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**Mindfulness, self-compassion and depressive symptoms in chronic pain:
the role of pain acceptance**

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SHORT TITLE: Mindfulness and Self-compassion in Chronic Pain

Key-words: chronic pain; pain willingness; activity engagement; mindfulness; self-compassion; depressive symptoms;

Abstract (Max. 150)

Objective(s): To test a theory driven model in which pain acceptance (both pain willingness and activity engagement) mediates the relationships of mindfulness and self-compassion with depressive symptoms, while controlling for pain intensity.

Method: A path analysis was conducted using AMOS software to test a mediational model in a sample of women with chronic musculoskeletal pain ($N = 231$).

Results: Participants with higher levels of mindful awareness and self-compassion presented lower levels of pain intensity and depressive symptoms, and higher levels of activity engagement. Pain willingness did not significantly correlate with any variable in study. The mediation analysis showed that activity engagement mediated the relationship between self-compassion and depressive symptoms, independently from pain intensity.

Conclusions: These findings seem to corroborate the hypothesis that self-compassion is rooted in a motivational system, as it seems to correlate with less depressive symptoms through increasing the engagement with valued actions despite experiencing pain.

Key-words: chronic pain; mindfulness; self-compassion; pain willingness; activity engagement; depressive symptoms.

INTRODUCTION

Chronic pain (CP) is a debilitating medical condition defined as constant or sporadic pain for at least three months (Elliot, Smith, Penny, Smith, & Chambers, 1999) that affects 12% to 30% of the population (Breivik, Collett, Ventafridda, Cohen, & Gallacher, 2006). It negatively impacts quality of life and is associated with significant disability (e.g. Breivik, Eisenberg, & O'Brien, 2013; Gatchel & Okifugi, 2006) and with depressive symptoms (Bair, Robinson, Katon, & Kroenke, 2003; Elliot, Renier, & Palcher, 2003; Ohayon & Schatzberg, 2010). Indeed, studies seem to suggest that having CP leads to depressive symptoms (see Wörz, 2003 for a review), and this seems to be influenced by psychological factors (see Gatchel, Peng, Peters, Fuchs, & Turk, 2007 for a review).

In the last two decades, acceptance of pain has emerged as an important psychological process for understanding the adaptation to CP and the course of symptomatology. Acceptance of pain is the acknowledgement that one experiences pain without attempting to unproductively control it, while being committed to engage in valued actions despite pain (McCracken, 1998). Research on pain acceptance has been conducted using this conceptualization, which implies two different domains underlying pain acceptance: 1) pain willingness, which is the overall openness to experience pain, and 2) activity engagement, the ability to commit to and engage in valued actions despite feeling pain (McCracken, Vowles, & Eccleston, 2004). Indeed, acceptance is a complex process that is more than a mental approach to internal experiences, but rather involves the active engagement with values-based daily activities in the presence of pain (McCracken & Eccleston, 2003; McCracken et al., 2004). There is growing evidence that the behavioural aspect of acceptance of pain is related to therapeutic changes (Jensen, Smith, Alschuler, Gillanders, Amtmann, & Molton, 2016; Rovner, Årestedt, Gerdle, Börsbo, & McCracken, 2014), and is negatively associated with depressive symptoms (Bendayan, Esteve, & Blanca, 2012) and with pain interference and severity (Fish, Hogan, Morrison, Stewart, &

McGuire, 2013). Research on pain acceptance suggests that individuals who have higher levels of pain acceptance are more likely to respond adaptively to pain (e.g. maintaining meaningful activities), even when controlling for depression and pain intensity (e.g. McCracken, Spertus, Janeck, Sinclair, & Wetzel, 1999; McCracken, Vowels, & Eccleston, 2005). Furthermore, acceptance of pain is prospectively associated with better emotional, social and physical functioning (McCracken & Eccleston, 2005), less depressive symptoms in individuals with disabilities (Jensen et al., 2016), less disability (Cook et al., 2015), and it mediates the effect of a mindfulness- and acceptance-based intervention for CP on physical functioning (Cederberg, Cernvall, Dahl, von Essen, & Ljungman, 2016). Nevertheless, although there is mounting evidence for the beneficial role of pain acceptance in CP, few studies have explored the potentially distinct roles that pain willingness and activity engagement might play in the relationship between depressive symptoms and other acceptance-related processes.

Mindfulness has been defined as a way of purposely and non-judgmentally paying attention to the present moment (Kabat-Zin, 2002), that may produce adaptive and flexible ways of responding to the context, instead of being entangled and over-identified with internal experiences (e.g. thoughts, emotions, physical sensations) (Shapiro, Carlson, Astin, & Freedman, 2006). Indeed, literature suggests that mindfulness promotes the non-judgmental acceptance of experience by letting go of one's thoughts and emotions, and the ability to see them as transient moment-to-moment experiences (Baer, 2003; Bishop et al., 2004; Kabat-Zinn, 1990). Research shows that mindfulness decreases the risk of depression relapse (Michalak, Heidenreich, Meibert, & Schulte, 2008), and reduces depressive symptoms (see Hofmann, Sawyer, Witt, & Oh, 2010), particularly in chronic illnesses (see Bohlmeijer, Prengera, Taala, & Cuijpers, 2010 for a review). Although there is mounting evidence of the benefits of mindfulness in CP (see Hilton, et al., 2017 for a meta-analytic review), fewer studies investigated the mechanisms via which mindfulness operates, as well as which aspects of

mindfulness lead to its benefits. However, some studies suggest that mindfulness-based interventions for CP promote acceptance of pain (e.g. Henriksson, Wasara, & Ronnlund, 2016), and indeed some have proposed that the acceptance of pain is an important process of change in mindfulness- and acceptance-based interventions for CP (e.g. McCracken & Vowles, 2014), which has been empirically supported (e.g. Day & Thorn, 2016). In fact, these studies corroborate the theoretical assumption that mindfulness, by promoting the contact with the present moment, is a useful tool for fostering acceptance of pain (Dahl, Luciano, & Wilson, 2005; Dahl & Lundgren, 2006). Nevertheless, a comprehensive model of how mindfulness relates to different domains of pain acceptance remains unexplored in CP.

Recently, there has been a growth of studies into self-compassion and its impact on mental and physical health. Several studies suggested that self-compassion promotes a range of adaptive behaviours (Sirois, Kitner, & Hirsch, 2015), and is associated with well-being, resilience to stress, and with less depressive and anxiety symptoms (see MacBeth & Gumley, 2012). Self-compassion is described as the ability to be open to one's suffering, combined with a kind motivation to alleviate it (Neff, 2003). This emotional self-regulatory skill is postulated to stem from an attachment-related evolutionary system (Gilbert, 2005) and has recently been proposed to be a relevant process in CP conceptualization (Vowles, Sowden, & Ashworth, 2014). Although this literature is in its infancy, there is growing evidence that self-compassion is associated with less emotional distress, depressive symptoms, and negative affect in CP (Costa & Pinto-Gouveia, 2011; 2013; Wren et al., 2012). Additionally, increases in self-compassion predicted a decrease in depression after an acceptance-based intervention for CP (Vowles, Witkiewitz, Sowden, & Ashworth, 2014). Nevertheless, the role of self-compassion in CP is not well understood, though it is an important process in other chronic illnesses. For example, self-compassion promotes better adaptation to and less depletion from illness (Terry

& Leary, 2011), and it buffers the impact of threatening illness cognitions on anxiety, depression, and avoidance coping in cancer (Gillanders, Sinclair, MacLean, Jardine, 2014).

There is still much to learn on how mindfulness and self-compassion overlap and differ. Indeed, although they both foster awareness and acceptance of the present moment (See Neff & Dahm, 2015 for a topical discussion), self-compassion is suggested to include an additional emphasis on affective and motivational components (i.e. a kind, caring and warm stance towards suffering and a desire to respond helpfully to that suffering) that mindfulness may not explicitly entail (Birnie, Speca, & Carlson, 2010). In relation to its motivational aspect, self-compassion encompasses an action-oriented attitude that can alter the experience of depressive symptoms (Pauley & McPherson, 2010). In the context of CP, this seems to raise the question of whether mindfulness and self-compassion are equally contributors to pain acceptance, or whether they relate to different aspects of pain acceptance. Indeed, although both mindfulness and self-compassion seem to foster acceptance (Neff & Dahm, 2015), one might hypothesize that self-compassion, due to its action-oriented nature (Gilbert, 2005; Pauley & McPherson, 2010), would be a stronger predictor of activity engagement. Moreover, self-compassion seems to be a stronger predictor (than mindfulness) of depression severity (Van Dam, Sheppard, Forsyth, & Earleywine, 2011), and it uniquely predicts (while controlling for mindfulness) post-traumatic stress disorder symptoms in war veterans (Dahm, Meyer, Neff, Kimbrel, Gulliver, & Morissette, 2015).

It is clear that both mindfulness and self-compassion have been shown to be potentially useful to advance our understanding of how people respond to CP. However, is not yet clear how these constructs overlap, how they are distinct, and how they relate with acceptance of pain to predict depressive symptoms in CP. Specifically, since acceptance of pain encompasses both attitudinal (pain willingness) and behavioural (activity engagement) aspects, it is worth exploring the distinct role these aspects of pain acceptance play on the relationship between

mindfulness, self-compassion, and depressive symptoms in CP. The aim of this study is therefore to test the mediating role of pain willingness and activity engagement in the relationship between mindfulness and self-compassion, and depressive symptoms, while controlling for pain intensity. As this is a cross-sectional study, controlling the effect of pain intensity on depressive symptoms will allow us to test the relationship between psychological processes and depressive symptoms independently from the role of pain intensity.

METHOD

Participants

The current study was conducted in a convenience sample that comprises 231 Portuguese women with CP. Recruitment was online via three national CP associations. Inclusion criteria include: a) having constant or sporadic pain, unrelated to oncological disease, for three months or more; b) age above 18 years; c) having access to an online device in order to complete the battery of questionnaires. Participants had a mean age of 48.51 ($SD = 10.89$). The majority of participants completed high school or above ($n = 195$; 84.4%), and were married ($n = 150$; 64.9%). The CP condition was previously established by a physician, and the most common diagnosis was Fibromyalgia ($n = 204$; 88.3%), followed by lower back pain ($n = 33$; 14.3%) and Arthrosis ($n = 30$; 13%). The majority of participants presented CP for more than 10 years ($n = 128$; 55.4%) or from 5 to 10 years ($n = 54$; 23.4%), and reported having other chronic illnesses ($n = 122$; 52.8%).

Procedure

The current study was approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of University of Coimbra, Portugal (January 12th 2017).

To recruit the sample, five nationwide CP associations were invited to collaborate. Three CP associations replied and agreed to collaborate by advertising the study to their mailing

list. The study was accessed by 479 participants, of which 246 completed the battery of questionnaires (51%). Nine men and six non-Portuguese women were excluded from the study, to allow a gender- and nationality-wise homogeneous sample. Data was collected between February and April of 2017.

Information regarding the aims of the study and the target population was provided, and the voluntary nature of participation and confidentiality of data was assured. All participants provided informed consent.

Measures

Numeric Pain Rating Scale (NPRS; Hartrick, Kovan, & Shapiro, 2003) is a self-report measure that assesses pain intensity in a 11-point scale (from 0 = “No pain” to 10 = “Worst imaginable pain.”). Respondents select the single number that best represents their pain intensity. NPRS was previously translated and validated for the Portuguese population (Ferreira-Valente, Pais-Ribeiro, & Jensen, 2011). A single score of “average pain intensity in the last 24h” was created from ratings of: 1) current pain; 2) highest pain in last 24h; 3) lowest pain in last 24h. Results showed an internal consistency of $\alpha = .85$.

Chronic Pain Acceptance Questionnaire-8 (CPAQ; McCracken et al., 2004) is a self-report measure of acceptance of pain, assessed on a 7-point scale (0 = never true; 6 = always true), that comprises two components of acceptance: pain willingness (PW) (i.e. the extent to which a person is willing to be with pain without attempts to avoid it) and activity engagement (AE) (i.e. engaging in daily activities despite having pain). The original version is composed of 20-items (McCracken et al., 2004) that was recently reduced to a shorter 8-items version (Fish, McGruiere, Hogan, Morrison, & Stewart, 2010) with the same two-factor structure (Fish et al., 2013), and is valid, reliable and able to detect rehabilitation changes (Rovner et al., 2014). In

the current study, we used the shorter 8-item version. Results from Cronbach's alpha were $CPAQ-PW\alpha = .67$ and $CPAQ-AE\alpha = .85$.

Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) is a 15-item self-report measure that assesses attention and awareness of present moment daily activities as a trait quality of mindfulness, using a 6-point Likert scale (1 = almost always; 6 = almost never). MAAS presents good internal consistencies, both in its original study ($\alpha = .84$) (Brown & Ryan, 2003) and in its Portuguese validation study ($\alpha = .90$) (Gregório & Pinto-Gouveia, 2013). The current study found acceptable values of Cronbach's alpha ($\alpha = .92$).

Self-Compassion Scale-short form (SCS; Raes, Pommier, Neff, & Van Gucht, 2013) is a 12-item version of the original 26-item version of SCS (Neff, 2003), which was developed to measure self-compassion on a 5-point Likert self-report scale (1 = almost never; to 5 = almost always). Although SCS is traditionally used as a one-factor (overall self-compassion) or six-factor scale (self-kindness, common humanity, mindfulness, self-judgment, isolation and over-identification) (Neff, 2016; Neff, Whittaker, & Karl, 2017), there has been new data suggesting that SCS can be used as a two-factor scale: one assessing a *self-compassionate* attitude (a composite of self-kindness, common humanity, and mindfulness) and one measuring a *self-critical* attitude (that results from the sum of self-judgment, isolation, and over-identification) (e.g. López et al., 2015; Costa, Marôco, Pinto-Gouveia, Ferreira, & Castilho, 2016). The current study follows the latter factor structure, and is only focused on the self-compassionate attitude, which will be used throughout this study as self-compassion. The current study found good internal consistency ($\alpha = .80$).

Depression, Anxiety and Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995) is a self-report instrument that assesses symptoms of depression, anxiety and stress over the last week, through 21 items rated on a 4-point scale (0 = did not apply to me at all; 3 = applied to me very much or most of the time). The Portuguese validation study found good internal

consistency (Pais-Ribeiro, Honrado, & Leal, 2004). For the purpose of the current study, only the depression subscale was introduced in data analyses. The current study found a good internal consistency ($\alpha = .93$).

Data analysis

Descriptive and correlational analyses were conducted using IBM SPSS Statistics v.21. To explore the adequacy of the data, preliminary data analyses were performed. Pearson product-moment correlation coefficients were calculated to explore the associations between pain intensity, pain willingness, activity engagement, mindful awareness, self-compassion, and depressive symptoms.

Path analysis was performed using AMOS software to explore the mediator role of pain willingness and activity engagement on the relationship between mindfulness and self-compassion, and depressive symptoms, while controlling for pain intensity. Path analysis allows the simultaneous examination of structural relationships, as well as the examination of direct and indirect paths. In order to assess the model overall fit, the following goodness-of-fit measures and recommended cut-points were used (Kline, 2005): Normed Chi-Square ($\chi^2/d.f. < 5$, acceptable fit, < 2 , good fit; Arbuckle, 2008), Comparative Fit Index ($CFI \geq .90$, acceptable, and $\geq .95$, desirable; Hu & Bentler, 1999), Tucker-Lewis Index ($TLI \geq .90$, acceptable, and $\geq .95$, desirable; Hu & Bentler, 1999), Goodness of Fit Index ($GFI \geq .90$, good, and $\geq .95$, desirable; Jöreskog & Sörbom, 1996), Root Mean Square Error of Approximation ($RMSEA \leq .05$, good fit; $\leq .08$, acceptable fit; Kline, 2005) with a 95% confidence interval. Differences between the initial model (all paths included) and re-specified model (only significant paths included) were assessed by calculating χ^2 difference test. Models do not differ if the χ^2 difference is non-significant (Koufteros & Marcoulides, 2006). Maximum Likelihood estimation method was chosen as it allows for the estimation of all model path coefficients and to compute fit statistics. The significance of the mediation effects was analyzed using a

bootstrap procedure (2000 resamples) with 95% bias-corrected confidence interval. An effect is considered significant at $p < .05$ if zero is not included in the interval between the lower and the upper bound (Kline, 2005).

RESULTS

Preliminary Data Analyses

Results from preliminary analysis suggested normal distribution of all variables, (skewness $< |3|$ and kurtosis $< |8-10|$) and no concerns about multicollinearity (VIF < 5 ; Kline, 2005). Although the Mahalanobis distance statistic (D^2) indicated the presence of some outliers, no extreme values were detected. This decision to retain outliers was based on the assumption that maintaining outliers makes the data more likely to be representative of the population under study (Kline, 2005; Tabachnick & Fidell, 2007).

Correlation analysis

Pearson product-moment correlation coefficients for all variables were computed (see Table 1).

-----*Insert table 1* -----

Results show that activity engagement has a positive and moderate association with self-compassion, but no significant association with mindful awareness. Moreover, activity engagement presented negative associations with depressive symptoms and pain intensity. While the association with depressive symptoms was moderate, the one with pain intensity was low. Mindful awareness and self-compassion were also positively and moderately related to one another, and displayed negative and moderate associations with depressive symptoms, but not with pain intensity. Pain intensity presented a positive and low correlation with depressive symptoms. Finally, pain willingness did not correlate significantly with any variable in study.

Path analysis: mediation analysis

A theory-driven model was built in order to test the mediation roles of pain willingness and activity engagement in the relationships of mindfulness and self-compassion with depressive symptoms, while controlling for pain intensity. Results showed the initial model presented overall acceptable fit ($\chi^2/d.f. = 3.47$; CFI = .96; TLI = .83; GFI = .98; RMSEA = .10, $p = .06$). Also, the initial model presented the following non-significant paths: mindful awareness \rightarrow activity engagement ($b = .000$, $p = .995$); mindful awareness \rightarrow pain willingness ($b = .023$, $p = .211$), and self-compassion \rightarrow pain willingness ($b = -.093$, $p = .111$). These paths were, then, progressively eliminated from the model, and we ended up with a reduced (“trimmed”) model, only with significant paths (see Figure 1).

----- insert Figure 1 here -----

The final model presented an acceptable model fit ($\chi^2/d.f. = 2.26$; CFI = .96; TLI = .92; GFI = .98; RMSEA = .07, $p = .168$), and the chi-square difference test showed that it was significantly better fit than the initial model ($\chi^2_{dif} = 4.147 > \chi^2_{.95} (4) = .711$). Although pain willingness was not significantly predicted by mindful awareness and self-compassion, we decided to maintain it in the model in order to control its contribution to the prediction of depressive symptoms. Results show that activity engagement mediated the relationship between self-compassion and depressive symptoms ($\beta = -.089$, 95% CI: $-.151$; $-.043$, $p = .001$), even though a direct path from self-compassion to depressive symptoms was still significant ($\beta = -.476$, 95%: $-.471$; $-.258$, $p = .001$). The total effect was significant ($\beta = -.459$, based on 95% CI: $-.707$; $-.452$, $p = .002$). Additionally, results show that self-compassion had a significant direct effect on activity engagement ($\beta = .395$, 95%: $.318$; $.597$, $p = .001$). Also, mindful awareness ($\beta = -.128$, 95%: $-.434$; $-.219$, $p = .001$), pain willingness ($\beta = -.140$, 95%: $-.233$; $-.043$, $p = .003$), activity engagement ($\beta = -.248$, 95%: $-.336$; $-.114$, $p = .001$), and pain

intensity ($\beta = .110$, 95% CI: .009; .212, $p = .035$) were significant direct predictors of depressive symptoms.

The final model explained 16% of activity engagement and 49% of depressive symptoms.

Discussion

The current study aimed to explore the mediating role of pain acceptance (pain willingness and activity engagement) on the relationship between mindful awareness and self-compassion, and depressive symptoms, while controlling for pain intensity.

Correlation analyses showed that participants who engage more in valued activities despite experiencing pain presented less depressive symptoms and pain intensity. This seems to be aligned with previous literature that shows that acceptance of pain is associated with less depression and pain intensity (e.g. McCracken et al., 1999; McCracken et al., 2005), and that being willing to engage in valued activities despite pain is associated with less depressive symptoms (Bendayan et al., 2012). Interestingly, activity engagement was positive and significantly correlated with self-compassion, but not with mindful awareness. Indeed, self-compassion is proposed to involve acceptance (Neff & Dahm, 2015), and previous studies suggest that self-compassion is related to acceptance of pain (Costa & Pinto-Gouveia, 2011). Regarding the non-significant association with mindful awareness, the MAAS measures overall awareness, with only one item focusing on physical sensations and not specifically related to pain, whereas CPAQ is a content-specific measure of pain acceptance. Thus, being aware of common daily experiences does not necessarily imply being willing to engage in valued activities when experiencing pain. Additionally, mindful awareness and self-compassion were negatively associated with depressive symptoms. This seems to suggest that being aware of the present moment, as well as being able to establish a self-to-self relationship of kindness and warmth may be particularly relevant protective skills against depressive symptoms in CP. Also,

results show that participants who engage less in valued daily activities have higher pain intensity. This seems to indicate that the level of pain intensity is a relevant aspect of the ability to accept pain and engage in meaningful daily activities. This is in line with previous research that overwhelmingly establishes that pain avoidance is a detrimental process in CP (e.g. McCracken & Samuel, 2007). These results seem to echo previous research on the importance of developing an accepting stance towards one's pain experiences, as well as a compassionate attitude towards the self in order to lessen depressive symptomatology (e.g. McCracken & Vowels, 2014).

Results from correlation analyses showed that pain willingness did not significantly correlate with any variable in study. Although without reaching significance, results showed a surprising pattern of correlations between pain willingness and other variables, particularly a negative non-significant association with activity engagement and with self-compassion. Although this was non-significant and of low magnitude, it could suggest that the items from this subscale (pain willingness) might not have been interpreted by participants as they were designed to. To our knowledge, this pattern of non-significant correlations was not found in previous studies – although there were non-significant associations between pain willingness and pain interference (Day & Thorn, 2016) –, even though the Cronbach's alpha found in this study ($\alpha = .67$) was similar to other studies using the same 8-items version of CPAQ (e.g. $\alpha = .69$) (Fish et al., 2010). Perhaps after reversing the scores of PW as proposed by the original authors (Fish et al., 2010; McCracken et al., 2014), we ended up measuring a different phenomenon than pain willingness in our sample. When interpreting these results, it is worth having in mind that although the two-factor 8-items version of CPAQ has previously presented better model fit than its longer 20-items and its one-factor structure, values of TLI and CFI were still problematic (Rovner et al., 2014). Future studies should consider this when conducting models exploring separately both dimensions of pain acceptance.

Results from the path analysis showed that the relationship between self-compassion and depressive symptoms in our sample was mediated by acceptance-based activity engagement. This means that being kind to oneself and responding to difficult life situations with warmth and care towards the self (instead of self-judgment and harshness) is related to committing to and engaging in valued life activities despite pain, which in turn may result in having less depressive symptoms. One way of interpreting this result is by considering the definition of self-compassion: it involves not only a kind and warm response to personal suffering, but also a motivation to alleviate one's suffering (Neff, 2003). Indeed, self-compassion seems to imply a motivation to action (Birnie et al., 2010; Gilbert, 2005), and this action-oriented motivation seems to be related to less depressive symptoms (Pauley & McPherson, 2010). This might explain why activity engagement, but not pain willingness, mediated the relationship between self-compassion and depressive symptoms. Indeed, being willing to experience pain does not necessarily imply having established a kind and warm stance towards perceived personal difficulties and setbacks, nor it implies engaging in actions that would alleviate one's suffering.

Another interesting result from the path analysis was that pain acceptance (both pain willingness and activity engagement) did not mediate the relationship between mindful awareness and depressive symptoms. Mindful awareness only predicted depressive symptoms directly. One should be particularly cautious when interpreting these results and not extrapolate them to mindfulness as a whole. Although mindful awareness is a key element of mindfulness (Bishop et al, 2004; Brown & Ryan, 2003), mindfulness involves more than present moment awareness (Coffey et al., 2010). Nevertheless, one possible reading of these results is that CPAQ is a content-specific measure, while MAAS measures general present moment awareness. Indeed, it is possible that being mindfully aware relates to having less depressive symptoms, not because one accepts pain, but because it involves other processes. For example,

one might conjecture that being more mindfully aware would lead to less fusion with internal experiences (e.g. thoughts, emotions, sensations) and less engaging in ruminative thinking, which in turn would lead to less depressive symptoms.

These results seem to suggest that engaging in valued activities despite experiencing pain is an important process through which self-compassion, but not mindful awareness, relates to having less depressive symptoms. This can be viewed in light of research suggesting that promoting self-compassion might be a behavioral activation approach (Veale, 2008). Indeed, it seems that both behavioral activation and compassion-inducing approaches share similar neural pathways related to positive emotions and reward systems (e.g. Longe et al., 2010; Lutz, Brefczynski-Lewis, Johnstone, & Davidson, 2008; Gawrysiak, Carvalho, Rogers, Nicholas, Dougherty, & Hopko, 2012), while mindfulness seems to operate through pathways related to executive functioning (e.g. Tang, Yang, Leve, & Harold, 2012; Tang, Hölzel & Posner, 2015).

Several limitations should be considered. Firstly, this study has a cross-sectional design, which precludes from establishing causal assumptions between variables. In order to do so, future studies should replicate our findings through a longitudinal or experimental design. Additionally, the sample was composed of women, which limits the generalization of the results to different genders. Further studies should consider using samples with mixed genders and explore whether differences do exist. Additionally, one should bear in mind that the pattern of non-significant correlations between pain willingness and other variables might be indicative that the items were not interpreted as they were designed to be in our sample. Although its internal consistency was similar to other studies, and it correlated in the expected direction with some variables in study, one should be mindful when reading these results. Finally, our model may be limited, as other (unmeasured) psychological processes might contribute to the relationships being tested. Specifically, personality traits (e.g. trait optimism, extraversion), psychological processes (e.g. catastrophizing, rumination, cognitive fusion), and particularly

values-related processes (e.g. values awareness and committing to valued-actions) may play an important role, as persisting or avoiding daily activities in the presence of pain may involve being aware of personal motivations that anchor willingness.

Conclusions

Our results suggest the importance of promoting the development of a self-compassionate stance towards personal experiences, particularly difficult and painful ones in individuals who suffer from CP. Although developing mindful- and acceptance-based interventions for promoting engagement with meaningful daily activities (which in turn potentially decreases depressive symptoms) seems crucial, the development of a kind, caring, and warm attitude when facing difficulties (pain-related or otherwise) seem to uniquely contribute to engage in valued activities despite pain and to experience less depressive symptoms in those living with CP. Finally, given that acceptance-based interventions promote self-compassion (Yadavaia, Hayes, & Vilaradaga, 2014), including in CP (Vowles et al., 2014; Wren et al., 2012), the effect of directly promoting self-compassion through targeted exercises in acceptance-based interventions for CP should be explored.

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Disclosure statement

The authors report no conflicts of interest

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Table 1.

Means, Standard deviations and pearson product-moment correlation coefficients between study's variables (N = 231).

Measures	M	SD	CPAQ_PW	CPAQ_AE	MAAS	SCS	DASS
CPAQ_PW	7.93	4.01	-	-	-	-	-
CPAQ_AE	12.58	5.23	-.06	-	-	-	-
MAAS	3.64	1.08	.05	.12	-	-	-
SCS	18.83	4.50	-.10	.40***	.31***	-	-
DASS_ Depression	8.05	5.84	-.12	-.43***	-.49***	-.55***	-
NPRS	5.69	1.77	-.08	-.21**	-.11	-.09	.24***

Note: * $p < .05$ ** $p < .01$; *** $p < .001$;

CPAQ_PW = Chronic Pain Acceptance Questionnaire-pain willingness; CPAQ_AE = Chronic Pain Acceptance Questionnaire-activity engagement; MAAS= Mindfulness Attention Awareness Scale ; SCS = ; Self-compassion Scale; DASS_Depression = Depression, Anxiety and Stress Scales; NPRS= Numeric Pain Rating Scale

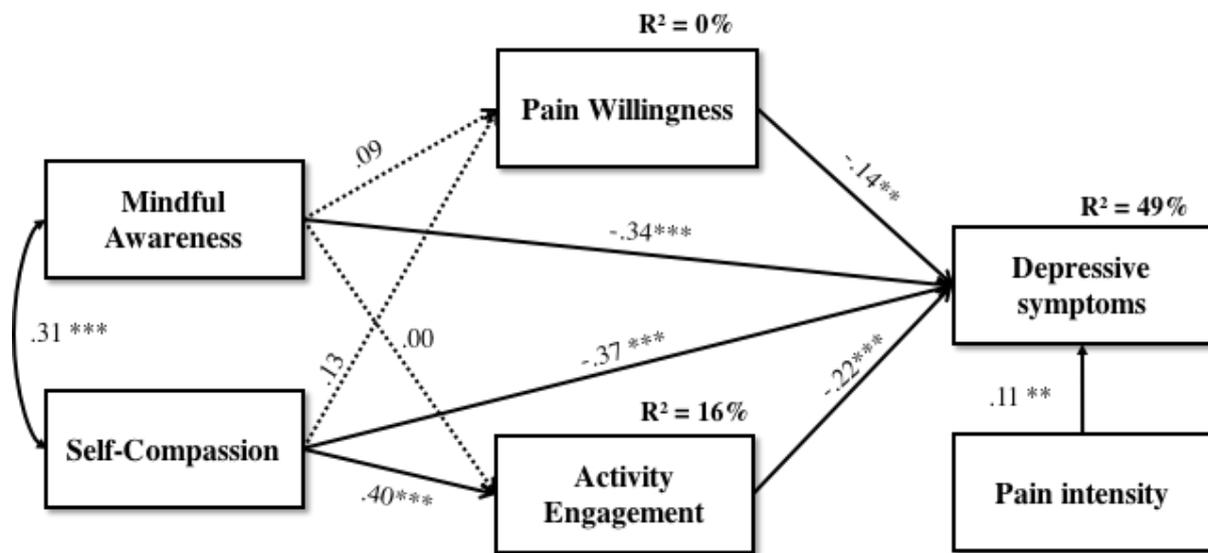


Figure 1. Path Model ($n = 231$).

Note. ** $p \leq .01$; *** $p \leq .001$; Standardized path coefficients among variables are presented. Dotted lines represent non-significant path coefficients.