Received: 28 August 2023 | Revised: 22 May 2024 | Accepted: 6 June 2024

DOI: 10.1002/smi.3436

WILEY

RESEARCH ARTICLE

Emotions in search of words: Does alexithymia predict treatment outcome in chronic musculoskeletal pain?

Roberta Lanzara[1] | Chiara Conti[1] | Vittorio Lalli[2] | Paolo Cannizzaro[2] | Gianna Pia Affaitati[3] | Maria Adele Giamberardino[4] | Alison Williams[1] | Piero Porcelli[1]

[1]Department of Psychological, Health, and Territorial Sciences, University "G. d'Annunzio" of Chieti-Pescara, Chieti, Italy

[2]Department of Anesthesia and Intensive Care, Regional Pain Unit, University Hospital SS. Annunziata, Chieti, Italy

[3]Department of Innovative Technologies in Medicine & Dentistry, University "Gabriele d'Annunzio", Chieti, Italy

[4]Department of Medicine and Science of Aging, "G. d'Annunzio" University of Chieti-Pescara, Chieti, Italy

Correspondence
Roberta Lanzara, Department of Psychological, Health, and Territorial Sciences, University "G. d'Annunzio" of Chieti-Pescara, Chieti, Italy.
Email: roberta.lanzara@unich.it

Abstract

Chronic pain, with its complex and multidimensional nature, poses significant challenges in identifying effective long-term treatments. There is growing scientific interest in how psychopathological and personality dimensions may influence the maintenance and development of chronic pain. This longitudinal study aimed to investigate whether alexithymia can predict the improvement of pain severity following a treatment-as-usual programme for chronic musculoskeletal pain over and above psychological cofactors (emotional distress, catastrophizing, and self-efficacy). A consecutive sample of 129 patients with diagnosed chronic musculoskeletal pain referred to two tertiary care centres was recruited and treated for 16 weeks. Clinical pain, psychological distress, self-efficacy, catastrophizing, and alexithymia were assessed with validated self-report measures at the first medical visit (T0) and at 16-week follow-up (T1). Compared with non-responder patients (n = 72, 55.8%), those who responded (i.e., reduction of >30% in pain severity; n = 57, 44.2%) reported an overall improvement in psychological variables except alexithymia. Alexithymia showed relative stability between baseline and follow-up within the entire sample and remained a significant predictor of treatment outcome even when other predictive cofactors (i.e., pain interference, depressive symptoms, and catastrophizing) were considered simultaneously. Our results suggest that identifying patients with a co-occurrence between alexithymia, depressive symptoms, catastrophizing, and the stressful experience of chronic pain can be clinically relevant in pain prevention and intervention programs.

KEYWORDS
anxiety, depression, emotion regulation, nociception/pain perception, treatment

1 | INTRODUCTION

Pain is recognized as an 'unpleasant sensory and emotional experience' (Raja et al., 2020) whose function is to signal potentially damaging stimuli to promote physiological homoeostasis (Bonica, 1953). Chronic pain has been defined as pain that persists beyond the usual healing time (it lasts or recurs over 3 months) and thus does not have the warning role of acute physiological noxious stimuli (Merskey & Bogduk, 1994). Globally, about 20% of the population suffers from chronic pain (Sà et al., 2019), with estimated direct and indirect costs of €440 billion per year in Europe (Societal Impact of Pain, 2017) and $560–635 billion per year in the United States (Institute of Medicine, 2011).

The multidimensional aetiology and inter-subject variability of chronic pain pose challenges to the effectiveness of treatments, with significant implications for patient quality of life (Global Burden of Disease, 2018). Up to 61% of patients undergoing treatment-as-usual (TAU) do not achieve a clinically significant reduction in pain severity (Breivik et al., 2006). Reviews and meta-analyses have pointed out that many treatments for chronic pain show low-to-medium efficacy and limited short-term benefits (Babatunde et al., 2017; Hylands-White et al., 2017; Wiffen & Xia, 2020). However, rather than a general lack of treatment efficacy, these results may indicate substantial interindividual heterogeneity which obscures positive outcomes in some patient subgroups (Edwards et al., 2018). The experience of pain is influenced by biological and psychosocial factors that interact dynamically, leading to considerable inter-patient variability in treatment outcomes (Edwards et al., 2018). International guidelines for pain management point out the need to identify psychological characteristics of patients who are at higher risk of developing and maintaining pain over time, to design individualised treatments and maximise their efficacy (e.g., Dowell et al., 2016; National Guideline Center United Kingdom, 2021). Systematic reviews have shown that psychopathological (such as anxiety and depression) and personality factors (such as pain catastrophizing and self-efficacy) are significantly associated with chronic pain (Edwards et al., 2016).

Anxiety and depression symptoms are some of the most studied psychological factors associated with chronic pain. The relationship between pain and psychological distress seems to be bidirectional; the impact of symptoms on daily life, the fear that pain will worsen, and the uncertainty of prognosis may contribute to the onset of distress symptoms (Rogers & Farris, 2022). At the same time, longitudinal studies have shown that premorbid psychological distress may be a risk factor for the onset of many chronic pain conditions (Lerman et al., 2015; Vadivelu et al., 2017) and can predict pain severity and response to treatment (e.g., Hooten, 2016; Stubbs, 2016). Catastrophizing is one of the strongest predictors of chronic pain and is defined as the tendency to amplify the perceived threat of the painful stimulus, to feel powerless in the context of pain, and from the inability to inhibit thoughts related to current or anticipated pain (Sullivan et al., 2001). Catastrophizing has been identified as one of the strongest predictors of chronic pain and is associated with increased pain intensity, pain interference, psychological distress, and demand for medical care, even when controlling for physical disability (Petrini & Arendt-Nielsen, 2020). Additionally, it has been identified as a significant pretreatment risk factor for the effectiveness of surgical or pharmacological treatments (Hill et al., 2007; Pinto et al., 2012; Toth et al., 2014). Self-efficacy, which has also been extensively studied in the chronic pain literature, is conceptualised as a set of beliefs about oneself and one's ability to perform specific activities within a given environment (Bandura, 1977). Low pain self-efficacy may affect the patient's ability to manage pain and perform daily activities (Vergeld & Utesch, 2020). Higher levels of self-efficacy have been associated with lower distress and higher physical function (Hayward & Stynes, 2021), while low levels of self-efficacy predicted adverse treatment outcomes and transition from acute to chronic pain (Pincus et al., 2013).

Over the past several decades, the construct of alexithymia has received considerable attention in chronic pain research (Aaron et al., 2019; Di Tella & Castelli, 2016). Alexithymia is an emotion-processing deficit composed of two higher-order dimensions: (1) a deficit in affective awareness (i.e., difficulty identifying emotions and describing them to others) and (2) operative thinking (externally oriented thinking with poor imaginative processes) (Luminet et al., 2018). Previous studies have shown that alexithymia may modulate illness severity, predispose patients to worse health outcomes, arise secondary to a clinical condition, or represent a complex combination of these factors (Luminet et al., 2018). A recent meta-analysis found that patients with chronic pain show higher levels of alexithymia than both the general population (effect sizes in the large range) and clinical samples without pain (effect sizes in the moderate range) (Aaron et al., 2019). Despite the association between alexithymia and increased pain interference, less is known about its association with pain severity (Di Tella & Castelli, 2016). In some studies, the association between alexithymia and pain severity has not been found or seems to be mediated by negative affect (Di Tella & Castelli, 2016). Another gap in the literature on alexithymia and chronic pain is due to the prevalence of cross-sectional study designs (Aaron et al., 2019). Few studies have examined longitudinal relationships between alexithymia and chronic pain (e.g., Baudic et al., 2016; Saariaho et al., 2016; Saariaho et al., 2017). Systematic reviews and meta-analyses have recommended implementing longitudinal studies to assess the relationship between alexithymia and chronic pain and the simultaneously considering cofactors that may compete with alexithymia as predictors of treatment outcomes (Aaron et al., 2019; Di Tella & Castelli, 2016).

Although alexithymia, emotional distress, catastrophizing, and pain self-efficacy are psychological factors that may affect the subjective perception of pain, the nature of these four constructs is different. Previous studies have shown that, compared to secondary psychological aspects, alexithymia is a stable personality trait that plays a relevant role in explaining non-response to treatment in a variety of medical conditions (Kojima, 2012; Porcelli et al., 2003). Nevertheless, longitudinal studies controlling for multiple intervening variables are needed to clarify the role of alexithymia in chronic pain syndromes (Luminet et al., 2018). For the first time to our knowledge, in the present observational longitudinal study of treatment effectiveness, we aimed to investigate the extent to which alexithymia may predict the improvement of pain severity following a four to 6 weeks TAU programme for chronic musculoskeletal pain over and above established psychological cofactors (i.e., psychological distress, catastrophizing, and self-efficacy). We expected that non-responder patients would exhibit more significant psychological problems (higher levels of pain interference, distress symptoms, catastrophizing, and alexithymia, and lower self-efficacy) at the 16-week follow-up than responders both at baseline and follow-up. Furthermore, we expected that pre-treatment alexithymia would predict treatment outcome at 16-week follow-up, even after controlling for established pain-related psychological cofactors (distressing symptoms, self-efficacy, and catastrophizing).

2 | MATERIALS AND METHODS

2.1 | Participants and procedure

A consecutive sample of 129 adult outpatients with chronic musculoskeletal pain was enroled in two pain units of the University Clinical Hospital of Chieti (Italy). Data was collected from January 2018 to February 2019. All the participants were involved in a non-invasive four-to-six weeks treatment programme which included pharmacological and/or non-pharmacological therapy (see Treatment programme section). Based on IMMPACT guidelines (Gewandter et al., 2015; Smith et al., 2020), patients were evaluated during their first medical examination (baseline, T0) and after 16 weeks from the end of treatment (follow-up, T1) for early monitoring of the treatment's effect.

Patients aged 18–65 years diagnosed with chronic musculoskeletal pain were included. To maximise ecological validity, patients were included even if previously treated (i.e., during the lifetime) for their pain condition. As expected in real-world clinical practice, individuals with chronic pain often try multiple medical and alternative interventions for alleviating their symptoms. Patients were excluded if they had certified pain secondary to cancer, acute pain (lasting less than 3 months), current or past psychotic disorders (issued from clinical records and prescribed pharmacologic treatments), impairment in cognitive functions, were not fluent Italian speakers, or were pregnant.

2.2 | Treatment programme

At the first visit, all patients received an initial medical examination for diagnostic screening and indication for treatment by a team of experienced physicians. For all patients, the primary target of the treatment programme was to reduce pain severity. Patients were treated on a case-by-case basis with pharmacological interventions (such as non-steroidal anti-inflammatory drugs, opioid analgesics, anti-epileptic drugs, steroid injections, muscle relaxants, and antidepressants), physical nonpharmacological interventions (such as manual therapies and therapeutic exercises), or with different combinations of these. Although the interventions were performed in two different pain units, the treatment protocol for each centre was similar, with treatment durations ranging from four to 6 weeks on a case-by-case basis.

2.3 | Measures

2.3.1 | Sociodemographic and clinical characteristics

Sociodemographic characteristics such as age, gender, years of education, employment status, and marital status were collected using an ad hoc semi-structured questionnaire. Patient medical records were used to collect information on the duration of pain (i.e., number of months/years since first diagnosis) and diagnostic classification (i.e., primary or secondary chronic pain). Based on the ICD-11 classification (World Health Organization, 2019), the diagnosis of chronic pain included all patients who had persistent or recurrent pain lasting more than three months or exceeding the expected time to recovery (Merskey & Bogduk, 1994).

2.3.2 | Clinical pain

Levels of pain were assessed using the Brief Pain Inventory (BPI) (Caraceni et al., 1996; Cleeland & Ryan, 1994; Furler, 2013). Based on the assumption that pain is multidimensional, the BPI includes two subscales: pain severity (BPI-S) over the past 24 h and pain interference (BPI-I) in daily activities over the past 24 h. The BPI-S subscale consists of four items rated on an 11-point Likert scale, ranging from 0 ("no pain") to 10 ("worst possible pain"), with a score range from 0 to 40. The BPI-I subscale consists of four items rated on an 11-point Likert scale ranging from 0 ("no interference") to 10 ("complete interference") with a score range from 0 to 70. Higher scores indicate greater levels of pain severity and interference. Within this sample, Cronbach's α was 0.86 (T0) and 0.93 (T1) for both subscales.

2.3.3 | Treatment outcome measure

Although treatment goals for chronic pain are numerous, reducing pain intensity is the most relevant. The IMMPACT guidelines indicate that a 30% reduction in pain intensity from baseline can be considered an optimal treatment goal (Gewandter et al., 2015; Smith et al., 2020). It has also been shown that the 30% pain intensity reduction threshold provides the same sensitivity and specificity as higher values and is appropriate for interpreting the results of clinical trials on chronic pain therapy (Smith et al., 2020).

In the current study, the threshold of a 30% reduction in pain severity on the BPI-S subscale was used as a cut-point to classify patients into responder and non-responder outcome groups. Data on pain severity was obtained during the first medical visit (baseline, T0) and after 16 weeks from the end of treatment (follow-up, T1). Change in pain severity (ΔBPI-S%) was expressed as the proportion of difference from pre- (T0) to post-treatment (T1) based on the level of baseline pain severity, and was calculated as follows:

$$\Delta\text{BPI} - \text{S}\% = [(\text{T0 initial pain severity} - \text{T1 current pain severity})/(\text{T0 initial pain severity})] \times 100$$

2.3.4 | Psychological distress

Symptoms of depression and anxiety were assessed using the Hospital Anxiety and Depression Scale (HADS) (Bjelland et al., 2002;

Iani et al., 2014; Zigmond & Snaith, 1983). Used for assessing emotional distress in patients with physical health problems, the HADS includes two subscales for depressive (HADS-D, 7-items) and anxiety (HADS-A, 7-items) symptoms. Each item is rated on a 4-point Likert scale ranging from 0 ("no symptoms") to 3 ("definite experience of symptoms"). Within this sample, Cronbach's α was 0.69 (T0) and 0.72 (T1) for the HADS-A subscale, and 0.83 (T0) and 0.87 (T0) for the HADS-D subscale.

2.3.5 | Pain self-efficacy

Pain self-efficacy was measured using the Pain Self-Efficacy Questionnaire (PSEQ) (Chiarotto et al., 2015; Nicholas, 2007), a 10-item self-report that measures the level of confidence the patient feels in performing activities despite experiencing pain (e.g., work, socialising with others, hobbies or leisure activities, housework, or unpaid work). Items are rated on a 7-point Likert scale ranging from 0 ("not confident at all") to 6 ("completely confident"). The total score ranges from 0 to 60, with higher scores indicating greater pain self-efficacy. Within this sample, Cronbach's α was 0.93 (T0) and 0.92 (T1) for the total scale.

2.3.6 | Pain catastrophizing

Pain catastrophizing was assessed using the Pain Catastrophizing Scale (PCS) (Ikemoto et al., 2020; Monticone et al., 2012; Sullivan et al., 1995), a 13-item self-report measure investigating three dimensions of catastrophizing: (1) helplessness (PCS-H), a measure of pessimism in relation to one's ability to deal with the pain experience; (2) magnification (PCS-M), a measure of the magnification of the unpleasantness of pain situations and expectancies for negative outcomes; and (3) rumination (PCS-R), a measure of the inability to suppress or divert attention away from pain-related thoughts. Each item is rated on a 5-point Likert scale ranging from 0 ("not at all") to 4 ("all the time") with a total score ranging from 0 to 52. Within this sample, Cronbach's α was 0.90 (T0) and 0.94 (T1) for the total scale.

2.3.7 | Alexithymia

Alexithymia was measured using the 20-item Toronto Alexithymia Scale (TAS-20) (Bagby et al., 1994, 2020; Bressi et al., 1996). Each item is scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) and scores range from 20 to 100. In addition to the total score, the TAS-20 provides scores for three subscales: (1) difficulty identifying feelings (DIF), a measure of the difficulty in discriminating between feelings and bodily sensations of emotional arousal; (2) difficulty describing feelings (DDF), a measure of the difficulty in describing feelings to other people; and (3) externally oriented thinking (EOT), a measure of the tendency to focus on external reality and avoid the emotional nuances of life. Within this sample, Cronbach's α was 0.80 (T0) and 0.83 (T1) for the total scale.

2.4 | Statistical analyses

Data analysis was performed using SPSS 26.0 for Windows. Descriptive statistics were reported as mean and standard deviation [Mean (SD)] or absolute frequencies. Alpha for all tests was set at 0.05, with all p values adjusted for Holm-Bonferroni sequential correction (Holm, 1979).

A four-step strategy was used for data analysis.

First, independent two-tailed Student's t-tests or chi-square tests (χ^2) were used to compare differences between responder and non-responder patients for sociodemographic, clinical, and psychological variables at baseline and follow-up. Cohen's d and Cramer's V were used as effect size measures. Cohen's d effect magnitudes of 0.20–0.50, 0.50–0.80, and >0.80 are considered small, moderate, and large, respectively (Cohen, 1988), and Cramer's V effect magnitudes of ≥0.10, ≥0.30, and ≥0.50 are considered small, moderate, and large, respectively (Cramer, 1946).

Second, repeated-measures analysis of covariance (ANCOVA) was used to compare between-group differences in psychological variables over time while controlling for baseline pain severity. The repeated-measures ANCOVA included the psychological scales BPI-I, HADS-A, HADS-D, PSEQ, PCS, and TAS-20 as dependent variables, the time points T0 and T1 as a within-subject factor, BPI-S at baseline as a covariate, and responder/non-responder groups as the between-subject factor. The partial eta-squared (η^2) was used as a measure of effect size. A standardized η^2 of 0.01–0.05 is considered small, 0.06–0.14 is considered moderate, and >0.14 is considered large (Adams & Conway, 2014).

Third, Pearson's correlation coefficient was used to examine the stability of clinical and psychological variables from baseline to follow-up.

Fourth, two binary logistic regression models were performed to investigate the relative and independent role of each psychological variable (i.e., BPI-I, HADS-A, HADS-D, PSEQ, PCS, TAS-20, and its subscales) in predicting the treatment outcome (i.e., ΔBPI%). The treatment outcome was considered as the dependent variable (dummy coded: 0 = non-responders; 1 = responders). The independent variables of BPI-I, HADS-A, HADS-D, PSEQ, PCS, and TAS-20 (Model 1) or TAS-DIF, TAS-DDF, and TAS-EOT (Model 2) at baseline (T0) were entered as predictors in separate blocks to determine how well each variable predicted the outcome. Five regression steps were processed and regression coefficients, confidence intervals (CI), odds ratio (OR), and p-values were estimated. BPI-I was entered in the first step as a control variable. In the next steps, the other key variables were added: HADS-A and HADS-D in the second step, PSEQ in the third step, PCS in the fourth step, and TAS-20 (Model 1) or TAS-DIF, TAS-DDF, and TAS-EOT (Model 2) in the fifth step. In particular, we aimed to investigate the extent to which each factor would significantly distinguish between the two outcome groups.

3 | RESULTS

3.1 | Participation in the study

The flow of participation in the study is described in Figure 1. Two hundred and thirty-five participants were screened for eligibility. One hundred and seventy-eight (75.7%) patients were eligible and participated in the study. Of the 178 participants assessed at T0, 49 (27.5%) were lost at follow-up and did not complete the measures at T1, and 129 (72.5%) were included in the present study.

No baseline differences were found between patients who completed and those who did not complete the follow-up (Table S1, see Supplementary Material).

3.2 | Characteristics of the sample

The socio-demographic and clinical characteristics of the sample are reported in Table 1. Included patients were mostly female (n = 75, 58.1%), employed in a full-time job (n = 73, 56.6%), married (n = 106, 82.2%), with a mean age of 53.17 years (SD = 13.25 years) and a mean education of 12.28 years (SD = 3.81), and had suffered pain for 7.86 years (SD = 9.75 years; Me = 3.90 years). According to the ICD-11 criteria (see Methods section), 79.1% (n = 102) of the sample had a diagnosis of chronic primary pain. Most of the sample (n = 80, 62%) received pharmacological treatment, while 18.6% (n = 24) and 19.4% (n = 25) received non-pharmacological treatments or a combination of pharmacological and non-pharmacological treatments, respectively. Comparing responder (n = 57, 44.2%) and non-responder patients (n = 72, 55.8%), no differences were found in sociodemographic and clinical variables between the two groups.

No differences were found between the responder and non-responder patients regarding the classes of compounds used for pharmacological treatments (Table S2, see Supplementary Material).

3.3 | Between-group comparisons over time

The differences in clinical and psychological variables at baseline (T0) and follow-up (T1) between responder and non-responder groups are reported in Table S3 (see Supplementary Material). When the two groups were compared at baseline, non-responder patients had significantly higher scores for total TAS-20 (d = 0.74), specifically DIF (d = 0.73) and DDF (d = 0.65), compared to responder patients (all moderate effect sizes). When the two groups were compared at follow-up, non-responder patients had higher scores for BPI-S (d = 1.76), BPI-I (d = 1.56), HADS-A (d = 0.78), HADS-D (d = 1.02), PCS (d = 0.78) and its subscales (PCS-R, d = 0.68; PCS-M, d = 0.67; PCS-H, d = 0.77), total TAS-20 (d = 0.51), and DIF (d = 0.61), and lower scores for PSEQ (d = 0.83) (moderate-to-large effect sizes).

The results of repeated measures ANCOVA are reported in Table 2. The baseline level of BPI-S was used as a covariate to investigate its influence on treatment outcome at follow-up.

Both time and baseline BPI-S covariates did not show significant effects on any variables. Compared with non-responder patients, responder patients reported a significant decrease in BPI-I (F = 59.39, p < 0.001), HADS-A (F = 19.67, p < 0.001), HADS-D (F = 26.69, p < 0.001), and PCS (F = 12.99, p < 0.001) scores, and a significant improvement in PSEQ (F = 12.56, p = 0.002) scoring over time, with moderate-to-large effect sizes. No differences were found between the two groups for TAS-20 over time. In sum, significant improvement in pain severity was associated with improvement in

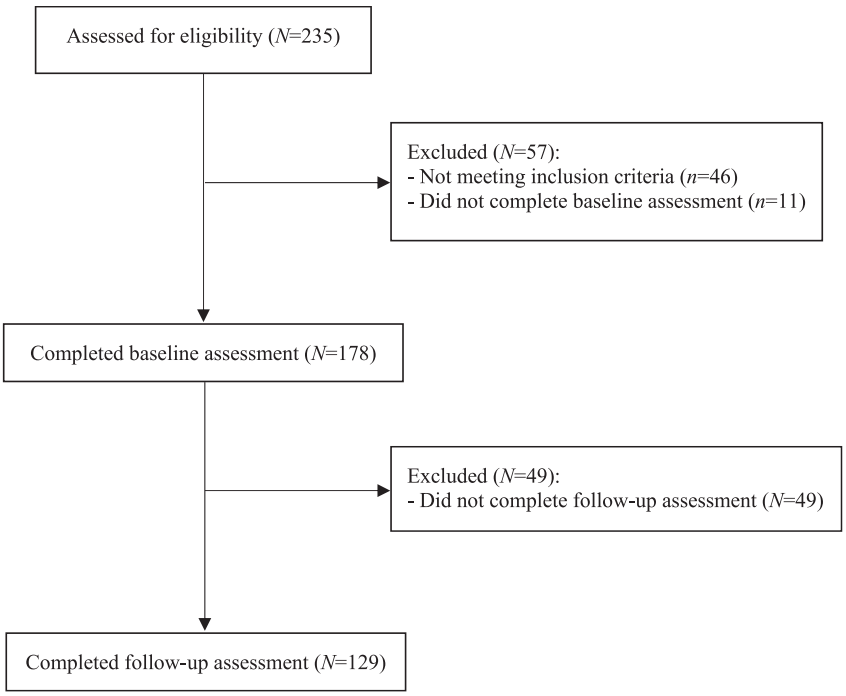

FIGURE 1 Consort diagram describing the flow of participation in the study (created using MS Office).

TABLE 1 Socio-demographic and clinical characteristics of the study sample ($N = 129$).

Variable	Total sample $N = 129$	Responders $n = 57$ (44.2%)	Non-responders $n = 72$ (55.8%)	t/χ^2	p	d/V
Age, *M* (*SD*)	53.17 (13.25)	52.86 (14.07)	53.42 (12.66)	0.24	0.81	0.06
Sex						
Male	54 (41.9%)	27 (47.4%)	27 (37.5%)	1.27	0.28	0.10
Female	75 (58.1%)	30 (52.6%)	45 (62.5%)			
Education, *M* (*SD*)	12.28 (3.81)	12.80 (3.90)	11.87 (3.71)	1.37	0.17	0.34
Employment status						
Full-time job	73 (56.6%)	30 (52.6%)	43 (59.7%)	0.65	0.47	0.07
Other	56 (43.4%)	27 (47.4%)	29 (40.3%)			
Marital status						
Unmarried	23 (17.8%)	12 (21.2%)	11 (15.3%)	0.72	0.49	0.07
Currently married	106 (82.2%)	45 (78.9%)	61 (84.7%)			
Pain duration (years), *M* (*SD*)	7.86 (9.75)	6.13 (8.28)	9.23 (10.63)	1.81	0.07	0.32
Diagnostic entity						
Chronic primary pain	102 (79.1%)	43 (75.4%)	59 (81.9%)	0.81	0.39	0.08
Chronic secondary pain	27 (20.9%)	14 (24.6%)	13 (18.1%)			
Treatment methods						
Pharmacological	80 (62%)	34 (59.6%)	46 (63.9%)	0.27	0.87	0.04
Non-pharmacological	24 (18.6%)	11 (19.3%)	13 (18.1%)			
Multimodal	25 (19.4%)	12 (21.1%)	13 (18.1%)			

pain interference, emotional distress, self-efficacy, and catastrophizing. Instead, alexithymia provided relative stability (i.e., relative differences between individuals remain the same over time despite treatment).

3.4 | Between-variable associations

Multiple significant correlations in the small-to-large range ($r = 0.28$–0.77) were found amongst variables. Psychological variables at baseline and follow-up were significantly associated with each other and with pain variables (see Table 3). In particular, several factors showed absolute stability (i.e., scores that did not change over time) with correlations in the high range ($r \geq 0.50$) between T0 and T1, suggesting that overall patients displayed stable levels of pain severity (BPI-S), emotional distress (HADS), catastrophizing (PCS), and pain self-efficacy (PSEQ). Of note, alexithymia (TAS-20) can be considered a stable personality trait within this sample ($r > 0.70$).

3.5 | Predicting treatment outcome

Table 4 shows the binary logistic regression model with the responder/non-responder groups (based on ΔBPI-S% score) as the binary outcome criterion. BPI-I, HADS-A, HADS-D, PSEQ, PCS, and TAS-20 scores at baseline served as independent variables.

In the first four steps, BPI-I (Step 1), HADS-A and HADS-D (Step 2), PSEQ (Step 3), and PCS (Step 4) did not contribute to explaining a significant added variance. When TAS-20 was added in Step 5, it significantly predicted an added 13% of the variance ($p = 0.001$), showing the most significant OR of 0.94 (95%CI = [0.91, 0.97]). In other words, for each point increase on the TAS-20, the odds of having a positive response to TAU decreased by 6%.

An additional binary logistic regression was performed to assess which dimension of alexithymia at baseline contributed most to explaining the treatment outcome (see Table 5).

The results remained substantially unchanged, showing that BPI-I, HADS-A, HADS-D, PSEQ, and PCS did not contribute to explaining a significant added variance. When TAS-DIF, TAS-DDF and TAS-EOT were added in Step 5, only the DIF dimension ($p = 0.02$) showed a significant OR of 0.92 (95% CI = [0.85, 0.99]). In other words, for each point increase on the TAS-DIF, the odds of having a positive response to TAU decreased by 8%.

Models show that as levels of alexithymia at baseline (specifically, of difficulty in identifying emotions) increase, the probability of having a positive response to treatment decreases. These findings suggest that, despite the other psychological cofactors, baseline alexithymia can independently and significantly explain the perceived pain severity after treatment.

TABLE 2 Comparisons of psychological variables before (T0) and after (T1) treatment between responder and non-responder groups.

			Time			Time*BPI-S (T0)			Time × Groups		
Variable, *M(SD)*	Responders *n* = 44 (43.6%)	Non-responders *n* = 57 (56.4%)	*F*	*p*	η^2	*F*	*p*	η^2	*F*	*p*	η^2
BPI-I											
T0	40.79 (16.01)	44.24 (15.70)	5.49	0.12	0.04	2.89	0.45	0.02	59.39	<0.001	0.32
T1	15.82 (15.76)	41.15 (16.49)									
HADS-A											
T0	8.37 (5.47)	9.65 (5.58)	2.56	0.44	0.02	0.02	1	0	19.67	<0.001	0.14
T1	5.02 (4.33)	9.69 (6.28)									
HADS-D											
T0	9.37 (4.56)	10.15 (4.37)	0.37	0.54	0	1.55	0.84	0.01	26.69	<0.001	0.18
T1	5.82 (3.74)	10.42 (4.65)									
PSEQ											
T0	31.84 (17.57)	28.14 (14.93)	4.17	0.21	0.03	0.15	1	0	12.56	0.002	0.09
T1	44.82 (13.69)	31.41 (14.90)									
PCS											
T0	23.35 (11.32)	27.34 (11.38)	0.91	0.68	0.01	0.41	1	0	12.99	<0.001	0.09
T1	16.65 (14.14)	27.07 (12.83)									
TAS-20											
T0	43.63 (11.75)	53.68 (14.46)	1.76	0.68	0.01	4.61	0.20	0.04	1.93	0.17	0.01
T1	46.54 (13.16)	53.99 (15.38)									

Abbreviations: BPI-I, Brief Pain Inventory – Interference; BPI-S, Brief Pain Inventory – Severity; HADS-A, Hospital Anxiety and Depression Scale – Anxiety; HADS-D, Hospital Anxiety and Depression Scale – Depression; PCS, Pain Catastrophizing Scale; PSEQ, Pain Self-Efficacy Questionnaire; TAS-20, Toronto Alexithymia Scale – 20.

4 | DISCUSSION

Three main findings can be highlighted from this perspective study. First, the effectiveness of the four-to-six weeks treatment programme was at best modest, with only 44.2% of the patients reaching the 30% reduction of pain severity threshold at a 16-week follow-up. Second, compared with responder patients, non-responders were characterised by higher levels of alexithymia at baseline and worsening psychological features (i.e., pain interference, emotional distress, catastrophizing, and self-efficacy) over time. Third, alexithymia showed relative stability between baseline and follow-up within the entire sample and remained a significant predictor of treatment outcome even when other predictive cofactors (i.e., pain interference, depressive symptoms, and catastrophizing) were considered simultaneously.

Our findings showed that more than half of patients did not reach the threshold of significant pain improvement after TAU, and although disappointing, this is consistent with previous studies showing a prevalence of responder participants in Europe ranging from 27% to 61% in short-to medium-term interventions (Breivik et al., 2006). Therefore, it is of fundamental importance to identify the biopsychosocial characteristics of treatment-resistant patient subgroups, including the psychological dimensions associated with the maintenance of pain over time.

In our first hypothesis, we expected that non-responder patients would exhibit higher pain interference, distress symptoms, self-efficacy, catastrophizing, and alexithymia than responder patients at baseline and follow-up. Interestingly, at baseline, responder and non-responder groups showed no significant differences in psychological variables except for alexithymia which was significantly higher in non-responder patients. At follow-up, responder patients showed significant improvement in pain interference, distress symptoms, self-efficacy, and catastrophizing compared to non-responders; alexithymia showed no change over time in both responder and non-responder patients at follow-up, suggesting high stability for alexithymia typical for a personality feature. Identifying the role of relatively stable personality traits in comparison with situational state characteristics, especially in the experience of pain, has been a main research target in recent decades (Dumenci et al., 2020; Turner & Aaron, 2001; Turner et al., 2002). Previous studies have suggested that catastrophizing, distress, and self-efficacy tend to improve over time in response to improved pain (Lape et al., 2020; Wade et al., 2012). Therefore, it has been hypothesised that these psychological factors may be considered situational-reactive states rather than stable traits.

TABLE 3 Zero-order correlations between clinical and psychological variables at baseline and follow-up.

Variable	Pain duration	BPI-S (T0)	BPI-S (T1)	BPI-I (T0)	BPI-I (T1)	HADS-A (T0)	HADS-A (T1)	HADS-D (T0)	HADS-D (T1)	PSEQ (T0)	PSEQ (T1)	PCS (T0)	PCS (T1)	TAS-20 (T0)
Pain duration	–													
BPI-S (T0)	0.26	–												
BPI-S (T1)	0.21	0.51**	–											
BPI-I (T0)	0.16	0.68**	0.39**	–										
BPI-I (T1)	0.23	0.44**	0.77**	0.45**	–									
HADS-A (T0)	0.07	0.40**	0.25	0.53**	0.24	–								
HADS-A (T1)	0.21	0.37**	0.55**	0.36**	0.54**	0.68**	–							
HADS-D (T0)	0.11	0.29*	0.18	0.41**	0.22	0.54**	0.38**	–						
HADS-D (T1)	0.24	0.19	0.47**	0.20	0.47**	0.38**	0.67**	0.51**	–					
PSEQ (T0)	−0.05	−0.45**	−0.27	−0.57**	−0.22	−0.26	−0.15	−0.34**	−0.17	–				
PSEQ (T1)	−0.14	−0.44**	−0.62**	0.43**	−0.59**	−0.25	−0.44**	−0.34**	−0.45**	0.50**	–			
PCS (T0)	0.13	0.53**	0.43**	0.49**	0.38**	0.62**	0.60**	0.49**	0.52**	−0.43**	−0.40**	–		
PCS (T1)	0.18	0.39**	0.64**	0.36**	0.55**	0.47**	0.68**	0.37**	0.58**	−0.27	−0.63**	0.69**	–	
TAS-20 (T0)	0.19	0.14	0.25	0.23	0.19	0.41**	0.43**	0.39**	0.53**	−0.12	−0.24**	0.45**	0.38**	–
TAS-20 (T1)	0.29*	0.28*	0.35**	0.25	0.27	0.48**	0.59**	0.36**	0.62**	−0.08	−0.33**	0.50**	0.53**	0.70**

Abbreviations: BPI-I, Brief Pain Inventory – Interference; HADS-A, Hospital Anxiety and Depression Scale – Anxiety; HADS-D, Hospital Anxiety and Depression Scale – Depression; PCS, Pain Catastrophizing Scale; PSEQ, Pain Self-Efficacy Questionnaire; TAS-20, Toronto Alexithymia Scale – 20.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

However, it is known that presumably stable psychological traits change over time, particularly following major life events (Bleidorn et al., 2018) and in the presence of chronic pain (Fishbain et al., 2006). For example, an evidence-based review on the effects of pain on personality traits found consistent results that scores on the Minnesota Multiphasic Personality Inventory improved with pain treatment (Fishbain et al., 2006). In our sample, while emotional distress, self-efficacy, and catastrophizing improved with pain relief, alexithymia showed significant relative stability, suggesting that it could be considered a stable psychological dimension over time. This is in line with previous longitudinal studies showing that alexithymia is a stable and long-lasting dispositional factor associated with higher pain severity and interference (Aaron et al., 2019; Horta-Baas & Romero-Figueroa, 2019; Saariaho et al., 2016, 2017). The high absolute and relative stability of alexithymia has been observed in various clinical populations (e.g., patients with cancer, functional gastrointestinal disorders, and myocardial infarction) (Karukivi & Saarijärvi, 2014). Numerous factors can explain the stability of alexithymia as a personality trait over time. Previous literature has highlighted the role of neurobiological (e.g., Jungilligens et al., 2022) and genetic characteristics (Castelli et al., 2023; Yang et al., 2019). Additionally, distinct cognitive and emotional processing patterns in individuals with alexithymia become entrenched and resistant to change, contributing to trait stability (Luminet et al., 2021). Limited emotional insight and awareness in alexithymic individuals further hinder the recognition of these patterns, perpetuating trait persistence (Hogeveen & Grafman, 2021). The association of alexithymia with mental health conditions also contributes to its stability, as core features persist even amid fluctuations in mental disorder symptoms (Karukivi & Saarijärvi, 2014).

Alexithymia can be considered a nonspecific transdiagnostic construct with a potential impact on treatment outcomes in a variety of physical illnesses (e.g., Beresnevaite, 2000; Conti et al., 2023;

TABLE 4 Logistic regression model examining baseline psychological variables as predictors of ΔBPI-S%[a] score as a binary outcome criterion (responders/non-responders) at 3-month follow-up.

	Step 1		Step 2		Step 3		Step 4		Step 5	
Variables	**Wald**	**OR [95% CI]**	**Wald**	**OR [95% CI]**	**Wald**	**OR [95% CI]**	**Wald**	**OR [95% CI]**	**Wald**	**OR [95% CI]**
BPI-I (T0)	1.20	0.98 [0.97, 1.01]	0.23	0.99 [0.97, 1.02]	0.01	1 [0.97, 1.03]	0.02	1 [0.97, 1.03]	0.03	1 [0.97, 1.03]
HADS-A (T0)			0.30	0.98 [0.90, 1.06]	0.45	0.97 [0.89, 1.05]	0.01	0.99 [0.91, 1.09]	0.11	1.02 [0.92, 1.12]
HADS-D (T0)			0.09	0.98 [0.90, 1.08]	0.03	0.99 [0.90, 1.09]	0.03	1 [0.91, 1.12]	0.67	1.05 [0.94, 1.16]
PSEQ (T0)					0.57	1.01 [0.98, 1.04]	0.17	1.01 [0.99, 1.03]	0.63	1.01 [0.98, 1.04]
PCS (T0)							1.62	0.97 [0.93, 1.01]	0.12	0.99 [0.95, 1.04]
TAS-20 (T0)									12.04***	0.94 [0.91, 0.97]
R^2		0.01		0.02		0.03		0.04		0.17
ΔR^2				0.01		0.01		0.01		0.13

Abbreviations: BPI-I, Brief Pain Inventory – Interference; HADS-A, Hospital Anxiety and Depression Scale – Anxiety; HADS-D, Hospital Anxiety and Depression Scale – Depression; PCS, Pain Catastrophizing Scale; PSEQ, Pain Self-Efficacy Questionnaire; TAS-20, Toronto Alexithymia Scale – 20.

[a]ΔBPI-S ≤ 30%, responders; ΔBPI-S > 30%, non-responders.

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

TABLE 5 Logistic regression model examining baseline alexithymia subscales as predictors of ΔBPI-S%[a] score as a binary outcome criterion (responders/non-responders) at 3-month follow-up.

	Step 1		Step 2		Step 3		Step 4		Step 5	
Variables	**Wald**	**OR [95% CI]**	**Wald**	**OR [95% CI]**	**Wald**	**OR [95% CI]**	**Wald**	**OR [95% CI]**	**Wald**	**OR [95% CI]**
BPI-I (T0)	1.20	0.98 [0.97, 1.01]	0.23	0.99 [0.97, 1.02]	0.01	1 [0.97, 1.03]	0.02	1 [0.97, 1.03]	0.03	1 [0.97, 1.03]
HADS-A (T0)			0.30	0.98 [0.90, 1.06]	0.45	0.97 [0.89, 1.05]	0.01	0.99 [0.91, 1.09]	0.11	1.02 [0.92, 1.12]
HADS-D (T0)			0.09	0.98 [0.90, 1.08]	0.03	0.99 [0.90, 1.09]	0.03	1 [0.91, 1.12]	0.67	1.05 [0.94, 1.16]
PSEQ (T0)					0.57	1.01 [0.98, 1.04]	0.17	1.01 [0.99, 1.03]	0.63	1.01 [0.98, 1.04]
PCS (T0)							1.62	0.97 [0.93, 1.01]	0.12	0.99 [0.95, 1.04]
TAS-DIF (T0)									4.82*	0.92 [0.85, 0.99]
TAS-DDF (T0)									1.66	0.93 [0.84, 1.04]
TAS-EOT (T0)									0.02	0.99 [0.92, 1.07]
R^2		0.01		0.02		0.03		0.04		0.19
ΔR^2				0.01		0.01		0.01		0.15

Abbreviations: BPI-I, Brief Pain Inventory – Interference; HADS-A, Hospital Anxiety and Depression Scale – Anxiety; HADS-D, Hospital Anxiety and Depression Scale – Depression; PCS, Pain Catastrophizing Scale; PSEQ, Pain Self-Efficacy Questionnaire; TAS-DDF, Toronto Alexithymia Scale – Difficulty Describing Feelings; TAS-DIF, Toronto Alexithymia Scale – Difficulty Identifying Feelings; TAS-EOT, Toronto Alexithymia Scale – Externally Oriented Thinking.

[a]ΔBPI-S ≤ 30%, responders; ΔBPI-S >30%, non-responders.

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

Porcelli et al., 2017; Probst et al., 2017). Accumulating results indicate that alexithymia may be a risk cofactor for somatic illnesses, a modulating factor of severity, a consequence of chronic conditions, or a combination of these factors (Luminet et al., 2018). In our second hypothesis, we expected that alexithymia would predict treatment outcome at a 16-week follow-up, over and above distressing symptoms, self-efficacy, and catastrophizing. This hypothesis was confirmed. Our finding pointed out that, even after controlling for other significant psychological cofactors, baseline alexithymia can independently explain a significant amount of variance in perceived pain severity after treatment. This result is in line with a large body of literature on the role of emotional processing in influencing the experience of pain (Koechlin et al., 2018). Individuals with high alexithymia levels are known to experience amplified bodily sensations (Kano & Fukudo, 2013; Nyklíček & Vingerhoets, 2000), so much so that the somatosensory amplification model of alexithymia has

been proposed (Kano & Fukudo, 2013; Nakao et al., 2002). This hypothesis maintains that alexithymia is characterised by altered sensitivity to body signals of psychophysiological activation, associated with difficulty in translating these visceral signals into higher levels of processing and awareness (Kano & Fukudo, 2013). Accordingly, individuals with alexithymia are more vulnerable to somatisation (Mattila et al., 2008) and somatosensory amplification (Nakao et al., 2002), experiencing emotional distress through somatic manifestations (Lindquist & Barrett, 2008). Consistently with these explanations, neuroscientific findings suggest that alexithymic traits are associated with lower reactivity in brain regions associated with emotion and interoception (e.g., limbic system) and enhanced neural activation in somatosensory and sensorimotor areas (e.g., insula) (Haase et al., 2015; Lemche et al., 2013). As a result, patients with chronic pain and high levels of alexithymia are predisposed to have an increased focus on bodily symptoms and may misinterpret perceived somatic correlates of emotions as threatening signals that exacerbate pain symptoms (Di Lernia et al., 2016). Specifically, the literature has shown that it is mainly the affective dimension of alexithymia (difficulty identifying and communicating emotions) that is associated with the intensity and interference of pain in patients with chronic pain (Aaron et al., 2019; Di Tella & Castelli, 2016). Consistent with previous literature, we found that difficulty identifying emotions was the dimension of alexithymia most strongly associated with change in pain after treatment. In our sample, higher levels of difficulty identifying emotions were associated with a higher likelihood of not responding to treatment. The results of a recent meta-analysis support the hypothesis that the difficulty in identifying feelings is the dimension of alexithymia most strongly associated with pain perception in patients with chronic pain, followed by difficulty in describing feelings and externally oriented thinking (Aaron et al., 2019). Interestingly, the TAS-DDF subscale did not predict the treatment outcome in our results. It could be speculated that difficulty in talking about one's emotional state to others may affect the overall patient's quality of life, whereas difficulty in recognising emotions may affect sensory perception of pain. The inability to recognise emotions leads to challenges in connecting emotional experiences with their sensory counterparts, promoting somatosensory amplification related to pain and the misinterpretation of emotional cues, which are perceived as indicators of illness.

The study has some limitations to take into account. First, the longitudinal study design allowed us to evaluate the specific role played by alexithymia in persisting pain symptoms after usual treatment, but patients were assessed at 16 weeks after the end of the short treatment. Although follow-up at 12 or 16 weeks is considered standard according to IMMPACT guidelines (Gewandter et al., 2015; Smith et al., 2020), long-term follow-up is needed to examine the treatment outcome and psychological variables, considering the wax-and-wane nature of chronic pain. Second, the dosage of medications and the hours of physical therapy were not pre-established to maximise the ecological validity of the trial and make the study as close as possible to clinical reality. However, the individualised approach to pain treatment limits the generalisability of our results to other intervention settings. In addition, possible medication misuse in our study was not assessed. High levels of alexithymia have been associated with problematic opioid use behaviours (Oberleitner et al., 2019) and should be considered in future investigations. Third, psychological variables were assessed using self-report scales. Although well-validated questionnaires were used, it would be preferable to use a multimethod assessment. Particularly for alexithymia, the integration of the TAS-20 with a multimethod assessment that includes facets of the constructs that are not well represented in the TAS-20 framework (e.g., the reduced fantasising facet) and other sources of data (such as clinician ratings, by-proxy information, and implicit motives) would be preferred, although it would be more difficult to utilise in clinical settings (Bagby et al., 2020). Fourth, the patients in this study were recruited from tertiary care centres and the usual treatments were tailored to each patient's needs, but further studies should evaluate the association between alexithymia and treatment outcomes in chronic pain patients from different medical settings and in randomized, controlled treatment trials. Fifth, the study included individuals who volunteered for medical intervention in tertiary care centres, thus limiting the generalisability to primary care patients or patients who do not seek treatment. There is growing evidence indicating individuals who seek medical care have higher levels of negative affectivity than those with the same clinical problems who do not seek care (Gruszka et al., 2021; Rohn et al., 2017; Setnik & Bazarian, 2007). Finally, in this study, biomarkers for pain, such as inflammatory immune modulation, levels of vitamins, exposure to environmental toxic agents, as well as lifestyle factors that are relevant for chronic pain severity (Djade et al., 2022), were not controlled for and should be considered in future investigations.

5 | CONCLUSION

Understanding the individual differences implicated in the maintenance of pain over time is crucial to managing it effectively and planning individualised interventions. The results of this longitudinal study suggest that alexithymia is a stable personality trait in chronic pain patients and may strongly predict pain severity after treatment. The present findings may have important clinical implications because no treatment is highly effective for chronic pain. Clinicians could improve treatment outcomes by identifying patients with high levels of alexithymia and referring them to targeted treatment programs. As highlighted by international guidelines (Edwards et al., 2018), the treatment of chronic pain should be based on multimodal phenotypic assessments (including psychological assessment and quantitative sensory testing). Given the links between alexithymia and somatosensory amplification, this approach may be particularly beneficial in the subgroup of patients with chronic pain and high alexithymia. In this regard, the literature has highlighted the modifiability of alexithymia with targeted psychological interventions which can improve affective awareness and reduce the tendency for somatosensory amplification (Bornemann & Singer, 2017; Melin

et al., 2010). Effective treatments involve psychoeducational strategies with skills training to enhance affect awareness. Therapies often focus on identifying and understanding emotions, incorporating structured tasks like cognitive behavioural therapy. Another option is psychodynamic therapy, which involves actively managing countertransference to respond empathetically, mirroring affective states, and taking into account the challenges alexithymic individuals may face with nonverbal communication. Group therapy (cognitive, interpersonal, or psychodynamic) is frequently included, as it provides opportunities for patients to observe and learn from others who express emotions effectively (for a review see Cameron et al., 2014). That increases the relevance of our findings that alexithymia can be clinically relevant in chronic pain prevention and intervention programs (Burger et al., 2016; Lumley et al., 2017).

AUTHOR CONTRIBUTIONS

Roberta Lanzara, Chiara Conti, and Piero Porcelli were responsible for the design and conduction of the study, as well as the acquisition, analysis, and interpretation of data. Vittorio Lalli, Paolo Cannizzaro, Gianna Pia Affaitati, and Maria Adele Giamberardino were involved in data acquisition and revised the manuscript critically. Alison Williams made substantial contributions to the manuscript draft and revised it critically. All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

ACKNOWLEDGEMENTS

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.

CONFLICT OF INTEREST STATEMENT

The authors did not receive support from any organization for the submitted work.

DATA AVAILABILITY STATEMENT

Data supporting this study are not publicly available due to ethical restrictions (sensitive data, such as participants' personally identifiable information). Please contact roberta.lanzara@unich.it.

ETHICS STATEMENT

Written informed consent was obtained from all individual participants included in the study. The study was designed and carried out in accordance with the World Medical Association Declaration of Helsinki and its subsequent revisions (World Medical Association, 2013) and was approved by the Ethics Committee of the Department of Dynamic and Clinical Psychology and Health Studies of the "Sapienza" University of Rome (Prot. n. 0000648).

ORCID

Roberta Lanzara https://orcid.org/0000-0001-8159-5218
Chiara Conti https://orcid.org/0000-0002-4923-4145
Alison Williams https://orcid.org/0009-0005-9976-1671
Piero Porcelli https://orcid.org/0000-0002-2263-8051

REFERENCES

Aaron, R. V., Fisher, E. A., de la Vega, R., Lumley, M. A., & Palermo, T. M. (2019). Alexithymia in individuals with chronic pain and its relation to pain intensity, physical interference, depression, and anxiety: A systematic review and meta-analysis. *Pain*, *160*(5), 994–1006. https://doi.org/10.1097/j.pain.0000000000001487

Adams, M. A., & Conway, T. L. (2014). Eta squared. In A. C. Michalos (Ed.), *Encyclopedia of quality of life and well-being research*. Springer. https://doi.org/10.1007/978-94-007-0753-5_918

Babatunde, O. O., Jordan, J. L., Van der Windt, D. A., Hill, J. C., Foster, N. E., & Protheroe, J. (2017). Effective treatment options for musculoskeletal pain in primary care: A systematic overview of current evidence. *PLoS One*, *12*(6), e0178621. https://doi.org/10.1371/journal.pone.0178621

Bagby, R. M., Parker, J. D., & Taylor, G. J. (1994). The twenty-item Toronto Alexithymia Scale--I. Item selection and cross-validation of the factor structure. *Journal of Psychosomatic Research*, *38*(1), 23–32. https://doi.org/10.1016/0022-3999(94)90005-1

Bagby, R. M., Parker, J. D. A., & Taylor, G. J. (2020). Twenty-five years with the 20-item Toronto alexithymia scale. *Journal of Psychosomatic Research*, *131*, 109940. Advance online publication. https://doi.org/10.1016/j.jpsychores.2020.109940

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Baudic, S., Jayr, C., Albi-Feldzer, A., Fermanian, J., Masselin-Dubois, A., Bouhassira, D., & Attal, N. (2016). Effect of alexithymia and emotional repression on postsurgical pain in women with breast cancer: A prospective longitudinal 12-month study. *The Journal of Pain*, *17*(1), 90–100. https://doi.org/10.1016/j.jpain.2015.10.001

Beresnevaite, M. (2000). Exploring the benefits of group psychotherapy in reducing alexithymia in coronary heart disease patients: A preliminary study. *Psychotherapy and Psychosomatics*, *69*(3), 117–122. https://doi.org/10.1159/000012378

Bjelland, I., Dahl, A. A., Haug, T. T., & Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale. An updated literature review. *Journal of Psychosomatic Research*, *52*(2), 69–77. https://doi.org/10.1016/s0022-3999(01)00296-3

Bleidorn, W., Hopwood, C. J., & Lucas, R. E. (2018). Life events and personality trait change. *Journal of Personality*, *86*(1), 83–96. https://doi.org/10.1111/jopy.12286

Bonica, J. J. (1953). *The management of pain* (Vol. 11, pp. 456–511). Lea & Febiger.

Bornemann, B., & Singer, T. (2017). Taking time to feel our body: Steady increases in heartbeat perception accuracy and decreases in alexithymia over 9 months of contemplative mental training. *Psychophysiology*, *54*(3), 469–482. https://doi.org/10.1111/psyp.12790

Breivik, H., Collett, B., Ventafridda, V., Cohen, R., & Gallacher, D. (2006). Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment. *European Journal of Pain*, *10*(4), 287–333. https://doi.org/10.1016/j.ejpain.2005.06.009

Bressi, C., Taylor, G., Parker, J., Bressi, S., Brambilla, V., Aguglia, E., Allegranti, I., Bongiorno, A., Giberti, F., Bucca, M., Todarello, O., Callegari, C., Vender, S., Gala, C., & Invernizzi, G. (1996). Cross validation of the factor structure of the 20-item Toronto alexithymia scale: An Italian multicenter study. *Journal of Psychosomatic Research*, *41*(6), 551–559. https://doi.org/10.1016/s0022-3999(96)00228-0

Burger, A. J., Lumley, M. A., Carty, J. N., Latsch, D. V., Thakur, E. R., Hyde-Nolan, M. E., Hijazi, A. M., & Schubiner, H. (2016). The effects of a novel psychological attribution and emotional awareness and expression therapy for chronic musculoskeletal pain: A preliminary, uncontrolled trial. *Journal of Psychosomatic Research*, *81*, 1–8. https://doi.org/10.1016/j.jpsychores.2015.12.003

Cameron, K., Ogrodniczuk, J., & Hadjipavlou, G. (2014). Changes in alexithymia following psychological intervention: A review. *Harvard*

Review of Psychiatry, *22*(3), 162–178. https://doi.org/10.1097/HRP.0000000000000036

Caraceni, A., Mendoza, T. R., Mencaglia, E., Baratella, C., Edwards, K., Forjaz, M. J., Martini, C., Serlin, R. C., de Conno, F., & Cleeland, C. S. (1996). A validation study of an Italian version of the Brief Pain Inventory (Breve Questionario per la Valutazione del Dolore). *Pain*, *65*(1), 87–92. https://doi.org/10.1016/0304-3959(95)00156-5

Castellini, G., Merola, G. P., Baccaredda Boy, O., Pecoraro, V., Bozza, B., Cassioli, E., Rossi, E., Bessi, V., Sorbi, S., Nacmias, B., & Ricca, V. (2023). Emotional dysregulation, alexithymia and neuroticism: A systematic review on the genetic basis of a subset of psychological traits. *Psychiatric Genetics*, *33*(3), 79–101. https://doi.org/10.1097/YPG.0000000000000335

Chiarotto, A., Vanti, C., Ostelo, R. W., Ferrari, S., Tedesco, G., Rocca, B., Pillastrini, P., & Monticone, M. (2015). The pain self-efficacy questionnaire: Cross-cultural adaptation into Italian and assessment of its measurement properties. *Pain Practice: the official journal of World Institute of Pain*, *15*(8), 738–747. https://doi.org/10.1111/papr.12242

Cleeland, C. S., & Ryan, K. M. (1994). Pain assessment: Global use of the brief pain inventory. *Annals Academy of Medicine Singapore*, *23*(2), 129–138.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Routledge Academic.

Conti, C., Di Nardo, M., Lanzara, R., Guagnano, M. T., Cardi, V., & Porcelli, P. (2023). Improvement in binge eating and alexithymia predicts weight loss at 9-month follow-up of the lifestyle modification program. *Eating and Weight Disorders: EWD*, *28*(1), 30. https://doi.org/10.1007/s40519-023-01560-5

Cramer, H. (1946). *Mathematical methods of statistics*. Princeton University Press.

Di Lernia, D., Serino, S., & Riva, G. (2016). Pain in the body. Altered interoception in chronic pain conditions: A systematic review. *Neuroscience & Biobehavioral Reviews*, *71*, 328–341. https://doi.org/10.1016/j.neubiorev.2016.09.015

Di Tella, M., & Castelli, L. (2016). Alexithymia in chronic pain disorders. *Current Rheumatology Reports*, *18*(7), 41. https://doi.org/10.1007/s11926-016-0592-x

Djade, C. D., Diorio, C., Laurin, D., & Dionne, C. E. (2022). An exploratory identification of biological markers of chronic musculoskeletal pain in the low back, neck, and shoulders. *PLoS One*, *17*(4), e0266999. https://doi.org/10.1371/journal.pone.0266999

Dowell, D., Haegerich, T. M., & Chou, R. (2016). CDC guideline for prescribing opioids for chronic pain—United States, 2016. *JAMA*, *315*(15), 1624–1645. https://doi.org/10.15585/mmwr.rr6501e1

Dumenci, L., Kroenke, K., Keefe, F. J., Ang, D. C., Slover, J., Perera, R. A., & Riddle, D. L. (2020). Disentangling trait versus state characteristics of the pain catastrophizing scale and the PHQ-8 depression scale. *European Journal of Pain*, *24*(8), 1624–1634. https://doi.org/10.1002/ejp.1619

Edwards, R. R., Dworkin, R. H., Sullivan, M. D., Turk, D. C., & Wasan, A. D. (2016). The role of psychosocial processes in the development and maintenance of chronic pain. *The Journal of Pain*, *17*(9 Suppl), T70–T92. https://doi.org/10.1016/j.jpain.2016.01.001

Edwards, R. R., Dworkin, R. H., Turk, D. C., Angst, M. S., Dionne, R., Freeman, R., Hansson, P., Haroutounian, S., Arendt-Nielsen, L., Attal, N., Baron, R., Brell, J., Bujanover, S., Burke, L. B., Carr, D., Chappell, A. S., Cowan, P., Etropolski, M., Fillingim, R. B., … Yarnitsky, D. (2018). Patient phenotyping in clinical trials of chronic pain treatments: IMMPACT recommendations. *Pain*, *157*(9), 1851–1871. https://doi.org/10.1097/j.pain.0000000000000602

Fishbain, D. A., Cole, B., Cutler, R. B., Lewis, J., Rosomoff, H. L., & Rosomoff, R. S. (2006). Chronic pain and the measurement of personality: Do states influence traits? *Pain Medicine*, *7*(6), 509–529. https://doi.org/10.1111/j.1526-4637.2006.00239.x

Furler, L. (2013). Validität und Reliabilität des Schmerzfragebogens "Brief Pain Inventory". Eine Literaturrecherche (Validity and reliability of the pain questionnaire "Brief Pain Inventory". A literature research). *Pflegezeitschrift*, *66*(9), 546–550.

GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. (2018). Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990-2017: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet (London, England)*, *392*(10159), 1789–1858. https://doi.org/10.1016/S0140-6736(18)32279-7

Gewandter, J. S., Dworkin, R. H., Turk, D. C., Farrar, J. T., Fillingim, R. B., Gilron, I., Markman, J. D., Oaklander, A. L., Polydefkis, M. J., Raja, S. N., Robinson, J. P., Woolf, C. J., Ziegler, D., Ashburn, M. A., Burke, L. B., Cowan, P., George, S. Z., Goli, V., Graff, O. X., … Walco, G. A. (2015). Research design considerations for chronic pain prevention clinical trials: IMMPACT recommendations. *Pain*, *156*(7), 1184–1197. https://doi.org/10.1097/j.pain.0000000000000191

Gruszka, W., Owczarek, A. J., Glinianowicz, M., Bąk-Sosnowska, M., Chudek, J., & Olszanecka-Glinianowicz, M. (2021). Is there a difference in body size dissatisfaction between the patients with obesity seeking and not seeking treatment for obesity? *BMC Public Health*, *21*(1), 1754. https://doi.org/10.1186/s12889-021-11771-z

Haase, L., May, A. C., Falahpour, M., Isakovic, S., Simmons, A. N., Hickman, S. D., Liu, T. T., & Paulus, M. P. (2015). A pilot study investigating changes in neural processing after mindfulness training in elite athletes. *Frontiers in behavioral neuroscience*, *9*, 229. https://doi.org/10.3389/fnbeh.2015.00229

Hayward, R., & Stynes, S. (2021). Self-efficacy as a prognostic factor and treatment moderator in chronic musculoskeletal pain patients attending pain management programmes: A systematic review. *Musculoskeletal Care*, *19*(3), 278–292. https://doi.org/10.1002/msc.1533

Hill, J. C., Lewis, M., Sim, J., Hay, E. M., & Dziedzic, K. (2007). Predictors of poor outcome in patients with neck pain treated by physical therapy. *The Clinical Journal of Pain*, *23*(8), 683–690. https://doi.org/10.1097/AJP.0b013e3181468e67

Hogeveen, J., & Grafman, J. (2021). Alexithymia. *Handbook of Clinical Neurology*, *183*, 47–62. https://doi.org/10.1016/B978-0-12-822290-4.00004-9

Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics*, *6*, 65–70.

Hooten, W. M. (2016). Chronic pain and mental health disorders: Shared neural mechanisms, epidemiology, and treatment. *Mayo Clinic Proceedings*, *91*(7), 955–970. https://doi.org/10.1016/j.mayocp.2016.04.029

Horta-Baas, G., & Romero-Figueroa, M. (2019). Self-reported disability in women with fibromyalgia from a tertiary care center. *Advances in rheumatology (London, England)*, *59*(1), 45. https://doi.org/10.1186/s42358-019-0086-4

Hylands-White, N., Duarte, R. V., & Raphael, J. H. (2017). An overview of treatment approaches for chronic pain management. *Rheumatology International*, *37*(1), 29–42. https://doi.org/10.1007/s00296-016-3481-8

Iani, L., Lauriola, M., & Costantini, M. (2014). A confirmatory bifactor analysis of the hospital anxiety and depression scale in an Italian community sample. *Health and Quality of Life Outcomes*, *12*(1), 84. https://doi.org/10.1186/1477-7525-12-84

Ikemoto, T., Hayashi, K., Shiro, Y., Arai, Y. C., Marcuzzi, A., Costa, D., & Wrigley, P. (2020). A systematic review of cross-cultural validation of the pain catastrophizing scale. *European Journal of Pain*, *24*(7), 1228–1241. https://doi.org/10.1002/ejp.1587

Institute of Medicine (US) Committee on Advancing Pain Research, Care, and Education. (2011). *Relieving pain in America: A blueprint for*

transforming prevention, care, education, and research. National Academies Press (US).

Jungilligens, J., Paredes-Echeverri, S., Popkirov, S., Barrett, L. F., & Perez, D. L. (2022). A new science of emotion: Implications for functional neurological disorder. *Brain: Journal of Neurology*, *145*(8), 2648–2663. https://doi.org/10.1093/brain/awac204

Kano, M., & Fukudo, S. (2013). The alexithymic brain: The neural pathways linking alexithymia to physical disorders. *BioPsychoSocial Medicine*, *7*(1), 1. https://doi.org/10.1186/1751-0759-7-1

Karukivi, M., & Saarijärvi, S. (2014). Development of alexithymic personality features. *World Journal of Psychiatry*, *4*(4), 91–102. https://doi.org/10.5498/wjp.v4.i4.91

Koechlin, H., Coakley, R., Schechter, N., Werner, C., & Kossowsky, J. (2018). The role of emotion regulation in chronic pain: A systematic literature review. *Journal of Psychosomatic Research*, *107*, 38–45. https://doi.org/10.1016/j.jpsychores.2018.02.002

Kojima, M. (2012). Alexithymia as a prognostic risk factor for health problems: A brief review of epidemiological studies. *BioPsychoSocial Medicine*, *6*(1), 21. https://doi.org/10.1186/1751-0759-6-21

Lape, E. C., Selzer, F., Collins, J. E., Losina, E., & Katz, J. N. (2020). Stability of measures of pain catastrophizing and widespread pain following total knee replacement. *Arthritis Care & Research*, *72*(8), 1096–1103. https://doi.org/10.1002/acr.24000

Lemche, E., Brammer, M. J., David, A. S., Surguladze, S. A., Phillips, M. L., Sierra, M., Williams, S. C., & Giampietro, V. P. (2013). Interoceptive-reflective regions differentiate alexithymia traits in depersonalization disorder. *Psychiatry Research*, *214*(1), 66–72. https://doi.org/10.1016/j.pscychresns.2013.05.006

Lerman, S. F., Rudich, Z., Brill, S., Shalev, H., & Shahar, G. (2015). Longitudinal associations between depression, anxiety, pain, and pain-related disability in chronic pain patients. *Psychosomatic Medicine*, *77*(3), 333–341. https://doi.org/10.1097/PSY.0000000000000158

Lindquist, K. A., & Barrett, L. F. (2008). Emotional complexity. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (pp. 513–530). The Guilford Press.

Luminet, O., Bagby, R. M., & Taylor, G. J. (2018). *Alexithymia: Advances in research, theory, and clinical practice*. Cambridge University Press. https://doi.org/10.1017/9781108241595

Luminet, O., Nielson, K. A., & Ridout, N. (2021). Cognitive-emotional processing in alexithymia: An integrative review. *Cognition & Emotion*, *35*(3), 449–487. https://doi.org/10.1080/02699931.2021.1908231

Lumley, M. A., Schubiner, H., Lockhart, N. A., Kidwell, K. M., Harte, S. E., Clauw, D. J., & Williams, D. A. (2017). Emotional awareness and expression therapy, cognitive behavioral therapy, and education for fibromyalgia: A cluster-randomized controlled trial. *Pain*, *158*(12), 2354–2363. https://doi.org/10.1097/j.pain.0000000000001036

Mattila, A. K., Kronholm, E., Jula, A., Salminen, J. K., Koivisto, A. M., Mielonen, R. L., & Joukamaa, M. (2008). Alexithymia and somatization in general population. *Psychosomatic Medicine*, *70*(6), 716–722. https://doi.org/10.1097/PSY.0b013e31816ffc39

Melin, E. O., Thulesius, H. O., & Persson, B. A. (2010). Affect School for chronic benign pain patients showed improved alexithymia assessments with TAS-20. *BioPsychoSocial Medicine*, *4*(1), 5. https://doi.org/10.1186/1751-0759-4-5

Merskey, H., & Bogduk, N. (1994). *Classification of chronic pain. 2nd edition, IASP task force on taxonomy*. IASP Press. Retrieved from http://www.iasp-pain.org/Education/content.aspx?ItemNumber=1698

Monticone, M., Baiardi, P., Ferrari, S., Foti, C., Mugnai, R., Pillastrini, P., Rocca, B., & Vanti, C. (2012). Development of the Italian version of the pain catastrophising scale (PCS-I): Cross-cultural adaptation, factor analysis, reliability, validity and sensitivity to change. *Quality of Life Research: an international journal of quality of life aspects of treatment, care and rehabilitation*, *21*(6), 1045–1050. https://doi.org/10.1007/s11136-011-0007-4

Nakao, M., Barsky, A. J., Kumano, H., & Kuboki, T. (2002). Relationship between somatosensory amplification and alexithymia in a Japanese psychosomatic clinic. *Psychosomatics*, *43*(1), 55–60. https://doi.org/10.1176/appi.psy.43.1.55

National Guideline Centre (UK). (2021). *Evidence reviews for factors that may be barriers to successfully managing chronic pain (chronic primary pain and chronic secondary pain): Chronic pain (primary and secondary) in over 16s: Assessment of all chronic pain and management of chronic primary pain*. National Institute for Health and Care Excellence (NICE).

Nicholas, M. K. (2007). The pain self-efficacy questionnaire: Taking pain into account. *European Journal of Pain*, *11*(2), 153–163. https://doi.org/10.1016/j.ejpain.2005.12.008

Nyklíček, I., & Vingerhoets, A. J. J. M. (2000). Alexithymia is associated with low tolerance to experimental painful stimulation. *Pain*, *85*(3), 471–475. https://doi.org/10.1016/S0304-3959(99)00295-X

Oberleitner, L. M. S., Lumley, M. A., Grekin, E. R., M Z Smith, K., Loree, A. M., Carty, J. N., & Valentino, D. (2019). Problematic prescription opioid use in a chronic pain treatment facility: The role of emotional processes. *Substance Use & Misuse*, *54*(3), 495–505. https://doi.org/10.1080/10826084.2018.1521426

Petrini, L., & Arendt-Nielsen, L. (2020). Understanding pain catastrophizing: Putting pieces together. *Frontiers in Psychology*, *11*, 603420. https://doi.org/10.3389/fpsyg.2020.603420

Pincus, T., Kent, P., Bronfort, G., Loisel, P., Pransky, G., & Hartvigsen, J. (2013). Twenty-five years with the biopsychosocial model of low back pain-is it time to celebrate? A report from the twelfth international forum for primary care research on low back pain. *Spine*, *38*(24), 2118–2123. https://doi.org/10.1097/BRS.0b013e3182a8c5d6

Pinto, P. R., McIntyre, T., Almeida, A., & Araújo-Soares, V. (2012). The mediating role of pain catastrophizing in the relationship between presurgical anxiety and acute postsurgical pain after hysterectomy. *Pain*, *153*(1), 218–226. https://doi.org/10.1016/j.pain.2011.10.020

Porcelli, P., Bagby, R. M., Taylor, G. J., De Carne, M., Leandro, G., & Todarello, O. (2003). Alexithymia as predictor of treatment outcome in patients with functional gastrointestinal disorders. *Psychosomatic Medicine*, *65*(5), 911–918. https://doi.org/10.1097/01.psy.0000089064.13681.3b

Porcelli, P., De Carne, M., & Leandro, G. (2017). The role of alexithymia and gastrointestinal-specific anxiety as predictors of treatment outcome in irritable bowel syndrome. *Comprehensive Psychiatry*, *73*, 127–135. https://doi.org/10.1016/j.comppsych.2016.11.010

Probst, T., Sattel, H., Gündel, H., Henningsen, P., Kruse, J., Schneider, G., & Lahmann, C. (2017). Moderating effects of alexithymia on associations between the therapeutic alliance and the outcome of brief psychodynamic-interpersonal psychotherapy for multisomatoform disorder. *Frontiers in Psychiatry*, *8*, 261. https://doi.org/10.3389/fpsyt.2017.00261

Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., Keefe, F. J., Mogil, J. S., Ringkamp, M., Sluka, K. A., Song, X. J., Stevens, B., Sullivan, M. D., Tutelman, P. R., Ushida, T., & Vader, K. (2020). The revised international association for the study of pain definition of pain: Concepts, challenges, and compromises. *Pain*, *161*(9), 1976–1982. https://doi.org/10.1097/j.pain.0000000000001939

Rogers, A. H., & Farris, S. G. (2022). A meta-analysis of the associations of elements of the fear-avoidance model of chronic pain with negative affect, depression, anxiety, pain-related disability and pain intensity. *European Journal of Pain*, *26*(8), 1611–1635. https://doi.org/10.1002/ejp.1994

Rohn, M. C., Lee, M. R., Kleuter, S. B., Schwandt, M. L., Falk, D. E., & Leggio, L. (2017). Differences between treatment-seeking and nontreatment-seeking alcohol-dependent research participants: An exploratory analysis. *Alcoholism: Clinical and Experimental Research*, *41*(2), 414–420. https://doi.org/10.1111/acer.13304

Sá, K. N., Moreira, L., Baptista, A. F., Yeng, L. T., Teixeira, M. J., Galhardoni, R., & de Andrade, D. C. (2019). Prevalenza del dolore cronico nei Paesi in via di sviluppo: Revisione sistematica e meta-analisi. *Pain Reports*, *4*(6), e779. https://doi.org/10.1097/PR9.0000000000000779

Saariaho, A. S., Saariaho, T. H., Mattila, A. K., Joukamaa, M. I., & Karukivi, M. (2016). The role of alexithymia: An 8-year follow-up study of chronic pain patients. *Comprehensive Psychiatry*, *69*, 145–154. https://doi.org/10.1016/j.comppsych.2016.05.015

Saariaho, A. S., Saariaho, T. H., Mattila, A. K., Ohtonen, P., Joukamaa, M. I., & Karukivi, M. (2017). Alexithymia and depression in the recovery of chronic pain patients: A follow-up study. *Nordic Journal of Psychiatry*, *71*(4), 262–269. https://doi.org/10.1080/08039488.2016.1275782

Setnik, L., & Bazarian, J. J. (2007). The characteristics of patients who do not seek medical treatment for traumatic brain injury. *Brain Injury*, *21*(1), 1–9. https://doi.org/10.1080/02699050601111419

Smith, S. M., Dworkin, R. H., Turk, D. C., McDermott, M. P., Eccleston, C., Farrar, J. T., Rowbotham, M. C., Bhagwagar, Z., Burke, L. B., Cowan, P., Ellenberg, S. S., Evans, S. R., Freeman, R. L., Garrison, L. P., Iyengar, S., Jadad, A., Jensen, M. P., Junor, R., Kamp, C., … Wilson, H. D. (2020). Interpretation of chronic pain clinical trial outcomes: IMMPACT recommended considerations. *Pain*, *161*(11), 2446–2461. https://doi.org/10.1097/j.pain.0000000000001952

Societal Impact of Pain (SIP). (2017). Impact of pain on society costs the EU up to 441 billion euros annually. Available at: https://www.sip-platform.eu/press-area/article/impact-of-pain-on-society-costs-the-eu-up-to-441-billion-euros-annually. Accessed 29 June 2023.

Stubbs, B. (2016). The prevalence and odds of suicidal thoughts, behaviours and deaths among people with painful comorbidities: An updated meta-analysis accounting for publication bias. *Journal of Psychiatric Research*, *72*, 72–73. https://doi.org/10.1016/j.jpsychires.2015.10.019

Sullivan, M. J., Thorn, B., Haythornthwaite, J. A., Keefe, F., Martin, M., Bradley, L. A., & Lefebvre, J. C. (2001). Theoretical perspectives on the relation between catastrophizing and pain. *The Clinical Journal of Pain*, *17*(1), 52–64. https://doi.org/10.1097/00002508-200103000-00008

Sullivan, M. J. L., Bishop, S. R., & Pivik, J. (1995). The pain catastrophizing scale: Development and validation. *Psychological Assessment*, *7*(4), 524–532. https://doi.org/10.1037/1040-3590.7.4.524

Toth, C., Brady, S., & Hatfield, M. (2014). The importance of catastrophizing for successful pharmacological treatment of peripheral neuropathic pain. *Journal of Pain Research*, *7*, 327–338. https://doi.org/10.2147/JPR.S56883

Turner, J. A., & Aaron, L. A. (2001). Pain-related catastrophizing: What is it? *The Clinical Journal of Pain*, *17*(1), 65–71. https://doi.org/10.1097/00002508-200103000-00009

Turner, J. A., Jensen, M. P., Warms, C. A., & Cardenas, D. D. (2002). Catastrophizing is associated with pain intensity, psychological distress, and pain-related disability among individuals with chronic pain after spinal cord injury. *Pain*, *98*(1–2), 127–134. https://doi.org/10.1016/s0304-3959(02)00045-3

Vadivelu, N., Kai, A. M., Kodumudi, G., Babayan, K., Fontes, M., & Burg, M. M. (2017). Pain and psychology-A reciprocal relationship. *The Ochsner Journal*, *17*(2), 173–180.

Vergeld, V., & Utesch, T. (2020). Pain-related self-efficacy among people with back pain: A systematic review of assessment tools. *The Clinical Journal of Pain*, *36*(6), 480–494. https://doi.org/10.1097/AJP.0000000000000818

Wade, J. B., Riddle, D. L., & Thacker, L. R. (2012). Is pain catastrophizing a stable trait or dynamic state in patients scheduled for knee arthroplasty? *The Clinical Journal of Pain*, *28*(2), 122–128. https://doi.org/10.1097/AJP.0b013e318226c3e2

Wiffen, P. J., & Xia, J. (2020). Systematic review of topical diclofenac for the treatment of acute and chronic musculoskeletal pain. *Current Medical Research and Opinion*, *36*(4), 637–650. https://doi.org/10.1080/03007995.2020.1716703

World Health Organization. (2019). *International statistical classification of diseases and related health problems* (11th ed.). World Health Organization.

World Medical Association. (2013). World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*, *310*(20), 2191–2194. https://doi.org/10.1001/jama.2013.281053

Yang, Y., Li, X., Zhao, J., Xue, M., Zhang, M., Wang, C., Song, H., He, L., Guo, W., & Gong, P. (2019). 5-HTTLPR and COMT Val158Met are not associated with alexithymia: New evidence and meta-analyses. *Progress in neuro-psychopharmacology & biological psychiatry*, *92*, 263–270. https://doi.org/10.1016/j.pnpbp.2019.01.015

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, *67*(6), 361–370. https://doi.org/10.1111/j.1600-0447.1983.tb09716.x

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Lanzara, R., Conti, C., Lalli, V., Cannizzaro, P., Affaitati, G. P., Giamberardino, M. A., Williams, A., & Porcelli, P. (2024). Emotions in search of words: Does alexithymia predict treatment outcome in chronic musculoskeletal pain? *Stress and Health*, *40*(5), e3436. https://doi.org/10.1002/smi.3436