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Response style and severity and chronicity of depressive disorders in primary health care

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ABSTRACT

Background: Response styles theory of depression postulates that rumination is a central factor in occurrence, severity and maintaining of depression. High neuroticism has been associated with tendency to ruminate. We investigated associations of response styles and neuroticism with severity and chronicity of depression in a primary care cohort study.
Methods: In the Vantaa Primary Care Depression Study, a stratified random sample of 1119 adult patients was screened for depression using the Prime-MD. Depressive and comorbid psychiatric disorders were diagnosed using SCID-I/P and SCID-II interviews. Of the 137 patients with depressive disorders, 82% completed the prospective five-year follow-up with a graphic life chart enabling evaluation of the longitudinal course of episodes. Neuroticism was measured with the Eysenck Personality Inventory (EPI-Q). Response styles were investigated at five years using the Response Styles Questionnaire (RSQ-43).
Results: At five years, rumination correlated significantly with scores of Hamilton Depression Rating Scale ($r = 0.54$), Beck Depression Inventory ($r = 0.61$), Beck Anxiety Inventory ($r = 0.50$), Beck Hopelessness Scale ($r = 0.51$) and Neuroticism ($r = 0.58$). Rumination correlated also with proportion of follow-up time spent depressed ($r = 0.38$). In multivariate regression, high rumination was significantly predicted by current depressive symptoms and neuroticism, but not by anxiety symptoms or preceding duration of depressive episodes.
Conclusions: Among primary care patients with depression, rumination correlated with current severity of depressive symptoms, but the association with preceding episode duration remained uncertain. The association between neuroticism and rumination was strong. The findings are consistent with rumination as a state-related phenomenon, which is also strongly intertwined with traits predisposing to depression.

1. Introduction

Response styles theory of depression postulates that the ways an individual responds to depressed mood influences the occurrence and severity of depression, but the influence of rumination on the duration of depression has remained unclear [1–3]. The postulated response styles comprise rumination, distraction, problem-solving and dangerous activities. Rumination is a characteristic response to distress; a perseverant cognitive process of focusing passively, repetitively and negatively on symptoms past and present, resulting in emotional distress. Rumination has been associated with female gender [4], and as a putatively transdiagnostic process, also with numerous psychiatric disorders besides depression, particularly anxiety [5–7]. Rumination is reported to be composed of different factors, such as brooding and pondering or reflection [8–11], but findings among depressed patients have been inconsistent [12]. Negative affectivity or neuroticism have been found to be correlated with rumination [12].

Rumination may be, at least in part, an expression of underlying high neuroticism. Neuroticism is characterized by proneness to anxiety, emotional instability and self-consciousness, whereas extraversion involves positive emotionality, energy and dominance [13]. They are to some degree inherited traits [13]. Neuroticism is

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believed to reflect a stable disposition involving specific biological and psychological mechanisms that produce its robust association with psychopathology [14,15]. High neuroticism has been shown to be a risk factor or indicator for MDD in prospective epidemiological twin [16,17], general population [18] and clinical [19–22] studies. Moreover, current mood has been found to influence neuroticism [22,23]. In contrast, the findings regarding to extraversion are more controversial [16,17,19–22,24,25].

Response styles have been investigated mostly either in non-depressed populations [6,7,26,27], especially students [2,28,29], or in bereaved individuals [30,31], with only few longitudinal prospective studies [26,29]. There are some clinical studies, both cross-sectional [32,33] and longitudinal [24,34–36], including a long-term study of inpatients with major depressive disorder (MDD) [37,38]. In a clinical trial among primary care patients with minor depression and dysthymia, depressive symptoms and rumination decreased over time but distraction did not; rumination and distraction were associated with more depressive symptoms at the conclusion of treatment [39]. Overall, the empirical status of the response styles theory of depression varies by type of response style. The association between rumination and depressive symptoms seems strong in non-clinical samples, but appears less consistent in clinically depressed patients [27,34]. The association between distraction and depression is inconsistent [29,40]. Problem-solving and dangerous activities have been investigated relatively seldom. Regarding associations with personality, longitudinal research among depressed patients is scarce. Despite research pertaining to relationships between response styles and personality with depressive symptoms, a need for long-term clinical studies among depressed patients exists.

The original response styles theory [1,2] postulates a longer duration of depression among individuals with a ruminative response style. To test this hypothesis, duration of depression episodes must be measured. To our knowledge, response styles have not been investigated with life-chart methodology among depressive patients. We investigated the influence of response styles in a naturalistic prospective Finnish cohort of primary care patients with depressive disorders. The study was limited by having measures of response style available only at the end of follow-up, but nevertheless allowed cross-sectional and retrospective analyses. We hypothesized that rumination would correlate, first, with both current severity and retrospective duration of major depressive episodes (MDEs) as well as with concurrent anxiety, gender and neuroticism, and, second, with other clinical and psychosocial factors. We also explored the correlation of the other response styles with outcome of depression and other clinical and psychosocial factors.

2. Material and methods

2.1. Patients and procedures

The Vantaa Primary Care Depression Study (PC-VDS) was approved by the pertinent Ethics Committee in 2001. Based on stratified sampling within the city of Vantaa, Finland, altogether 373 of 1119 general practitioners' patients aged 20–69 years screened with the Primary Care Evaluation of Mental Disorders (PRIME-MD) had a positive screen for depression [41]. The presence of at least one core symptom of MDD according to the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID I/P) was confirmed by telephone. All of the 175 potentially eligible patients were interviewed face-to-face using the SCID I/P with psychotic screen. Inclusion criteria were current:

- MDD;
- dysthymia;
- subsyndromal MDD with two to four depression symptoms (minimum one core symptom) and lifetime MDD;
- and minor depression otherwise similar to subsyndromal MDD, but without MDD history.

Patients who refused to participate (15%) did not differ significantly in age or gender from those who consented. The diagnostic reliability for current depressive disorder diagnoses was excellent (kappa = 1.0).

The final study sample comprised 137 patients. Current and lifetime psychiatric disorders were assessed with SCID-I/P and SCID-II interviews. In addition to the face-to-face interviews, observed and self-report scales and all medical and psychiatric records were used to assess retrospective and prospective course of depression, comorbid disorders and psychosocial and socioeconomic factors [41]. Scales comprised Hamilton Rating Scale for Depression (HAMD), Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Beck Hopelessness Scale (HS), Social and Occupational Functioning Assessment Scale for DSM-IV (SOFAS) and Scale for Suicidal Ideation (SSI).

After baseline, patients were prospectively investigated at 3, 6 and 18 months and 5 years [42]. The 5-year investigation included the same diagnostic interviews, scales and medical and psychiatric records as the baseline investigation. Exact timing and duration of episodes of depression and substance abuse were examined by gathering all available data from symptom ratings and from medical and psychiatric records and by reviewing with the patient all information from the follow-up period using important life events in order to improve the accuracy of the assessment, a best estimate of which was then integrated into a graphic life-chart. Dropouts (18%) did not differ from participants in age, gender or baseline depression severity [42]. Of patients followed for 5 years, 87% (97/111) fulfilled the Response Styles Questionnaire (RSQ); they were more often females, younger and less depressed than those who didńt. Baseline and 5-year patient characteristics are shown in Table 1.

2.2. Measures of response style and personality

Response styles were measured with Response Styles Questionnaire (RSQ), which is administered to assess tendencies to react in response to symptoms of negative emotion [43]. The RSQ-43 includes rumination scale (24 items), distraction scale (11 items), problem-solving scale (4 items) and dangerous activities scale (4 items). The items are measured on a 4-point Likert-type scale. The ruminative response scale consists of items that assess responses to dysphoric mood focused on self, symptoms, or possible consequences and causes of mood, and also includes behavioural responses. Regarding rumination, we analysed separately the most commonly used scale including 22 items (rumination-22), the short RSQ (rumination-10; those 10 items that have had the highest item-total correlations with the full-scale rumination and with BDI), and brooding (5 items) and pondering (3 items) subscales [9]. With permission by the developer (Nolen-Hoeksema, 2007, personal correspondence), we translated the questionnaire into Finnish with the standard method including back-translation. Internal consistency of the scales was measured with Cronbach's alpha and generally found to be good to excellent: alpha for rumination-24 = 0.94, rumination-22 = 0.93, rumination-10 = 0.90, brooding = 0.80, pondering = 0.69, distraction = 0.82, problem-solving = 0.71, dangerous activities = 0.37 (= 0.60 without item 37).

Personality was assessed with Eysenck Personality Inventory, form B (EPI) [44] at baseline and at the 18-month follow-up and with EPI-Q [45] at the 5-year follow-up. EPI-Q is a short measure based on EPI and comprises 18 items, 9 of the EPI's original 24 neuroticism items and 9 of the original 24 extraversion items.

Table 1
Characteristics of patients in the Vantaa Primary Care Depression Study ($n = 97$).

Variable	At base-line		At five years		T-test
	n	%	*n*	%	*P*
Socio-demographic features					
Male gender	17	17.5	–	–	
Cohabiting	53	54.6	49	50.5	0.167
Employed	56	57.7	50	51.5	0.241
Unemployed	19	19.6	11	11.3	0.059
	Mean	SD	Mean	SD	
Age (years)	43.8	13.2	–	–	
	n	%	*n*	%	
Clinical features					
Anxiety disorder (any)	45	46.4	47	48.6	0.339
Generalized anxiety disorder	12	12.4	13	13.4	0.783
Panic disorder	7	7.2	10	10.3	0.259
Social phobia	15	15.5	14	14.4	0.516
Somatoform	12	12.4	12	12.4	1.000
Personality disorder	48	49.5	41	42.3	0.070
Cluster B	28	28.9	24	24.7	0.158
Cluster C	30	30.9	30	30.9	1.000
Substance use disorder	12	12.4	10	10.3	0.090
Physical illness interfered with everyday life	43	44.3	53	54.6	< 0.001
	Mean	SD	Mean	SD	
Age at onset of depression (years)	28.3	12.3	–	–	
Hamilton Rating Scale for Depression	16.0	5.6	10.8	7.8	< 0.001
Beck Depression Inventory	18.5	10.9	13.9	11.0	< 0.001
Beck Anxiety Inventory	17.5	12.7	13.2	12.3	0.009
Beck Hopelessness Scale	8.0	5.1	7.2	5.3	0.239
Social and Occupational Functioning Assessment Scale	58.0	11.1	65.6	15.1	< 0.001
Scale for Suicidal Ideation	2.5	5.2	1.5	4.3	0.075
Time spent in MDE during follow-up (months)	–	–	19.5	21.4	
Off work due to depression during follow-up (months)	–	–	14.5	22.7	
Response style					
Rumination (22 items)			44.6	12.8	
Short RSQ (Rumination 10 items)	–	–	21.2	6.4	
Brooding (5 items)	–	–	10.3	3.2	
Pondering (3 items)	–	–	5.4	1.9	
Distraction (11 items)	–	–	24.9	5.2	
Problem-solving (4 items)	–	–	8.9	2.4	
Dangerous activities (4 items)	–	–	5.9	1.4	
Personality					
Neuroticism	6.4	2.0	5.6	2.4	< 0.001
Extraversion	4.1	2.0	3.7	2.4	0.025

The correlation between EPI and EPI-Q was good at baseline and at 18-months for neuroticism ($r = 0.89$, $P < 0.001$, and $r = 0.91$, $P < 0.001$, respectively) and extraversion ($r = 0.81$, $P < 0.001$, and $r = 0.89$, $P < 0.001$, respectively). Cronbach's alphas for EPI-Q questions were also good for neuroticism and extraversion at all 3 time-points (alpha at baseline = 0.65 and 0.67; at 18 months = 0.72 and 0.72; and at 5 years = 0.76 and 0.71, respectively).

The correlation between rumination at 5 years and neuroticism was consistent irrespective of time-point of measurement of neuroticism ($r = 0.52$, $r = 0.45$ and $r = 0.58$; $P < 0.001$), which allowed us to use rumination as an independent variable in linear regression analyses. In univariate linear regression (adjusted for age, gender and follow-up time), neuroticism at baseline ($\beta = 3.559$, $P < 0.001$), at 18 months ($\beta = 2.749$, $P < 0.001$), and at 5 years ($\beta = 3.486$, $P < 0.001$) were equal predictors of rumination. The relationship persisted after controlling for current HAMD.

2.3. Statistical methods

Between-group comparisons were computed using ANOVA. Bivariate correlational analyses and linear regression models were used to analyse associations of different variables with response styles. In the final multivariate models, the non-significant variables were omitted. Models were adjusted for age, gender and follow-up time, and, when appropriate, also for the severity of depression (HAMD) and the duration of MDEs. Regression analysis allows the impact of the severity and duration of depression to be controlled because response style and depression are often highly correlated.

To estimate the influence of current depressive state on variations in response style, we conducted a separate sensitivity analysis of a subgroup of patients in full remission or in MDE at 5 years and examined the potential influence of the duration of the last full remission.

3. Results

3.1. Rumination and depression

Rumination total score was significantly associated with the current clinical state of depression (full remission, partial remission or MDE) cross-sectional at 5 years (Table 2). More specifically, all of the brooding ($r = 0.31$–0.57; $P = < 0.001$–0.021)

Table 2
Response styles in full remission, in partial remission and in MDE at five years in the Vantaa Primary Care Depression Study ($n = 97$).

	Full remission $n = 46$		Partial remission $n = 33$		MDE $n = 18$		P
	Mean	SD	Mean	SD	Mean	SD	
Response style							
Rumination	39.8	10.8	44.2	9.9	57.4	12.8	< 0.001
Rumination-10	18.4	5.0	21.6	5.2	28.3	6.6	< 0.001
Brooding	9.3	2.7	9.8	2.9	13.5	3.0	< 0.001
Pondering	5.2	1.9	5.2	1.9	6.0	2.0	0.341
Distraction	26.1	4.2	24.0	5.5	23.6	7.9	0.106
Problem-solving	9.3	2.4	8.8	2.5	8.0	2.3	0.171
Dangerous activities	5.6	1.1	6.1	1.7	6.8	1.6	0.010
Psychiatric symptoms							
Beck Depression Inventory	6.7	4.5	15.0	6.6	31.1	9.6	< 0.001
Hamilton Rating Scale for Depression	5.2	2.9	12.2	4.6	23.1	5.1	< 0.001
Beck Anxiety Inventory	6.7	5.9	14.3	10.0	28.2	14.9	< 0.001
Personality							
Neuroticism	4.7	2.6	6.1	2.0	7.4	1.6	0.001
Extraversion	3.9	2.6	3.3	2.4	3.67	2.2	0.564

ANOVA: analysis of variance.

but none of the pondering ($r = 0.10$–0.14; $P = 0.171$–0.353) items were significantly associated with the current state of depression (HAMD scores). Table 3 shows, that the tendency to ruminate correlated with current severity of depressive or anxiety symptoms, duration of depression and neuroticism. The association of total scores of rumination with those of HAMD is depicted in Fig. 1.

In the small subgroup of eight patients who spent the entire 5-year follow-up in MDEs, the mean rumination scores cross-sectional at 5 years were markedly higher (65.8, SD 13.0) than those of other patients (43.2, SD 10.9; $P < 0.001$). Within the subgroup of 46 patients fully remitted at 5 years, the same tendencies remained mostly significant within the limited range of none to mild symptoms present (Table 4). Importantly, however, within this subgroup rumination had no significant correlation with the retrospective duration of time spent in MDEs during the follow-up or with duration of full remission immediately before the 5-year interview.

In univariate linear regression analyses with time spent in MDEs during follow-up as the dependent variable, the association with rumination was significant ($B = 0.674$, $\beta = 0.405$, 95% CI: 0.362–0.986; $P < 0.001$). However, in multivariate analyses including baseline variables HAMD ($B = 1.167$, $\beta = 0.308$, 95% CI:

Table 3
Bivariate correlations between response styles and other variables in the Vantaa Primary Care Depression Study at five years ($n = 97$).

	Rumination	Rumination-10	Brooding	Pondering	Distraction	Problem-solving	Dangerous activities
Response styles							
Rumination	–	0.938**	0.861**	0.717**	−0.003	−0.226*	0.502**
Rumination-10	0.938**	–	0.861**	0.522**	−0.150	−0.314**	0.515**
Brooding	0.861**	0.861**	–	0.498**	0.068	−0.116	0.483**
Pondering	0.717*	0.522**	0.498**	–	0.094	−0.157	0.285**
Distraction	−0.003	−0.150	0.068	0.094	–	0.639**	−0.145
Problem-solving	−0.226*	−0.314**	−0.116	−0.157	0.639**	–	−0.163
Dangerous activities	0.502**	0.515**	0.483**	0.285**	−0.145	−0.163	–
Symptom variables							
Anxiety disorder 5y	0.341**	0.285**	0.308**	0.150	−0.047	−0.154	0.255*
Personality disorder	0.248*	0.324**	0.366**	0.161	−0.074	−0.177	0.282**
Cluster C	0.240*	0.269**	0.340**	0.118	−0.144	−0.168	0.110
Beck Depression Inventory BL	0.445**	0.468**	0.400**	0.283**	−0.027	−0.163	0.242*
Beck Depression Inventory 5y	0.611**	0.636**	0.575**	0.242*	−0.165	−0.307**	0.397**
Hamilton Rating Scale for Depression 5y	0.537**	0.603**	0.505**	0.150	−0.181	−0.241*	0.327**
Beck Anxiety Inventory 5y	0.496**	0.520**	0.425**	0.193	−0.112	−0.209*	0.418**
Beck Hopelessness Scale 5y	0.511**	0.558**	0.472**	0.262*	−0.234*	−0.359**	0.386**
Scale for Suicidal Ideation 5y	0.358**	0.324**	0.379**	0.202*	−0.033	−0.119	0.278**
Social and Occupational Functioning Assessment Scale 5y	−0.474**	−0.556**	−0.434**	−0.190	0.141	0.289**	−0.266**
Substance use disorder 5y	0.304**	0.305**	0.251*	0.183	−0.017	−0.179	0.451**
Age at onset of depression	−0.119	−0.212*	0.228*	−0.085	0.017	−0.002	−0.231*
Time spent in MDEs BL-5y	0.376**	0.303**	0.404**	0.122	−0.015	−0.203	0.217*
Recurrences BL-5y	0.232*	0.213*	0.232*	0.114	0.019	−0.069	−0.005
Time spent unable to work BL-5y	0.181	0.209*	0.202	0.074	−0.085	−0.066	0.027
Personality							
Neuroticism 5y	0.584**	0.630**	0.526**	0.301**	−0.089	−0.299**	0.367**
Extraversion 5y	−0.231*	−0.260*	−0.193	−0.126	0.290**	0.392**	−0.099

BL: at baseline; 5y: at five years; BL-5y: during the five-year follow-up.
* $P < 0.050$.
** $P < 0.010$.

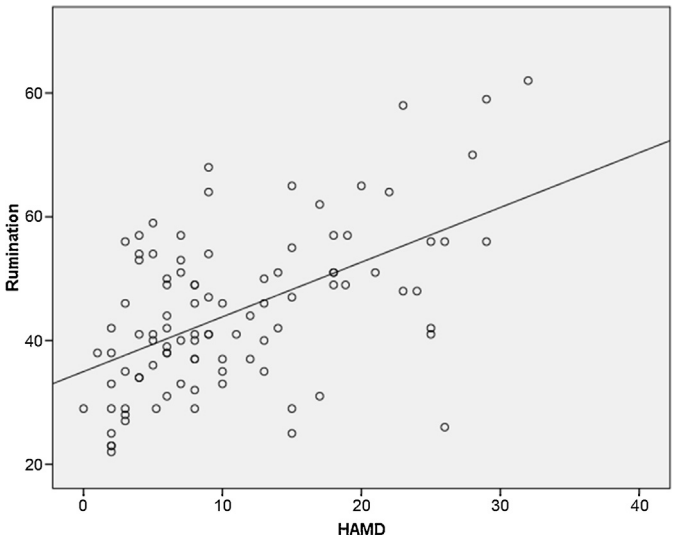

Fig. 1. Rumination and Hamilton Rating Scale for Depression (HAMD) at five years in the Vantaa Primary Care Depression Study ($n = 97$).

0.455–1.879; $P = 0.002$), substance use disorder ($B = 23.921$, $\beta = 0.371$, 95% CI: 11.875–35.967; $P < 0.001$) and rumination as independent variables, rumination lost significance ($P = 0.270$).

In analyses predicting rumination at five years, HAMD at baseline and time spent in MDEs during follow-up were significant predictors. In univariate linear regression analyses predicting rumination as the dependent variable, both HAMD ($B = 1.001$, $\beta = 0.440$, 95% CI: 0.567–1.434; $P < 0.001$) and time spent in MDEs during follow-up ($B = 0.248$, $\beta = 0.413$, 95% CI: 0.133–0.362; $P < 0.001$) were significant predictors. In multivariate analyses of baseline variables, BAI ($B = 0.374$, $\beta = 0.376$, 95% CI: 0.191–0.558; $P < 0.001$) and substance use disorder ($B = 12.254$, $\beta = 0.326$, 95% CI: 5.246–19.263; $P < 0.001$) predicted rumination.

Table 5
Multivariate linear regression for rumination among depressed primary care patients ($n = 97$).

	B	β	95% CI	*P*
Age	0.028	0.030	−0.139; 0.195	0.741
Gender	−2.396	0.075	−3.403; 8.194	0.413
Follow-up time	−0.007	−0.060	−0.028; 0.015	0.531
Time spent in MDEs during follow-up	−0.019	−0.032	−0.154; 0.116	0.777
Beck Depression Inventory, at five years	0.502	0.419	0.177; 0.826	0.003
Beck Anxiety Inventory, at five years	−0.082	−0.080	−0.368; 0.198	0.550
Neuroticism, at five years	2.312	0.452	1.217; 3.408	< 0.000

However, in multivariate linear regression analyses including concurrent BDI, BAI and neuroticism as independent variables, all of these factors were significantly associated with the dependent variable rumination, but duration of time ill during the follow-up was not (Table 5).

3.2. Rumination, neuroticism, and depression

Regarding associations between personality, rumination and depression, we found that the correlation between neuroticism and rumination was significant ($r = 0.58$, $P < 0.001$), as was the correlation between rumination and depression (HAMD) ($r = 0.54$, $P < 0.001$). However, in correlational analyses, the correlation between neuroticism and depression ($r = 0.48$, $P < 0.001$) disappeared when controlled for rumination ($r = 0.27$, $P = 0.012$). In univariate linear regression, adjusted with age and gender, neuroticism predicted rumination ($B = 0.113$, $\beta = 0.579$, 95% CI: 0.079–0.147; $P < 0.001$, SE = 0.017) and depression (HAMD) ($B = 1.567$, $\beta = 0.513$, 95% CI: 0.969–2.165; $P < 0.001$, SE = 0.301). In multivariate regression model, neuroticism ($B = 1.036$, $\beta = 0.339$, 95% CI: 0.316–1.755; $P = 0.005$, SE = 0.069) plus rumination ($B = 0.172$, $\beta = 0.288$, 95% CI: 0.034–0.310; $P = 0.015$, SE = 0.316) predicted depression.

Table 4
Bivariate correlations between response styles and other variables in the Vantaa Primary Care Depression Study among patients in full remission at five years ($n = 46$).

	Rumination	Rumination-10	Brooding	Pondering	Distraction	Problem-solving	Dangerous activities
Response style							
Rumination		0.947**	0.850**	0.789**	0.111	−0.197	−0.197
Rumination-10	0.947**		0.820**	0.676**	0.034	−0.296	0.278
Brooding	0.850**	0.820**		0.612**	0.252	−0.085	0.230
Pondering	0.789**	0.676**	0.612**		0.103	−0.178	0.310*
Distraction	0.111	0.034	0.252	0.103		0.548**	0.200
Problem-solving	−0.197	−0.296	−0.085	−0.178	0.548**		−0.162
Dangerous activities	−0.197	0.278	0.230	0.310*	−0.200	−0.162	
Symptom variables							
Beck Depression Inventory	0.596**	0.580**	0.537**	0.538**	0.170	−0.300*	0.406**
Hamilton Rating Scale for Depression	0.435**	0.462**	0.211	0.333*	0.114	−0.086	0.131
Beck Anxiety Inventory	0.307*	0.309*	0.157	0.268	0.032	0.093	0.425**
Beck Hopelessness Scale	0.382**	0.313*	0.231	0.569**	0.021	−0.338*	0.288
Social and Occupational Functioning Assessment Scale	−0.260	−0.301*	−0.139	−0.212	−0.177	0.225	0.041
Scale for Suicidal Ideation	0.227	0.108	0.260	0.536*	0.268	0.168	0.062
Time spent in MDEs BL-5y	0.074	0.113	0.073	−0.058	0.243	0.099	−0.107
Duration of last full remission	−0.061	−0.120	−0.098	0.005	−0.193	−0.051	0.149
Personality							
Neuroticism	0.533**	0.584**	0.418**	0.307	−0.090	−0.335*	0.299
Extraversion	−0.343*	−0.369*	−0.250	−0.222	−0.030	0.308*	−0.138

BL-5y: during the five-year follow-up.
* $P < 0.050$.
** $P < 0.010$

3.3. Gender differences

Overall, gender differences in response styles were small. A significant gender difference emerged only in the problem-solving scale, with females scoring higher than males (mean 9.14, SD 2.4 vs. mean 7.60, SD 2.2; $P = 0.025$; ANOVA).

3.4. Distraction, problem-solving and dangerous activities

Dangerous activities was associated significantly with the current state of depression cross-sectional at 5 years (Table 2). The tendency towards dangerous activities increased with symptoms and duration of depression and neuroticism, whereas the reverse was true for distraction and problem-solving (Table 3). In univariate linear regression analyses, problem-solving ($\beta = -0.217$, 95% CI: −3.620; −0.059; $P = 0.043$) and dangerous activities ($\beta = 0.302$, 95% CI: 1.433–7.068; $P = 0.004$) but not distraction ($\beta = -0.094$, 95% CI: −1.217; 0.447; $P = 0.360$) were significantly associated with the time spent in MDEs during follow-up. However, in multivariate analyses they lost significance.

4. Discussion

In following up depressive primary care patients for five years, we found that the tendency to ruminate at endpoint was strongly related to the current severity of depressive and also anxiety symptoms. While ruminative response style was also moderately strongly related to duration of time spent in depressive episodes during the preceding five years, this finding was no longer significant after adjusting for current severity of depression, nor was it found among patients fully remitted. Thus, by far the most consistent relationship was between rumination and current symptoms. We could not produce unequivocal evidence for rumination being associated with chronicity of depression. Neuroticism predicted rumination, even after accounting for depressive and anxiety symptoms.

A major strength of the study was the life-chart methodology, which enabled us to evaluate the longitudinal course of illness and time-related psychosocial factors. Further strengths included the screening-based medium-sized cohort from a stratified sampling of 1119 patients, structured interviews with SCID-I/P and SCID-II by psychiatrists and the longitudinal study design with a five-year follow-up and a small drop-out rate. Depressive disorders in this primary care cohort were typically major depressive episodes of only mild to moderate severity, but usually recurrent or chronic in nature [41,42]. Comprehensive clinical interviews allowed us to analyse the influence of clinical symptoms and other characteristics on rumination; use of life-charts enabled measuring the time spent in different states of depression during the preceding five years. In addition, we carefully evaluated presence of psychiatric comorbidity [41], and in particular, investigated the role of concurrent anxiety, which has more seldom been included in earlier studies [5]. Finally, as rumination was measured at the final interview, there was wide variation in severity of patients' depressive symptoms, ranging from complete remission to severe outpatient depression in some cases [42]. This variation allowed effective analysis of the influence of clinical state factors on rumination.

Several limitations of the study must be noted. First and foremost, response styles were measured only at the end of follow-up, not at baseline and certainly not before the onset of depressive disorders. Their predictive value, temporal variation and causality of associations remain unknown. Thus, despite the study design otherwise being prospective, with regard to course of rumination it was cross-sectional and retrospective. Course and intra-individual variation of rumination over time remain unknown, and we cannot fully exclude the possibility of reverse causation, i.e. rumination could be influenced or caused by (chronic) depression. Memory biases due to depression are possible. However, to investigate the role of depressive state, we statistically adjusted both the symptoms of depression at five years and the duration of last remission or last MDE, and specifically analysed the subgroup of patients who were not currently depressed. Particularly the latter allowed investigation of the relationship of retrospective chronicity and current response style without significant bias caused by current symptoms. Second, the sampling of the cohort was based on stratified screening of depression to ensure representativeness [41]. However, inclusion of consecutive patients with depressive disorders unavoidably enriches chronicity, as longer duration of depression increases the probability of becoming recruited. Nevertheless, the sample accurately reflects characteristics of actual patients and the actual workload of physicians. Third, despite the moderate sample size, the number of patients in some subgroups remained small, thus increasing risk of type II errors. However, the main findings were robust. Fourth, earlier research has used different versions of the RSQ, which somewhat complicates the comparisons. Fifth, the study was naturalistic and the treatment received, if any, was not controlled. Finally, generalizability of our findings to populations other than urban or suburban primary care patients remains unknown. Generalizability may be limited by occupational or private health care services not being included.

Partly consistent with our hypothesis, rumination was associated robustly with the current state (severity) of depression and with the current severity of anxiety. Based on cross-sectional analysis and lacking information on its preceding course, presence of rumination appears a strongly state-related phenomenon. In contrast, findings for rumination being associated with increased duration of depressive episodes and chronicity remained tenuous. While we found a moderate correlation between duration of MDEs and rumination, this is likely explained by the correlation with severity and duration of depression. In the absence of current depressive symptoms, no such correlation is found. Our findings are partly at odds with earlier research suggesting rumination to put persons at risk for more severe depression and more time spent in MDEs and also new MDEs [40]. Previous research has also found that rumination is more a trait- than a state-related characteristic [29,46]. However, the trait-state issue necessitates research with longitudinal designs [9]. While our findings cannot refute the possibility of also a significant trait component, they speak strongly for an influence of the clinical state on the reported degree of rumination.

We found the two subscales for rumination, brooding and pondering, to have slightly different relationships with depression. Both the total score and items of brooding had a consistent strong correlation with depressive symptoms, whereas that association appeared weaker for pondering, in agreement with earlier findings [47,48]. Findings of factor analytical studies are not consistent as to whether rumination is unidimensional [12] or comprises two [8,9,11,49] or more [33,46] dimensions. Overall, in addition to RSQ with 22 rumination items, both the rumination-10 and the brooding scales seem to be applicable. Furthermore, our findings regarding correlations with comorbid anxiety and substance use disorders are in accord with the transdiagnostic hypothesis of rumination [27].

The consistent association between neuroticism and rumination in our sample is in accordance with most of earlier literature on non-depressed samples [8,46,50,51]. Rumination might act as a general proximal mechanism through which other vulnerability factors affect depression [25,26,46,50,51]. However, even though high neuroticism was associated with high rumination even after controlling for anxiety and depressive symptoms, we found no consistent evidence for rumination causing chronicity. Thus,

rumination may be exaggerated in the presence of depressive symptoms or possible stressors triggering depression, but whether or not this represents a mechanism by which depression more often becomes chronic warrants investigation via prospective longitudinal studies.

Contrary to what was originally postulated by the response styles theory [52], we found few and small gender differences. Significant differences emerged only in problem-solving, with females scoring higher than males. An explanation for our finding of similar rumination by both men and women may derive from the fact, that we examined primary care patients already suffering from depressive disorders, not gender differences in presence of rumination within the general population. Earlier research has focused on rumination, where females have been noted to ruminate more than males, although the effect sizes have been small [49]. Of other response styles, we found distraction most strongly associate with extraversion. Previous studies have reported distraction to be associated with a lower risk of depression [29,33–35,37], but the findings have been somewhat inconsistent [39,40]. We found problem-solving and particularly dangerous activities to be associated not only with severity of depression, but also with several other symptom and psychosocial variables. However, in contrast to the other subscales, the internal consistency of the dangerous activities scale was poor. This subscale has also shown poor validity in other studies [1]. Elucidation of the significance of distraction and problem-solving and the possibility that they comprise an active coping subtype [5,28] warrants investigation in prospective longitudinal studies.

5. Conclusions

In this study, we evaluated the relationships between rumination, neuroticism and depression. We found that among primary care patients with depression, the association between neuroticism and rumination was strong. Rumination correlated strongly with current severity of depressive symptoms, but the association with preceding episode duration remained uncertain. These findings are consistent with rumination as a state-related phenomenon, which is also strongly intertwined with traits underlying vulnerability to depression.

Disclosure of interest

The authors declare that they have no competing interest.

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