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**Rumination and valued living in women with chronic pain: how they relate to  
the link between mindfulness and depressive symptoms**

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## **Rumination and valued living in women with chronic pain: how they relate to the link between mindfulness and depressive symptoms**

### **Abstract**

This study explores the mediating role of rumination and valued living in the relationship between mindfulness and depressive symptoms in a sample of women with chronic pain. Women with musculoskeletal chronic pain (N = 124) were recruited online through the advertisement of the study in several national associations for individuals with chronic pain. Participants responded a set of questionnaires that aimed to assess mindfulness, rumination, obstructions to and progress in valued living, and depressive symptoms. All variables were significantly associated in the expected directions. Results showed the relationship between mindfulness and depressive symptoms was fully mediated by rumination and experiencing obstructions in valued living, but not by difficulties in moving forward towards valued living. Clinical implications are discussed. Results seem to suggest the potential benefits of explicitly targeting general rumination and internal obstructions to living congruently to personal values, when conducting mindfulness-based interventions for reducing depression in chronic pain.

**Keywords:** chronic pain; mindfulness; rumination; values; depression; path analysis.

## Introduction

Research shows that depressive symptoms are a common experience in chronic pain (CP) (e.g. Elliott et al. 2003; Ohayon and Schatzberg 2003). The relationship between pain and depressive symptoms is complex and bidirectional (see Wörz 2003 for a review), and it can be conceptually understood within the Fear-Avoidance Model (FAM) as a result from the cascade of events produced by the perceiving of pain as threatening (Vlaeyen et al. 2016). Although a better understanding of the psychological processes underlying the relationship between pain and depressive symptoms is needed (Gatchel et al. 2007), data suggest that when the two co-occur the CP prognosis is worse (Linton and Bergbom 2011), with significant impact on pain-related outcomes (Egloff et al. 2017; Rayner et al. 2016). Additionally, research has expanded on the FAM understanding of CP by exploring the role of attentional processes such as mindfulness, which seems to moderate the relationship between pain intensity and catastrophizing (Schütze et al. 2010).

During the last two decades, mindfulness has been a topic of interest in psychotherapy research (Baer 2003; Christopher and Maris 2010), particularly in depression (e.g. Hofmann et al. 2010). Although differently conceptualized through the years (Bishop et al. 2004), there is an overall agreement on defining mindfulness as a way of purposely and non-judgmentally paying attention to the present moment (Kabat-Zin 2002). Indeed, mindfulness encompasses different components (see Coffey et al. 2010 for a topical discussion), one of which being the ability to intentionally regulate attention, i.e. mindful awareness (Brown and Ryan 2003). This is a particularly important component of mindfulness as it is the building block where mindfulness begins (Bishop et al. 2004). There is an ongoing discussion on the measurement of mindfulness, both empirically (Baer et al. 2009), and conceptually (Bergomi et al. 2012), and Mindful Attention Awareness Scale (MAAS; Brown and Ryan 2003) has been the most widely used measure of mindful awareness. Indeed, MAAS is particularly useful when conducting research on its relationship with negative output (such as psychopathological symptoms and detrimental psychological processes such as rumination), as its items are negatively formulated (e.g. “It seems I am ‘running on automatic’ without much awareness of what I’m doing”). This makes the MAAS a useful measure of lack of attentiveness and autopilot (Grossman 2008). Present moment awareness is a key element in mindfulness, and it is empirically different than other mindfulness facets such as acceptance and non-judgement (Coffey et al. 2010). Mindfulness, measured by MAAS, has been suggested to be an important psychological process in CP as its non-judgmental present moment awareness seems to be contrary to the

rather automatic nature of detrimental cognitive processes (such as rumination) involved in CP disability (Sullivan et al. 2005). Indeed, the benefits of mindfulness in CP has been explored (Bawa et al. 2015; Mun et al. 2014), but more research is needed on both its efficacy and the underlying processes operating the relationship between mindfulness and depression in CP. Although mindfulness seems to be effective in reducing depressive symptoms in CP (e.g. Hilton et al. 2017), effect sizes are usually small (e.g. Sephton et al. 2007). This suggests the importance of better understanding the pathways in which mindfulness and depressive symptoms relate in CP. Increasing this understanding will inform us on whether promoting mindful awareness is a sufficient approach to reducing depressive symptoms in CP, or whether psychological interventions would benefit from introducing other strategies that would tackle psychological processes underlying this relationship.

An important factor for understanding the mechanisms underlying mindfulness is rumination. Rumination has been conceptualized as a pattern of response in which a person's attention and thinking are focused on their negative emotional states (Nolen-Hoeksema 2000). It is a mode of responding to distress that consists in repetitive and passively focusing on one's emotional states, its causes and consequences, that does not result in useful problem solving nor taking action (Nolen-Hoeksema et al. 2008). This pattern of repetitive thinking about one's thoughts and emotional states has a reciprocal relationship with depressive symptoms: feeling sad can increase the likelihood of engaging in rumination, which in turn can produce more feelings of sadness and/or depression, creating a vicious cycle (Moberly and Watkins, 2008). It has been proposed that mindfulness reduces depressive symptoms through the reduction of rumination (Segal et al. 2002; Teasdale et al. 2002). Indeed, there is growing evidence that mindfulness reduces ruminative thinking (Deyo et al. 2009; Heeren and Philippot 2011), although to our knowledge this relationship is underexplored in CP. Overall, rumination as a general psychological process has had little attention in CP research. Research on rumination in CP has been mainly focused on pain-related rumination as a subset of pain catastrophizing (Buenaver et al. 2012; Sullivan et al. 1998). Nevertheless, empirical results seem to suggest that rumination in CP is not limited to pain-related content (Curtin and Norris 2017; Edwards et al. 2011). Indeed, rumination is significantly correlated with poor mental health and psychological inflexibility, and significantly predicts depression in CP (McCracken et al. 2014). This suggests that other psychological flexibility processes may be relevant in understanding the link between mindfulness, rumination and depressive symptoms. This seems to be in

line with the evidence that interventions that promote valued-based action in addition to mindfulness present higher effect sizes than those that are solely mindfulness-based (Veehof et al. 2016).

Literature suggests that automatic responding and lack of awareness limit the ability to consider and choose engaging in actions that are congruent with personal needs and values (e.g. Brown and Ryan 2003; Hayes et al. 2006). Indeed, valued-based action seems to be a relevant factor in CP functioning (e.g. McCracken 2013; McCracken and Vowles 2014; McCracken and Yang 2006; Scott et al. 2016) and depressive symptoms (Jensen et al. 2015), and it is associated to changes in depressive symptoms after a mindfulness- and values-based intervention for CP (Vowles and McCracken 2008). Results have evidenced that mindfulness and willingness to engage in valued activities significantly predict a reduction of depressive symptoms in CP (McCracken et al. 2007), and success in valued living predicts having less depressive symptoms beyond mindfulness-related processes such as acceptance (McCracken and Yang 2006). Although it is theoretically proposed that mindfulness produces a shift in perspective that reduces rumination, thus creating the space in which a present-focused values clarification can occur (Shapiro et al. 2006), to our knowledge this has never been empirically tested. Specifically, although it has been suggested that suffering and disability in CP is a result from processes of reduced awareness, entanglement with thoughts and emotions, and inflexible patterns of avoidant behaviors (McCracken 2005), to our knowledge the relationship between mindfulness, rumination, valued living and depressive symptoms in CP has never been explored. Thus, the current study is built on previous research that shows that mindfulness significantly decreases depressive symptoms in CP (e.g. Hilton et al. 2017), and that this relationship occurs through a reduction in ruminative thinking (Segal et al. 2002; Teasdale et al. 2002), even though this has never been tested in CP. Also, the current study stems from the theoretical proposition that, by reducing rumination, mindfulness allows for values clarification to occur, thus promoting the engagement with valued actions (Shapiro et al. 2006), which research shows relevant in CP (Jensen et al. 2015).

Our goal is to test a mediational model in which mindfulness negatively predicts depressive symptoms sequentially through rumination and valued-based action. Specifically, we expect that 1) mindfulness negatively predicts depressive symptoms through rumination and valued living; 2) rumination mediates the relationship between mindfulness and valued living; 3) valued living mediates the positive association between rumination and depressive symptoms.

## **Method**

### *Participants*

The current cross-sectional study was conducted in a sample of 124 Portuguese woman with CP, and it is part of a larger one that aims to explore the relationship between psychological processes and depressive symptoms in CP. Inclusion criteria: a) previous CP diagnosis; b)  $\geq 18$  years of age; c) Portuguese nationality (i.e. being born in Portugal); d) access to an online device for completing the questionnaires.

The current sample has a mean age of 48.07 (SD = 10.50). Participants were married ( $n = 82$ ; 66.1%) and had completed high school ( $n = 37$ ; 29.8%) or had a bachelor's degree ( $n = 54$ ; 43.5%). Also, participants were employed ( $n = 91$ ; 73.4%). From those who were unemployed ( $n = 33$ ; 26.6%), 3 were on sick leave due to CP (2.4%). Participants reported their CP condition was diagnosed by a medical doctor ( $n = 123$ ; 99.2%), specifically by a rheumatologist ( $n = 102$ ; 82.3%). The most common diagnosis was fibromyalgia ( $n = 109$ ; 87.9%), followed by low back pain ( $n = 16$ ; 12.9%) and arthrosis ( $n = 10$ ; 8.1%). It is worth noting that participants could report more than one CP condition. Participants reported having CP for more than 10 years ( $n = 69$ ; 55.6%), were taking medication for CP ( $n = 109$ ; 87.9%) and presented on average moderate levels of pain intensity (measured by numeric pain rating scale; NPRS = 5.21). Also, participants presented other comorbid chronic health conditions ( $n = 75$ ; 60.5%). See Table 1 for more information on sample characteristics.

----- insert Table 1 here -----

### *Procedures*

The current study is part of a larger prospective study that aims to explore the role of several psychological processes in the etiology of psychopathological symptoms in CP.

Recruitment was conducted online (Limesurvey online platform). Five national associations for CP individuals were contacted and invited to participate by advertising the study to their mailing list. Three CP associations accepted to collaborate. These are non-lucrative associations for CP patients that do not provide medical nor psychological treatment, but are rather institutions where CP patient can get legal advisement, information on latest scientific advances in CP treatment and contact information of where to get the appropriate clinical help. The protocol was completed by 125 individuals with CP. As one male completed the protocol, we have excluded his responses from data base, in order to attain a homogenous sample in terms of gender. Our final sample was composed of 124 women with CP. Participants were not compensated for participating in the study. Information regarding the study's goals

and the target population was provided. The voluntary nature of participation and confidentiality of data was assured. Participants provided informed consent. See flow diagram of participants in Figure 1.

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

The current study was previously approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of University of Coimbra, Portugal.

### *Measures*

The current study used the Portuguese validated versions of all measures.

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

**Ruminative Response Scale – short version** (RRS; Treynor et al. 2003; Dinis et al. 2011) is a 10-item measure of rumination over symptoms, causes and consequences of one's depressed mood, in a 4-point scale (1 = almost never; 4 = almost always). Although the RRS is most commonly used as a two-factor measure (assessing brooding and reflection as two dimensions of rumination), it can be used as a one-factor measure of ruminative thinking, depending on the research question at hand (i.e., if one is interested in exploring overall rumination, or rather each dimension separately) (e.g. Whitmer and Gotlib 2011). The current study used the one-factor structure of rumination. Higher scores mean greater tendency to ruminate. The original study found acceptable internal consistency ( $\alpha = .85$ ). Our study found a Cronbach alpha of  $\alpha = .86$ .

**Valuing Questionnaire** (VQ; Smout et al. 2014; Carvalho et al. 2018) is a 10-item instrument designed to measure valued living congruent with the psychological flexibility model (Hayes et al. 2006). It has a two-factor structure: 1) VQ-Obstruction, which measures obstacles to valued living, and 2) VQ-Progress, progress in engaging in values-based actions. The original study found good internal consistency (VQ-O:  $\alpha = .79$ ; VQ-P:  $\alpha = .81$ ), as well as the present study (VQ-O:  $\alpha = .83$ ; VQ-P:  $\alpha = .86$ ).

**Depression, Anxiety and Stress Scale-21** (DASS-21; Lovibond and Lovibond 1995; Pais-Ribeiro et al. 2004) is 21-item measure of depression, anxiety and stress symptoms, in a 4-point scale (0 = did not apply to me at all; 3 = applied to me very much or most of the time). In the original study, the subscales



had good internal consistency ( $\alpha = .91$  depression;  $\alpha = .84$  anxiety;  $\alpha = .90$  stress). Given the amount of evidence for the role of rumination in depressive symptoms, we will only focus on depressive symptoms. The current study found a good internal consistency ( $\alpha = .91$ ) for the depression subscale.

#### *Data analysis*

Statistical analyses were conducted using SPSS (v. 21, SPSS, Chicago, IL, USA) and Amos Softwares (v. 18, Amos, Crawfordville, FL, USA).

Descriptive analyses were performed to analyze demographic variables and means scores of all variables. Pearson product-moment correlation coefficients were calculated to explore the relationships between mindful awareness, rumination, obstruction to valued living, progress in valued living and depressive symptoms.

Path analysis was performed to estimate the relations among variables, based on theoretically hypothesized causal relations (Kline 2005). In the path model tested, it was examined whether mindful awareness would impact upon depressive symptoms, mediated by rumination, obstacles to valued living and progress in valued living. Additionally, it was tested whether mindful awareness would impact upon obstacles to and progress in valued living, mediated by rumination. Finally, it was also tested whether the effect of rumination on depressive symptoms is mediated by obstacles to and progress in valued living.

The Maximum Likelihood (ML) estimation method was used, as it allows for the estimation of all model path coefficients and to compute fit statistics (Kline 2005; Chou and Bentler, 1995), and it is the most commonly used estimation method in path analysis (Iacobucci 2010). Several goodness-of-fit indices were analyzed to evaluate overall model fit. We have used Chi-square value and the associated degrees of freedom (i.e. normed chi-square) as a measure of the discrepancy between our sample and the fitted covariances' matrices (Hu and Bentler 1999). As the Chi-square is highly sensitive to sample size (Schermelleh-Engel et al. 2003), we have also used Comparative Fit Index ( $CFI \geq .95$ , good; it is a non-centrality based index that tests whether the model is better than the alternative model established with the covariance matrix) and Tucker-Lewis Index ( $TLI \geq .95$ , good; it is a non-normed and incremental fit index, thus not required to be between 0 and 1, and it compares the tested model with one where all variables are uncorrelated), which are less sensitive to sample size (Kline 2005; Byrne 2010). Also, we have considered the Root Mean Square Error of Approximation ( $RMSEA \leq .05$ , good fit;  $\leq .08$ , acceptable fit;  $\geq .10$ , poor fit; it tests how well the model with optimal parameter values would fit the population covariance matrix), with 95% confidence interval (CI) (Hu and Bentler 1999). Significance

tests of indirect effects were performed using Bootstrap sampling with 2000 samples and bias-corrected confidence levels set at .95 (Hayes and Preacher 2010; Kline 2005). The effects were considered significant ( $p < .05$ ) if zero was outside of the upper and lower bounds of the 95% bias-corrected confidence interval (Hayes and Preacher 2010; Kline 2005).

## Results

### *Preliminary Data Analyses*

All variables presented acceptable values of skewness and kurtosis ( $SK < |3|$  and  $Ku < |8-10|$ ) (Tabachnick and Fidell 2014), thus not suggesting severe violations of normality. No outliers were detected. Also, there were no missing data as the online protocol did not allow submitting incomplete questionnaires.

### *Descriptive analyses*

Mean and standard deviation results are depicted in Table 2.

-----Insert table 2 around here -----

It is worth noting that our sample presented sub-clinical levels of depressive symptoms ( $M = 5.97$ ). Additional analysis showed that some participants ( $n = 32$ ) presented mild to moderate levels of depressive symptoms (Lovibond and Lovibond 1995).

### *Correlation analyses*

Results from correlation analysis are depicted in Table 1, and show that all variables are significantly associated. Specifically, mindful awareness is negatively correlated with depressive symptoms, rumination and obstruction to valued living, while positively associated with progress in valued living. Also as expected, rumination was positively associated with depressive symptoms and obstruction with valued living, and negatively correlated with progress in valued living. Depressive symptoms were positively associated with obstruction, and negatively with progress, in valued living.

### *Mediation analysis*

Results from path analysis showed an initial oversaturated model, i.e., with a perfect model fit,  $\chi^2 = 0.00$  (0, 124), with the following non-significant paths: mindful awareness  $\rightarrow$  depressive symptoms ( $b = -.008$ ,  $p = .724$ ) and progress in valued living  $\rightarrow$  depressive symptoms ( $b = -.043$ ,  $p = .408$ ). The fitness of the model was re-calculated after progressively eliminating the two non-significant paths.

The final “trimmed” model (see Figure 2) presented good model fit:  $\chi^2 = .843$  (2, 124); CFI = 1.000; TLI = 1.024; RMSEA = .000,  $p = .732$ . According to the chi-square difference test, the “trimmed”

model presented a significantly better fit than the initial oversaturated model ( $\chi^2_{dif} = .843 > \chi^2_{.95(2)} = .103$ ). The model explained 13% of rumination, 50% of obstruction to valued living, 20% of progress in valued living and 59% of depressive symptoms.

----- insert Figure 2 -----

Results show an indirect association between mindful awareness and depressive symptoms ( $\beta = -.415$ , 95% CI:  $-.525; -.307$ ,  $p = .001$ ), through rumination ( $\beta = -.37 \times .30 = -.111$ ), through obstruction to valued living ( $\beta = -.39 \times .54 = -.211$ ), and sequentially through rumination and obstruction to valued living ( $\beta = -.37 \times .46 \times .54 = -.090$ ). Additionally, rumination mediated the relationship between mindful awareness and obstruction to valued living ( $\beta = -.169$ , 95% CI:  $-.290; -.088$ ,  $p = .001$ ), and between mindful awareness and progress in valued living ( $\beta = .118$ , 95% CI:  $.049; .228$ ,  $p \leq .001$ ). Nevertheless, mindful awareness still directly predicted both obstruction to valued living ( $\beta = -.391$ , 95% CI:  $-.547; -.219$ ,  $p = .001$ ), and progress in valued living ( $\beta = .216$ , 95% CI:  $.019; .415$ ,  $p = .031$ ). Also, results showed an indirect association between rumination and depressive symptoms through obstacles to valued living ( $\beta = .249$ , 95% CI:  $.154; .386$ ,  $p = .001$ ), even though its direct association remained significant ( $\beta = .305$ , 95% CI:  $.121; .454$ ,  $p = .001$ ).

### Discussion

Research suggests that mindfulness, rumination and valued action are relevant variables for understanding depressive symptoms in CP (e.g. Hofmann et al. 2010; Edwards et al. 2011; McCracken et al. 2007). Although literature hypothesizes that mindfulness reduces rumination, and in turn produces values-congruent behaviors (Shapiro et al. 2006), to our knowledge this has never been tested in a conceptual model.

Results from correlational analyses showed that those who were more mindfully aware tended to experience less depressive symptoms, as well as were less likely to engage in ruminative thinking. This is in line with previous studies that show the negative association between mindfulness and depressive symptoms (e.g. Bawa et al. 2015; Mun et al. 2014) and rumination (e.g. Curtin and Norris 2017) in CP. Additionally, participants who were more mindfully aware also experienced less obstacles to engaging in valued activities, and reported more progress in living in accordance to personal values. These results seem to be in line with the theoretical (e.g. Shapiro et al. 2006) and empirical (e.g. McCracken and Vowles 2014) literature on the role of mindfulness as a mechanism that facilitates valued actions. Also, rumination was associated to valued living: it correlated positively with obstructions to valued living, and negatively with

progress in valued living. Although to our knowledge this has never been explored in CP, it is in line with theoretical literature that proposes a relationship between being entangled with internal experiences (such as ruminative thinking) and acting guided by avoidance rather than personal values (e.g. McCracken 2005). Indeed, these results seem to be in line with similar associations found between closely conceptualized processes, such as committed action, cognitive fusion and decentering (Scott et al. 2016). Finally, depressive symptoms were correlated positively with obstructions to valued living, and negatively with progress in valued living, which seems to echo previous results on the relationship between valued living and depressive symptoms in CP (e.g. Jensen et al. 2015).

In order to better understand the relationships between these variables, a theory-driven mediational model was tested. Results showed that the relationship between mindfulness and depressive symptoms was sequentially mediated by rumination and obstructions to valued living. This seems to be in line with the view that suffering and disability in CP results from a lack of awareness, entanglement with internal experiences and lack of valued living (e.g. McCracken 2005). According to the well established Fear-Avoidance Model (FAM), the pain experience is highly influenced by interpretations of pain-cues, such as pain catastrophizing (e.g. Vlaeyen et al. 2016) that modulate pain and emotional outputs. Our findings are in line with the FAM and adds to it by suggesting that psychological processes that are not focused on pain may also play a role in the relationship between mindful awareness and depressive symptoms in CP. Specifically, adding to previous findings showing that mindfulness is a significant and unique contributor of pain beyond other variables in the FAM (Schütze et al. 2010) and is a moderator of the relationship between pain intensity and disability (Poulin et al. 2016), our results seem to expand the knowledge on the role of mindfulness in depressive symptoms in CP by pointing to the role of ruminative thinking and (obstructions to) valued living as mediators of this relationship. Indeed, these results seem to align with the hypothesis that mindfulness leads to less depressive symptoms through a reduction in ruminative thinking (e.g. Segal et al. 2002; Teasdale et al. 2002), which in turn result in more values-guided behaviours (Hayes et al. 2006). An interesting result was that progress in valued living did not mediate this association. One possible way of reading this result is considering it a potential statistical artefact. Obstacles to valued living are measured in the same direction as rumination and depressive symptoms, thus possibly tapping into more similar constructs than the positively formulated items in progress in valued living. Additionally, it is worth noting that the magnitude of correlation between obstacles in valued living and depressive symptoms is high ( $r = .73$ ), which may indicate they may be measuring an underlying similar process. Another possible

explanation may follow a more functional interpretation: items in VQ-Progress may be tapping into behaviours that are not necessarily engaged in a mindful manner (e.g. “worked toward my goals even if I didn’t feel motivated to”), thus not involved in how mindfulness and rumination relate to depressive symptoms. Indeed, the function and intention that underlie a behaviour (e.g. avoiding difficult experiences versus moving towards a purposeful life) seem to impact intervention outcomes (Hurl et al. 2016), thus being potentially relevant in how it relates to depressive symptoms in CP. One may experience progress in valued actions, not because one is more mindfully aware of the present moment and of one’s personal values, but as a result from autopilot and/or from an underlying avoidance-based process. For example, one might engage in leisure activities despite pain, not because one values personal health, but to avoid loneliness. Additionally, results suggest the association between mindfulness and valued living occurs negatively through rumination. This seems to suggest that those who are more mindfully aware experience less obstacles and more progress in valued living because they tend to ruminate less about their emotional states. This seems to echo both the role rumination seems to play as a predictor of negative outcomes in CP (e.g. Curtin and Norris 2017; McCracken et al. 2014), as well as the proposition that mindfulness, by reducing rumination, creates a space in which values clarification are more likely to occur (Shapiro et al. 2006; Hayes et al. 2006). Finally, results seem to indicate that thinking negatively and repetitively on one’s emotional states relate to depressive symptoms through the experiencing of obstructions to valued living. Literature on psychological suffering suggests that the entanglement with internal experiences (e.g. ruminative thinking) leads to behaviours that are more avoidant-focused, thus creating obstacles to both values identification and valued-based actions (Hayes et al. 2006). Our results seem to corroborate this by showing that those who tend to ruminate more experience more depressive symptoms, and one mechanism through which this occurs is by the experience of obstructions to living in accordance to personal values. On the other hand, experiencing less progress in valued living did not mediate this relationship. This is an interesting result, as it seems to indicate that experiencing less progress in valued living is less nefarious to depressive symptoms than experiencing more obstacles in valued living. One possible explanation is that while obstructions to valued living can be directly experienced (e.g. pain-related catastrophic thoughts, worry, ruminative thinking), the realization that one is not moving towards a purposeful life may need a more conscious reflection on personal values, which may be subordinated to and hindered by an avoidant-driven automatic responding.

Several limitations should be considered. The cross-sectional design prevents us from establishing causal relations between variables. Future studies should consider replication of the current study with a longitudinal design. It should also be acknowledged that the convenience sampling of the current study makes our sample non-probabilistic and non-representative of the population. It should be noted that motivation/willingness to participate in the study may have influenced results: for example, those who have access to online platforms might be younger and more educated than the overall CP population. An interesting future study, with a larger sample, would be to explore if the role of rumination and valued action would be invariant when considering age clusters and levels of education. Also, it may have been the case that those who did not present clinically-relevant depressive symptoms were disproportionately more motivated to participate, thus influencing results. Indeed, one should acknowledge that participants presented on average subclinical levels of depressive symptoms. An interesting study would be to test this model in a sample of CP and major depression. Additionally, our sample was female-only, thus the generalization of these results to other genders is unwarranted. Future studies should test this model with other genders, and conduct multi-group analyses to explore differences. Finally, it should be noted that mindfulness is not limited to mindful awareness, so future studies should consider exploring other facets of mindfulness.

Results from this study are in line with the theoretical hypothesis that mindfulness decreases rumination, that in turn creates a space in which values-congruent behaviors can occur (e.g. Shapiro et al. 2006). Although the relevance of the variables in study has been individually demonstrated in CP, to our knowledge this is the first study that tested a comprehensive model that explored how mindfulness, rumination, valued living and depressive symptoms relate. This yields potential clinical implications. On the one hand, it corroborates the benefits of mindfulness in CP (e.g. Hilton et al. 2017), but adds on new information on other relevant processes that should be considered in psychological interventions in CP. It suggests the importance of addressing ruminative thinking beyond pain-related rumination. It seems that interventions in CP would benefit from not being exclusively focused on pain-related content, and broaden their focus by promoting a mindful way of relating to relevant ruminative thoughts. Also, this study suggests that in promoting behaviors that are valued, one should consider tackling rumination as a potential obstacle to valued living. Accepting and defusing from ruminative thoughts may be useful psychotherapeutic goals in helping clients engage in valued actions in CP, thus leading to a more fulfilling life.

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Table 1  
*Demographic and medical characteristics of the sample (N = 124)*

	N	%
Marital status		
Single	20	16.1
Married	82	66.1
Separate/Divorced	20	16.1
Widower	2	1.6
Education level		
Elementary school	2	1.6
Middle school	15	12.1
High school	37	29.8
Bachelors	54	43.5
Post-Grad	8	6.5
Masters	7	5.6
Doctorate	1	0.8
CP diagnoses provided by medical doctors*		
General practitioner	17	13.7
Rheumatologist	102	82.3
Psychiatrist	9	7.3
Other	105	84.7
CP diagnoses*		
Fibromyalgia	109	87.9
Arthrosis	10	8.1
Rheumatoid Arthritis	9	7.3
Lateral Epicondylitis	2	1.6
Low Back Pain	16	12.9
Neck Pain	7	5.6
Other	98	79.0
Duration of CP		
< 1 year	1	0.8
1 year - 5 years	21	16.9
5 years - 10 years	33	26.6
> 10 years	69	55.6

\*participants could choose more than one option.

Table 2  
*Mean (M), Standard Deviation (SD) Range of scores (Min-Max) of all variables, and Pearson moment correlation between all variables in the total sample (N = 124)*

Measures		<i>M</i>	<i>SD</i>	Min-Max	Correlations			
					1	2	3	4
1.Mindful awareness (MAAS)		51.12	14.90	16-84	-	-	-	-
2.Rumination (RRS)		21.63	6.01	10-37	-.37***	-	-	-
3.Obstruction to valued living (VQ-0)		12.45	6.99	0-28	-.56***	.60***	-	-
4.Progress in valued living (VQ-P)		18.39	6.71	3-30	.34***	-.40***	-.52***	-
5.Depressive symptoms (DASS)		5.97	5.05	0-20	-.43***	.63***	.73***	-.45***

*Note.* \*\*\*  $p < .001$ ;

MAAS = Mindful Attention Awareness Scale; RRS = Ruminative Response Scale; VQ-O = Valuing Questionnaire-Obstruction; VQ-P = Valuing Questionnaire-Progress; DASS = Depression, Anxiety and Stress Scale – depression subscale)

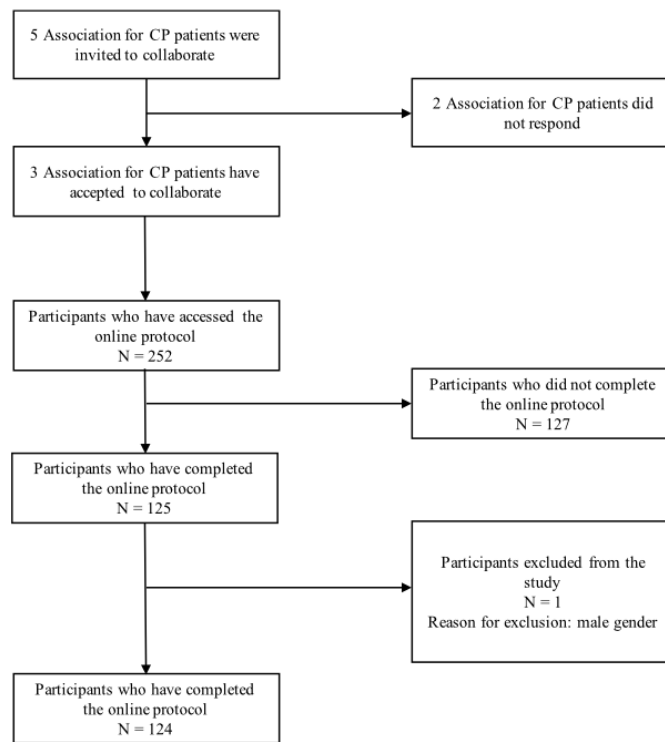


Figure 1. Flow chart of participants

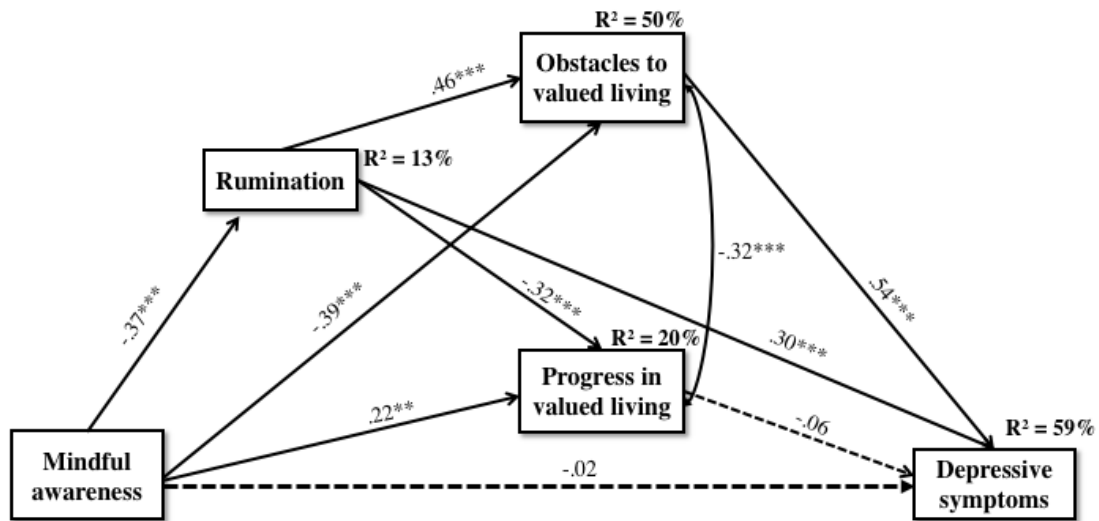


Figure 2. Path diagram for the final model showing the associations between mindful awareness, rumination, obstacles to and progress in valued living and depressive symptoms. Standardized regression coefficients and multiple correlations coefficients are presented; all paths are statistically significant ( $p < .001$ ), except for the two paths drawn in dotted lines, which were non-significant ( $p > .05$ ).

\*\*\*  $p < .001$