

# What Else Do You Feel When You Feel Sad? Emotional Overproduction, Neuroticism and Rumination

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Numerous experimental and naturalistic studies have shown the relevant role of ruminative styles in the onset, duration and severity of depressive episodes. Recent research has increasingly focused on the precursors of these ruminative responses. Neuroticism has been found to be closely related to ruminative styles, but the nature of this relationship is unknown. Across three studies, we explored the role of emotional overproduction, conceptualized as the tendency to simultaneously experience an elevated number of negative emotions and feelings during sad episodes. Study 1 showed that emotional overproduction is independently and strongly associated with ruminative styles. Furthermore, emotional overproduction was found to mediate the relationship between neuroticism and ruminative styles. Study 2 replicated these findings in a large community sample even after controlling for mood, personality, and other emotion-related variables. In Study 3, we conducted a laboratory study to increase the internal and external validity of our findings. Implications for personality, for coping and stress literature, and for clinical research and treatment are suggested.

*Keywords:* neuroticism, ruminative style, depression, emotional responses, emotional processing

Ruminative style has been defined as the tendency to focus on depressive symptoms or on the causes or consequences of those symptoms (Nolen-Hoeksema, 1991). Research has demonstrated that people who tend to ruminate in response to dysphoria are more vulnerable to experiencing depressive episodes and that such episodes are longer and more severe (Just & Alloy, 1997; Nolen-Hoeksema, 2000; Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Nolen-Hoeksema, Parker, & Larson, 1994; Robinson & Alloy, 2003; Treynor, Gonzalez & Nolen-Hoeksema, 2003).

Consequences of ruminative responses have also been explored extensively (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). For example, it has been found that rumination increases negative and global attributions (Lyubomirsky & Nolen-Hoeksema, 1995), makes negative memories more accessible (Lyubomirsky, Caldwell & Nolen-Hoeksema, 1998; Teasdale & Green, 2004), exacerbates pessimism (Lyubomirsky, Tucker, Caldwell, & Berg, 1999), and impairs problem solving (Lyubomirsky & Nolen-Hoeksema, 1995; Watkins & Baracaia, 2002).

However, for depression prevention and treatment, even more important than consequences are the precursors of ruminative responses. Recent research has pointed out several personality factors that may be at the origin of ruminative responses: beliefs or metacognitions about rumination (e.g., Papageorgiou & Wells, 2000; Watkins & Baracaia, 2001), emotional clarity (e.g., Salovey,

Mayer, Goldman, Turvey, & Palfai, 1995), sensitivity to punishment (e.g., Leen-Feldner, Zvolensky, Feldner, & Lejuez, 2004) or neuroticism (e.g., Roberts, Gilboa, & Gotlib, 1998).

Neuroticism is especially relevant for at least two reasons. First, it is a basic personality trait that has important consequences in diverse areas of normal human functioning. Second, several studies have shown that neuroticism might be a vulnerability factor to several clinical disorders such as depression (e.g., Hirschfeld et al., 1989; Kendler, Kessler, Neale, Heath, & Eaves, 1993).

The relation between neuroticism and ruminative style has been found in several studies with nonclinical (e.g., Muris, Roelofs, Rassin, Franken, & Mayer, 2005; Wupperman & Neumann, 2006) and clinical samples (Bagby & Parker, 2001). Moreover, some research has shown that ruminative style might be the mechanism by which neuroticism is associated with depression. In a prospective longitudinal study, Nolan, Roberts, and Gotlib (1998) observed that ruminative styles mediated the relation between neuroticism and increases in depressive symptoms over time. Other research also showed that neuroticism predicted lifetime episodes of dysphoria and again, ruminative styles acted as a mediator (Roberts et al., 1998). The authors concluded that rumination seemed to be an “important cognitive manifestation of neuroticism” (Roberts et al., 1998, p. 419). However, the nature of the relationship between neuroticism and ruminative styles remains unclear.

Neuroticism is associated with a tendency to experience more frequent and intense negative emotions (e.g., Costa & McCrae, 1980; Suls & Martin, 2005). Individuals high in neuroticism commonly tend to react to different situations with high negative affect (e.g., Gross, Sutton, & Ketelaar, 1998). For example, whereas individuals high in neuroticism react after a broad range of minor negative events (e.g., an argument with a roommate) with marked feelings of sadness, individuals low in neuroticism react with

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significantly less sadness and only to a small portion of such negative events (e.g., Zautra, Affleck, Tennen, Reich, & Davis, 2005). Besides frequency and intensity, other parameters of emotional reaction could also be relevant for understanding negative affect reactions. One of these parameters is the number of emotions elicited after a negative event. A tendency to react with an excessive number of negative emotions simultaneously is what could be labeled as “emotional overproduction.”

Emotional overproduction focuses on the number of emotions typically generated by an individual, not on their frequency or intensity. In consequence, it can be considered as a different construct from neuroticism, although a positive correlation between the two constructs is expected.

Previous research has documented that emotional blends of several negative emotions are common (Scherer & Tannenbaum, 1986; Zelenski & Larsen, 2000), although it has commonly focused on emotional blends of two single emotions (e.g., Scherer & Ceschi, 1997). However, to our knowledge no research to date has examined the consequences of experiencing a high number of negative emotions simultaneously, or specifically its dysfunctional effects.

In this research, we explicitly expect that emotional overproduction is related to ruminative style. That is, the more emotions and feelings elicited after a negative event, the more likely and intense the ruminative response will be. A recent meta-analysis found that negative emotions were associated with increases in self-focus and that the presence of rumination boosted this relationship (Mor & Winquist, 2002). Self-focus might be a programmed strategy designed to ensure that the individual pays attention to the emotional information generated and thinks about the eliciting situation. Thus, in view of these theoretical and empirical considerations, we hypothesize that an elevated number of emotions will intensify self-focus and, specifically, ruminative responses.

Some clinical evidence is consistent with the hypothesized association between emotional overproduction and rumination. For example, research has shown that dysphoric people often experience sadness and anger, and sadness and fear, in synchrony (Seidnitz, Fujita, & Duberstein, 2000). Since rumination is commonly associated with dysphoria (Extremera, Fernández-Berrocal, Ruiz-Aranda, & Cabello, 2006; Kasch, Klein, & Lara, 2001), this result suggests the existence of a potential link between rumination and the tendency to experience overloaded emotional states.

Recent literature on posttraumatic stress has shown that experiencing anger or shame in addition to other common emotions (i.e., fear and horror) predicts poorer outcomes (Brewin, Andrews, & Rose, 2000). Since ruminative style and depressive mood are conditions commonly associated with posttraumatic stress disorder (e.g., Elwood, Hahn, Olatunji, & Williams, 2009), this result could indicate that emotional overproduction might also play a role in the severity and course of PTSD through fostering rumination.

Other literature from the clinical field has also indicated that some individuals may generally react with more emotions than others after a negative event. For example, Greenberg and Safran (1987) suggested that the tendency to experience additional emotions, not directly related to the situation, but related to the individual's reaction to the initial emotions (i.e., metaemotions), may complicate emotional processing. For example, after an experience of loss, although most people feel sadness or other related emo-

tions, some individuals may react to their initial reaction of sadness with other emotions such as embarrassment, fear, irritation, or even anger thereby complicating the bereavement resolution.

Thus, after reviewing theoretical arguments suggesting that neuroticism could foster emotional overproduction, and some indirect evidence pointing out that emotional overproduction may be associated with the activation or intensification of ruminative responses, we conclude that it is plausible that emotional overproduction mediates the relation between neuroticism and ruminative style. Specifically, previous research showing that negative emotions promote self-focus (Mor & Winquist, 2002) links the emotional component of neuroticism with self-focus, which can be considered a core aspect of ruminative style. These relations allow us to hypothesize a mediational role of emotional overproduction.

In summary, theoretical and empirical evidence converges on the idea that emotional overproduction could lead to more negative processes and outcomes. In the research reported here, we explored the role of emotional overproduction in order to better understand the emotional basis of rumination as well as the neuroticism-rumination relation. Specifically, we hypothesized that the tendency to experience a high number of negative emotions and feelings (i.e., emotional overproduction) would positively correlate with rumination. Furthermore, it was expected that emotional overproduction would mediate the relation between neuroticism and ruminative style. We designed three studies with different samples and methodologies to test these hypotheses.

## Study 1

A cross-sectional design was used to initially explore the relation between neuroticism, emotional overproduction and ruminative style. We also conducted a mediation analysis in order to test our second hypothesis. In this study we included an initial measure of trait emotional overproduction.

## Method

**Sample.** Eighty university students (65 female) were recruited and received partial credit toward completion of a course requirement. Their mean age was 21.1 ( $SD = 1.53$ ).

### Measures.

**Emotional overproduction.** We designed a scale in order to measure to what extent participants were likely to experience other additional feelings during episodes of sadness (EOPS, Emotional Overproduction Scale). The scale was comprised of 13 items consisting of different negative emotions and feelings rated on a five-point Likert scale (from *Never* to *Always*). Instructions encouraged participants to recall moments when they felt sadness and then to answer the extent they generally experience other feelings concurrently when feeling sad. The items included in the scale were collected from several sources. The first cluster of items was selected from the Differential Emotions Scale (DES; Izard, 1977). Four emotions were selected for their potential to appear associated with sadness (i.e., anger, fear, shame, and discouragement). Based on recent research that points out that self-devaluative emotions may have a significant role in depression vulnerability (Park, Goodyer, & Teasdale, 2004), an additional set of self-referent feelings was included (i.e., irritation with self, disappointment in self, and self-doubt). Finally, as the general aim

of the scale was to cover a wide range of feelings potentially present in sadness episodes, we further broadened the scope of the scale. Three psychologists with ample clinical experience listed several emotions and feelings usually associated with sadness. Based on their suggestions, another extra subset of diverse emotions and feelings was also added (i.e., hopelessness, isolation, frustration, abandonment, pessimism, and distrust). As a result, 13 items were included in the scale. Participants were given the following instructions: "We request you to answer some questions on how you experience emotions. The following questions are about your typical way to experience intense emotional episodes. Read each emotion carefully and mark the adequate response considering the following scale (*Never-Always*)."<sup>Fn1</sup> An additional heading was presented: "*When I feel sad, I usually also feel. . .*" and then the 13 emotional items of the scale were presented for rating. In this sample the internal consistency for this scale was high ( $\alpha = .84$ ). This scale has shown to be correlated but not redundant with negative affectivity.<sup>AQ: 3</sup> Finally, a 7-week test-retest reliability calculated in a different sample (AUTHOR, 2010) was good ( $r = .69$ ).

**Ruminative style.** We used the Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991). It is a 22-item scale with a five-point Likert scale (*Totally Agree to Totally Disagree*). Score range varies from 22 to 110. Previous research has demonstrated good reliability and validity of the scale (Nolen-Hoeksema et al., 1993; Just & Alloy, 1997).

**Neuroticism and extraversion.** We used the Eysenck Personality Questionnaire—Revised (EPQ-R; Eysenck & Eysenck, 1991). The neuroticism scale contains 23 items and the extraversion scale contains 19 items. Participants had to answer each item by using a true versus false format. Prior use of the EPQ has yielded high internal consistency (see Miles & Hempel, 2004).

**Depressive symptoms.** We used the Beck Depression Inventory—II (BDI-II; Beck, Steer, & Brown, 1996). This scale contains 21 items. For each item participants have to select one of four sentences with a different degree of severity.

**Procedure.** Participants were given a packet of questionnaires to complete at home and all questionnaires were returned the following week.

## Results

**Preliminary analysis.** Table 1 shows the means, standard deviations and correlations of the variables included in the study. Zero-order correlations revealed strong correlations between ruminative style and the rest of the measures—except extraversion—although the strongest correlation was found with emotional overproduction ( $r = .72, p < .001$ ).

**Mediational analysis.** A series of regression analyses were conducted to test the second hypothesis, namely that emotional overproduction would mediate the relation between neuroticism and ruminative style. We followed the conditions proposed by Baron and Kenny (1986). The first condition for the mediation was fulfilled as neuroticism predicted both emotional overproduction ( $\beta = .59, p < .001$ ) and ruminative style ( $\beta = .50, p < .001$ ) separately. The second condition was also fulfilled as emotional overproduction also predicted ruminative style ( $\beta = .72, p < .001$ ). For the third condition, we introduced ruminative style as the criterion variable and then included as predictors both emo-

tional overproduction and neuroticism at the same time. Emotional overproduction remained significant ( $\beta = .65, p < .001$ ) but neuroticism became nonsignificant ( $\beta = .12, ns$ ; see Figure 1) which means that emotional overproduction fully mediated the relationship between neuroticism and ruminative style.

**Unique variance.** We also examined whether emotional overproduction would predict ruminative styles after controlling for the rest of the variables included in the study. We conducted a regression analysis in order to analyze predictors of unique variance of ruminative style. We entered into the equation neuroticism and BDI-II scores along with emotional overproduction. Fifty-two percent of the variance of ruminative style was explained by the model (adjusted  $R^2 = .52$ ), and only emotional overproduction ( $\beta = .63, p < .001$ ) explained unique variance of ruminative style.

## Discussion

Emotional overproduction was defined as the chronic tendency to experience a high number of negative emotions along with sadness. Study 1 showed that emotional overproduction was strongly associated with ruminative style. Taking into account the absence of content overlap between the measures of emotional overproduction (i.e., a list of 13 selected negative emotions) and ruminative style, the high correlation found between these two variables indicates that an accumulation of negative emotions might be crucial in understanding ruminative responses.

Previous research has linked neuroticism and ruminative style (e.g., Roberts et al., 1998) but the nature of this relationship has remained relatively unexplored. In this study, we found that emotional overproduction fully mediated the neuroticism-ruminative style link suggesting that experiencing emotional overload might explain, at least in part, why people with high levels of neuroticism tend to respond to negative experiences with rumination.

The main limitation of Study 1 has to do with the sample used. For example, the small size of the sample may have limited the statistical power in regression analyses and thus the full mediation could become a partial mediation in a larger sample. In addition, the sample was biased in age and gender which might limit the generalizability of the results. Furthermore, some alternative hypotheses could explain the findings concerning the relation between emotional overproduction and ruminative style. First, it could be argued that it is not the emotional overproduction itself that is responsible for the activation of rumination. It is possible only a subset of specific emotions is entirely responsible for the observed relation. Perhaps elevated ratings on just those items produce a significant increase in global scores of emotional overproduction masking that only a portion of these emotions, and not the overall emotional overproduction, has the capacity of activating rumination.

It is also possible that participants' mood in the moment of filling out the questionnaires may artificially inflate associations between emotional overproduction and ruminative style. For example, participants in a sad mood may have overestimated the

<sup>1</sup> As item content from the EOPS considerably overlaps with the negative affect scale of the PANAS, we calculated the correlation between the two scales in an additional sample for ruling out the possibility that the two constructs were redundant. Correlation was significant but even lower than with neuroticism ( $r = .52; p < .001$ ).

Table 1  
Means (M), Standard Deviations (SD), Cronbach's Alpha, and Correlations Among the Main Variables Included in Study 1

	N	M	SD	α	1	2	3	4
1. Ruminative style	80	51.1	12.6	.90				
2. Emotional overproduction	80	38.7	8.6	.84	.72***			
3. Neuroticism	80	11.2	5.6	.86	.50***	.59***		
4. Extraversion	80	13.4	3.7	.80	-.11	-.15	-.14	
5. Depressive symptoms	80	9.3	7.0	.90	.47***	.46***	.65***	-.30**

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

frequency of negative emotions usually experienced along with sadness and, at the same time, have overestimated their tendency to ruminate. Previous evidence has shown that ruminative style covariates with depressed mood (Kasch et al., 2001).

Finally, responses to the EOPS could be artificially elevated by respondents' deficit to differentiate emotions. Since low emotional clarity has been associated with ruminative responses in previous research (Salovey et al., 1995), association between emotional overproduction and ruminative style could be a result of a response artifact.

Study 2 was designed to address these possibilities in detail.

### Study 2

Study 1 showed a strong association between emotional overproduction and ruminative style and also provided initial evidence for the mediational role of emotional overproduction in the relation between neuroticism and ruminative style. Study 2 served two main purposes. First, we tried to replicate our findings in a larger and less biased sample in terms of age, sex, and education. We conducted the second study in a large community sample. Second, we controlled for some third variables that could artificially increase associations between emotional overproduction and ruminative styles. First, we assessed participants' mood so that we were able to evaluate the association between emotional overproduction and ruminative style controlling the concurrent mood. We also included some affect-related variables like severity of depressive symptoms, emotional attention, emotional clarity, and emotional repair. As we have discussed above, all of them have been found to be associated with ruminative styles and, because of their emotional content, might be also associated with emotional overproduction.

Furthermore, responses to the EOPS could be artificially elevated by respondents' deficit to differentiate emotions. As we

assessed emotional clarity, we tested the validity of this alternative explanation exploring the association between emotional overproduction and ruminative styles controlling for emotional clarity.

Third, it is possible that ruminators are more likely to generate a larger number of negative emotions because of the resulting increase in negative and global attributions (Lyubomirsky & Nolen-Hoeksema, 1995), in negative memories (Lyubomirsky, Caldwell & Nolen-Hoeksema, 1998; Teasdale & Green, 2004), and in pessimism (Lyubomirsky et al., 1999). Thus, we also explored the validity of an alternative mediational model in which ruminative style mediated the relationship between neuroticism and emotional overproduction.

Additionally, we examined whether emotional overproduction is equally related to the two subscales included in the RRS (Trenor et al., 2003). We expected that both Reflection and Brooding scales would be related to emotional overproduction. As discussed above, accumulation of emotions is hypothesized to enhance self-focus which is associated with both reflection and brooding (e.g., Trapnell & Campbell, 1999).

Finally, as mentioned above, it could be argued that only some specific emotions are actually related to ruminative style creating a spurious association between emotional overproduction and ruminative style. To ensure the validity of the finding, we calculated correlations between each of the items from the EOPS and the overall scores in the RRS.

To sum up, for Study 2 we recruited a larger sample from the community to replicate the findings obtained in Study 1 and to explore the validity of some alternative explanations.

### Method

**Sample.** Two hundred and 54 participants from the general population (age:  $M = 38.9$  years,  $SD = 12.5$ ; 105 male, 143

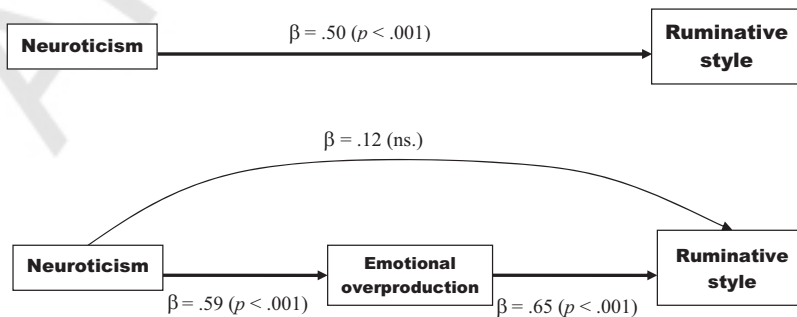


Figure 1. Mediational role of emotional overproduction between neuroticism and ruminative style.

female, 6 unknown) were recruited for the study. Age ranged from 18 to 75 years old. Regarding marital status, 37.8% was never married, 55% of the sample was married or cohabiting with a partner, 5.2% was divorced or separated, and 2.0% was widowed. Regarding educational status, 14.1% completed only primary studies, 16.9% completed secondary studies, 34.7% completed high school, and 34.3% obtained some university degree.

#### Measures.

**Emotional overproduction.** We used the same scale as in Study 1.

**Ruminative style.** We used the RRS (Nolen-Hoeksema & Morrow, 1991). Information about this scale is reported in Study 1.

**Neuroticism and extraversion.** We used the Eysenck Personality Questionnaire—Revised (EPQ-R; Eysenck & Eysenck, 1991). Information about this scale is reported in Study 1.

**Depressive symptoms.** We used the Beck Depression Inventory—II (BDI-II; Beck, Steer, & Brown, 1996). Information about this scale is reported in Study 1.

**Emotional attention, clarity and repair.** A reduced version of the Trait Meta-Mood Scale (TMMS; Salovey et al., 1995) was used. The range of scores of the three subscales varies from 8 to 40.

**Mood assessment.** We assessed current sad and happy mood intensity by means of a set of adjectives rated on a visual scale. Each of the two mood subscales were comprised of four items. The sadness subscale included the following items: sad, gloomy, low-spirited, and downhearted. The happiness subscale included the following items: happy, cheerful, animated, and hopeful. Each item was rated on an 11-point visual scale. The range of scores of each subscale varies from 0 to 40. In this study the internal consistency for these two subscales was high (sadness,  $\alpha = .86$ ; happiness,  $\alpha = .88$ ).

**Procedure.** A snowball procedure (Thomson, 2002) was used in order to recruit participants for this study. This method allowed us to access a community sample from a university setting. To avoid the sampling bias, a well-known shortcoming of this procedure (Hendricks & Blanken, 1992), we provided very detailed instructions to the initial sample of participants (i.e., volunteer university students). Each of the students had to select from their environment five people that belonged to four different age ranges (i.e., 18–30, 31–40, 41–50, and 51–75). They were also instructed to select a similar number of male and female participants. Students personally supervised partic-

ipants while they completed the questionnaires. Participants filled out the questionnaires and, when finished, placed the packet into a sealed envelope we provided. Once the questionnaires were finished and the envelopes were sealed, students brought them to the lab.

## Results

**Preliminary analysis.** Table 2 shows the Cronbach's alphas, means, standard deviations and correlations of the variables included in the study. We found gender differences for emotional overproduction, neuroticism, and emotional attention. Women ( $M = 33.95$ ,  $SD = 10.17$ ) showed significantly more emotional overproduction than men ( $M = 29.41$ ,  $SD = 9.88$ ),  $t(246) = 1.29$ ,  $p < .001$ . Women ( $M = 26.29$ ,  $SD = 5.68$ ) also showed more emotional attention than men ( $M = 24.37$ ,  $SD = 5.77$ ),  $t(244) = .74$ ,  $p < .05$  and higher scores in neuroticism ( $M = 11.71$ ,  $SD = 5.69$ ) than men ( $M = 8.56$ ,  $SD = 6.31$ ),  $t(246) = .76$ ,  $p < .001$ . Zero-order correlations revealed significant correlations between ruminative style and the rest of the measures (see Table 2) although interestingly, as in Study 1, the strongest correlation was again found with emotional overproduction ( $r = .67$ ,  $p < .001$ ). This high correlation can raise doubts about the discriminant validity of emotional overproduction and ruminative style. For this reason, we calculated whether emotional overproduction was associated with depressive symptoms over and above the common variance shared with ruminative style. A partial correlation showed that, when controlling ruminative style, the association between emotional overproduction and depressive symptoms remained high and significant ( $r = .38$ ;  $p < .001$ ).

Similarly, a high correlation was found between emotional overproduction and neuroticism ( $r = .60$ ,  $p < .001$ ). We explored whether these two variables in effect predicted depressive symptoms differently. When we partialled out neuroticism, the correlation between emotional overproduction and depressive symptoms remained significant ( $pr = .37$ ,  $p < .001$ ). When we partialled out emotional overproduction, the correlation between neuroticism and depressive symptoms also remained significant ( $pr = .36$ ,  $p < .001$ ). We can conclude that there is a substantial portion of variance of depressive symptoms that is independently predicted by each of the variables. This suggests that uncommon variance from the variables is not merely error measurement and supports

Table 2  
Means (*M*), Standard Deviations (*SD*), Cronbach's Alpha, and Correlations Among the Main Variables Included in Study 2

	<i>N</i>	<i>M</i>	<i>SD</i>	$\alpha$	1	2	3	4	5	6	7
1. Emotional overproduction	254	32.0	10.2	.91							
2. Ruminative style	254	44.5	12.5	.92	.67***						
3. Neuroticism	253	10.3	6.1	.79	.60***	.56***					
4. Extraversion	253	12.7	4.4	.84	-.21**	-.21**	-.26***				
5. Depressive symptoms	254	9.4	8.3	.90	.58***	.51***	.65***	-.35***			
6. Emotional attention	251	25.5	5.8	.88	.28***	.38***	.29***	.10	.12		
7. Emotional clarity	251	29.7	6.6	.90	-.31***	-.24***	-.28***	.24***	-.33***	.14*	
8. Emotional repair	251	28.7	6.4	.73	-.29***	-.24***	-.20**	.30***	-.33***	.16*	.36***

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

the validity of the construct of emotional overproduction as a different trait from neuroticism.

**Mood state, emotional overproduction and ruminative styles.** Emotional overproduction correlated with sad mood ( $r = .43, p < .001$ ) and with happy mood ( $r = -.25, p < .001$ ). In order to eliminate the possibility of a spurious correlation between emotional overproduction and ruminative styles, we correlated these two variables partialing out both current sad and happy moods. Correlation between emotional overproduction and ruminative styles remained significant and almost invariant in magnitude ( $pr = .60, p < .001$ ).

**Ruminative style and specific negative emotions.** To further explore the relationship between emotional overproduction and ruminative style, we calculated zero-order correlations between items from the EOPS and ruminative style. We also included reflection and brooding subscales to examine whether a different pattern existed with any of such items. As Table 3 shows, correlations between ruminative style and emotional items from EOPS were very uniform. With the exception of anger ( $r = .21$ ), correlations ranged from .41 to .57. This result suggest that the relation between ruminative style and emotional overproduction is not based on the presence of an emotion or a set of emotions but, as predicted, it is the consequence of an accumulation of emotions regardless of their specific emotional content.

With regard to the ruminative style subscales, results showed that most of the items from EOPS significantly correlated with both reflection and brooding, although the correlation size was higher in the case of brooding (see Table 3).

Finally, we examined the association between the reflection and brooding subscales with the overall scale of emotional overproduction. The correlation with reflection and brooding was .27 and .62, respectively (both  $p$ 's  $< .001$ ).

**Emotional clarity and emotional overproduction.** We found a negative correlation between emotional clarity and emotional overproduction ( $r = -.31, p < .001$ ). To rule out the possibility that a low emotional differentiation could be responsible for an artificial increase of scores in the emotional overpro-

duction scale, we correlated emotional overproduction with ruminative style partialing out the effect of emotional clarity. We found that the magnitude of the correlation remained unaltered ( $pr = .67, p < .001$ ).

**Test of the hypothesized mediational model.** Similarly to Study 1, a series of regression analyses were conducted to test the mediational model which states that emotional overproduction mediates the relation between neuroticism and ruminative style. We followed the conditions proposed by Baron and Kenny (1986). The first condition for the mediation was fulfilled as neuroticism predicted both emotional overproduction ( $\beta = .60, p < .001$ ) and ruminative style ( $\beta = .56, p < .001$ ) separately. The second condition was also fulfilled as emotional overproduction also predicted ruminative style ( $\beta = .67, p < .001$ ). For the third condition, we introduced ruminative style as the criterion variable and then included as predictors both emotional overproduction and neuroticism at the same time. Emotional overproduction remained significant ( $\beta = .52, p < .001$ ) and so did neuroticism ( $\beta = .25, p < .001$ ) although in the latter case  $\beta$  was considerably reduced, from .56 to .25 (55%). A Sobel test showed that mediation was significant ( $z = 7.29, p < .001$ ). Thus, emotional overproduction partially mediated the relationship between neuroticism and ruminative style.

We repeated the same mediational analysis with reflection and brooding instead of ruminative styles as dependent variables. As regards reflection, we found that neuroticism predicted both emotional overproduction ( $\beta = .60, p < .001$ ) and reflection ( $\beta = .24, p < .001$ ) separately. Emotional overproduction significantly predicted reflection ( $\beta = .27, p < .001$ ). Furthermore, we found that, when included at the same time with emotional overproduction, neuroticism became nonsignificant ( $\beta = .12, ns$ ), but emotional overproduction remained significant ( $\beta = .20, p < .01$ ). Thus, emotional overproduction fully mediated the relation between neuroticism and reflection.

Regarding brooding, we found that neuroticism predicted both emotional overproduction ( $\beta = .60, p < .001$ ) and brooding ( $\beta = .58, p < .001$ ) separately. Emotional overproduction significantly predicted brooding ( $\beta = .62, p < .001$ ). Finally, when we included neuroticism and emotional overproduction at the same time, emotional overproduction remained significant ( $\beta = .44, p < .001$ ) and so did neuroticism ( $\beta = .32, p < .001$ ). A Sobel test showed that mediation was significant ( $z = 6.25, p < .001$ ). Thus, emotional overproduction partially mediated the relation between neuroticism and brooding.

**Test of the alternative mediational model.** We also tested the validity of an alternative mediational analysis in which ruminative style mediated the relationship between neuroticism and emotional overproduction. The first condition for the mediation was fulfilled as neuroticism predicted both ruminative style ( $\beta = .67, p < .001$ ) and emotional overproduction ( $\beta = .60, p < .001$ ) separately. The second condition was also fulfilled as ruminative style also predicted emotional overproduction ( $\beta = .67, p < .001$ ). For the third condition, we introduced emotional overproduction as the criterion variable and then included as predictors both ruminative style and neuroticism at the same time. Ruminative style remained significant ( $\beta = .49, p < .001$ ) and so did neuroticism ( $\beta = .33, p < .001$ ). In this case,  $\beta$  was reduced from .60 to .33 (45%) after including the mediator. A Sobel test showed that

Table 3  
*Zero-Order Correlations Among Items From the Emotional Overproduction Scale and Ruminative Style and Its Two Subscales: Reflection and Brooding*

	Ruminative style	Reflection	Brooding
Overall EOPS	.67***	.27***	.62***
Abandonment	.57***	.28***	.50***
Hopelessness	.56***	.19**	.56***
Self-doubt	.56***	.28***	.50***
Disappointment in self	.51***	.18**	.48***
Isolatedness	.51***	.28***	.41***
Pessimism	.47***	.22***	.45***
Distrust	.47***	.17**	.44***
Frustration	.45***	.19**	.39***
Irritation with myself	.44***	.10	.47***
Discouraged	.43***	.20**	.37***
Fear	.41***	.16*	.40***
Shame	.40***	.14*	.36***
Anger	.21**	.03	.26***

Note. EOPS = Emotional Overproduction Scale.  
\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

T3

mediation was significant ( $z = 7.00, p < .001$ ). Thus, this model also fits the data, specifically suggesting a partial mediation.

**Unique variance explained.** As in Study 1, we also examined whether emotional overproduction would predict ruminative styles even after controlling for the rest of the variables included in the study. We conducted a regression analysis in order to analyze predictors of unique variance of ruminative style. We entered into the equation neuroticism, the three TMMS subscales and BDI-II scores along with emotional overproduction. Fifty-five percent of the variance of ruminative style was explained by the model (adjusted  $R^2 = .54$ ). Emotional overproduction, neuroticism, and emotional attention significantly predicted variance (see Table 4), emotional overproduction being the variable that explained the most unique variance of ruminative style ( $\beta = .42, p < .001$ ).

## Discussion

Study 2 was designed to overcome some limitations of our first study as well as to further examine the validity of our findings against some alternative explanations. Our results support the existence of a strong relation between emotional overproduction and ruminative style. Neither participants' current mood nor emotional clarity could explain this relation. Moreover, correlations between specific items of emotional overproduction and ruminative style demonstrated that the relation between these constructs is not determined by a specific set of emotions. Conversely, results showed that associations between items from EOPS and overall RRS scores were highly homogeneous suggesting that ruminative style is associated with a chronic accumulation of emotions, and not with any specific subset of emotions.

We also tested whether responses to the EOPS could be artificially elevated by respondents' deficit to differentiate emotions. Our results are not coherent with such claim. Although emotional clarity was assessed only by a self-report measure (i.e., the TMMS), the absence of change in the magnitude of the correlation between emotional overproduction and ruminative style when emotional clarity was controlled ruled out the possibility of a spurious association between emotional overproduction and ruminative style resulting from deficits in emotional differentiation.

In this study, we also explored the differential pattern of results regarding brooding versus reflection. We observed that emotional overproduction correlated more strongly with brooding than with reflection. Previous research has pointed out the key role of brooding in explaining the negative outcomes associated with ruminative style (e.g., Treynor et al., 2003). Thus, the strong and consis-

tent association found between emotional overproduction and brooding emphasizes the capacity of emotional overproduction to help to better explain negative outcomes associated with rumination.

Study 2 partially replicated results obtained in Study 1 regarding the mediational model. We found that emotional overproduction partially mediated the relationship between neuroticism and ruminative style. The same was found when brooding was introduced as the criterion. However, we found that emotional overproduction fully mediated the relationship between neuroticism and reflection.

As we pointed out above, it is possible that individuals who tend to ruminate generate a larger number of negative emotions. Thus, it is also theoretically conceivable that the second part of the mediational model is reversed, that is, ruminative style mediates the relation between neuroticism and emotional overproduction. We tested the validity of such an alternative mediational model and a significant partial mediation was found. Thus, both models fit the data quite well with a slight advantage for our original model (55% vs. 45% of  $\beta$  reduction after including the mediator). Nevertheless, this pattern of results indicates that both models might be valid thus suggesting a possible bidirectional relation. Although future research should further explore both parts of the bidirectional model, Study 3 will focus on the validation of our original model (i.e., emotional overproduction as the mediator) with a different methodology.

We should note that characteristics of the sample were not fully representative. Although similar to the normal population regarding age and marital status, our sample contained a higher proportion of individuals with university degrees than the normal population. This limitation should be taken into account when interpreting and generalizing these results.

We have to note that we found a very high correlation between emotional overproduction and ruminative style (as in Study 1). This high correlation may be interpreted as an indication that the two constructs are possibly redundant. An alternative interpretation is that one construct exerts a direct causation on the other (or it is closely involved in the causation process) generating such a high association. Thus, a very high correlation does not necessarily mean that the constructs are redundant. Interestingly, in this study we found a similar correlation between neuroticism and depressive symptoms ( $r = .65$ ). There are few doubts about the discriminant validity of these two measures, and the explanation for such high correlation is that neuroticism predisposes to experience depressive symptoms.

We think there are several arguments supporting that emotional overproduction and ruminative style are not redundant constructs: (a) there is no content overlap between the items from both scales; (b) there is not conceptual overlap between the constructs as one is focused on emotional functioning (i.e., emotional overproduction), and the other on cognitive and behavioral functioning (i.e., ruminative style); (c) we provided a rationale for the mechanism by which one construct would be causally related to the other (i.e., ~~negative affect~~ self-focus); (d) mediational analyses provide construct validity for both constructs and, in fact, support a bidirectional relation between the constructs which increases the probability of finding a high association between the variables; and (e) partial correlation showed that, when controlling ruminative style, the association between emotional overproduction and depressive symptoms remained high and significant which supports its valid-

Table 4  
*Ruminative Style: Unique Variance Explained*

	B	SE	$\beta$	<i>t</i>
Emotional overproduction	.51	.07	.42	6.8***
Neuroticism	.40	.13	.19	3.1**
Extraversion	-.12	.14	-.04	-.84
Depressive symptoms	.13	.09	.09	1.5
Emotional attention	.48	.11	.22	4.54***
Emotional clarity	-.11	.09	-.05	-1.15
Emotional repair	.01	.12	.01	.12

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

ity. Thus, there are theoretical and empirical arguments suggesting that the two constructs are, although highly correlated, essentially different.

The same arguments are applicable for the validity of the construct of emotional overproduction beyond neuroticism. Furthermore, we showed that both variables independently predicted depressive symptoms beyond common variance.

Nevertheless, although Studies 1 and 2 support construct validity of the scale proposed to assess emotional overproduction, relying only on a retrospective self-report measure of emotional overproduction may limit the validity of our hypotheses. A more direct way to assess emotional overproduction would ensure that our results are not the consequence of shared common variance due to assessment method and/or retrospective memory biases.

Study 3 included a mood induction design and a direct assessment of emotional overproduction. This design allowed us to address the mediational role of emotional overproduction by increasing its external and internal validity.

### Study 3

Studies 1 and 2 showed a strong association between emotional overproduction and ruminative style and also provided evidence for the mediational role of emotional overproduction in the relation between neuroticism and ruminative style. Study 2 explored the validity of our hypothesized mediational model (i.e., emotional overproduction as a mediator in the relation between neuroticism and ruminative style) and the validity of an alternative model (i.e., ruminative style as a mediator in the relation between neuroticism and emotional overproduction). The results supported both models suggesting a possible bidirectional relation. Since our initial hypothesized model (i.e., emotional overproduction as a mediator) was more explicative in Study 2, we designed another study to replicate this finding in a lab setting.

In Study 3 we included an alternative and more direct method to measure emotional overproduction in the present moment. We assessed the quantity of emotions and feelings experienced, using an emotion checklist so that after the sad mood induction, participants just had to respond whether or not they experienced each of the items. This was included to obtain a measure of current emotional production which could reduce the role of recall biases. An alternative method had been to assess emotional reaction using an open format. However, with that method, participants would have to detect their emotional reactions unaided and thus, emotional differentiation skills would have a marked role in their responses.<sup>2</sup>

Eliciting participants' emotional reactions, and assessing them just after the induction allowed us to test whether emotional overproduction preceded rumination. Correspondingly, we induced a sad mood to participants, then we assessed the number of emotions and feelings generated and, finally, we assessed participants' ruminative tendency. Our prediction was that the higher the number of emotions and feelings experienced, the higher tendency to ruminate would be observed. This result would provide additional support for our hypothesized mediational model (i.e., emotional overproduction as a mediator).

Finally, we hypothesized that, consistently with results from Studies 1 and 2, our state measure of emotional overproduction (i.e., the number of negative emotions and feelings experienced

after the mood induction) would mediate the relationship between neuroticism and postinduction rumination.

### Method

**Sample.** Seventy-two university students (17 men, 55 women) were recruited and received partial credit toward completion of course requirements. Their mean age was 21.6 ( $SD = 2.0$ ).

#### Measures.

**Ruminative style.** In this study we again used the Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991).

**Emotional overproduction.** We used the same scale as described in Study 1.

**Depressive symptoms.** We used the Beck Depression Inventory-II described in Study 1 (BDI-II; Beck, Steer, & Brown, 1996).

**Neuroticism and extraversion.** In this study we used the NEO Five Factor Inventory—Revised (NEO-FFI; Costa & McCrae, 1992). This 60-item questionnaire assesses the Big Five personality factors: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. For this study we only used the neuroticism and extraversion subscales. Items explore characteristic behaviors or reactions, which are answered on a five-point Likert scale ranging from *Strongly Disagree* to *Strongly Agree*. The manual reports extensive data on the reliability and validity of this inventory (see Costa & McCrae, 1992).

**Mood assessment.** Before and after the mood induction procedure, we assessed participants' current mood intensity using a set of adjectives for assessing sad and happy mood. Information about these scales is reported in Study 2. In the present study the internal consistency for these two subscales was high (sadness,  $\alpha = .86$ ; happiness,  $\alpha = .88$ ).

**Emotion checklist.** A self-report rating scale with 26 different negative emotions and feelings (e.g., sadness, self-blame, anger, frustration, shame, anxiety, insecurity, disappointment, and so on) was designed for the purposes of the study. For each item/emotion, participants simply had to answer whether or not that specific emotion was present. The items were selected from the Differential Emotions Scale (DES; Izard, 1977), and from other emotion checklists employed in previous research (e.g., Carstensen, Pasupathi, Mayr, & Nesselroade, 2000). This method of exploring affect reactions based on ratings of emotional adjectives has been demonstrated to be reliable and valid in widely used scales as, for instance, the Positive Affect and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Moreover, recent research suggests that self-report of feelings reflects actual experience beyond language or cognitive constraints (Feldman-Barrett, 2004). The internal consistency for this scale was high ( $\alpha = .87$ ).

**State Rumination.** A scale assessing the tendency to ruminate in the present time was designed based on the Ruminative Responses Scale (RRS; Nolen-Hoeksema & Morrow, 1991) and removing explicit references to depressive symptoms (Roberts et al., 1998). The scale was comprised of 12 items rated on a 1 (*Totally Agree*) to 7 (*Totally Disagree*) Likert-type scale. Sample items included: "At this moment I would like to spend some time

<sup>2</sup> In fact, the task employed in the Level of Awareness Scale (LEAS; Lane & Schwartz, 1987) describes a situation and employs an open format to challenge individual's emotional abilities to label emotions. AQ: 7

*thinking about my problems*"; "What I would like to do most right now is to have some time to focus deeply on what I feel"; "At this moment, I feel impelled to think about why I have problems that other people do not have"; "At this time, I cannot stop thinking about how life is so unfair." Brooding and reflection subscales correlated highly with the overall scale ( $r = .91$  and  $r = .86$ , respectively). The internal consistency was very high both for the overall scale ( $\alpha = .94$ ) as well as for the brooding and reflection subscales (.90 in both cases). The correlation between trait and state rumination scales was good (.46) considering that participants had gone through a mood induction procedure before completing the state version.<sup>3</sup>

**Procedure.** Participants who gave informed consent were recruited from several classes, and were divided in groups of approximately 10 individuals and scheduled at the lab. There, they were seated in front of a computer separated at least seven feet from each other, and were given a initial packet of questionnaires (ruminative style, depressive symptoms, emotional overproduction, initial mood). Then they were induced into a sad mood via a guided imagery procedure combined with sad music (i.e., Prokofiev's "Russia Under the Mongolian Yoke" played at half speed). Participants were asked to listen through a pair of earphones to a voice that guided them, step by step, to imagine that they were experiencing the following situation: Their partner—real or imaginary—broke up with them using vague excuses. The duration of the mood induction procedure was nine minutes. After the mood induction, participants were randomly assigned to two conditions. For half of the sample, we assessed the participants' emotional reactions by asking them to mark the emotions and feelings they were experiencing on the emotion checklist. In order to limit the possibility that the results with respect to postinduction rumination were dependent on the mere exposure to the emotion checklist, the other half of the sample did not go through this task. In order to equate the two groups time-wise, participants who did not fill out the emotions checklist filled out a scale with several items regarding the subjective quality of the imagery experience, and describing the moment of the scene that they imagined most vividly. Afterward, all participants completed the state rumination measure. Finally, before leaving the lab, participants were given a positive mood induction.

## Results

**Preliminary analysis.** No significant gender differences were found for the variables included in this study. Table 5 shows means, standard deviations, alphas and zero-order correlations of the variables included in the study.

No differences were found in postinduction ruminative tendency when we compared the subsample which completed the emotion checklist ( $M = 40.36$ ,  $SD = 17.02$ ) with the subsample which did not go through this task ( $M = 37.44$ ,  $SD = 17.12$ ),  $t(70) = -.72$ ,  $ns$ . This result suggests that responding to the emotion checklist did not affect significantly the ruminative tendency of participants and rules out the alternative hypothesis described above. No significant differences emerged when we compared the two groups on the other variables assessed before the induction.

The correlation between the emotion checklist and happy mood postinduction was nonsignificant ( $r = -.30$ ,  $ns$ ) but between the

emotion checklist and sad mood postinduction it was significant ( $r = .64$ ,  $p < .001$ ).

**Sad mood induction.** As a consequence of the mood induction procedure, positive mood scores decreased from pre- ( $M = 23.10$ ,  $SD = 5.96$ ) to postmood induction ( $M = 12.99$ ,  $SD = 7.91$ ) assessments and this difference was statistically significant,  $t(71) = 11.2$ ,  $p < .001$ . Sad mood increased from pre- ( $M = 8.28$ ,  $SD = 7.36$ ) to postmood induction ( $M = 20.07$ ,  $SD = 9.44$ ) and this difference was also significant,  $t(71) = -10.4$ ,  $p < .001$ . Thus, the sad mood induction was successful.

**Mediational analyses: Replication of studies 1 and 2.** First, we tried to replicate the finding that trait emotional overproduction mediates the relation between neuroticism and trait ruminative style using a cross-sectional design as we did in Study 1. We again followed the conditions proposed by Baron and Kenny (1986). The first condition for the mediation was fulfilled as neuroticism predicted both emotional overproduction ( $\beta = .70$ ,  $p < .001$ ) and ruminative style ( $\beta = .71$ ,  $p < .001$ ) separately. The second condition was also fulfilled as emotional overproduction also predicted ruminative style ( $\beta = .70$ ,  $p < .001$ ). For the third condition we conducted a multiple regression analysis with ruminative style as the criterion variable and including as predictors both emotional overproduction and neuroticism at the same time. Emotional overproduction remained significant ( $\beta = .41$ ,  $p < .001$ ) and so did neuroticism ( $\beta = .42$ ,  $p < .001$ ) suggesting a possible partial mediation. A Sobel test showed that the mediation was significant ( $z = 3.40$ ,  $p < .001$ ). This result confirmed that emotional overproduction partially mediated the relation between neuroticism and ruminative style.

**Mediational analysis using postinduction rumination as the criterion.** In order to better test the mediational hypothesis (i.e., emotional overproduction mediating the relation between neuroticism and ruminative responses) we used a measure of state rumination assessed after the sad mood induction as the criterion. Using trait emotional overproduction as a mediator, we found that the first two conditions in regarding Baron and Kenny's (1986) guidelines were fulfilled: neuroticism predicted both trait emotional overproduction ( $\beta = .70$ ,  $p < .001$ ) and state rumination ( $\beta = .46$ ,  $p < .001$ ) and trait emotional overproduction predicted state rumination ( $\beta = .57$ ,  $p < .001$ ). As to the third condition, when we included neuroticism and trait emotional overproduction at the same time both variables remained significant in predicting state rumination: neuroticism ( $\beta = .33$ ,  $p < .05$ ) and trait emotional overproduction ( $\beta = .35$ ,  $p < .05$ ). A Sobel test showed that mediation was significant ( $z = 3.37$ ,  $p < .001$ ). Hence, trait emotional overproduction partially mediated the relationship between neuroticism and postinduction ruminative responses.

It could be argued that completing the feeling checklist may increase self-focus and thus artificially foster ruminative responses especially in neurotic participants. In order to reject this possibility we repeated the last mediational analysis only with the half of the sample that did not fill out the feelings checklist but the results were identical.

<sup>3</sup> The scale was designed to allow the calculation of reflection and brooding subscales. Since results were virtually identical using the brooding scale, the reflection scale and the overall scale, for the sake of clarity we only report results calculated with the overall scale.

Table 5  
Means (*M*), Standard Deviations (*SD*), Cronbach's Alpha, and Correlations Among the Variables Included in Study 3

	<i>N</i>	<i>M</i>	<i>SD</i>	$\alpha$	1	2	3	4
1. Ruminative style	72	50.4	12.6	.91				
2. Emotional overproduction	72	38.3	9.4	.85	.70***			
3. Neuroticism	72	33.3	8.8	.86	.71***	.70***		
4. Extraversion	72	45.5	7.3	.86	-.24*	-.21	-.17	
5. Depressive symptoms	71	8.7	7.0	.90	.48***	.47***	.58***	-.20

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

We performed another mediational analysis maintaining state rumination as the criterion but using the total number of negative emotions experienced after the mood induction as the mediational variable. This analysis included the half of the sample (i.e., those who completed the emotion checklist). The first two conditions of mediation were fulfilled as neuroticism predicted both total emotions experienced ( $\beta = .50, p < .001$ ) and state rumination ( $\beta = .57, p < .001$ ), and the total emotions experienced predicted state rumination ( $\beta = .60, p < .001$ ). For the third condition, we included in the regression equation neuroticism and total emotions reported, but only total emotions remained significant ( $\beta = .48, p < .001$ ). Neuroticism became nonsignificant ( $\beta = .25; ns$ ) which imply a complete mediation.

**Total number of emotions as a predictor of rumination.** A regression analysis was conducted to examine whether the total number of feelings experienced after the sad mood induction (i.e., state emotional overproduction) predicted ruminative tendency even when controlling for trait emotional overproduction and neuroticism.

To evaluate this hypothesis we regressed three variables on state rumination: trait emotional overproduction, neuroticism, and the number of emotions experienced; first separately, and then simultaneously. State rumination was significantly predicted by trait emotional overproduction ( $\beta = .46, p < .001$ ), neuroticism ( $\beta = .57, p < .001$ ), and total number of emotions ( $\beta = .60, p < .001$ ). When the three variables were included in the equation at the same time, only total number of emotions remained significant ( $\beta = .43, p < .05$ ). Trait emotional overproduction ( $\beta = .15; ns$ ) and neuroticism ( $\beta = .16; ns$ ) became nonsignificant.

## Discussion

In this study, we included an emotion checklist as an alternative and more direct method to measure emotional overproduction in the present moment. Study 3 replicated results previously found in Studies 1 and 2. Using only cross-sectional data from this study, we again found that emotional overproduction partially mediated the relation between neuroticism and ruminative style.

However, Study 3 also extended the results of Studies 1 and 2 in several ways. First, we used a sad mood induction and then assessed the total number of emotions elicited (i.e., state emotional overproduction) and state rumination. Consistent with our hypotheses, we found that the total number of emotions fully mediated the relationship between neuroticism and state rumination. With this study, we provide support to the notion that emotional overproduction precedes and predicts rumination.

This result did not rule out an alternative to this model, namely ruminative style as the mediator and emotional overproduction as the dependent variable. This alternative mediational model (i.e., ruminative style as the mediator) is also consistent with theoretical and empirical considerations described in the introduction section. Moreover, results from Study 2 showed that a partial mediation of ruminative style between neuroticism and emotional overproduction was, although less compelling, also supported by our data. Consequently, we consider rumination very likely to foster emotional overproduction creating a self-perpetuating cycle of rumination and emotional overproduction. Future research should further study the validity of this alternative model. However, it is important to note that Study 3 provides additional support at least for the validity of our original model as participants' emotional overproduction generated in the lab preceded ruminative responses.<sup>4</sup>

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Results from Studies 1 and 2 showed that our measure of trait emotional overproduction is highly reliable. In this study we observed a high correlation between this measure and the total number of negative emotions reported after a sad mood induction, confirming its concurrent validity.

Recent research has shown that emotional complexity, defined as having emotional experiences that are broad in range and well differentiated, is associated with better outcomes (e.g., Kang & Shaver, 2004; Lindquist & Barrett, 2008). Results from this study clearly show that experiencing a high number of emotions may lead to rumination. Thus, the capacity of reacting with a wide range of emotions in response to different situations is adaptive, but to simultaneously experience such wide range of emotions in a given moment seems to be maladaptive.

We also found that the total number of emotions predicted postinduction state rumination even when controlling for both neuroticism and trait emotional overproduction. These results confirm the key role of simultaneously experiencing a high number of negative emotions in understanding ruminative responses.

<sup>4</sup> It is possible that participants could ruminate during the mood induction procedure fostering emotional overproduction. Although our data do not allow us to completely rule out this hypothesis, we think this possibility was minimized in our design as the key component of the induction (i.e., the partner breakup) it was revealed 35 sec before the end of the 9-min induction. Mood induction time was largely employed to describe some contextual aspects about the partner, the characteristics of their relationship and previous episodes in order to make the story convincing.

## General Discussion

This research has focused on a potential mechanism linking neuroticism and ruminative responses. Clarifying the nature of this link is particularly important for both theoretical and practical reasons. First, ruminative responses seem to mediate the relation between neuroticism and depressive symptoms over time (Roberts et al., 1998). Second, recent psychological interventions for depression are focusing specifically on rumination as a target for treatment (e.g., Watkins et al., 2007). Thus, research in this area might lead to improvements in the efficacy of current treatments and may help to reduce the high rate of relapses found in depression (Judd, 1997). We proposed the construct of emotional overproduction to better explain the neuroticism-rumination link. It was defined as the tendency to experience an elevated number of negative emotions and feelings along with sadness.

Using cross-sectional designs, Studies 1 and 2 showed that emotional overproduction was strongly associated with a ruminative thinking style, explaining unique variance even when controlling for other relevant variables. More importantly, emotional overproduction partially mediated the relation between neuroticism and ruminative style.

We found in Studies 1 and 2 that our trait measure of emotional overproduction presented very good psychometric properties and discriminant validity. Yet, as this measure can be biased by retrospective memory biases, we designed a third study to explore emotional overproduction in a lab setting where participants were subjected to a mood-induction procedure. Using a state-like measure of emotional overproduction, the main pattern of results was again replicated in Study 3. Moreover, our hypotheses were tested against several alternative explanations. The analyses conducted to evaluate such explanations yielded results that supported the validity of our initial predictions.

We should note that it is possible that our results are created artificially by a third variable that we did not assess. This limitation is inherent to the mediational design we used, as noted by Spencer, Zanna, and Fong (2005). Nevertheless, the same authors proposed that when a mediator is easy to assess, but difficult to manipulate, as in our case, the more appropriate design is the one we used (Spencer et al., 2005).

## Neuroticism, Emotional Overproduction and Rumination

The theoretical nature of the relationship between neuroticism and ruminative style had not been sufficiently investigated in previous literature. We believe that our results help to explain this relationship and provide a valid framework for further exploration. Neuroticism is generally associated with a tendency to experience negative affect (e.g., Eaton & Funder, 2001). Emotional overproduction focuses on a dimension of emotional reactions other than classic dimensions associated with neuroticism such as intensity or frequency of negative affect. Emotional overproduction relates to quantity, that is, the number of negative emotions and feelings activated in an emotional reaction (i.e., the emotional load). We hypothesized that participants with higher emotional overproduction would react experiencing an elevated amount of emotions and feelings which would ultimately lead them to ruminate. The pattern of results obtained in each of the three studies was coherent

with this general hypothesis. Although each study has its own limitations considered separately, we think that, taken together, they strongly support our predictions. A recent study using experience-sampling methodology has found that healthy subjects with a high neuroticism score tend to experience longer sad episodes (Verduyn, Delvaux, Van Coillie, Tuerlinckx, & Van Mechelen, 2009). Thus, these results help to explain the link between neuroticism and ruminative style but, more specifically, they shed light on why neuroticism may become an obstacle for emotion regulation (e.g., Suls & Martin, 2005).

Furthermore, this research offered additional evidence for the key role of emotional overproduction in relation to ruminative responses beyond its relation to neuroticism. In Study 2, emotional overproduction was found to predict unique variance of ruminative style even after controlling for the rest of the variables included in the study (i.e., depressive symptoms, personality, and TMMS variables). In Study 3, the total number of experienced emotions and feelings (i.e., state emotional overproduction) predicted postinduction rumination even when controlled for trait neuroticism and trait emotional overproduction. Overall, these results revealed the crucial role of the content of emotional reactions in the development of ruminative responses.

Recent theoretical discussions have focused on the specific role of facets of ruminative style, namely reflection and brooding (e.g., Treynor et al., 2003). From a theoretical point of view, emotional overproduction is expected to be associated with both reflection and brooding as we argued in the introduction. Our results show that emotional overproduction seems to be related to both facets of rumination. In the same vein, recent research has suggested that reflectors are likely to ruminate and reflect simultaneously (Takanaka & Tanno, 2009).

## Emotional Overproduction and Emotional Processing

Several implications regarding emotional processing can be derived from our overall pattern of findings. We might argue that when a high number of negative emotions and feelings are elicited, automatic emotional processing may be compromised (i.e., bottleneck phenomenon), and explicit emotional processing will be required. How may emotional processing be promoted? Based on previous research (e.g., Mor & Winquist, 2002), we think that self-focus might be such programmed strategy designed to ensure that the individual pays attention to the emotional information generated and, thus, to favor adaptive emotional processing (i.e., reflection). Yet, on the other hand, deficient emotional skills (e.g., Salovey et al., 1995), a marked evaluative mode of processing (e.g., Rude, Maestas, & Neff, 2007; Watkins, 2004; Watkins & Moulds, 2005), or a tendency to suppress emotions (e.g., Liverant, Brown, Barlow, & Roemer, 2008) might eventually lead from emotional overproduction to maladaptive forms of rumination.

## Sources of Emotional Overproduction

Future research should also focus on the study of the precursors of emotional overproduction. As we have shown in this research, neuroticism acts as an antecedent of emotional overproduction. But other personality and contextual factors may also predispose individuals to experience emotional overload. As we pointed out in the introduction, some individuals have a tendency to experience

additional emotions not directly related to the situation, but as a consequence of their own initial reactions (e.g., Greenberg & Safran, 1987). For instance, an initial emotion of embarrassment may lead some individuals to experience additional emotions such as self-irritation, disappointment in self, or anger. Other individuals experience fear when facing intense negative emotions (Williams, Chambless, & Ahrens, 1997), or anxiety sensitivity, a very close construct defined as the tendency to fear anxiety-related symptoms (Reiss, Peterson, Gursky, & McNally, 1986). Greenberg (2002) suggested that certain attitudes such as lack of emotional acceptance are typically associated with the activation of these additional emotions.

Other basic personality traits such as behavioral inhibition system (BIS) or avoidant coping, related theoretically and empirically to neuroticism, might also predispose to experience emotional overproduction. For example, previous research has demonstrated that BIS is associated with rumination (Leen-Feldner et al., 2004) but the psychological mechanisms of such relation are still unclear.

Future research will determine whether lack of emotional acceptance (e.g., Liverant et al., 2008; Watkins, Moberly, & Moulds, 2008) as well as other traits (e.g., BIS or avoidance temperament) or dysfunctional coping styles (e.g., avoidant coping) might be associated with chronic emotional overproduction or even whether they are able to predict ruminative styles with emotional overproduction acting as the mediator.

Situational factors may also be related to the experience of emotional overload. Negative life events or particular patterns of life situations—or a combination of them—can have the capacity of activating a high number of emotions in most people. For example, having a car accident due to a distraction may lead the driver to experience feelings of fear, apprehension, anxiety, and so on. But when this same life event happens when a loved one was also in the vehicle, a significant number of additional feelings may arise, for instance, shame, guilt, regret, worry, and so on. Thus, although emotional overproduction may be mainly guided by individual differences (i.e., personality, appraisals, etc.), it can also partially be a result of specific patterns of life stress or specific negative life events. Interestingly, epidemiological research on depression has also shown that different stressors differ in their ability to elicit specific symptoms of depression. For instance, compared to other stressors, a romantic loss is much more likely to elicit appetite loss, whereas the death of a loved one is more likely to elicit sadness (Keller, Neale, & Kendler, 2007).

Furthermore, this discussion on emotional overproduction and negative life events may be useful for future research in the field of stress and coping. For example, previous research has found it very difficult to find a set of criteria to assess the severity of a negative life event beyond subjective ratings (McLean & Link, 1994). Theories about stressful life events have oscillated between considering the amount of life change required by the event (e.g., Sarason, Johnson, & Siegel, 1978) and the intensity of emotions activated (e.g., Brown, 1979) as the factor responsible for the severity of a negative event. In regard to the results of our study, it is conceivable that a parameter such as the likelihood of different negative events to generate emotional overproduction might predict the impact of negative life events and, more broadly, might be relevant in defining stress severity.

Thus, precursors of emotional overproduction may be diverse. In addition to neuroticism, other personality and situational factors might be responsible for emotional overproduction.

### Clinical Implications

Since ruminative style has been shown to be a key factor in depression onset and maintenance, present findings are applicable primarily in the context of depression models and treatments, although other disorders (e.g., PTSD) can also be relevant in this discussion. Cognitive-behavioral interventions are increasingly targeting rumination for treatment (e.g., Watkins et al., 2007). Our line of research may contribute to the understanding and treatment of rumination tendencies when clinical assessment identifies a pattern of emotional overproduction (i.e., chronic trait) or a state of emotional overload (i.e., in reaction to a severe negative life event).

Classical theoretical models of depression often consider emotion somewhat as a by-product of cognitive processes or behaviors (e.g., Beck, Rush, Shaw, & Emery, 1979). Similarly, studies on vulnerability processes have focused on cognitions and behaviors but rarely on emotions. However, in light of our results, some vulnerability processes may be present once the emotions have been activated, that is, in the process of the development and management of emotions. Specifically, effective management of an overloaded emotional state might be crucial to avoid entering in a depressed mood-rumination loop. In fact, a treatment modality specifically designed to improve emotional management (i.e., Emotion-Focused Therapy; Greenberg, 2002) has demonstrated to be effective as a treatment for depression (Greenberg & Watson, 2002). This kind of intervention for depression might be effective through enhancing emotional processing as these authors propose. However, in view of our results, it is also plausible to think that this treatment may be also effective through reducing and preventing rumination.

We also think that the present results may help to better understand the PTSD literature for several reasons. First, rumination is increasingly considered a powerful predictor of persistent PTSD (e.g., Michael, Halligan, Clark, & Ehlers, 2007). Second, previous discussion on negative life events and emotional overproduction may be particularly appropriate here. One of the potential consequences of traumatic events, in addition to the experience of intense fear or horror, is that a great variety of other emotions are usually elicited. For instance, being a witness to a violent and tragic crime committed toward another person may elicit not only horror or fear but a great deal of other emotions such as insecurity, shame, disappointment in self, distrust, self-blame, and so on. Thus, some events can elicit a high number of different negative emotions. Furthermore, individual differences in emotional overproduction are relevant as well. As we pointed out in the introduction, literature on posttraumatic stress has shown that, after a traumatic event, experiencing emotions as shame or anger to others, in addition to fear and horror, predicted a worse course of PTSD (Brewin et al., 2000). Similarly, the appraisal of trauma when involving a perceived breakdown of world assumptions (Janoff-Bulman, 1992) may also collaborate in the generation of emotional overload since, besides having to handle symptoms and emotions, victims have to manage shattered basic assumptions about themselves, others, or the world. For instance, threats to

basic beliefs about benevolence of self or others could elicit additional emotions and feelings (i.e., self-blame, shame, insecurity, distrust, and so on) thus fostering emotional overproduction. Thus, the accumulation of emotions directly generated by traumatic events, or through specific appraisals, might feed ruminative responses and, eventually, the onset or maintenance of a stress-related psychological disorder (i.e., PTSD, depression, substance abuse disorder) via fostering rumination.

To sum up, studying emotional overproduction may be a very fruitful line of research for explaining the origins of ruminative style and its clinical outcomes. Additionally, it may be very useful in improving the treatment of pathological rumination and depressive disorders, or in preventing individuals high in neuroticism from developing a mood disorder. Training individuals how to cope with and prevent emotional overload could be an effective means to reduce ruminative responses, and hopefully, the onset or relapse of depressive and/or stress-related disorders.

## Conclusion

Emotional overproduction was defined as the enduring tendency to experience an excessive number of negative emotions and feelings in reaction to negative events. Across three studies, we found that emotional overproduction predicted rumination above other important and distinct variables. Moreover, we found that emotional overproduction repeatedly mediated the relationship between neuroticism and rumination. Future research should further examine the link between overloaded emotional states and rumination using other samples (i.e., clinical samples), and methodologies (e.g., diaries, experience sampling methods, etc.). Nevertheless, our findings consistently support our initial hypotheses. We believe that our results can provide a framework for further exploration and comprehension with regard to different research areas related to emotional processing, life stress and coping mechanisms, as well as clinical disorders.

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