.88 (-2.34 to 0.58)	0.23	
Partial weightbearing	1.22 (-0.21 to 2.65)	0.09	

SHAI and PROMIS have been dropped because of multicollinearity with PCS.
[a]Semi-partial R-squared is a statistical measure to assess the contribution of a single independent variable such as the Pain Catastrophizing Scale to the overall variation explained by the regression model, while controlling for the effects of other independent variables. It represents the proportion of the total variation in the dependent variable that can be explained by a single independent variable. The R-squared value for the PSEQ (0.14) represents the proportion of the total variation in the dependent variable that is explained by the independent variables in the regression model. Adjusted R-squared is a statistical measure that adjusts the R-squared value to account for the number of independent variables included in the model. It is similar to the R-squared value but takes into account the potential impact of adding additional independent variables to the model.

in other populations. Third, our study enrolled patients with various lower extremity injuries, which could be considered a strength because enrolling consecutive patients likely resulted in a representative spectrum of lower extremity injuries. The results might vary for individual injuries, but in our opinion, that is unlikely. We accounted for the severity of the injury by controlling for weight-bearing status, use of assistive devices, and operative treatment of the fracture; each of those factors had limited impact.

Fourth, we recorded race or ethnicity as a dichotomous "White" versus "non-White." As mentioned, we grouped self-described Hispanic ethnicity and non-White race as people who are historically marginalized in our region. Rather than evaluating whether a particular race or ethnicity was associated with pain in the uninjured leg, we attempted to investigate whether historically marginalized or historically nonmarginalized people had different levels of pain in the uninjured leg and different correlations with unhelpful thinking, and they did not. Fifth, we anticipated there would be some symptomatic or accommodated pathophysiology (for example, hip arthritis) in the contralateral leg. There are several reasons we did not try to control for this: First, it would not be possible to detect all accommodated pathophysiology in the leg. Second, there is limited correlation between pathophysiology and comfort or capability [5, 8, 9, 17]; and third, we were interested in associations that held for the broad spectrums of associated contralateral pathophysiology that occurs in patients seeking specialty care for their lower extremity. Experiments that control for specific types and severities of contralateral pathophysiology might demonstrate a lesser or greater relationship between contralateral leg pain and catastrophic thinking, but we think that is unlikely, and in any case, our experiment is a useful first step. Sixth, this study cannot address direction or causation. In our opinion, direction can be considered irrelevant, and association is sufficient. Unhelpful thoughts or feelings of distress are treatable aspects of illness regardless of their source.

Is Pain Intensity in the Uninjured Leg Associated With Unhelpful Thoughts?

The finding that greater pain intensity in the uninjured leg during recovery from lower extremity injury is associated with modestly greater unhelpful thinking regarding symptoms suggests that a patient's expression of pain in the contralateral leg may be a verbal indicator of underlying unhelpful thinking regarding symptoms. Prior studies [2, 27] have shown similar associations of verbal and nonverbal cues with unhelpful thinking. For instance, patients who use phrases like "I can't …" or "Something is wrong …" are often experiencing more unhelpful thoughts. Further, in a study of patients with upper limb problems, protective hand postures, such as flexing the wrist when making a fist, are more likely in patients experiencing catastrophic thinking, and there may be lower extremity equivalents [2, 27]. The results of our study lead us to believe that a patient's reporting of "overcompensation" or any concern regarding pain in the uninjured extremity may be another cue for the orthopaedic surgeon that the patient might be manifesting unhelpful thinking. This observation has an important clinical application, namely that clinicians can recognize concern regarding uninjured leg pain as a signal of potential unhelpful thoughts that could benefit from reorientation. The foundation of successful reorientation is trust-building. To achieve this, first, use compassionate and normalizing statements such as "We hear this a lot. It's not uncommon for people to wonder whether it's healthy to use their other leg more often." Or you could add some empathy to the noticing statement: "and on top of the pain you're feeling after you broke your bone, now you're also dealing with pain on the other side." Look at the patient's face as you say this. Pause and let the patient consider what you are saying. Give that person time to reflect and then respond. If a patient seems receptive, he or she might be ready for a gentle reorientation, such as "We think of this soreness as exercise. It's a good kind of sore." Some patients, however, will cling to the idea that pain in the uninjured leg represents harm. These patients may not be receptive to reorientation. Instead, return to an emphasis on building a trusting relationship. Consider scheduling more frequent touchpoints, involving other members of the team who can help with navigation and reorientation (if the patient is receptive), or reaching out to other clinicians the patient trusts. Some patients may ultimately benefit from psychosocial interventions such as mindfulness meditation, cognitive behavioral therapy, and relaxation response strategies, which alleviate pain and improve capability in people with musculoskeletal disorders [20, 26]. These can only be initiated on patient request. There may be a moment where you can say with compassion, "This is hard … tell me about your emotional support," and then perhaps, "Could you use more support?" If you never reach this point of trust and receptiveness, further interventions can often be coordinated with the patient's primary care clinician.

Are Pain Intensity in the Injured Leg, Magnitude of Capability, and Accommodation of Pain Associated With Unhelpful Thoughts?

The findings that greater pain intensity in the injured leg and lower accommodation of pain are associated with

unhelpful thinking regarding symptoms—and the finding that magnitude of incapability was associated with symptoms of depression in sensitivity analyses—are consistent with prior studies of people with musculoskeletal disorders [10, 11, 23, 24]. Unhelpful thoughts such as catastrophic thinking and kinesiophobia are common during recovery from injury. The absence of multivariable association between greater magnitude of capability and less unhelpful thinking regarding symptoms in this study may be due to confounding with other factors such as employment and use of an assistive device. In a sensitivity analysis, we found that when we included symptoms of depression (PROMIS Depression) rather than catastrophic thinking (PCS), mindsets had a modest association, which is more consistent with other evidence. Regardless, what is becoming clear is that unhelpful thinking and feelings of distress, more so than severity of pathology, account for variation in pain intensity, magnitude of incapability, and accommodation of pain [5, 8, 9, 17]. Awareness of these associations helps clinicians anticipate these opportunities to facilitate recovery. Orthopaedic surgeons can be attuned to verbal and nonverbal cues that a patient is experiencing unhelpful thoughts (symptom misinterpretation) and distress regarding symptoms and be prepared with communication strategies to gain trust and provide gentle reorientation toward healthier thoughts, feelings, and behaviors.

Conclusion

Based on this study of patients recovering from an isolated traumatic lower extremity injury, we believe that a patient's reporting of pain in the uninjured limb (such as "I'm overcompensating.") can be considered an indicator of unhelpful thinking regarding symptoms. Recognizing unhelpful thinking can help clinicians anticipate important symptom misinterpretation and work toward gentle reorientation toward healthier thoughts and behaviors.

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