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Testing the Metacognitive Model of Rumination and Depression in Non-clinical Population: New Data about PBRS and NBRS Scales

Julia B Cano-López[1] · José M Salguero[1] · Esperanza García-Sancho[2] · Juan Ramos-Cejudo[3]

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Abstract
Rumination is a maladaptive emotion regulation strategy linked to depression. An intriguing question is why some people tend to use it. The metacognitive model proposes that people having positive metacognitive beliefs ("ruminating helps me cope") are more prone to engage in ruminative processes. On the other hand, negative metacognitive beliefs ("rumination is uncontrollable") lead to negative appraisals about rumination, increasing depressive symptomatology. Two scales assess both of these core beliefs: the Positive and Negative Beliefs about Rumination Scales (PBRS and NBRS). While they have been widely used, few studies have examined their factor structure and psychometric properties. Preliminary support has also been provided for the metacognitive model of rumination and depression, but contrary results exist about the specific contributing negative beliefs. In this study, we aimed, first, to add new evidence of the factor structure and psychometric properties of the PBRS and NBRS in a non-clinical population and, second, to test the metacognitive model using structural equation modeling (SEM). We also add the Spanish version of these scales. The participants included 427 individuals from the general population. We confirmed the one-factor structure of the PBRS and found evidence for a three-factor structure of the NBRS (uncontrollability, harm and social consequences), differing from the two-factor structure found in previous studies. SEM analyses showed that positive beliefs were associated to rumination and negative beliefs about social consequences partially mediated the relations among rumination and depression. Our findings show new data about the validity of the two scales and suggest the utility of considering a three-factor model of the NBRS.

Keywords Depression · Rumination · PBRS · NBRS · Metacognition

Introduction

Depression is one of the leading causes of disability worldwide (Kessler and Bromet 2013). It is a highly prevalent and often chronic condition (Beshai et al. 2011) and one of the most debilitating psychiatric disorders (Mrazek et al. 2014). Thus, efforts to identify risk factors and underlying mechanisms of depression are much needed to advance both theory and treatment.

A hallmark of depression is rumination (Nolen-Hoeksema et al. 2008; Papageorgiou and Wells 2004). Rumination is repetitive thinking that focuses the individual's attention on the nature and antecedent of negative mood, which is not goal-directed, and do not motivate individuals to make plans for remedial actions (Nolen-Hoeksema et al. 2008; Papageorgiou and Wells 2004). From this definition, rumination is considered as a maladaptive emotion regulation strategy, used in response to negative affect (Joormann and Quinn 2014), and that can be differentiated from other adaptive strategies, such as reflection (a purposeful turning inward to engage in cognitive problem-solving) or cognitive reappraisal (the attempt to reinterpret an emotion-eliciting situation to alters its meaning and changes its emotional impact) (see Joormann and Stanton 2016, for a review). Rumination is related to different psychological disorders (Nolen-Hoeksema and Watkins 2011), and a specific vulnerability factor for depression (for a review, see Nolen-Hoeksema et al. 2008). Rumination is a cognitive process, distinct from depressive symptoms (Treynor et al. 2003), that predicts the onset and

✉ José M Salguero
jmsalguero@uma.es

[1] Department of Personality, Evaluation and Psychological Treatment, School of Psychology, University of Malaga, Campus de Teatinos s/n., 29071 Malaga, Spain

[2] University of Cordoba, Cordoba, Spain

[3] Complutense University of Madrid, Madrid, Spain

maintenance of depression and depressive symptoms in both naturalistic and experimental studies (for a review see Watkins 2008). Different mechanisms have been proposed through which rumination could exacerbate and prolong depression, for example, enhancing the effects of depressed mood on thinking, or interfering with effective problem-solving (see Lyubomirsky and Tkach 2004, for a review). Therefore, if rumination is an emotion regulation strategy with negative consequences, an intriguing question here is why some people tend to use it.

The Self-Regulatory Executive Function Model (S-REF; Wells and Matthews 1996) tries to address this key question. A central tenet of this model is the distinction between cognitive and metacognitive systems; where metacognition refers to the structures, content and processes involved in the monitoring, appraisal and control of cognition (Wells 2019). From the S-REF, a particular style of cognition linked to psychological disorders is the Cognitive Attentional Syndrome (CAS). The CAS is a way of thinking where negative self-relevant information is attended and become perseverative, in the form of negative repetitive thinking (e.g., rumination or worry). The CAS is controlled for the metacognitive system. The activation and maintenance of the CAS is dependent on stable beliefs people have about their own cognitive system and coping strategies, called metacognitive beliefs. These metacognitive beliefs (e.g. "ruminating helps me to cope") guide people to select and continue using perseverative thinking, which in turn increases and maintains emotional distress (Wells 2000). From this approach, metacognitive beliefs are causal factors in predicting emotional disorders, and considerable evidence has linked these beliefs to psychopathology (for a meta-analytic review, see Sun et al. 2017; see also Wells 2019).

Drawing on the S-REF model, Papageorgiou and Wells (2003, 2004) described a specific metacognitive model of rumination and depression. Two metacognitive beliefs are principal in this model: positive beliefs, referring to the utility of rumination (e.g. "I need to ruminate to find answers to my problems"); and negative beliefs, referring to the uncontrollability and danger of rumination (e.g. "rumination about my problems is uncontrollable") and to its negative interpersonal and social consequences (e.g. "people will reject me if I ruminate"). When faced with negative emotions and problems, people having positive metacognitive beliefs are more prone to using rumination as a "useful" strategy. However, rumination interferes in effective problem solving and increases the negative affect. As a result, negative metacognitive beliefs of rumination arise. These negative beliefs lead people to appraise their own rumination as uncontrollable and dangerous (e.g. socially), increasing the accessibility of negative information (e.g. negative emotions or thoughts), and thus enhancing and maintaining depressive symptomatology.

To test the metacognitive model, the measurement of metacognitive beliefs about rumination was advanced by the development of the Positive Beliefs about Rumination Scale (PBRS; Papageorgiou and Wells 2001b) and the Negative Beliefs about Rumination Scale (NBRS; Papageorgiou and Wells 2001a). In line with the model, preliminary results with the PBRS showed a one-factor structure, whereas the NBRS showed a two-factor structure – beliefs about uncontrollability and danger, and beliefs about the social consequences of rumination – showing adequate psychometric properties. The PRBS and NBRS have been widely used in the literature (as reviewed below); however, additional research is needed regarding their factor structure and psychometric properties. So far, there are only two studies that have examined the factor structure of the PBRS, using a non-clinical (Papageorgiou and Wells 2001b) and a clinical sample (Roelofs et al. 2010). In the case of the NBRS, its factor structure and properties have only been examined in one study using a clinical sample (Roelofs et al. 2010).

Using the PBRS and the NBRS, preliminary support has been provided for the metacognitive model of rumination and depression in both clinical and non-clinical samples (Papageorgiou and Wells 2001b, 2003; Roelofs et al. 2007, 2010; Yilmaz 2016). Evidence from cross-sectional and prospective studies shows that positive and negative metacognitive beliefs are significantly associated with rumination and depression (Kraft et al. 2019; Kubiak et al. 2014; Papageorgiou and Wells 2003, 2009; Roelofs et al. 2007; Weber and Exner 2013; Yilmaz 2016). Moreover, different studies examined the mediation model using path analysis and found that positive beliefs lead to rumination, and that rumination leads to depressive symptoms both directly and indirectly, through negative metacognitive beliefs (Papageorgiou and Wells 2003; Roelofs et al. 2007, 2010). Research shows differing pathways associating rumination with depressive symptomatology via negative metacognitive beliefs. For example, Papageorgiou and Wells (2003) found that rumination leads to depressive symptomatology only via social negative beliefs. Contrary, Roelofs et al. (2007) found that the negative beliefs were associated with depressive symptoms only via the uncontrollability and harm subscales. This disparity of results has been found in both clinical and non-clinical samples.

Taken together, reviewed studies are consistent with the main underlying tenet of the metacognitive model, although the specific contribution of each subtype of negative beliefs to depressive symptoms is unclear. On the other hand, while the PBRS and NBRS have been widely used, more studies are needed to analyze their factor structure and psychometric properties.

Our Study

The first aim of the present study was to confirm the original one-factor structure for the PBRS and the two-factor structure

for the NBRS. We also examined associations between these scales and related constructs. We hypothesized positive and significant associations between scores on the PBRS and NBRS with measures of other metacognitive beliefs and expected that the PBRS and NBRS would be positively related to both rumination and worry, since they can be considered as two forms of repetitive negative thinking that only differ in their specific content (McEvoy et al. 2013).

The second aim of this study was to test the metacognitive model of rumination and depression in a non-clinical sample by means of structural equation modeling (SEM). Whereas previous studies have used path analysis to test the model, few have used SEM, a methodology that reduces the measurement error. We hypothesized that we would find a link between positive beliefs and rumination. We also expected to find both a direct link between rumination and depression and an indirect link via negative beliefs. We did not have expectations about which subtype of negative beliefs would be more strongly associated with depressive symptoms.

Finally, because a Spanish version of the PBRS and NBRS has not yet been validated, which poses an obstacle to advances in research in the field of metacognition in the Spanish population, our data will also show evidence of the validity of these scales in a Spanish non-clinical population.

Method

Participants

Participants in this study consisted of 427 Spanish individuals (74.5% female, 24.8% male and 0.7% missing value), ranging in age from 18 to 70 ($M = 25.64$, $SD = 12.35$). Of these, 229 were undergraduate students, whose ages ranged from 18 to 55 ($M = 20.35$, $SD = 4.89$; 82.5% female, 16.6% male and 0.9% missing value), and 198 were participants selected using a snowball sampling procedure, whose ages ranged from 18 to 70 ($M = 31.77$, $SD = 15.21$; 65.2% female, 34.3% male, 0.5% missing value). To evaluate test-retest reliability, 184 participants of the initial sample (81% female, 17.9% male and 1.1% missing value), ranging in age from 18 to 60 ($M = 22.74$, $SD = 9.9$), participated in the study a second time, approximately 5 months after the first administration.

Instruments

Positive Beliefs about Rumination Scale (Papageorgiou and Wells 2001b). The PBRS is a 9-item scale that assesses positive metacognitive beliefs about rumination (e.g. "ruminating about the past helps me to prevent future mistakes and failures"). Respondents are asked to indicate the extent to which they agree with each item on a 4-point Likert scale ranging between 1 = "Do not agree" and 4 = "Agree very much," so the total score ranges from 9 to 36, with higher scores indicating greater conviction in positive metacognitive beliefs. Reliability ($\alpha = .89$) and validity of the PBRS are good (Papageorgiou and Wells 2001b).

The Spanish translation was created using a well-established method (World Health Organization 2016). Thus, we used a back-translation procedure involving two independent translators (a native Spanish speaker and a native English speaker), both of whom were psychologists with expertise in clinical psychology and cognitive processes.

Negative Beliefs about Rumination Scale (Papageorgiou and Wells 2001a). The NBRS is a 13-item scale evaluating negative beliefs about ruminative thinking. There are two subscales: NBRS1 is composed of 8 items that assess metacognitive beliefs about the uncontrollability and harmfulness of rumination (e.g. "rumination about my problems is uncontrollable," "Ruminating can make me harm myself"); and NBRS2 contains 5 items examining metacognitive beliefs concerning the social and interpersonal consequences of ruminating (e.g. "people will reject me if I ruminate"). Respondents are asked to indicate the extent to which they agree on each item through a 4-point Likert scale (1 = "Do not agree" to 4 = "I agree"). Therefore, NBRS1 scores range from 8 to 32, and NBRS2 scores range from 5 to 20. Higher scores indicate higher levels of negative metacognitive beliefs. The reliability and validity of both NBRS1 and NBRS2 are good ($\alpha = .82$ and $\alpha = .77$, respectively; Luminet 2004; Papageorgiou and Wells 2001a). The translation of the NBRS followed the same procedure described for the PBRS.

Patient Health Questionnaire-9 (PHQ-9; Kroenke et al. 2001). This 9-item questionnaire assesses symptoms of depression with a two-week recall period (e.g. "Feeling down, depressed or hopeless"). Items are rated on a scale from 0 = "Not at all" to 3 = "Nearly every day," with total scores ranging from 0 to 27. Both the original version and the Spanish version that we used have shown good reliability and validity (Diez-Quevedo et al. 2001; Kroenke et al. 2001).

Patient-Reported Outcomes Measurement Information System; Depression domain (PROMIS; Cella et al. 2007). The PROMIS is an 8-item self-report measure that appraises the severity of depressive symptomatology (e.g. "I felt that I have nothing to look forward to"). Responses range from 1 = "Never" to 5 = "Always," so the total score varies from 8 to 40. Findings showed good psychometric properties and validity in both the original and the Spanish version of PROMIS (Cella et al. 2007; Vilagut et al. 2019).

Ruminative Response Scale; Brooding Subscale (RRS; Nolen-Hoeksema and Morrow 1991). The RRS assesses individuals' tendencies to ruminate in response to sadness or a depressed mood. In the current study, we only used the brooding subscale (e.g. "think about a recent situation, wishing it had gone better"), since it is the ruminative dimension associated with depression. This subscale is comprised of 5 items. Responses

range from 1 = "Almost never" to 4 = "Almost always," and the brooding score varies from 5 to 20. Both the original and Spanish versions have shown that the RRS is a reliable and valid measure (Luminet 2004; Hervás 2008).

Rumination-Reflection Questionnaire; Rumination Subscale (RRQ; Trapnell and Campbell 1999). This questionnaire assesses, regardless of affective state, the tendency to use rumination and reflection about past events. Reflection is considered an adaptive strategy, characterized by a purposeful insight to engage in cognitive problem solving. Subsequently, in this study, we only use the rumination subscale (e.g. "I spend a great deal of time thinking back over my embarrassing or disappointing moments"), with 12 items. Items are rated on a 5-point Likert scale ranging between 1 = "Strongly disagree" and 5 = "Strongly agree," with the total score ranging from 12 to 60. The original study showed good internal consistency for both scales. We used a Spanish version of the RRQ (see Pena and Losada 2017), which has shown adequate psychometric properties.

Penn State Worry Questionnaire-3 (PSWQ-3; Berle et al. 2011). The PSWQ is a three-item, ultra-brief version derived from the full PSWQ. This questionnaire assesses the core features of worry: uncontrollability ("once I start worrying, I cannot stop"); excessiveness ("I worry all the time"); and multiple worry domains ("many situations make me worry"). Items are scored on a 5-point Likert scale (from 1 = "Not at all typical" to 5 = "Very typical"), with the total score varying from 3 to 15. The psychometric properties of the PSWQ-3 are comparable to the original PSWQ (see Kertz et al. 2014). The Spanish version of the PSWQ has shown good psychometric properties (Sandín et al. 2009).

Meta-Cognitions Questionnaire-30 (MCQ-30; Wells and Cartwright-Hatton 2004). The MCQ-30 is designed to assess individual differences in dysfunctional metacognitive beliefs. It consists of 5 subscales including a total of 30 items: (1) positive beliefs about worry (e.g. "worry helps me cope"); (2) negative beliefs of uncontrollability and danger (e.g. "when I start worrying I cannot stop"); (3) cognitive confidence (e.g. "my memory can mislead me at times"); (4) need to control thoughts (e.g. "not being able to control my thoughts is a sign of weakness"); and (5) cognitive self-consciousness (e.g. "I pay close attention to the way my mind works"). It has a 4-point Likert scale, ranging from 1 = "Do not agree" to 4 = "Agree very much," and therefore, the total score ranges from 30 to 120. The MCQ-30 possesses good reliability and validity. The Spanish version of the MCQ-30, which we used, also showed adequate psychological properties (Ramos-Cejudo et al. 2013).

Procedure

The study sample is part of a larger study that aims to examine the role of cognitive variables and emotion regulation in depression. Student participants were verbally informed about the study during their university lessons. Subsequently, the questionnaires were administered electronically and completed individually, with instructions given in writing. Non-student participants were approached using snowball sampling. Student participants were compensated with class credit for their participation, whereas no compensation was given to the non-student sample. Participation was voluntary and anonymous. The study obtained ethical approval from the Complutense University of Madrid (Ref.: 2017/18–021).

Overview of Data Analytic Approach

We used the Statistical Package IBM SPSS version 22 for computing descriptive statistics, correlation analyses and internal consistency, as well as EQS. 6.3 (Bentler 1995) to compute confirmatory factor analysis (CFA) and SEM.

We carried out CFA and SEM using the maximum likelihood (ML) method. As departures from multivariate normality can have a significant impact on maximum-likelihood estimation, we first calculated descriptive analyses measures. Since multivariate kurtosis statistics indicated non-normality, we used the Satorra-Bentler scaled ML correction to adjust the model's chi-square (Hu et al. 1992). According to Schweizer's recommendations (Schweizer 2010), additional measures of model fit were used: (a) root mean square error of approximation (RMSEA); (b) the Bentler comparative fit index (CFI); and (c) standardized root mean square residual (SRMR). For the CFI, values exceeding 0.90 signify an acceptable fit. For the RMSEA, values below 0.08 are considered an acceptable fit, whereas values below 0.05 are indicative of good fit. Finally, values of the SRMR are expected to stay below 0.10 (Schweizer 2010). According to Kline (2011), the current sample size is adequate for both CFA and SEM analyses.

First, we used all measures to examine the validity of PBRS and NBRS. Specifically, MCQ-30 was used to examine convergent validity whereas PSWQ-3, RRS and RRQ were used to examine criterion validity. Second, to test the mediation model in SEM, we used RRS, RRQ, PROMIS-D and PHQ-9 jointly with PBRS and NBRS.

Results

Confirmatory Factor Analysis

CFA was used to test the fit of the PBRS one-factor model and the NBRS two-factor model. Modification indices were inspected in the case of inadequate fit of the model to the data.

Firstly, for the PBRS, results varied by index: S-B $\chi 2 = 170.45$, df = 27, $p < 0.01$; normed $\chi 2$ ($\chi 2$/df) = 6.31, RMSEA =0.11 (0.10–0.13); CFI = .93; SRMR = 0.03, with RMSEA indicating an inacceptable fit. Inspection of the modification

index showed that two items (7 and 8) had significant residual correlation. This is reasonable, as the content of these items refers to how ruminating about the past may help in future situations. Allowing errors of items 7 and 8 to correlate resulted in a significant improvement in fit: S-B $\chi2 = 90.25$, df = 26, $p < 0.01$; normed $\chi2$ ($\chi2$/df) = 3.47, RMSEA =0.07 (0.06–0.09); CFI = .97; SRMR = 0.07. Factor loadings are displayed in Table 1.

With respect to the NBRS, the two-factor model showed inacceptable fit: S-B $\chi2 = 365.75$, df = 64, $p < 0.01$; normed $\chi2$ ($\chi2$/df) = 5.71, RMSEA =0.10 (0.09–0.11); CFI = .77; SRMR = 0.08. Inspection of the modification indices showed the following items had significant residual correlation: items 13 and 7; 11 and 9; 6 and 9 in the first factor, and items 4 and 5 regarding the second factor. The content of items 13 and 7 refers to harmful effects of rumination. The content of items 6, 9 and 11 refers to the uncontrollability of rumination. Regarding the items from the second factor, 4 and 5, they refer to social consequences of rejection or abandonment due to rumination. Allowing the error of these items to correlate resulted in a significant improvement in fit: S-B $\chi2 = 195.28$, df = 60, $p < 0.01$; normed $\chi2$ ($\chi2$/df) = 3.25, RMSEA =0.07 (0.06–0.08); CFI = .90; SRMR = 0.07. All factor loadings were higher than .41 (see Table 2). We found these results to be revealing. The residual correlation between items 6, 9 and 11, whose content refers to the uncontrollability of rumination, suggested that these three items might correspond to an independent factor instead. Thus, factor 1, which originally included uncontrollability and harm, would be separated into two different factors. In this sense, the NBRS had three factors: 1) uncontrollability; 2) harm; and 3) social consequences. We decided to carry out a CFA with the hypothesized three-factor model of the NBRS, which showed the following fit indices: S-B $\chi2 = 190.75$, df = 62, $p < 0.01$; normed $\chi2$ ($\chi2$/df) = 3.07, RMSEA =0.07 (0.06–0.08); CFI = .90; SRMR = 0.06. Globally, these indices indicate a good fit to the data, with all factor loadings being higher than .40 (see Table 2).

Taking into account these results, we decided to examine the reliability and validity of the NBRS considering both the two- and three-factors models.

Descriptive Statistics and Reliability

We calculated the descriptive statistics, reliability and zero-order correlation coefficients for all the study variables (see Table 3). Regarding the reliability of the measures, all of them were satisfactory, ranging from .71 to .95. We also assessed reliability using test-retest analyses. Test-retest correlations over 5 months were acceptable for all the subscales: $r = .54$ for PBRS, $r = .66$ for NBRS uncontrollability and harm factor; $r = .69$ for uncontrollability factor of the NBRS three-factor model; $r = .61$ for harm factor of the NBRS three-factor model; and $r = .56$ for the NBRS social consequences factor.

Validity

The PBRS correlated positively and significantly with all measures. The PBRS showed moderate correlations with rumination and depressive symptoms measures, ranging between .40 and .54. Convergent validity was supported by positive and significant correlation between the PBRS and the positive beliefs about worrying scale of the MCQ-30.

Table 1 *PBRS items and their standardised factor loadings (N = 427)*

Items PBRS	Loading
Item 1. Necesito rumiar mis problemas para encontrar respuestas a mi depresión	
I need to ruminate about my problems to find answers to my depression	.77
Item 2. Rumiar acerca de mi depresión me ayuda a comprender las equivocaciones y fracasos del pasado	.76
Ruminating about my depression helps me to understand past mistakes and failures	
Item 3. Necesito rumiar mis problemas para encontrar las causas de mi depresión	
I need to ruminate about my problems to find the causes of my depression	.87
Item 4. Rumiar mis sentimientos me ayuda a identificar los desencadenantes de mi depresión	
Ruminating about my feelings helps me to recognize the triggers for my depression	.78
Item 5. Necesito rumiar todas las cosas malas que han ocurrido en el pasado para poder darles sentido	
I need to ruminate about the bad things that have happened in the past to make sense of them	.64
Item 6. Para comprender mis sentimientos depresivos necesito rumiar mis problemas	
In order to understand my feelings of depression I need to ruminate about my problems	.83
Item 7. Rumiar acerca del pasado me ayuda a prevenir futuros fallos y fracasos	
Ruminating about the past helps me to prevent future mistakes and failures	.48
Item 8. Rumiar acerca del pasado me ayuda a entender cómo se podrían haber hecho mejor las cosas	
Ruminating about the past helps me work out how things could have been done better	.62
Item 9. Rumiar mis problemas me ayuda a centrarme en las cosas más importantes	
Ruminating about my problems helps me to focus on the most important things	.38

Table 2 *NBRS items and their standardised factor loadings for both models (N = 427)*

Items/Factor	Two-factor model loading	Three-factor model loading
Factor/s: Uncontrollability and harm		
Item 1. Rumiar me hace sentirme físicamente enfermo/a	.67	.70
Ruminating makes me physically ill		
Item 2. Cuando rumio no puedo hacer nada más	.73	.74
When I ruminate I can't do anything else		
Item 3. Cuando rumio me siento fuera de control	.80	.82
Ruminating means I'm out of control		
Item 7. Rumiar sobre mi depresión me puede llevar a suicidarme	.53	.52
Ruminating about my depression could make me kill myself		
Item 13. Rumiar me puede llevar a hacerme daño a mí mismo/a	.53	.51
Ruminating can make me harm myself		
Item 6. Rumiar sobre mis problemas es algo que no puedo controlar	.53	.82
Ruminating about my problems is uncontrollable		
Item 9. No puedo parar mi rumiación	.56	.82
I cannot stop myself from ruminating		
Item 11. Es imposible no rumiar sobre las cosas malas que me han sucedido en el pasado	.41	.62
It is impossible no to ruminate about the bad things that have happened in the past		
Factor: Social consequences		
Item 4. Todo el mundo me abandonaría si supiese cuánto rumio sobre mí mismo/a	.62	.84
Everyone would desert me if they knew how much I ruminate about myself		
Item 5. Si rumio la gente me rechazará	.67	.87
People will reject me if I ruminate		
Item 8. Rumiar me convertirá en un fracasado	.77	.59
Ruminating will turn me into a failure		
Item 10. Soy una mala persona por estar rumiando	.50	.44
Ruminating means I'm a bad person		
Item 12. Sólo las personas débiles rumian	.50	.40
Only weak people ruminate		

Note: bold items belong to the uncontrollability factor in the three-factor model

Likewise, we found a positive and significant correlation between the PBRS and pathological worry.

Regarding the NBRS, positive and significant correlations were found between the subscales and all the other measures. We examined the validity of the three-factor model of the NBRS, analyzing the differences in the magnitude of the correlations between the NBRS uncontrollability and the NBRS harm factors with key variables. We found statistically significant differences, with Fisher's Z indices ranging from $z = 2.63$ to $z = 5.46$ for rumination and depressive symptoms, and $z = 4.8$ for pathological worry, indicating that the magnitude of correlations was higher for the NBRS uncontrollability factor than for the NBRS harm factor. These results support the utility of considering the NBRS as a three-factor model. Moreover, convergent validity was also supported by a positive and significant correlation between the NBRS uncontrollability factor and the MCQ-30 negative beliefs subscale. On the other hand, the NBRS social consequences factor correlated moderately with rumination and depression measures, ranging from .41 to .57, as well as with worry.

Structural Equation Model

We tested the metacognitive model of rumination and depression. Taking into account our previous findings in this study, we examined the metacognitive model including the three factors of the NBRS (see Fig. 1). We used SEM with latent variables to control measurement error. We averaged the item subset of the PBRS into two parcels to create a latent factor, and used the scores of the RRS and the RRQ as indicators for the rumination latent factor. In the case of the NBRS uncontrollability factor, we used the three different items contained in it as a latent factor, whereas we averaged the items subset of NBRS harm and

Table 3 *Means, standard deviations, alpha reliabilities and inter-correlations among study variables (N = 427)*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Depressive symptoms (PHQ-9)	–														
2. Depressive symptoms (PROMIS)	.82**	–													
3.Depressive rumination (RRS)	.57**	.56**	–												
4.Rumination (RRQ)	.64**	.62**	.76**	–											
5.Pathological worry (PSWQ-3)	.64**	.61**	.60**	.73**	–										
6. Positive beliefs about worry (MCQ)	.22**	.24**	.29**	.32**	.28**	–									
7. Negative beliefs about worry (MCQ)	.58**	.59**	.53**	.64**	.71**	.22**	–								
8. Cognitive confidence (MCQ)	.25**	.19**	.18**	.19**	.18**	.06	.23**	–							
9. Need to control thoughts (MCQ)	.47**	.50**	.45**	.48**	.44**	.33**	.56**	.19**	–						
10. Cognitive self-consciousness (MCQ)	.32**	.34**	.36**	.49**	.35**	.32**	.46**	−.01	.52**	–					
11. Positive Beliefs about Rumination (PBRS)	.40**	.41**	.46**	.54**	.47**	.35**	.50**	.11*	.44**	.39**	–				
12. Uncontrollability and harm (NBRS)	.59**	.60**	.55**	.61**	.57**	.15**	.65**	.21**	.45**	.32**	.34**	–			
13. Uncontrollability (NBRS)	.58**	.61**	.59**	.69**	.63**	.22**	.65**	.19**	.48**	.31**	.51**	.78**	–		
14. Harm (NBRS)	.46**	.45**	.39**	.41**	.39**	.06	.49**	.17**	.33**	.25**	.15**	.91**	.45**	–	
15. Social consequences (NBRS)	.56**	.57**	.41**	.43**	.37**	.17**	.45**	.19**	.48**	.24**	.28**	.56**	.48**	.49**	–
M	8.03	16.28	12.21	38.03	8.62	11.10	13.39	11.92	11.40	15.75	21.73	16.20	6.21	9.88	6.77
SD	5.95	7.85	3.71	10.98	3.15	3.74	4.32	4.29	3.51	4.17	6.44	5.33	2.46	3.75	2.66
α	.87	.95	.78	.75	.88	.86	.82	.84	.71	.82	.89	.82	.80	.79	.77

Note: PHQ-9 Patient Health Questionnaire-9, PROMIS Patient-Reported Outcomes Measurement Information System depression domain, RRS Ruminative Response Scale, RRQ Rumination-Reflection Questionnaire, MCQ- Metacognitions Questionnaire (positive beliefs about worry), MCQ- Metacognitions Questionnaire (negative beliefs about uncontrollability and danger), MCQ- Metacognitive Questionnaire (cognitive confidence), MCQ- Metacognitions Questionnaire (need to control thoughts), MCQ- Metacognitive Questionnaire (cognitive self-consciousness), PBRS Positive Beliefs about Rumination Scale, NBRS- Negative Beliefs about Rumination Scale (uncontrollability and harm); NBRS- Negative Beliefs about Rumination Scale (social consequences), PSWQ-3 Penn State Worry Questionnaire-3;

** $p < .01$, * $p < .05$

NBRS social consequences into two parcels to create latent factors. Lastly, the scores of PHQ-9 and PROMIS were used as indicators for the depression symptoms latent factor. The metacognitive model showed an excellent fit to the data: S-B $\chi2 = 31.17$, $df = 48$, $p = 0.97$; normed $\chi2$ ($\chi2/df$) = 0.65, RMSEA = 0.00; CFI = 1; SRMR = 0.04.[1] As presented in Fig. 1, we found a direct effect of positive beliefs on rumination and a direct effect of rumination on depressive symptoms. Only metacognitive beliefs about the social consequences of rumination were significantly linked to depressive symptoms and mediated the relation among rumination and depressive symptoms. This mediation was partial, since the direct association between rumination and depression remained significant.

Discussion

Our first aim in this study was to add evidence of the validity of the PBRS and NBRS, examining its factor structure, psychometric properties and associations with related constructs, in a Spanish non-clinical population. Our data confirmed the hypothesized one-factor structure for the Spanish version of the PBRS according to the original structure of the scale. These findings are in line with those obtained by Papageorgiou and Wells (2001b) in a non-clinical sample, as well as with Roelofs et al. (2010), who confirmed the PBRS one-factor structure in a Dutch clinical sample. Moreover, as expected, the PBRS was positively and significantly associated with other variables of theoretical interest, as well as with metacognitive beliefs about worry.

With respect to the NBRS, our results showed some revealing findings. Whereas the hypothesized two-factor model had a good fit to the data after including some modifications, we found evidence for a three-factor model of the NBRS. In this factor structure, three different subscales would compose NBRS: 1) uncontrollability; 2) harm; and 3) social

[1] We performed the SEM analysis including the link between worry and rumination to control for the effects of worry in the mediation analyses. We used scores of each item of the PWSQ-3 as indicators for the worry latent factor. Results did not change substantially: S-B $\chi2 = 63.17$, $df = 86$, $p = 0.97$; normed $\chi2$ ($\chi2/df$) = 0.73, RMSEA = 0.00; CFI = 1; SRMR = 0.07

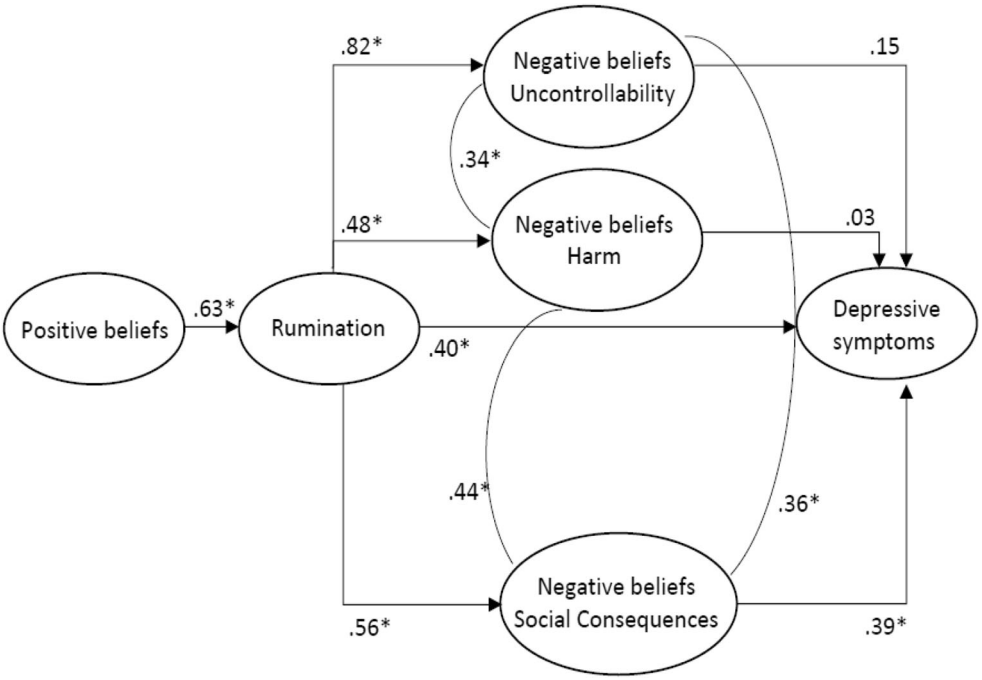


Fig. 1 Metacognitive model of rumination and depression, considering the three-factor model of the NBRS *$p < .01$.

consequences. It is theoretically reasonable to think of uncontrollability and harm as different subscales, since they might assess different metacognitive beliefs. In this sense, it is possible that people can hold beliefs about the uncontrollability of rumination independently of their beliefs about the harmfulness of this strategy, and that these beliefs have a specific effect on depression and other related constructs. Our results are in line with this suggestion. CFA analysis showed a good fit to the data for the three-factor model, and we found adequate reliability for the three subscales. Moreover, the pattern of correlations of the uncontrollability and harm subscales with criterion measures for depression, rumination and worry suggests that it is informative to use the three-factor model, with the uncontrollability subscale being significantly more correlated with these variables than the harm subscale.

These findings are novel in this field, since no study has yet tested a different factor structure for the NBRS. On the other hand, the factor structure of the NBRS has been not examined before in a non-clinical sample, and only one study has done so in a clinical sample. Future studies confirming this three-factor model of the NBRS in both clinical and non-clinical samples are thus warranted to examine whether there are differences in NBRS factor structure between the clinical and non-clinical population. In addition, these findings also pose the question of whether other measures of metacognitive beliefs, like the MCQ-30, could be re-analyzed to examine whether the negative beliefs subscale contains two independent factors: uncontrollability and harm of worry.

Regarding our second aim, our findings supported the metacognitive model of rumination and depression by means of SEM. Positive beliefs were associated with rumination, whereas rumination was both directly and indirectly associated with depression, via negative beliefs. This result is also consistent with the generic S-REF model, from which negative beliefs are considered of greater relevance (Wells 2019). Negative metacognitive beliefs lead people to appraise their own rumination as uncontrollable and dangerous, making rumination an internal process that become a threat in itself. As a result, there is an increased accessibility of negative information (e.g. negative emotions or thoughts) that interfere with effective control and lead to an increase and maintenance of depressive symptomatology. In our study, only metacognitive beliefs about the social consequences of rumination were significantly linked to depressive symptoms in the SEM analysis. This finding is consistent with the results found by Papageorgiou and Wells (2003) in undergraduates and by Roelofs et al. (2010) in clinical samples, and suggests that, in the context of depression, the belief that ruminate is socially dangerous is especially relevant, which is theoretically reasonable given the importance of social reinforcement in depression (Spates et al. 2006). However, other studies have found contrary results (Huntley and Fisher 2016; Roelofs et al. 2007), showing that negative beliefs of uncontrollability and harm were more linked to depression. This discrepancy points the needed for further exploration. In our study, data showed that the uncontrollability subscale is more relevant than the harm subscale. It is possible that metacognitive beliefs concerning uncontrollability could be especially relevant in the presence of other depression-related constructs, such as comorbid anxiety levels, since uncontrollability is a core feature of anxiety disorders (Wells 1999), or the suicide crisis syndrome (Cohen et al. 2018), which is characterized by the

feeling of uncontrol and entrapment. Future studies must examine these suggestions. Finally, it is to point out that negative beliefs partially mediated the association between rumination and depressive symptoms. This is a finding consistent with previous works (Roelofs et al. 2007, 2010) and suggest that there are other variables through which rumination is related to depression (e.g. avoidance behaviors and inactivity; Lyubomirsky and Tkach 2004).

Among the strengths of the current study are the use of a heterogeneous sample composed of student and non-student participants, well-validated measures and a methodology that reduces the measurement error. Despite these strengths, our study has several limitations that must be taken into account before we generalize our findings. First, it is not possible to attribute causality because of the cross-sectional design we used. Positive and negative metacognitive beliefs have been shown to predict depression and rumination in previous prospective studies; however, prospective designs are necessary to corroborate our findings in the Spanish population. Second, our study used mixed sampling methods, a convenience sample and a snowball sample, the latter recruited through non-random and uncontrolled means; furthermore, our sample consisted mainly of women, thus, future studies must corroborate our findings using the same sampling method in gender-equilibrated samples. Third, the use of a non-clinical sample precludes the generalization of our results to clinical samples; future research is needed to corroborate our findings in clinical settings.

Despite these limitations, our results provide new evidence of the validity of the PBRS and NBRS, show that these scales are valid to assess metacognitive beliefs about rumination in Spanish population and suggest the utility of considering a three-factor model of the NBRS in future research. In addition, we found evidence of the role of positive beliefs and negative beliefs about the social consequences of rumination in understanding rumination and depression, consistently with the underlying tenets of the metacognitive model. This has clinical implications. Metacognitive therapy seems to be a promising treatment for depression (Wells 2009). This therapy includes: (1) novel procedures and interventions aimed to promote a metacognitive mode of processing, such as detached mindfulness; (2) enhance attentional resources through the practice of Attention Training Treatment (ATT; Wells 2000); and (3) modify metacognitive beliefs via verbal reattribution and behavioral experiments. Our results suggest that in order to reduce the use of rumination and the effects of rumination on depression, treatment must be mainly focused on positive metacognitive beliefs and on beliefs concerning the social consequences of rumination.

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Compliance with Ethical Standards

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest All the authors have no competing interests.

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