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RESEARCH PAPER

Pain is inevitable, but suffering is optional: A cross-sectional study of positive psychology variables in chronic back pain

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Abstract

Background: Chronic back pain is the leading cause of disability worldwide. Negative mental health outcomes, such as depression and anxiety, are common in those with chronic pain. Positive Psychology Variables (PPVs) including mindfulness, gratitude, pain self-efficacy and self-compassion have variously been found to be associated with the experience of pain itself, and with mental health in those with pain.

Aims: The current study sought to assess the relationships of these variables to depression and satisfaction with life in people with chronic back pain.

Method: This was an online cross-sectional survey with data from 211 adults with chronic back pain living in Ireland and the UK.

Results: Controlling for demographic variables, personality, and level of pain, the four PPVs collectively explained 25.2% of variance in satisfaction with life scores, and 8.8% in depression scores. Gratitude was the strongest unique predictor.

Discussion: Dispositional or trait gratitude was found to be an important predictor of satisfaction with life and in depression in people with chronic back pain.

Conclusion: Positive psychology variables play an important role in pain-related outcomes. Future research should evaluate the role of gratitude interventions among people with chronic back pain.

Keywords: *chronic pain; back pain; wellbeing; depression; gratitude; mindfulness; self-compassion; self-efficacy; positive psychology*

INTRODUCTION

Chronic back pain, particularly low back pain, is the leading cause of disability globally (Wu et al., 2020). It is responsible for high treatment costs, sick leave, work absenteeism and individual suffering (Alonso-Garcia & Sarria-Santamera, 2020; Dagenais et al., 2008; Kleinman et al., 2014; Maniadakis & Gray, 2000; Parthan et al., 2006; Wu et al., 2020). While most people experiencing back pain will recover within a few weeks, a quarter to a third will continue to experience pain after 12 months (Hayden et al., 2010). Those who develop chronic, longstanding back pain tend to show a more persistent course (Hayden et al., 2010).

Treating chronic back pain can be complex due to the multifaceted biopsychosocial nature of the condition (Hartvigsen et al., 2018), for example beliefs about back pain

can influence pain and disability (Morton et al., 2019), and pain-related fear can be more disabling than the pain itself (Crombez et al., 1999). There is a significant placebo effect in chronic pain (Colloca, 2019) and chronic back pain (Puhl et al., 2011). The placebo effect can be described as a contextual improvement or healing resulting from the clinical encounter (Miller & Kaptchuk, 2008). In two systematic reviews, it was found that placebo effects can significantly reduce pain outcomes in the context of a health care interaction (Di Blasi et al., 2001; Mistiaen et al., 2015).

There are various individual factors - including comorbidities, sedentary lifestyle, age, chronic disease, environmental and psychological factors - which can impact the experience of chronic pain (Andersson, 1999; Bentsen et al., 2007; DiNapoli et al., 2016). Chronic pain has a comorbidity with a number of conditions including depression (Fishbain et al., 1997), anxiety (Hawley & Wolfe, 1993), disrupted sleep (Tang et al., 2007), and weakened physical condition due to decreased activity and a negative impact on social relationships (van den Berg-Emons et al., 2007).

Clinical studies struggle to identify the factors that lead to pain chronicification (Chou & Shekelle, 2010), although maladaptive pain coping behaviours, psychiatric comorbidities and general health status are the factors most likely to predict pain becoming chronic. Depressed mood, negative beliefs, and somatization, have all been shown to affect chronicity of pain and disability related to pain (Pincus et al., 2002). Hashmi and colleagues have shown that chronic pain is associated with a heightened emotional state, which orientates the person towards 'suffering' with the condition (Hashmi et al., 2013).

Up to half of people who suffer from chronic pain also suffer from depression (Bair et al., 2003). Depression itself complicates the management of pain; while it is often comorbid with pain, it may not always be diagnosed, which in turn may heighten the risk of suicide. Smith, Perlis and Haythornthwaite found a greater risk of suicide in people suffering from chronic pain when the person's sleep was disrupted (Smith et al., 2004). Sleep disturbance is commonly associated with chronic pain, with one study showing that 76% of the participants with chronic pain had insomnia (Ng & Wong, 2013).

We know that psychological distress and maladaptive coping strategies are significantly associated with severe pain (DiNapoli et al., 2016). Older adults with chronic lower back pain tend to develop behavioural and cognitive coping strategies to help them tolerate or reduce pain and these in turn, significantly predict pain, functional capacity, and chronification of back pain. For example, adaptive coping strategies are generally associated with reduced pain, positive affect, and better psychological adjustment (Elliott et al., 2002). Conversely, maladaptive coping strategies have been linked with negative outcomes such as distress, greater pain, and disability (Wertli, Eugster, et al., 2014; Wertli, Rasmussen-Barr, et al., 2014). In a systematic review conducted by Pincus and his team in the UK, it was found that psychological factors including distress, depressed mood and somatization, are implicated in the transition from acute to chronic low back pain (Pincus et al., 2002).

BACKGROUND, AIMS AND OBJECTIVES

Positive Psychology and Pain

While much of the psychological research around pain has tended to focus on the role of negative states and traits (Amiri et al., 2020; Pincus et al., 2002), there is increasing evidence for the beneficial role of positive psychological variables (Basten-Gunther et al., 2019; Boselie et al., 2018; Finan & Garland, 2015; Iddon et al., 2016). Positive psychology focuses on optimal function and the idea that positive health is associated with improved disease prognosis and increased longevity (Seligman, 2008).

The potential for positive psychology interventions to help manage or reduce pain is evidenced by research showing that positive affect can enhance pain resilience through neurobiological and cognitive pathways (Hanssen et al., 2017). Various rigorous reviews have found that interventions based on positive psychology principles can improve mental health and wellbeing (Bolier et al., 2013; Casellas-Grau et al., 2014; Kletter et al., 2021; Sin & Lyubomirsky, 2009), in clinical populations such as breast cancer patients (Casellas-Grau et al., 2014) and people with psychiatric and somatic disorders (Chakhssi et al., 2018).

More recently, researchers have started to examine the role of positive psychology interventions for chronic pain (Boselie et al., 2018; Hanssen et al., 2017; Iddon et al., 2016; Peters et al., 2017). For example, in a systematic review, eight studies evaluating the impact of positive psychology interventions on chronic pain found improvement in wellbeing and pain self-efficacy (Iddon et al., 2016). There were various methodological limitations with the studies being reviewed, however, and larger, better controlled randomized controlled trials are needed examine the benefits of positive psychology interventions in clinical practice (Casellas-Grau et al., 2014; Macaskill, 2016).

Considering the high prevalence, cost and consequences of pain on wellbeing and quality of life, understanding the impact

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of positive psychological factors in chronic pain is essential, and there is some evidence that this can play a very significant role.

There are many positive psychology dimensions which might be considered; however, four of the most commonly evidenced are mindfulness, gratitude, self-compassion and self-efficacy. In the next section, we define and review some of the recent evidence linking those positive psychological variables and pain, before introducing the aims of our study.

Mindfulness

Ludwig and Kabat-Zinn described mindfulness as cultivating awareness through paying attention to aspects of moment-to-moment experience in a non-judgemental way (Ludwig & Kabat-Zinn, 2008). In its original Buddhist setting its aim was to alleviate suffering and cultivate compassion. As it developed in western settings, its potential for medical patients was realized. Pain relief induced by mindfulness was found to be associated with greater activation of brain areas associated with the cognitive regulation of pain (Zeidan et al., 2015). The focus in research has been two-fold: firstly examining the impact of mindfulness on various dimensions of pain, and secondly testing its effectiveness among different types of pain, or patient groups. In a meta-analysis of twenty-two studies, Shires examined the impact of mindfulness on acute pain (Shires et al., 2020). They found that although there was an absence of evidence for effectiveness on pain severity or pain-related distress, there was a beneficial impact on pain tolerance (moderate evidence) and pain threshold (weak evidence). These effects are not inconsistent with a causal explanation based on cognitive appraisals. In a meta-analysis of thirty randomized control trials on the impact of mindfulness on chronic pain, Hilton and colleagues found that there was a significant effect compared to treatment as usual, passive controls or educational support (Hilton et al., 2017). Although effects can be demonstrated, more rigorous trials are needed to provide more compelling evidence. Hilton et al. suggest, in light of the cognitive appraisal hypothesis, that psychological measures which would be impacted by this should be included in trials.

Gratitude

Gratitude is generally viewed as a dispositional trait or as an emotional state that can be enhanced (Davis et al., 2016). As a personality trait, it is defined as: 'a sense of thankfulness and joy in response to receiving a gift, whether the gift be a tangible benefit from a specific other or a moment of peaceful bliss evoked by natural beauty' (Emmons & Mccullough, 2004, p554). It stems from the recognition that something good has happened (Wood et al., 2010). Research on gratitude has found this to be easy to deliver and generally quite effective in improving psychological wellbeing (Ouweneel et al., 2014; Ouweneel et al., 2013). A recent systematic review of nineteen studies evaluating the effectiveness of gratitude interventions found these to improve sleep, with mixed results for other health outcomes (Boggiss et al., 2020). Two of the studies reported in the review evaluated the effects of gratitude on the use of pain medication, finding no effect (Martinez-Marti et al., 2010).

Self-Compassion

Self-compassion is described as the ability to be touched by one's suffering, combined with the motivation to alleviate it through a mindful and kind manner, with the wisdom to acknowledge that suffering is part of our common humanity (Neff, 2003). It encompasses a mindful and accepting way of experiencing difficulties, but goes beyond that as it entails a kind and warm way of relating to the self (Neff & Dahm, 2015). Only nine studies (n=1,430) have examined the relationship between self-compassion and chronic pain, and have recently been collated in a systematic review (Lanzaro et al., 2021). The studies were so heterogenous and methodologically weak, that it was not possible for these authors to draw any definitive conclusions between self-compassion and pain outcomes.

There is some indication that dispositional mindfulness and self-compassion may help moderate pain intensity. A study of 231 females with chronic pain found that higher levels of mindful awareness along with self-compassion buffered the relationship of pain intensity with depressive symptoms (Cardozo et al., 2006).

Self-Efficacy

Self-efficacy is the belief that one has the ability to achieve a particular goal (Bandura, 1977). Beliefs about self-efficacy for managing pain have been linked to pain in various studies (Pells et al., 2008). Furthermore, self-efficacy was found to account for a significant amount of variance in experimental pain tolerance between marathon runners and matched controls (Johnson et al., 2012). In relation to mental health, a meta-analysis of 23 studies involving participants with chronic obstructive pulmonary disease found exercise barrier self-efficacy or confidence to overcome barriers and partake in exercise and general self-efficacy to be significant predictors of health-related quality of life (Selzler et al., 2020).

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While many treatments exist for chronic back pain, no one treatment has a demonstrated superiority to the alternatives; while existing treatments may reduce the pain they rarely provide a cure for the majority of people suffering from chronic pain (Turk et al., 2011). This may be due to the complex multi-dimensional nature of chronic back pain. The biopsychosocial aspects of pain may mean that there is a complex combination of neuro-physiological, physical and psychosocial aspects, which vary from individual to individual (Turk, 2002). Consequently, a biopsychosocial model of chronic pain is warranted, such that there is a focus on disease and illness, where illness is viewed as the complex linked biological, psychological and social factors (Gatchel, 2005).

Furthermore, while systematic reviews of RCTs and large controlled studies provide rigorous evidence for the effectiveness of interventions on health outcomes, including chronic pain, it is also useful to conduct cross-sectional studies that help to examine some of the links and mediating effects between dispositional traits and wellbeing. For example, a cross sectional study of 224 chronic pain patients found that dispositional gratitude was associated with lower depression and anxiety, in both cases partly mediated by sleep (Ng & Wong, 2013). In a more recent survey, the positive psychology variables being investigated (mindfulness, gratitude, satisfaction with life, optimism) explained 23% of the variance in pain intensity (Verhiel et al., 2019). It is not clear however, which of these variables plays a more significant role in terms of moderating pain and mental health.

OBJECTIVES

This research paper aims to examine the extent to which positive psychology constructs predict psychological well-being in people with chronic back pain. The positive psychology constructs being studied in this research are gratitude, mindfulness, self-efficacy, and self-compassion. Their association with well-being is examined in terms of satisfaction with life and depression. Assessing the relationship between mindfulness, self-compassion, gratitude and self-efficacy and chronic back pain may help identify effective positive psychology interventions for this population.

METHODS

Participants

The criteria for participants' eligibility included: (1) ³ 18 years of age; (2) Experiencing back pain for longer than three months, thus meeting the definition of chronic back pain (Frank, 1993).

A total of 211 participants patients with chronic back pain responded to our survey. Most (82.67%) were female (159 female, 52 male), and their ages ranged between 18 and 79 years, with a mean of 31.22 (SD=12.40). Recruitment was on an ad hoc basis, with the research being advertised among the student body of University College Cork, and on the websites of Chronic Pain Ireland and Pain Support UK.

Design

The study was conducted using an anonymous online survey to gather cross-sectional data. A survey design was selected so as to allow for gathering a large number of responses, while reducing the risk of attrition; surveys are also a useful approach to establishing whether there are cross-sectional relationships which might indicate potential therapeutic interventions. The use of an anonymous online instrument made it more likely that respondents would respond truthfully to sensitive questions on matters of mental health and wellbeing (Suler, 2004).

Measures

Pain. A single item was used to assess intensity of pain. Participants were asked to rate their present pain intensity on a six-point scale ranging from 1 ('no pain') to 6 ('worst possible pain').

Satisfaction with Life. The Satisfaction with Life Scale (SWLS) is a 5-item questionnaire, with each item scored on a 7-point Likert scale (Diener et al., 1985). Scores range from 7 to 35, with higher scores indicating greater satisfaction with life. Examples of items include: 'In most ways my life is close to my ideal' and 'I am satisfied with my life'. The scale has good convergent and divergent validity (Pavot & Diener, 1993). Cronbach's alpha in the current study was .88.

Depression. The Centre for Epidemiologic Studies Depression Scale – 8 Item (CES-D-8) is a short version of the original 20-item CES-D (Radloff, 1977). The full version has been validated against DSM-IV diagnostic criteria (Okun, Stein, Buman & Silver, 1996), and the shorter version has been found to correlate strongly with the 20-item version (Briggs, Carey, O'Halloran, Kenny & Kennelly, 2018). Scores on the CES-D-8 range from 0 to 24, with higher scores indicating greater levels of depression. A score of 9 can be used to identify those with clinically significant symptoms (Briggs, Carey, O'Halloran, Kenny & Kennelly, 2018). Items are scored on a scale of 0 (none

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or almost none of the time) to 3 (all or almost all of the time). Questions include: 'How much of the time over the past week… did you feel depressed?. In the current study, the Cronbach's alpha for this scale was .88.

Pain Self-Efficacy. The Pain Self-Efficacy Questionnaire (PSEQ) is a 10-item scale measuring people's confidence that they can perform activities, including social, domestic, and work-related, despite pain (Nicholas, 2007). Validity of the scale was demonstrated through strong correlations with scales measuring related constructs, including the Pain Beliefs Questionnaire and a modified version of the self-report Sickness Impact Profile. The PSEQ employs a seven-point Likert scale, ranging from 0 to 6. Total scores range from 0 to 60, with higher scores indicating greater pain self-efficacy. Some of the items include: 'I can enjoy most things despite the pain', and 'I can cope with my pain without medication'. In this study, the Cronbach's alpha for this scale was .96.

Self-Compassion. The Self-Compassion Scale–Short Form is a 12-item scale (Raes et al., 2011). This is derived from the longer Self-Compassion Scale (Neff, 2003), whose validity was demonstrated through its correlations with measures of such constructs as happiness, neuroticism, and positive and negative affect. The SCS-SF was correlate with the long form SCS at r = .97 or higher across three samples. A five-point scale, with anchors ranging from 1 to 5, is used for responses. Scores range between 12 and 60, with higher scores indicating greater self-compassion. An example of scale items includes: 'When I fail at something important to me, I become consumed by feelings of inadequacy'. Cronbach's alpha in the current study was .87.

Gratitude. The Gratitude Questionnaire-Six Item Form (GQ-6) (McCullough et al., 2002), is used to measure individual differences in participants' experiences of gratitude. This scale was validated through positive correlations with such constructs as life satisfaction, spirituality, and subjective happiness, and through negative correlations with constructs such as materialism and envy. Each item (e.g. 'I have so much in my life to be grateful for') is scored on a scale of 1=strongly disagree to 7=strongly agree. Total scores range from 6 to 42, with higher scores indicating a greater tendency to experience gratitude. Cronbach's alpha in this study was .81.

Mindfulness. The Mindfulness Attention Awareness Scale (MAAS) is a 15-item scale measuring dispositional mindfulness (Brown & Ryan, 2003). Response options (e.g. 'I could be experiencing some emotion and not be conscious of it until sometime later'), range from 1 (Almost always) to 6 (Almost never). Total scores were calculated through averaging responses to the 15 items, and so total scores also range from 1 to 6. Higher scores indicate greater dispositional mindfulness. Cronbach's alpha in this study was .88.

Personality. The Eysenck Personality Questionnaire – Brief Version (EPQ-BV) is a 24-item scale that includes two equally-sized subscales, measuring neuroticism and extraversion (Sato, 2005). The EPQ-BV was validated through correlation with the EPQ Revised Short Scale. Each item is responded to on a 1 to 5 Likert scale, with total scores for both subscales ranging from 12 to 60. Higher scores indicate higher neuroticism and extraversion respectively. Cronbach's alpha in the current study was .89 for neuroticism and .93 for extraversion.

Procedure. The survey instrument was uploaded to an electronic platform and, following piloting, a link and accompanying explanatory email was sent to Chronic Pain Ireland and to Pain Support UK. Both of these groups made the link available on their websites. In addition, the link was sent to the student body of University College Cork through the student email exchange. Participants were invited to report the duration of time in which they had been experiencing back pain, and only those who reported a duration of greater than three months were deemed to be in chronic back pain (Frank, 1993). All other volunteers were excluded from the study.

The study was conducted with regard to the Psychological Society of Ireland Code of Professional Ethics (2010). Ethical approval was obtained from the School of Applied Psychology Ethics Committee of University College Cork.

Data Analysis

Data were analysed using IBM SPSS Statistics version 25. Data were cleaned, and descriptive statistics were produced. The two dependent variables of depression and satisfaction with life were correlated to determine whether they were measuring separate dimensions. Following this, bivariate analyses were conducted to examine relationships between independent variables and control variables, and the two dependent variables of satisfaction with life and depression.

Hierarchical multiple regressions were then conducted for each dependent variable. In each case, only independent and control variables which had a significant bivariate relationship with the dependent variable were included in the regression

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model. In each regression, Block 1 consisted of demographic and control variables, and Block 2 included positive psychology variables. Overall R^2, R^2 change, and significance of the models are reported, along with beta weights and significance levels of each predictor variable in the model.

RESULTS

The sample consisted of 211 respondents, of whom 159 were female and 52 were male. All reported chronic back pain lasting for longer than 3 months. Reported frequency of duration of pain is presented in Table 1.

Descriptive data for each of the continuous dependent variables, independent variables and control variables are presented in Table 2.

Following the generation of the descriptive data, inferential analyses were conducted. To begin, Satisfaction With Life and Depression scores were correlated with one another. They correlated strongly with one another (r = -.61) but shared only 37.21% of their variance. Therefore, it was decided to use each as a dependent variable in the subsequent analyses.

Pearson's correlations were conducted to assess the strength of the relationships between each of the dependent variables, and the continuous independent and control variables. Results are presented in Table 3.

Table 1:
Reported Duration of Pain

Duration of Pain	Frequency	Percent
3-6 months	7	3.3
>6-12 months	15	7.1
>1-2 years	30	14.2
>2-5 years	66	31.3
>5-10 years	46	21.8
> 10 years	47	22.3
Total	211	100.0

As can be seen from Table 3, large correlations (Cohen & Nee, 1990) were found between Satisfaction With Life scores and gratitude, and between Depression and both neuroticism and self-compassion scores; medium correlations were found between Satisfaction with Life scores and both neuroticism and self-compassion, between Depression and level of pain, mindfulness and gratitude scores, and between both DVs and pain self-efficacy and extraversion scores; small significant correlations were found between Satisfaction With Life and age, level of pain and mindfulness scores. The only non-significant correlation was that between age and Depression scores, and so age was not included as a predictor in the hierarchical multiple regression for Depression.

Table 2:
Descriptive Statistics for Continuous Variables

	Mean	Median	SD	Min	Max
Depression	9.95	9.00	5.75	.00	23.00
Satisfaction With Life	20.52	21.00	7.64	5.00	35.00
Age	31.22	26.00	12.40	18.00	79.00
Level of Pain	3.34	3.00	1.01	1.00	6.00
Extraversion	37.11	38.00	9.88	14.00	59.00
Neuroticism	33.77	33.00	9.67	12.00	56.00
Pain Self-Efficacy	37.00	39.00	15.53	.00	60.00
Self-Compassion	34.56	35.00	8.94	15.00	59.00
Gratitude	33.15	34.00	6.68	12.00	42.00
Mindfulness	3.58	3.67	.90	1.00	5.47

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Table 3:
Correlations between Satisfaction With Life, Depression, and continuous independent variables

	Satisfaction With Life		Depression	
	r	p	r	p
Satisfaction With Life	1.00		-.61	<.0005
Depression	-.61	<.0005	1.00	
Age	-.21	.003	.10	.16
Level of Pain	-.21	.002	.35	<.0005
Pain Self-Efficacy	.45	<.0005	-.43	<.0005
Self-Compassion	.39	<.0005	-.55	<.0005
Gratitude	.64	<.0005	-.48	<.0005
Mindfulness	.22	.001	-.44	<.0005
Extraversion	.41	<.0005	-.37	<.0005
Neuroticism	-.31	<.0005	.63	<.0005

Table 4:
Coefficients Table for Final Multiple Regression – Satisfaction With Life

	B	Std. Error	Beta	p	Part Correlation
Age	-.06	.04	-.10	.08	-.09
Neuroticism	-.10	.06	-.13	.06	-.09
Extraversion	.10	.04	.13	.02	.12
Level of Pain	.66	.48	.09	.17	.07
Self-Compassion	.09	.06	.10	.17	.07
Gratitude	.51	.07	.45	<.0005	.35
Pain Self-Efficacy	.09	.03	.18	.01	.13
Mindfulness	-.55	.54	-.07	.15	-.05

$F(8,202) = 26.06$, $p < .0005$, $R^2 = 50.8\%$

A t-test was conducted to examine sex differences in levels of both DVs. A significant difference ($t[209] = 2.69$, $p = .008$) was identified in relation to Depression, with higher depression scores among females. No significant difference was identified in Satisfaction With Life scores ($t[209] = .57$, $p = .57$). Therefore, sex was included in the multiple regression for Depression, but not for Satisfaction With Life. Two hierarchical multiple regressions were conducted, one for each DV. These regressions are presented here in turn, beginning with Satisfaction With Life.

Two blocks were entered into the regression model. Block 1 included the control variables age, level of pain, extraversion and neuroticism; Block 2 included the positive psychology variables of pain self-efficacy, self-compassion, gratitude and mindfulness. The first block yielded a significant predictive model – $F(4, 206) = 17.75$, $p < .0005$ – which explained 25.6% of the variance. The addition of Block 2 significantly improved the model – $F(4,202) = 25.82$, $p < .0005$ – adding 25.2% to its predictive capacity. Coefficients for the final model are presented in Table 4.

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Table 5:
Coefficients Table for Final Multiple Regression – Depression

	B	Std. Error	Beta	p	Part Correlation
Sex	-2.04	.67	-.15	.003	-.13
Neuroticism	.20	.04	.34	<.0005	.23
Extraversion	-.09	.03	-.15	.005	-.13
Level of Pain	2.16	.62	.18	<.0005	.15
Self-Compassion	-.09	.04	-.13	.045	-.09
Gratitude	-.17	.05	-.20	<.0005	-.16
Mindfulness	-.36	.36	-.06	.31	-.04
Pain Self-Efficacy	-.05	.02	-.13	.02	-.10

F (8,202) = 39.46, p < .0005, R2 = 61.0%

As can be seen from Table 4, gratitude is by far the most powerful contributor to the model, uniquely explaining 12.25% of the variance. Pain self-efficacy and extraversion also emerge as significant unique contributors to the model, explaining 1.7% and 1.4% of the variance respectively. These results are in line with expectations.

The regression model for Depression also included two blocks. Block 1 included the control variables of sex, extraversion, neuroticism and level of pain. Block 2 included the positive psychology variables of pain self-efficacy, self-compassion, gratitude and mindfulness. The first block yielded a significant predictive model – $F(4, 206) = 56.15$, $p < .0005$ – which explained 52.2% of the variance. The addition of Block 2 significantly improved the model – $F(4,202) = 11.41$, $p < .0005$ – adding 8.8% to its predictive capacity. Coefficients for the final model are presented in Table 5.

The most powerful unique contributor to the model was neuroticism, explaining 5.76% of the variance. Among the positive psychology variables, gratitude was the most powerful predictor, explaining 3.24%. Pain self-efficacy and self-compassion were also significant unique contributors, each explaining 0.81% of the variance. These results are in line with expectations.

DISCUSSION

This study sought to assess the extent to which positive psychology variables (PPV) predicted satisfaction with life and depression in a sample of adults reporting chronic back pain.

Uncontrolled analyses showed that all of the positive psychology variables correlated significantly with both satisfaction with life and depression, in most cases with medium or large effect sizes, consequently these correlations likely represent real world associations. Controlling for demographics and for personality, the combined contribution of the positive psychology variables to each of the wellbeing measures was significant – accounting for 25.2% of the variance in satisfaction with life, and 8.8% of the variance in depression. These figures indicate a noteworthy association of positive psychology variables and wellbeing.

At the level of individual positive psychology variables, the strongest contributor to both models was gratitude, uniquely accounting for 3.24% of the variance in depression scores and 12.25 % of the variance in satisfaction with life scores. This is consistent with the finding of Ng and Wong that gratitude was associated with depression and anxiety in people with chronic pain (Ng & Wong, 2013). It is particularly striking, however, that a far stronger association was found with satisfaction with life than with depression. Considering the WHO definition of health as more than

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simply the absence of disease, the finding indicates that gratitude is an important contributor to health in those with chronic back pain. The result also chimes with Kok's model (Kok et al., 2013). This model suggests that links between physical health and positive affect are mediated by perceptions of social relationships – while gratitude can of course relate to non-human phenomena, much of gratitude is related to the characteristics, actions and affections of others (Konig & Gluck, 2014), and it is through these social aspects that gratitude impacts on well-being (Lin, 2016).

A smaller, but significant, relationship to wellbeing also emerged for pain self-efficacy, which uniquely explained 1.7% and 0.81% of the variance in satisfaction with life and depression respectively. This is consistent with the evidence linking pain self-efficacy to the experience of pain (Somers et al., 2010), while also reflecting the findings of Selzler et al. that self-efficacy is linked to mental health (Selzler et al., 2020).

Mindfulness was found to be significantly associated bivariately with both depression and satisfaction with life; this relationship was not sustained however in the multivariate analysis. The bulk of prior research in the area of mindfulness and pain has focused on the experience of pain itself, rather than on psychological wellbeing in those with pain (Hilton et al., 2017). A recent meta-analysis examining mindfulness in acute pain found that there was an association with pain tolerance, but not with pain distress (Shires et al., 2020). The results of the current study suggest that, as with Shires et al.'s finding on acute pain, mindfulness does not have an impact on one's psychological state in chronic back pain.

The final PPV assessed was self-compassion. Previous studies found associations with adjustment to pain and functioning levels among those with chronic pain, but it did not examine its relationship to psychological wellbeing. The current study suggests, as with mindfulness, that self-compassion is not a contributor to satisfaction with life in those with chronic back pain, and that it has a small association with depression. Thus, self-compassion does not seem an important predictor of psychological wellbeing in chronic back pain, but it may remain an important factor in other ways.

Considering all of the results, it appears that gratitude in particular has potential as a means of improving mental health and wellbeing in chronic back pain, while self-efficacy may also play a role. As was previously argued, gratitude as an emotion can be impacted, and this opens the way to investigating the efficiency and efficacy of gratitude interventions designed for people suffering from chronic back pain.

There are however, some limitations to the current study. As the sample was recruited in an ad hoc fashion, it cannot be assumed that the results can be generalized to the entire population of those suffering chronic back pain. Future research should also include a control group in order to compare results to participants with chronic back pain. This would allow us to see if this is a unique population when it comes to positive psychology constructs, or whether things work in a similar way for the rest of the population.

Participation was necessarily restricted to those who had Internet access, however with widespread societal access this may not have biased the sample in a particular direction. As data were gathered remotely, it is possible that participants may have been completing the survey in sub-optimal conditions or may have had uncertainty around the meanings of items. However, large inconsistencies in responses were not evident. Having said all of this, online surveys are a common way of conducting research, and the results do appear consistent with related research.

Future research could attempt to build on these findings by conducting an intervention study with a sample of chronic back pain sufferers. A randomized controlled design which saw gratitude and self-efficacy interventions (separately or together) compared to a control group would provide useful evidence for the potential of PPIs to improve wellbeing in this population. This could include a nested qualitative design to explore experiences with the interventions. Using the Person-Activity-Fit diagnostic may also help to identify participants most likely to benefit from the gratitude intervention.

A future survey could also, in light of previous findings (Ng & Wong, 2013), assess the extent to which the relationship of gratitude to psychological wellbeing in chronic back pain is mediated by sleep. A further avenue would be to investigate how social support could be optimized in order to maximize the influence of gratitude on well-being within this population. Finally, considering the temporal nature of chronic back pain, longitudinal studies examining the beneficial effects of positive psychology factors including gratitude are warranted.

CONCLUSION

This cross-sectional study demonstrates a significant relationship of positive psychology variables with measures of psychological wellbeing in people with chronic back pain, with a particularly strong association of gratitude to satisfaction with life. Our finding

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contributes to the growing research identifying the link between positive psychological wellbeing and pain (Larsson et al., 2019), and the evidence of positive psychology interventions enhancing wellbeing in people with chronic pain (Peters et al., 2017).

As chronic back pain accounts for approximately half of all chronic pain cases (Raftery et al., 2011), and as it is established as a risk factor for mental health conditions such as depression and anxiety (Amiri et al., 2020; Pincus et al., 2002), the study's results point to the potential for gratitude and pain self-efficacy interventions to provide a significant public health benefit to this population and fulfil the potential of the Positive Health Movement of improving disease prognosis and optimizing well-being. ■

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