

# Is worry different from rumination? Yes, it is more predictive of psychopathology!

## Unterscheiden sich Sorgen und Grübeln? Ja, Sorgen hängen stärker mit psychopathologischen Symptomen zusammen!

### Abstract

**Objective:** Although worry and rumination are everyday phenomena as well as common symptoms across numerous psychopathological disorders, the theoretical and clinical delineations of both concepts need more clarification. This study explored the degree of overlap between worry and rumination on the levels of standardized questionnaires and a priori lay concepts.

**Method:** The subjective conceptualization of worry and of rumination of 221 undergraduate and graduate students was assessed with the semantic differential technique, together with the frequency and intensity with which they experienced worry and rumination (based on their lay concepts). Standardized self-report measures for worry, rumination, depression, and anxiety were also administered.

**Results:** Worry was viewed as more negative than rumination and was more predictive of anxiety as well as of depression than rumination, especially when the assessment was based on the subjective lay concepts. The different measures of worry and rumination were only moderately correlated with each other.

**Conclusion:** It is concluded that the lay concepts worry and rumination and the hypothetical constructs worry and rumination should not be confused in personality and clinical research.

**Keywords:** worry, rumination, anxiety, depression, semantic differential technique, assessment

### Zusammenfassung

**Hintergrund:** Die Konzepte „Sorgen“ und „Grübeln“ bezeichnen gleichermaßen Alltagserleben wie auch verbreitete psychopathologische Symptome. Dennoch bedarf es einer klareren theoretischen und klinischen Abgrenzung zwischen beiden Konzepten. In der vorliegenden Studie untersuchten wir, inwieweit sich Symptome des Sich-Sorgens und des Grübelns überlappen, wenn sie einerseits mittels standardisierter Fragebögen, andererseits auf der Basis von Häufigkeitsangaben, die auf a-priori gegebene Laienkonzepte der Probanden zurückgingen, erfasst wurden.

**Methoden:** Die subjektiven Konzepte von „Sorgen“ und „Grübeln“ von 221 deutschsprachigen Studenten wurden mit dem Semantischen Differential untersucht, ferner die Häufigkeit und Intensität, mit der Sorgen und Grübeln erlebt wurden. Standardisierte Fragebögen für Sorgen, Grübeln, Depression und Angst wurden ebenfalls eingesetzt.

**Ergebnisse:** Sich-Sorgen wurden als negativer eingeschätzt als Grübeln und prädizierte sowohl Angst- als auch Depressionssymptome besser als Grübeln. Dies galt besonders dann, wenn den Häufigkeitsangaben die Laienkonzepte zugrunde lagen. Die verschiedenen Maße für Sorgen und Grübeln waren nur mäßig miteinander korreliert.

**Schlussfolgerung:** Unsere Schlussfolgerung ist, dass die Laienkonzepte „Sich-Sorgen“ und „Grübeln“ und die entsprechenden hypothetischen

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Konstrukte in der Persönlichkeits- und klinischen Forschung nicht miteinander vermischt werden sollten.

**Schlüsselwörter:** Sorgen, Grübeln, Angst, Depression, Semantisches Differential, Operationalisierung

## Introduction

Worry and rumination are repetitive cognitive processes central to the understanding of anxiety and affective disorders; they are everyday phenomena as well as clinical symptoms pervasive throughout psychopathology [1]. Both coping processes can have adaptive and maladaptive functions (e.g., [2], [3]), share obvious similarities [4] and correlate positively with neuroticism and negative affectivity [5], [6]. Present conceptualizations, however, suggest that worry is specifically linked to anxiety and its disorders, especially generalized anxiety disorder (GAD; [7], [8], [9]), whereas rumination is specifically linked to depression [10]. The empirical evidence concerning whether these processes are mainly overlapping or distinctive is inconsistent.

The most frequently cited definition of worry conceptualized the construct as “a chain of thoughts and images, negatively affect-laden, and relatively uncontrollable; it represents an attempt to engage in mental problem-solving on an issue whose outcome is uncertain but contains the possibility of one or more negative outcomes; consequently, worry relates closely to the fear process” [11]. In contrast, rumination is conceptualized as a coping response to depressive mood and is defined as “behaviors and thoughts that passively focus one's attention on one's depressive symptoms and on the implication of these symptoms” [12]. Both worry and rumination, though each typical for everyday thinking [13] are believed to specifically contribute to diagnosable disorders, in particular GAD and major depression. Worry is a defining feature of GAD and rumination is thought to prolong and intensify depression (see [10], for a review).

Theoretical assertions about the psychological nature and functions of worry and rumination clearly differ from one another. Borkovec, in his avoidance theory of worry (e.g., [14]), assumes that worry is a verbal and cognitive activity, which (as opposed to more imaginative and concrete information processing) serves to draw attention away from material that is emotionally more painful and more arousing. Thus, worry is a form of internal distraction. In contrast, Nolen-Hoeksema [12] sees rumination as a maladaptive coping response that is characterized by a self-absorbing focus on depressing content and symptoms and a relative inability to distract oneself from this content. Hence, rumination is more of an elaboration of the depressing content than an avoidance of it.

These conceptualizations exemplify how the fields of anxiety and depression research have developed relatively independently. Some authors draw contrasts between worry and rumination, even though the two phenomena share a number of features, including those related to processes, mechanisms, and content. As described

earlier, both worry and rumination are elevated in psychiatric samples ([14], [15], and both are seen as core elements in anxiety and depression disorders that are often co-morbid with each other. A further complicating matter is that laypersons sometimes use the terms “worry” and “rumination” interchangeably, and some scientific definitions of the two terms highlight their overlapping nature [16]. For example, according to Martin and Tesser [17], worrying is a specific form of ruminative thinking (see [18], for a converse interpretation).

Empirical studies addressing the overlap and unique aspects of worry and rumination examine associations between the constructs based nearly entirely on data derived from questionnaires. Segerstrom, Tsao, Alden, and Craske [19] found strong correlations ( $r$ 's = .52 to .55) between worry and rumination in both non-clinical and clinical samples. In this study, depressive rumination was found to correlate stronger with depressive and anxiety symptoms ( $r$ 's = .44 to .67) than worry ( $r$ 's = .24 to .37) and there was no clear evidence for the specificity of associations between worrying and anxiety and rumination and depression. A latent variable (repetitive thought), comprised of indicator variables for rumination and worry, was closely associated with both depression and anxiety. The authors suggested that a third variable, namely negative affectivity or neuroticism, accounts for the tendency both to ruminate and to worry.

Fresco, Frankel, Mennin, Turk, and Heimberg [20] also examined overlap versus distinctiveness of worry and rumination in a series of exploratory factor analyses. They submitted items from the Penn State Worry Questionnaire (PSWQ [21]) and the Rumination Response Scale (RRS), a standard measure of rumination [12], [22] conjointly to factor analysis and obtained a 4-factor solution that included two worry factors and two rumination factors. The authors concluded that worry and rumination represent “related but distinct cognitive processes that are similarly related to anxiety and depression” (p. 179). The authors assume that this similarity may be due to the fact that both worry and rumination serve an avoidance function.

Watkins, Moulds, and Mackintosh [4] used a set of descriptive attributes for worry and rumination (again from PSWQ and RRS) to elucidate the similarities and distinctions between the two concepts in a nonclinical sample. They did not find differences with respect to appraisals and strategies concluding that worry and rumination share the same processes but that they involve different content [23].

Taken together, these findings suggest that there are more overlapping than distinguishing features of worry and rumination. It should be noted, however, that these results are all based on items from a small range of

questionnaires. As such they all share common assumptions and biases. Specifically, those who developed worry and rumination questionnaires assumed that these concepts are clinically relevant as evidenced by their uncontrollable and persistent nature observed in the clinic. It is therefore not surprising that the attributes describing the processes in the instruments overlap. Nevertheless, this does not automatically tap into a layperson's conceptualization of these constructs.

It is critically important to discriminate between different forms of assessment when trying to clarify the relationship between constructs [24], [25]. Previous research focused primarily on the association between established measures of worry, rumination, or both. This strategy runs the risk of confusing different levels of inference: assertions about hypothetical (latent) constructs, data on the operationalization of constructs (indicator variables, mostly from questionnaires), and data based on laypersons' understanding of worry and rumination. Analyses based on questionnaire items do not inform us about the relationship between worry and rumination *per se*, but only about the relationship between the specific measures used in the study. The degree to which these items correspond to respondents' ideographic understanding of worry and rumination remains empirically unknown.

The present study investigated the degree to which features of worry and rumination are overlapping versus distinctive using several analytic approaches. In a first step, we analyzed laypersons' a priori concepts of the terms worry and rumination. We utilized adjective lists as typically used in the semantic differential technique (SDT, [25], see description below) to explore qualitative and quantitative differences in the meaning of both concepts. We then administered standardized questionnaires as well as lay concept-based measures of worry and rumination in order to test how closely the most often used questionnaires (for worry: the PSWQ [21], for rumination: the RRS [10] or versions of it) correspond with priori understanding of the terms. Given the specific clinical meaning of rumination as defined by Nolen-Hoeksema [10] we expected relatively lower correlations between the RRS and the lay concept derived measure of rumination than between the PSWQ and the respective measure of worry. Furthermore, we tested the assumption that the amount overlap versus distinction between worry and rumination depends largely on the assessment strategy. Finally, we examined the specificity of associations between worry and anxiety and rumination and depression using both standardized questionnaires and SDT-derived ideographic ratings of both worry and rumination. Based on extant theories, we expected stronger associations between worry and anxiety and between rumination and depression than vice versa [7], [8], [9], [10].

## Methods

### Participants

Participants were 227 students at a German university who participated voluntarily and anonymously during one of their classes. 42.2% (n=80) were psychology students, 21.3% (n=47) students of rehabilitation sciences, 27.6% (n=61) studied education and 14.1% (n=31) other subjects. Mean age was 22.9 years ( $SD=3.63$ ); 81.9% of the sample was female.

### Semantic differential technique

The semantic differential technique (SDT) aims to measure the connotative meaning of words and concepts. To accomplish this, each concept is rated on bipolar scale anchored on each end with contrasting adjectives. Initially, Osgood [25] created the SDT to evaluate meanings people attribute to different words. The versatility and simplicity of the procedure has generated research in a variety of applications including personality and clinical psychology [26]. Although Osgood [25] utilized a list of specific adjectives, other adjectives conceptually tied to the targeted domain and facets of interest yield more sensitive measurements [27].

To arrive at a list of attributes which economically describe key features of worry and rumination, attributes commonly used to characterize worry or rumination in the literature were identified [11], [12], [17], [21], [22]. After exclusion of synonyms, the list was then cross-checked by two independent experts for their appropriateness and completeness. This process resulted in a final list of 26 attributes (see Table 2, for the full list). Each of the adjectives was paired with its antonym to create 26 bipolar 6-point scales.

### Assessment of self-engagement of worry and rumination based on lay concepts

To arrive at simple self-ratings of the amount of worry or rumination that respondents found typical of themselves according to their a priori understanding, the following questions were formulated: (a) How often do you worry/ruminate?; (b) How typical is worrying/ruminating for you?; (c) How strongly do you worry/ruminate? These questions were positioned directly after the SDT items, and the instructions clarified that the respondent should use the exact meaning of "worry" and of "rumination" that they had used while completing the SDT list of attributes. All items were answered on a 5-point Likert scale. The resultant Worry-scale (WS) and Rumination-scale (RS) scores were the sum of these three items for worry and rumination, respectively. Both scales were internally consistent ( $\alpha=.91$ ) in this sample.

## Standardized questionnaires

*Penn State Worry Questionnaire (PSWQ)*. The PSWQ [21] is a 16-item inventory designed to assess trait worry and to capture the general, excessive, and uncontrollable characteristics of pathological worry. The PSWQ is the standard measure for assessing worry. The current study used the German version of the PSWQ [28], which has repeatedly demonstrated good psychometric properties. Cronbach's  $\alpha$  in this sample was .89.

*Ruminative Responses Scale (RRS)*. The Response Styles Questionnaire (RSQ), a self-report measure which assesses four coping styles in response to depressed mood developed by Nolen-Hoeksema and Morrow [12]. We used the 21-item Ruminative Response Scale, a subscale for measuring the frequency of ruminative thoughts and action in response to depressive symptoms (German version: [29]). Item values range from "1" (almost never) to "4" (almost always). Respondents are not instructed to report their *general* tendency to ruminate (as is the case when *worry* is measured with the PSWQ). Instead, items are presented in an "if-then" format. After the introductory phrase "When you feel sad, down, depressed, how much would you use the following responses?" respondents are requested to indicate to what extent ruminative coping behaviors follow such as "I try to understand myself by focusing on my depressed mood." Cronbach's  $\alpha$  in this sample was .84.

Finally, standardized measures of anxiety (State Trait Anxiety Inventory, STAI; [30]; German version: [31];  $\alpha$  in this sample = .89) and depression (Beck Depression Inventory, BDI; [32]; modified German version, BDI-V: [33];  $\alpha$  in this sample = .89) were used.

## Results

### Attributes from the semantic differential

Moderate to large differences were observed for the majority of attributes describing worry and rumination (see Table 1). Generally, worry was evaluated as being more negative in its valence, its effects and its potential to interfere; e.g., there were strong effects ( $d > .8$ ) characterizing worry as more negative, sad, unpleasant, and hindering. Furthermore, the content of worry was judged to be more future-oriented than that of rumination ( $d = .64$ ).

Only few attributes characterize the two processes in a highly comparable way. Both worry and rumination were described as similarly realistic, unavoidable, internally oriented, and automatic.

### Descriptive statistics

Means and standard deviations for the PSWQ ( $M = 45.7$ ;  $SD = 9.8$ ), RRS ( $M = 23.4$ ;  $SD = 8.7$ ), STAI ( $M = 40.9$ ;  $SD = 8.8$ ), and BDI-V ( $M = 26.6$ ;  $SD = 12.9$ ) were similar to previous studies with student populations (e.g., for PSWQ/RRS:

[24]; for STAI: [34]; for BDI-V: [35]). Scores for both lay concept scales indicate that respondents described their general tendency to worry or to ruminate to be in the medium range (WS:  $M = 3.07$ ,  $SD = .82$ ; RS:  $M = 3.32$ ,  $SD = .84$ ).

## Intercorrelations

The intercorrelations between measures of worry and rumination (Table 2) were positive and statistically significant. Nonetheless, the pattern of correlations also suggests that different constructs were measured. The correlations between both PSWQ and RRS ( $r = .48$ ) and between the lay concept measures of worry and rumination (WS and RS;  $r = .54$ ) were high but cannot be considered to indicate a unitary construct (with only 29% explained variance). While the PSWQ was highly correlated with the lay concept based measure of worry (WS), there was only a moderate correlation between the RRS and frequency and intensity of rumination as based on the lay concept-based measure of rumination (RS).

The correlations with anxiety (STAI) are higher for both worry and rumination than those with depression (BDI). Further contradicting initial specificity assumptions, measures of worry appear to be more strongly linked to anxiety and depression than measures of rumination.

## Regression analysis

Prior to running the regression analyses we assessed multicollinearity by examining the Variance Inflation Factor (VIF). All VIF were  $< 2$ , indicating that multicollinearity is not a cause for concern for our analyses.

Hierarchical regression analyses were conducted to determine how measures of worry and rumination were related to measures of depression and anxiety (Table 3). *First*, the worry and rumination measures based on lay concepts were entered as the predictors, and BDI or STAI as the dependent variables (Table 3, upper half). Entering lay concept ratings of worry alone in Step 1 accounted for 24% of the BDI variance. Entering lay concept rumination ratings in Step 2 predicted a small (1%) but significant incremental proportion of variance. Because the two predictors were inter-correlated, both variables were then entered in reversed order. Lay concept rumination ratings accounted for 12% of the variance in depression when entered in Step 1. Adding lay concept worry ratings in Step 2 resulted in a much larger increment in  $R^2$  ( $\beta$  for worry = .42,  $p < .001$ ;  $\beta$  for rumination = .14,  $p < .05$ ). Similarly, when predicting STAI scores, worry ( $\beta = .54$ ,  $p < .001$ ) was a stronger predictor of anxiety than rumination ( $\beta = .20$ ,  $p < .01$ ).

The same analyses were repeated using standardized questionnaires as predictors (Table 3, lower half). Again the relative contribution of the indicator for worry (PSWQ) was stronger than that of the indicator of rumination (RRS), regardless of whether BDI or STAI scores were predicted.



**Table 1: Semantic differential ratings of worry and rumination in 221 students**

Attributes <sup>a</sup>	worry		rumination		$d^b$	$t$	$p$
	$M$	$SD$	$M$	$SD$			
1. positive – negative	4.59	.99	3.48	1.23	0.99	11.46	<.001
2. sad – happy	2.14	.91	3.00	.96	-0.92	-10.13	<.001
3. exciting – relaxing	2.34	.80	3.01	.92	-0.78	-8.81	<.001
4. pleasant – unpleasant	4.87	.90	3.99	1.04	0.91	11.11	<.001
5. adequate – inadequate	3.69	.97	3.38	1.04	0.31	4.13	<.001
6. confusing – clear	2.78	.95	3.23	1.15	-0.43	-4.89	<.001
7. precious – worthless	3.58	1.04	3.17	1.16	0.37	4.88	<.001
8. dangerous – protective	3.05	.86	3.67	.98	-0.68	-7.60	<.001
9. helpful – hindering	4.51	1.05	3.50	1.32	0.85	10.49	<.001
10. goal-orient. – distracting	4.35	1.05	3.45	1.26	0.78	8.82	<.001
11. causing fear – calming	2.26	.90	3.27	.95	-1.09	-13.11	<.001
12. creating problems – resolving problems	4.03	1.01	3.20	1.14	0.77	8.57	<.001
13. encouraging – discouraging	4.44	1.01	3.78	1.06	0.64	7.52	<.001
14. preventative – not preventative	3.53	1.11	3.40	1.20	0.11	1.37	.17
15. automatic – deliberate	3.08	1.16	3.14	1.26	-0.05	-.62	.54
16. conscious – unconscious	3.56	1.20	3.26	1.25	0.24	2.98	<.01
17. easily influenced – not easily influenced	3.60	1.29	3.38	1.19	0.18	2.24	<.05
18. unintended – intended	2.73	.92	3.22	1.15	-0.47	-5.40	<.001
19. controlled – uncontrolled	4.23	.97	3.65	1.12	0.55	6.44	<.001
20. self-induced – extern. induced	3.23	.93	2.89	.93	0.36	4.21	<.001
21. past-orientated – future-orient.	4.49	1.12	3.76	1.17	0.64	7.24	<.001
22. internally oriented – ext orient.	2.67	1.00	2.76	1.08	-0.09	-1.09	.28
23. common – seldom	3.35	1.21	3.04	1.22	0.25	3.83	<.001
24. realistic – unrealistic	3.29	1.07	3.29	1.17	0.00	.000	1.0
25. necessary – unnecessary	3.49	1.18	3.08	1.21	0.34	4.70	<.001
26. avoidable – unavoidable	4.06	1.17	4.10	1.06	-0.04	-.52	.61

<sup>a</sup> The first attribute was the left (score = 1), the second the right (score = 6) anchor in the bipolar dimension.

$$^b d = \frac{\mu_1 - \mu_2}{\sigma}$$

**Table 2: Correlations among measures of worry and rumination and of anxiety and depression**

	PSWQ	RRS	WS	RS	STAI	BDI
PSWQ		.45**	.79**	.48**	.71**	.56**
RRS			.41**	.31**	.54**	.49**
WS				.54**	.66**	.50**
RS					.49**	.36**
STAI						.72**

*Note.* PSWQ = Penn State Worry Questionnaire; RRS = Ruminative Response Scale; WS = worry self-ratings based on lay concept of worry; RS = rumination self-ratings based lay concept of rumination; STAI = State-Trait Anxiety Inventory; BDI-V = Beck Depression Inventory, simplified German version. \*\* $p < .01$ .

**Table 3: Hierarchical regression models analyzing the incremental contribution ( $\Delta R^2$ ) of worry or rumination for explaining depression (BDI) and anxiety (STAI) (N=221)**

		Criterion: BDI Depression scores				Criterion: STAI Anxiety scores			
		$R^2$	$\Delta R^2$	$F$	$\beta$	$R^2$	$\Delta R^2$	$F$	$\beta$
<i>Lay Concept Measures as the Predictor Variables</i>									
Model 1									
Step 1:	WS	.24		74.46***		.41		161.15***	
Step 2:	WS				.42***				.54***
	RS	.25	.01	4.17*	.14*	.44	.03	11.68**	.20**
Model 2									
Step 1:	RS	.12		34.00***		.23		69.30***	
Step 2:	RS				.14*				.20**
	WS	.25	.13	39.90***	.42***	.44	.21	85.54***	.54***
<i>Questionnaire Measures as the Predictor Variables</i>									
Model 1									
Step 1:	PSWQ	.30		102.23***		.49		221.27***	
Step 2:	PSWQ				.42***				.58***
	RRS	.38	.08	28.33***	.31*	.55	.06	33.53***	.28***
Model 2									
Step 1:	RRS	.24		73.01***		.28		92.56***	
Step 2:	RRS				.31*				.28***
	PSWQ	.38	.14	53.14***	.42***	.55	.27	138.30***	.58***

*Note.* PSWQ = Penn State Worry Questionnaire; RRS = Ruminative Response Scale; WS = worry self-ratings based on lay concept of worry; RS = rumination self-ratings based lay concept of rumination; STAI = State-Trait Anxiety Inventory; BDI-V = Beck Depression Inventory, simplified German version. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

## Discussion

This study assessed the overlap versus distinction between the constructs of worry and rumination. It did so by examining participants' understanding of the two constructs as reported via a priori lay concepts and standardized questionnaires. Both with respect to participants' a priori concepts as well as to standardized measures of worry and rumination, the distinctiveness

of worry and rumination was clearly demonstrated which is in line with more recent studies [36], [37]. Also pointing at distinctiveness, measures of worry predicted symptoms of anxiety and depression more clearly than rumination measures. Additionally, it should be emphasized that the frequency of "depressive rumination" as measured with the RRS was only moderately associated with the frequency of rumination in the everyday understanding of the term. The latter finding is not surprising given that

the RRS measures a specific construct, depressive rumination [10], rather than rumination more generally. In contrast, frequency of worry as measured by the PSWQ was strongly correlated with the frequency of worrying as based on participants' a priori concepts of the term.

Comparisons between worry and rumination across 26 attributes rated using SDT showed that respondents viewed worry as more negative or problematic. In 21 of 26 attributes significant differences were found, with effect sizes ranging between 0.25 and 1.09. While the valence of rumination in its everyday meaning was regularly evaluated as being in the medium range, the concept worry was characterized by a negative tone with scores closer to the negative anchor of the 6-point scales we used. These results differ from previous findings that point to the substantial overlap between worry and rumination [4]. It is of note that this study differs markedly in its methodological approach from the Watkins et al. study. In the present study, laypersons' a priori concepts of worry and rumination were ideographically rated, whereas Watkins et al. ([4]) based their comparison on items from clinical scales (PSWQ, RRS). Thus, it appears as if the few differences between worry and depressive rumination as clinically defined hypothetical constructs stand in contrast to the clear differences between the everyday understanding of these concepts. As our results suggest, laypersons' understanding of rumination (compared to that of worry) includes repetitive cognitive processes that are not necessarily aversive or dysfunctional (see Segerstrom et al. [19] for another finding that demonstrates only moderate correlation between "global rumination" and clinical symptoms) Since these results could alternatively also be explained by the fact that rumination and worry might be expressions of the same process on a different severity level, the intercorrelations between the two variables and with third variables have to be taken into account. Consistent again with distinctiveness, manifest and latent correlations between worry and rumination were only moderate to strong, and were never strong enough so that the two processes were indiscriminable from each other.

The other central question addressed in the present study was whether worry and rumination are differentially related to measures of anxiety and depression, as current models of psychopathology predict. Both the hierarchical regression analyses and the associations among latent constructs based on multi-group covariance analysis consistently contradict this view. While worry accounted for a higher proportion of the variance of anxiety symptoms, the expected reverse pattern for rumination (explaining more of the variance of depression symptoms) was not found, neither on the level of questionnaires nor on that of lay concepts. Rather, worry, in general, was found to be a stronger predictor of emotional symptoms. This replicates previous findings by Muris et al. [38] who found both rumination and worry to be "self-report derivatives of information processing distortions" (p. 550) and concluded that worry is a better indicator of an underlying vulnerability factor. One explanation for this may be that

worry is not related to specific content – nearly everything can become the trigger for worrisome thinking – while rumination is much more circumscribed, at least when regarded as *depressive* rumination (its focus being restricted to depressive symptoms). Thus, worry is more global as a construct and more pervasive and common as a process and should therefore account for larger proportions of variance in measures of anxiety and depression. When referring to lay concepts, a level on which now both worry and rumination are broad and global concepts, it is simply the respondents' understanding that rumination *per se*, in contrast to worry, is not closely linked to psychopathology.

This study has several limitations. First, the sample was not representative of the general or of any clinical population. Respondents were students who were relatively young, functional, and highly educated. Furthermore, most of the respondents were students of psychology or related fields who potentially can be characterized by an enhanced capability to differentiate between psychological constructs. Samples that include less well-educated persons or patients with diagnosed anxiety or depression disorders would be expected to differ from students in their (potentially lower) ability to discriminate between worry and rumination [19]. Second, the use of BDI and STAI as indicators of depressive and anxious symptomatology does not automatically generalize to patients with diagnosable anxiety and depression disorders.

Furthermore, it has to be critically discussed that respondents' understanding of worry and rumination might be language and culture dependent. It is not known how perfectly the common understanding of the terms worry and rumination in English and their standard translation into German (*Sorgen* and *Grübeln*) correspond to each other or whether there are nuances in what these terms are understood to mean in English-speaking and German-speaking cultures. The results may only be generalizable to German speaking populations and may not inform us about what would be found with the same research strategy in other cultures (such as the Anglo-American one). Given this restriction, the findings are still relevant because they make researchers cautious to adopt results from Anglo-American worry and rumination research to other cultures and vice versa. Further research with cross-cultural comparison groups is obvious.

Our finding that a lay concept based measure of rumination was less strongly correlated with symptom measures than the standard questionnaire (RRS) should, however, not completely be attributed to language issues. Indeed, the item content may prove to be more important in that the lay concept based measure of rumination (RS) did not include implicit symptoms of depressive as does the RRS (i.e., "I try to understand myself by focusing on my depressed mood"). Further research focusing on the effects of rumination *per se* (affectively neutral rumination) should therefore use instruments such as the Global Rumination Scale by McIntosh and Martin [39].

## Conclusion

The above mentioned limitations notwithstanding, the results of this study suggest that the concept of worrying is more relevant for psychopathology than that of rumination. Furthermore, the clinical understanding and the lay concept of worrying are strongly related making the use of measures such as the PSWQ face valid for clinical use, e.g., for screening high worriers [40]. The results also demonstrate that the lay concept of rumination and that of the most often used clinical measure of rumination (RRS) clearly differ. As such, it is important to keep in mind that researchers and laypersons – or also patients – may be referring to different phenomena when discussing psychological constructs in general, and rumination in particular. Given the difficulty to identify specific predictors of anxiety and depression, these variables should be very precisely defined on the operational level, and multimodal approaches to measure the constructs should be preferred.

## Notes

### Conflicts of interest

None declared.

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