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Beyond pain intensity and catastrophizing: The association between self-enhancing humour style and the adaptation of individuals with chronic pain

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Abstract

Background: Many questions regarding the process by which self-enhancing humour style has an effect on chronic pain individuals' adjustment remain unanswered. The aim of the present study was to analyse the association of self-enhancing humour style with adjustment in a sample of individuals with chronic pain, over and above the role of catastrophizing and pain intensity. Adjustment was assessed using measures of depression, pain interference and flourishing. We also examined the indirect association between self-enhancing humour style and adjustment via pain acceptance.

Methods: The study included 427 patients with heterogeneous chronic pain conditions. The study hypotheses were tested using three multiple linear regression analyses, one for each of the criterion variables.

Results: Consistent with the study hypothesis, both direct and indirect associations were found between self-enhancing humour style and depressive symptoms, pain interference and flourishing via pain acceptance.

Conclusions: Self-enhancing humour style could potentially help individuals with chronic pain to gain perspective and distance themselves from the situation through the acceptance of pain-related negative emotions.

Significance: Very few studies have investigated the relationship between humour styles and adjustment in chronic pain samples. The results of the current study support the idea that adaptive dispositional traits, such as patient's self-enhancing humour style, play a role in the adaptation of individuals with chronic pain. Given that the association between self-enhancing humour style and adjustment evidenced an indirect association through pain acceptance, training in the use of humour, as individuals with self-enhancing humour style do, might be a useful addition to ACT treatment.

1 | INTRODUCTION

Chronic pain interferes in the main areas of life (Breivik, Collett, Ventafridda, Cohen, & Gallacher, 2006) and has a negative impact on people's well-being. The negative effects of pain are known to be influenced by a number of psychological factors, such as an individual's tendency to catastrophize about their pain (Craner, Sperry, Koball, Morrison, & Gilliam, 2017). Pain catastrophizing has been defined as exaggerated maladaptive cognitions in response to ongoing, anticipated or recalled pain (Kapoor, Thorn, Bandy, & Clements, 2015). The detrimental role of catastrophizing in managing and coping with pain is well documented, and catastrophizing is widely acknowledged as an important predictor of pain experience (Campbell et al., 2010; Khan et al., 2011; Mankovsky, Lynch, Clark, Sawynok, & Sullivan, 2012; Ramírez-Maestre, Esteve, Ruiz-Párraga, Gómez-Pérez, & López-Martínez, 2017). However, not all individuals with chronic pain report significant levels of catastrophizing or problems in psychological adjustment (Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, 2012). Theoretical models of chronic pain have to take into account how individuals try to function despite pain, or how they attempt to recover (Crombez et al., 2012). Research is needed to better understand the role that personal individual differences play in successful adjustment to chronic pain. According to Martin (2007), humour is anything that people say or do that is perceived as funny and makes others laugh. However, humour is a complex concept that might be understood as a cognitive style, a way of relating to others, a way of coping or a personality trait (Moran, 2013). Sense of humour has been conceptualized as a stable personality trait that can lead to differences in behaviour (Martin, Puhlik-Doris, Larsen, Gray, & Weir, 2003) and attitudes (Ford, McCreight, & Richardson, 2014). Martin et al. (2003) posited four styles or uses of humour that influence adjustment: (a) *affiliative humour style* (i.e. using humour to enhance one's relationships with others); (b) *self-enhancing humour style* (i.e. using humour to enhance the self); (c) *aggressive humour style* (using humour to enhance the self at expense of others); and (d) *self-defeating humour style* (use of humour to enhance relationships at expense of self). Empirical literature indicates that affiliative and self-enhancing styles are adaptive (Schneider, Voracek, & Tran, 2018). Research findings in otherwise healthy individuals are also consistent with this hypothesis (Ford, Lappi, O'Connors, & Banos, 2017; Richards & Kruger, 2017; Yue, Hao, & Goldman, 2010). Thus, the studies by Richards and Kruger (2017) and Yue et al. (2010) analysed the role of these humour styles in samples of undergraduate students. The results of both transactional studies showed a negative association between self-enhancing humour, perceived stress and psychological distress.

In the chronic pain context, some cross-sectional studies show that the use of humour as a strategy for managing stress is associated with lower levels of anxiety, greater perceived ability to control pain (Hallberg & Carlsson, 1998) and positive reappraisals (Cuevas-Toro, Torrecillas, Medina, & Diaz-Batanero, 2008). One longitudinal study found that the use of humour as a coping strategy was related to less pain and distress (Merz et al., 2009). However, very few studies have investigated the relationship between humour styles and adaptation in chronic pain samples (Pérez-Aranda et al., 2019). Sánchez Espinar et al. (2016) found that self-enhancing humour style and humour-based coping strategies were associated with more life satisfaction and positive affect. Many questions regarding the process by which self-enhancing humour style has an effect on adjustment in chronic pain individuals remain unanswered. Martin et al.'s (2003) suggested that people use the self-enhancing humour style to maintain a positive subjective state even under stressful conditions, being the reappraisal of stressful situations a defining component of this humour style. Studies are needed to identify the potential of other variables that could explain the association between self-enhancing humour style and adaptation in chronic pain patients. One such potential variable is pain acceptance. Acceptance has been defined as a response to pain-related experiences that do not involve control or avoidance leading the patient to engage in valued activities and reaching personal goals regardless of pain (McCracken & Eccleston, 2003). Several studies have found positive associations between measures of pain acceptance and adjustment to chronic pain (Ramírez-Maestre, Esteve, & López-Martínez, 2014; Serbic & Pincus, 2017). In contrast, the adaptive use of humour could potentially provide health benefits by increasing the acceptance of negative emotions as an adaptive emotional regulation strategy (Kuiper, Martin, & Olinger, 1993). Consistent with this possibility, Mathews (2016) found an association between the use of self-enhancing and affiliative humour styles and the use of this emotional regulation strategy (acceptance of negative emotions). Although pain acceptance and the acceptance of negative emotions are different concepts, it would be reasonable to hypothesize a positive association between a self-enhancing humour style and pain acceptance in individuals with chronic pain.

Given these considerations, this study had two primary objectives. First, we sought to replicate and extend previous research on the association between self-enhancing humour style and measures of adjustment (depression, pain interference and well-being) in a sample of individuals with chronic pain. In order to test the contribution of self-enhancing humour to adaptation in such patients, catastrophizing and pain intensity were included in the hypothetical model as strong predictors of pain maladjustment. Our second aim was to

evaluate the role of acceptance in explaining the association between self-enhancing humour style and the study criterion variables. On the basis of the studies reviewed above, we hypothesized that higher levels of self-enhancing humour style would be associated with lower levels of depressive symptoms (Cann & Collette, 2014; Rnic, Dozios, & Martin, 2016) and pain interference (Helvik, Jacobsen, & Hallberg, 2006); and higher levels of well-being (Martin et al., 2003). We also hypothesized that the measure of self-enhancing humour style would have an indirect association with depression, pain interference and flourishing, via its relationship with pain acceptance.

2 | METHODS

2.1 | Participants

Participants were recruited using a database of individuals with medical conditions commonly associated with pain. This database is maintained by the University of Washington. Inclusion criteria were as follows: (a) having chronic pain (defined as a constant or recurrent bothersome pain during the last 3 months for at least half of the days during this period); and (b) having access to a computer or smartphone with internet connection. The study data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools (Harris et al., 2009) hosted at the University of Washington. REDCap is a secure web-based application designed to support data capture for research studies.

2.2 | Procedures

In total, 2,871 potential participants were sent emails containing a brief explanation of the study purposes, a general description of the contents of the survey questions and a link to the online survey that they could follow if they were interested in learning more about the study. Of these, 899 expressed an interest in participating and were then presented with some screening questions. Of these, 212 did not meet the inclusion criteria. The remaining 687 who qualified for the study were shown an informed consent statement that they had to sign digitally if they wanted to participate. After signing their consent, they were then given the first question of the survey. Finally, 427 participants answered all the survey questions. The consent obtained from all participants was both written and informed.

Data were collected anonymously between October 2016 and June 2017. Participation was voluntary and the participants were not required to answer any question they did not want to answer. Participants were not compensated for their time. Before starting the study, the Institutional Review Board of the University of Washington reviewed the protocols and considered the study of 'minimal' risk and exempt from a full board review.

2.3 | Measures

2.3.1 | Demographic variables

Participants provided basic demographic information including age, sex, race or ethnicity, diagnosis, education level and work status.

2.3.2 | Pain location

The participants were provided with a list of 12 possible pain locations and asked to check off all the areas of the body where they were experiencing pain. The list of pain locations participants could choose from was developed for the study. This approach to assessing pain locations and their extent has been frequently used in other studies (McBeth, Wilkie, Bedson, Chew-Graham, & Lacey, 2015; Miró, Gertz, Carter, & Jensen, 2014; de la Vega et al., 2016).

2.3.3 | Pain intensity

Participants were asked to rate their least, average and worst pain during the previous week, as well as their current pain intensity level, on a numerical rating scale (NRS) ranging from 0 ('No pain') to 10 ('Worst pain possible'). These ratings were then averaged into a single composite pain intensity score (Jensen, Turner, Romano, & Fischer, 1999). Numerical rating scales are commonly used in pain research, and are known to provide valid and reliable measures of pain intensity across different populations (Jensen & Karoly, 2001).

2.3.4 | Catastrophizing

The 2-item Coping Strategies Questionnaire (CSQ; Jensen, Keefe, Lefebvre, Romano, & Turner, 2003) was used to assess pain catastrophizing. With this measure, respondents indicate the frequency with which they experienced two catastrophizing thoughts and feelings when in pain on a 7-point scale ranging from 0 ('Never') to 6 ('Always'). For example, one of the item questions is 'I feel I can't stand it anymore'. This scale has been shown to provide a valid and reliable measure of catastrophizing when used with chronic pain patients (Jensen et al., 2003). In the current sample, following Eisinga et al.'s suggestion (Eisinga, Te Grotenhuis, & Pelzer, 2013), both the Spearman–Brown coefficient and the

standardized coefficient alpha were calculated to measure the internal consistency of these two items. Both indicated good levels of reliability in the current sample (Spearman–Brown coefficient = 0.84; Cronbach's alpha = 0.83).

2.3.5 | Acceptance

Pain acceptance was measured with the 8-item Chronic Pain Acceptance Questionnaire (CPAQ-8; Fish, Hogan, Morrison, Stewart, & McGuire, 2013; Fish, McGuire, Hogan, Morrison, & Stewart, 2010). With this questionnaire, respondents rate how true each acceptance item is for them on a scale ranging from 0 ('Never true') to 6 ('Always true'). For example, one of the items is, 'When my pain increases, I can still take care of my responsibilities'. The CPAQ-8 total score has been shown to provide reliable and valid measures of pain acceptance in chronic pain populations (Fish et al., 2013). In this study, the total score evidenced a marginal level of reliability (Cronbach's alpha = 0.63).

2.3.6 | Self-enhancing humour style

Self-enhancing humour style was measured with the Self-enhancing humour style subscale of the Humor Style Questionnaire (HSQ; Martin et al., 2003). Although HSQ assesses four humour styles, the self-enhancing humour style alone was assessed in the present study. This subscale comprises eight items that are answered on a scale ranging from 1 ('Totally disagree') to 7 ('Totally agree'). The items include the following example statements: 'If I am feeling depressed, I can usually cheer myself up with humour', 'Even when I'm by myself, I'm often amused by the absurdities of life' and 'It is my experience that thinking about some amusing aspect of a situation is often a very effective way of coping with problems'. In an earlier study (Sánchez Espinar et al., 2016), we administered the Spanish self-enhancing humour scale (HSQ-SE) to 111 patients with chronic pain. The results showed that HSQ-SE had an acceptable internal consistency reliability (alpha = 0.77) and a positive and statistically significant association with the use of humour-coping strategies (COPE), positive affect (PANAS) and satisfaction with life (SWLS). These findings support the reliability and concurrent criterion validity of the HSQ-SE in chronic pain populations. In this sample, the reliability of the HSQ-SE was excellent (Cronbach's alpha = 0.91).

2.3.7 | Flourishing

The Flourishing Scale (FS; Diener et al., 2010) comprises eight items that address several aspects of well-being, such as positive relationships, feelings of competence, and having meaning and purpose in life. Each item is answered on a scale ranging from 1 ('Strong disagreement') to 7 ('Strong agreement'). An item example is 'I lead a purposeful and meaningful life'. The scale has been shown to provide a reliable and valid measure of perceived flourishing when used with chronic pain patients (Ramírez-Maestre, Correa, et al., 2017). In this sample, the reliability of the FS score was excellent (Cronbach's alpha = 0.92).

2.3.8 | Depressive symptoms

Depressive symptoms were assessed using the 8-item Patient Reported Outcome Measurement Information System (PROMIS) Emotional Distress-Depression Scale short form (Cook et al., 2016). Respondents indicate how frequently they have experienced eight symptoms of depression over the past 7 days on a scale ranging from 1 ('Never') to 5 ('Always'). An example item is 'I felt depressed'. The scale has been shown to provide reliable and valid scores representing depressive symptom frequency when used with chronic pain patients (Cook et al., 2016). In this sample, the internal consistency of the scale was excellent (Cronbach's alpha = 0.94).

2.3.9 | Pain interference

Pain interference was assessed using the 6-item PROMIS Pain Interference Scale (Cook et al., 2016). With this measure, respondents indicate how much pain has interfered with their day-to-day activities over the past 7 days on a scale ranging from 1 ('Not at all') to 5 ('Very much'). An example item is 'How much did pain interfere with your day to day activities?' The scale has been shown to provide a reliable and valid measure of pain interference when used with chronic pain patients (Cook et al., 2016). In the current this sample, the internal consistency of the scale was excellent (Cronbach's alpha = 0.95).

2.4 | Data analyses

We first computed descriptive statistics to characterize the sample. We then computed the univariate associations among the study variables by computing Pearson correlation coefficients. Next, we examined the distributions of the study variables for normality, and evaluated the predictors for homoscedasticity and multicollinearity to ensure that they met the assumptions for the planned regression analyses (Tabachnick & Fidell, 2007). The study hypotheses were tested using three multiple linear regression

TABLE 1 Means, standard deviations and correlations between the main study variables

Variables	Mean (SD)	1	2	3	4	5	6	7
1. Pain intensity	5.52 (1.71)	1						
2. Pain catastrophizing	4.31 (3.29)	0.39**	1					
3. Self-enhancing humour style	38.83 (10.23)	−0.039	−0.23**	1				
4. Pain acceptance	29.93 (7.03)	−0.18**	−0.26**	0.20**	1			
5. Depressive symptoms	16.76 (7.14)	0.24**	0.55**	−0.42**	−0.36**	1		
6. Pain interference	18.25 (6.38)	0.43**	0.44**	−0.21**	−0.50**	0.50**	1	
7. Flourishing	45.36 (8.57)	−0.23**	−0.45**	0.41**	0.39**	−0.66**	−0.49**	1

**p < .01.

analyses (Cohen, Cohen, West, & Aiken, 2003), one for each criterion variable. Age and sex were entered in each analysis as control variables in step 1. The measures of catastrophizing and pain intensity were then entered in step 2. Finally, self-enhancing humour style was entered in step 3. Variables with $p \geq .1$ were excluded from the equation. Thus, a value of 0.1 was set as the limit for the removal of variables to reduce the risk of overlooking potential predictors. Continuous variables were mean centred to reduce the effects of multicollinearity (Aiken, West, & Reno, 1991). Finally, Preacher and Hayes' (2008) procedure was applied to investigate the indirect association of self-enhancing humour style and adjustment through pain acceptance. All analyses were conducted using the Statistical Package for Social Sciences (SPSS; Windows version 22.0, SPSS Inc.).

3 | RESULTS

3.1 | Sample characteristics

The final sample comprised 427 individuals with chronic pain. Their average age was 58.6 years ($SD = 10.7$). Most of the participants were women (66%) and Caucasian (90%); some participants (4%) reported themselves as belonging to more than one race. At the time of the study, 40% were retired, 12% were unemployed due to pain, 18% were unemployed for other reasons, 14% were employed full time and 12% were employed part-time. A total of 84% of participants had attended University or Graduate School. Regarding clinical variables, the most frequent diagnoses were as follows: back pain (43%), multiple sclerosis (37%), osteoarthritis (20%) and spinal cord injury (20%). The main pain sites were the back (71%), legs (66%), shoulders (55%) and neck (52%). Average pain intensity was 5.52 (range 0–10; $SD = 1.71$).

3.2 | Assumptions testing

The result of assumptions testing showed that skewness (range −1.24 to 0.84) and kurtosis (range −0.86 to 1.33) did not exceed the standard cut-off of 3 (Tabachnick & Fidell, 2007), indicating that the distributions of the study variables included in the regression analyses were normal. The values of the variance inflation factors (1.00–1.31) in the three regression analyses were less than the standard cut-off of 10 (Hair, Anderson, Tatham, & Black, 1995), indicating an absence of multicollinearity between the predictor variables. The absolute values of the correlation coefficients between the predictors (range 0.18–0.39) were all less than 0.50. Finally, Durbin-Watson values ranged between 1.5 and 2.5 for the three criterion variables (depressive symptoms: 1.88; pain interference: 2.10; and flourishing: 1.82).

3.3 | Descriptive analyses and correlations between variables

Table 1 shows the mean, standard deviations and correlations between the study variables.

3.4 | Association of pain intensity, catastrophizing and self-enhancing humour style with depressive symptoms, pain interference and flourishing

Table 2 shows the results of the regression analysis for the prediction of depressive symptoms, pain interference and flourishing. Regarding depressive symptoms, after controlling for demographic variables (age and sex), pain catastrophizing ($\beta = 0.54$, $p < .001$), but not pain intensity ($\beta = 0.03$, $p = .468$), significantly contributed to the prediction of depressive symptoms (R^2 change = 0.29; $p < .001$). After

Criterion variables	Predictive Variables	Beta (standardized)	R^2	F
Depressive symptoms				82.74**
	Model 1		0.29	
	Pain catastrophizing	0.53**		
	Pain intensity	0.03		
	Model 2		0.38	
	Pain catastrophizing	0.45**		
	Pain intensity	0.05		
	Self-enhancing humour style	−0.30**		
Pain interference				43.22**
	Model 1		0.27	
	Pain intensity	0.31**		
	Pain catastrophizing	0.32**		
	Model 2		0.29	
	Pain intensity	0.33**		
	Pain catastrophizing	0.27**		
	Self-enhancing humour style	−0.14*		
Flourishing				59.96**
	Model 1		0.22	
	Pain intensity	−0.06		
	Pain catastrophizing	−0.47**		
	Model 2		0.39	
	Pain intensity	−0.08		
	Pain catastrophizing	−0.40**		
	Self-enhancing humour style	0.30**		

*$p < .005$; **$p < .001$.

controlling for pain intensity and pain catastrophizing, self-enhancing humour style ($\beta = -0.30$, $p < .001$) significantly contributed to the prediction of depressive symptoms (R^2 change $= 0.09$; $p < .001$). In this study, pain intensity, catastrophizing and self-enhancing humour style explain 38% of depressive symptoms variance.

As shown in Table 2, after controlling for age and sex, pain catastrophizing ($\beta = 0.32$, $p < .001$) and pain intensity ($\beta = 0.31$, $p < .001$) both made significant contributions to the prediction of pain interference (R^2 change $= 0.27$; $p < .001$). Finally, after controlling for pain intensity and pain catastrophizing, self-enhancing humour style ($\beta = -0.14$, $p < .005$) made an additional significant contribution to the prediction of this criterion variable (R^2 change $= 0.02$; $p < .001$). Pain intensity, catastrophizing and self-enhancing humour style altogether explained 29% of the pain interference variance.

Finally, after controlling for demographic variables (age and sex), pain catastrophizing ($\beta = -0.47$, $p < .001$), but not pain intensity ($\beta = -0.06$, $p = .219$), significantly contributed

to the prediction of flourishing (R^2 change $= 0.22$; $p < .001$). After controlling for pain intensity and pain catastrophizing, self-enhancing humour style ($\beta = 0.30$, $p < .001$) significantly contributed to the prediction of flourishing (R^2 change $= 0.09$; $p < .001$). The 39% of flourishing variance was explained by catastrophizing and self-enhancing humour style ($R^2 = 0.39$).

3.5 | The indirect association between self-enhancing humour style and flourishing through pain acceptance

Table 3 shows the path coefficients and confidence intervals for each association tested in the model. The results show that pain acceptance had a statistically significant indirect association with all three criterion variables. Overall, the results showed that increased self-enhancing humour style was significantly associated with higher levels of pain acceptance,

TABLE 3 Path coefficients and confidence intervals of the direct and indirect effects of acceptance

Independent variable (IV)	Mediating variable (M)	Dependent variable (DV)	Effect of IV on M	Effect of M on DV	Direct effect	Indirect effect	95% CI for indirect effect	Total effect
SE Humour	Acceptance	Depression	0.14**	−0.29**	−0.25**	−0.04**	−0.0679 to −0.0203	−0.29**
		Interference		−0.44**	−0.07**	−0.06**	−0.0950 to −0.0330	−0.13**
		Flourishing		0.39**	0.29**	0.05**	0.0276–0.0873	0.34**

Note: Estimated using bias corrected and accelerated bootstrapping, with 5,000 samples.

Abbreviations: CI, confidence interval; SE humor, self-enhancing humour style.

**$p < .001$.

which in turn was related to higher levels of flourishing and lower levels of depressive symptoms and pain interference.

4 | DISCUSSION

The aim of this study was to investigate the association between self-enhancing humour style and adjustment in a sample of individuals with chronic pain, after controlling for demographic variables, pain catastrophizing and pain intensity. We also assessed the role of pain acceptance in the association between self-enhancing humour style and adjustment in these patients. Consistent with the study hypothesis, we found that increased self-enhancing humour style was directly and indirectly associated with all three criterion variables (depressive symptoms, pain interference and flourishing). These results have important clinical and theoretical implications. Our finding that self-enhancing humour style is significantly associated with all three criterion measures assessing adjustment in consistent with previous findings regarding the association between self-enhancing humour style and measures of adjustment in other samples (e.g. depression, Yue et al., 2010; positive mood, Richards & Kruger, 2017). Thus, this finding appears to be reliable across measures of adjustment and samples of individuals with chronic pain. It is consistent with Martin et al.'s (2003) model of self-enhancing humour style as being an adaptive response. It also raises the possibility—not tested yet in this or previous correlational studies—that self-enhancing humour might influence adjustment to chronic pain. Future research to examine this possibility appears warranted.

The analyses indicating that acceptance had a significant indirect effect explaining the association between self-enhancing humour style and the study criterion variables is consistent with the possibility that self-enhancing humour style could be considered an emotion-regulation skill that could facilitate the acceptance of pain and pain-related negative emotions (Mathews, 2016). Cognitive defusion, a process hypothesized to facilitate acceptance, allows individuals to detach themselves from their emotions and pain such that the

emotions and pain do not have to guide behaviour. Greater defusion and acceptance would then allow individuals with chronic pain to decide their course of action based more on their values than on their fluctuations in pain and the negative emotions associated with it. Future research to evaluate this possibility is warranted. For example, longitudinal studies to evaluate how changes in self-enhancing humour style might prospectively predict changes in defusion and acceptance, which might then prospectively predict changes in measures of adaptation.

We found it very interesting that pain catastrophizing and self-enhancing humour style, but not pain intensity, significantly contributed to the prediction of flourishing. This result supports the well-known relevance of psychological variables in chronic pain patients' well-being and, therefore, the need to include psychological interventions in the overall treatment of these individuals. Once again, catastrophizing emerges as a central predictor of maladjustment in chronic pain patients (Ramírez-Maestre, Correa, et al., 2017; Ramírez-Maestre, Esteve, et al., 2017), while self-enhancing humour is related to flourishing in this sample. Therefore, regardless of the level of pain experienced by patients, psychological interventions could take into account both variables in order to improve patients' well-being. Flourishing is a 'positive psychology' domain that is an important component of overall well-being (Seligman, 2011). Well-being is a global multidimensional concept that is reflected by subjective appraisals made by individuals concerning the quality of their lives (Ryff & Singer, 2000). To our knowledge, this is the first study that has evaluated the association between self-enhancing humour style and flourishing as a measure of well-being. The findings support both a direct and an indirect association between self-enhancing humour style and flourishing.

The results of the current study show that psychological variables—such as catastrophizing and self-enhancing humour style—had a significant association with a variety of measures of adjustment in individuals with chronic pain. Again, this result highlights the relevant role of psychological variables in understanding the experience of chronic pain (Jensen & Turk, 2014). Overall, the findings support the idea

that even when catastrophizing plays a role in the adjustment of individuals with chronic pain, adaptive dispositional traits, such as patient's self-enhancing humour style, should also be taken into account. According to Ramírez-Maestre, Esteve, and López-Martínez (2012), positive personality characteristics could play a crucial role in patient adjustment, and thus researchers and clinicians should take into account the positive path to capacity to better understand the chronic pain experience. According to the postulates of Seligman and Csikszentmihalyi (2014) and those of positive psychology, interventions should not only attempt to decrease negativity but also to increase the well-being. From this point of view, attempts could be made to increase self-enhancing humour and decrease catastrophizing in individuals with chronic pain.

As indicated previously, in addition to longitudinal research, experimental research would be useful for determining the potential benefits of interventions that might increase patient's skills in the use of self-enhancing humour styles as a way to improve adjustment in individuals with chronic pain. In this line, Ford et al. (2017) conducted three experiments to determine the effect of self-enhancing humour on state anxiety in an anticipated stressful event, showing that engaging in self-enhancing humour can alleviate state anxiety associated with these kinds of events. Studies on positive affective induction have suggested that laughter and humour therapy may be of use in individuals with chronic pain (Behrouz et al., 2017; Gonot-Schoupinsky & Garip, 2018; Tse et al., 2010). People who have high levels of self-enhancing humour style find amusement in the incongruities and absurdities of life, making an optimistic reappraisal of stressful situations and negative life events (Ford et al., 2017; Kuiper et al., 1993; Martin et al., 2003). Thus, in stressful situations, such as chronic pain, patients with a self-enhancing humour style could try to make an optimistic reappraisal of their pain situation. This way of behaving has been associated with positive affect.

Given our findings that the association between self-enhancing humour style and adjustment evidenced an indirect association through pain acceptance, training in the use of humour, as individuals with self-enhancing humour style do, might be a useful addition to *Acceptance and Commitment Therapy* (ACT) treatment (Dahl, Wilson, & Nilsson, 2004). Part of the ACT approach to chronic pain is the defusion of negative cognition. That is, ACT does not question the validity of negative cognitions associated with pain; rather, the purpose of this intervention is to foster an accepting posture towards disturbing negative cognitive content associated with pain. As previously explained, self-enhancing humour could help to reach this goal. Research to evaluate this possibility is warranted.

This study has a number of limitations that should be considered when interpreting the results. Firstly, given the methods used for data collection, we have no way of knowing the characteristics (i.e. demographic, diagnostic) of the potential participants who did not respond, and so it is possible that only those with a higher motivation responded. Thus, the study could be limited by the sample not being representative. On the other hand, it is important to acknowledge some controversy regarding the use of the HSQ to measure self-enhancing humour style. For example, Heintz and Ruch (Heintz, 2017; Heintz & Ruch, 2015) noted a mismatch between the definition and measurement of self-enhancing humour style, as measured with the HSQ scale. At the same time, Heintz and Ruch (2019) also noted that a great deal of evidence supports the reliability and validity of the HSQ scores (see Martin, 2015). Recent studies support the convergent validity of all of the HSQ scale's scores, except for the self-defeating scale (e.g. Heintz, 2017; Ruch & Heintz, 2013, 2017). Indeed, the validity of the HSQ measure of self-enhancing humour style was supported by the current findings, which showed, yet again, that it was significantly associated with the measures of important adaptation domains. Still, the field would benefit from the development of alternative measures of humour styles, in order to evaluate the specific role that humour itself has on adjustment in individuals with and without chronic pain.

In addition, we only used self-report measures in this study. Future research could use more objective measures of humour style (e.g. humour ratings of participants by those who know them). Finally, the cross-sectional design of the current study design precludes the possibility of drawing causal conclusions regarding the associations found. As discussed previously, longitudinal methods would be useful to investigate the predictive value of self-enhancing humour style in the adaptation of chronic pain patients. Further, experimental research is needed to determine the extent to which the self-enhancing humour style might influence pain-related and well-being outcomes.

Despite the study's limitations, the findings indicate that self-enhancing humour style may be a useful domain to study further to help us understand how individuals deal with and adjust to chronic pain. It remains possible that efforts to increase an individual's use of humour—including self-enhancing humour—may help individuals with chronic pain not only reduce the negative effects of these conditions (i.e. reduce depression and pain interference), but even improve 'positive psychology' domains of overall well-being, including flourishing (Seligman, 2011).

DISCLOSURE

No potential conflict of interest was reported by the authors. All the authors declare no conflict of interest. All the procedures involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was individually obtained from all study participants. This article does not refer to any animal studies conducted by any of the authors. The Human Subjects Division of the University of Washington approved this study. The Institutional Review Board of the University of Washington reviewed the protocols and considered the study of 'minimal' risk and exempt from a full board review.

AUTHORS' CONTRIBUTION

All the authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content. Carmen Ramírez-Maestre, Rocío de la Vega and Mark Jensen take responsibility for the integrity of the work as a whole, from inception to published article. All the authors meet the following criteria: 1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; 3) final approval of the version to be published.

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