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RUMINATION, DYSPHORIA, AND SUBJECTIVE EXPERIENCE

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ABSTRACT

An experiment is presented which investigated the relationship between rumination, dysphoria, and subjective experience during a short word-fragment completion task. Consistent with previous work off-task thinking, operationalized as task unrelated thought, was associated with dysphoria. By contrast, rumination was a significant predictor of task appraisal defined as task-related interference (TRI). While rumination did not directly contribute to the experience of task unrelated thinking (TUT), evidence was presented which suggests that when combined with a negative mood a ruminative style may amplify the association between this style of thinking and dysphoria. These findings suggest that we can distinguish between the phenomenological experience associated with rumination as distinct from dysphoria and this dissociation may be important in our ability to explain how self-focused attention contributes to enhanced psychological vulnerability.

INTRODUCTION

It has been suggested that depression is associated with a pre-occupation with loss of a central source of self-esteem [1]. Consistent with this perspective, states associated with self-focused attention such as private self-consciousness [2]

have been associated with high levels of dysphoria [3, 4]. More recently, thought sampling techniques have demonstrated that under laboratory conditions, dysphoria is associated with increased self-focused or off-task thinking [5-7]. These findings support the assertion that self-focus may function as a vulnerability factor for subsequent psychological problems [4] although little is known about the situational determinants (internal or external) that amplify the relationship [8].

Rumination can be considered the process by which one "isolates one self to think about feelings, writing and telling others how bad one feels, worrying about the causes and consequences of depression" [9]. Rumination has been consistently related to an exacerbation of the psychological consequences of a dysphoric mood, for example, greater deficits in problem solving [10], increased recall of negative memories [11], and a higher level of negative thoughts [12]. In the research literature, there is a consensus that "rumination affects cognition through exacerbating the effects of a negative mood" [10]. One's tendency to ruminate may represent an internal factor which moderates the relationship between off task thinking and dysphoria.

Under laboratory conditions the subjective experience of off task-thinking can be considered to consist of two distinct components [13]. First, it is possible to become pre-occupied with task performance. A good example of this is interfering thoughts regarding how one is performing on the current task. This aspect of cognition has been described as task related interference [TRI, 14-17]. Second, from time to time, one's attention can become directed to information which is neither in the current environment nor relevant to the current task. These cognitions can be conceptualized as task unrelated thinking [TUT, 18, 19] reflecting the fact that they are not derived from the context of the current task within which they are recorded. The distinction between TUT and TRI has proved important in studies of ongoing consciousness [e.g., 17] and this investigation will examine whether this distinction sheds light on the relationship between off-task thinking, dysphoria and rumination.

Studies of ongoing consciousness indicate that the task makes an important contribution to the nature of subjective experience. This issue is often investigated in the context of Baddeley and Hitch's [20] model of working memory. Broadly, studies confirm that tasks which tend to involve executive processes tend to maintain attention on the current situation [21, 22]. This framework has been demonstrated to interact with the two dimensions of subjective experience outlined above [17]. Briefly, in tasks with less involvement of executive processes, such as encoding and vigilance, as time on task increases thinking tends to shift from task-related interference toward task unrelated thought. By contrast when the task loads heavily on executive processing, such as a fluency task, no such shift in thinking is observed over the same period of time [17]. If the current task plays a role in determining the nature of concurrent subjective experience it is possible that it could also moderate the relationship between rumination, dysphoria and subjective experience.

In a previous series of experiments [6] rumination inductions led to reliable increases in cognitive interference[1] (Studies One and Three) but did not yield changes in the frequency of off-task thinking, presumably an analog of TUT (Study Two). In this case, off-task thinking was equitable in dysphoric individuals irrespective of whether they were allocated to an experimental rumination or distraction condition. Similarly, self-reported rumination was associated with lower frequencies of off-task thinking while encoding verbal information [7]. By contrast, convergent evidence demonstrates that a combination of dysphoria and rumination are associated with high levels of pre-occupation with how one is performing on the task [6, 7]. In the literature that exists, therefore, it is possible to broadly distinguish between rumination and depression in terms of their contributions to the two components of subjective experience: depression is associated with high levels of off-task thinking (TUT), whilst rumination is associated appraising how one is performing on the current task (TRI).

HOW DOES RUMINATION CHANGE THINKING IN A DYSPHORIC MOOD?

Within the literature, two mechanisms have been proposed to explain how rumination amplifies the consequences of a negative mood. One possibility, *the attentional inflexibility* hypothesis [23] suggests that rumination is associated with an inability to change attentional set. Consistent with this perspective, rumination is associated with higher levels of perseverative errors on the Wisconsin Card Sorting Test (WCST) [23] implying that the individuals may become pre-occupied with the current attentional set. An alternative mechanism for the process through which rumination exacerbates a negative mood is the *mood-as-input* hypothesis [24, 25]. From this perspective, a ruminative style is conceptualized as a state in which a negative mood is interpreted as poor progress toward a goal, and as a consequence the individual mobilizes strategic resources toward self-evaluation. Consistent with this view, ruminators have been shown to generate a higher number of reasons for their depressed mood when assigned to an "as many as you can" and a "no stop rule" condition in comparison to a "feel like continuing" condition [25].

[1] It is worth noting that in these studies the authors conflated both TRI and TUT in a single measure: the Cognitive Interference Questionnaire. Recent evidence has suggested that this measure in fact contains two factors (see Matthews et al., 1999).

Methodological Considerations

Laboratory studies have already yielded evidence to support the validity and reliability for the construct of TUT and TRI [15-17, 22, 26]. For example, when the content of one's thinking is directed away from the current situation, a phenomenon in the laboratory which can be operationalized as task-unrelated thought,[2] changes in task performance were observed which corresponded to: i) a shift in reaction time and task performance during both encoding [16], and ii) an inability to generate random numbers [22]. Similarly, TRI was associated with higher levels of self-consciousness [26], slower reaction times during encoding [27] and high levels of TRI while encoding was associated with more accurate subsequent retrieval [7]. Physiologically TUT is associated with a higher heart rate during encoding [28].

Given the time consuming nature of laboratory thought sampling, however, the sample sizes employed in these investigations described above are relatively small (15-30 individuals per experiment). The experiment described in this article uses a short, three-minute task and a questionnaire based measure of both dimensions of subjective experience. This design affords the investigation of larger samples of individuals than the more intensive laboratory sessions do and therefore provides a viable alternative source of evidence for the investigation of self-referent thinking because it demonstrates that the relationships identified in the more detailed laboratory investigations can be generalized to larger groups of individuals.

This experiment investigates the relationships between dysphoria, rumination, and subjective experience in the context of a short undemanding task. While we do not manipulate the nature of this task in these experiments, it was chosen because previous work has focused on demanding tasks (encoding and retrieval, [7]; prose reading, lecture comprehension, and proof reading, [6]). The relationships described in this article can be compared to data generated in the context of more effortful task processing to examine the extent to which the associations depend upon the involvement of effort toward the task.

Specific Aims

The aims of the experiment were two-fold. First, to replicate the association between rumination, dysphoria, and self-focus described in the literature [6, 7]. In particular, we hypothesized that i) dysphoria would be associated with situations in which task-unrelated issues become the focus of one's thinking and, therefore, attention departs from the current situation and ii) rumination would be associated with high levels of task-related interference reflecting the strategic appraisal of the individual "task performance." Second, to examine the possibility that the association between dysphoria and self-referent thinking was amplified by high

[2] See Smallwood et al. [17] for published criteria on making this judgment.

levels of rumination, we investigated whether the relationship between dysphoria and task unrelated thinking was strongest in those individuals who reported high levels of rumination.

METHODS

Participants

Ninety-eight undergraduate students from a University Psychology Department were recruited to participate in this study. The participants were all assessed on one occasion. The mean age of the samples was 20.0 (*SD* = 4.5, Range 17- 46). Of the 98 individuals included in this experiment, 86 individuals were female (87.8%).

Measures and Procedure

Subjective experience was assessed at the start of the experimental session in two stages. In stage one, participants completed a word-fragment completion task. These word-fragments were derived from the ANEW word norms [29]. The criteria for inclusion were that the words fell within the middle third of each of the four dimensions of the ANEW word norms: i) word frequency, ii) arousal, iii) dominance, and iv) valence. To generate each word-fragment the vowels were removed from each word (e.g., Cannon: C_N N_N; Stomach: ST _ M_C H). This task lasted three minutes.

At the end of the task participants were required to complete the Thinking Content component of the Dundee Stress State Questionnaire [14]. This scale is a 16-item measure of the cognitions experienced while completing an experimental task; each item is scored on a 5-point Likert-type scale. It is comprised of two eight-item factors each measuring a component of subjective experience described in the introduction: i) Task Unrelated Thinking (TUT), and ii) Task Related Interference (TRI). The TUT factor includes items such as "I thought about personal worries." By contrast, TRI focuses on thoughts regarding one's own task performance such as "I thought about my level of ability." This measure has previously been shown to have a valid and reliable factor structure [14] and to show a meaningful correspondences to online measures of thinking [7, 16].

Following the completion of the word-fragment task and Thinking Style questionnaire, each participant completed a battery of questionnaires examining self-reported rumination (Response to Situation Questionnaire short-form, RSQ [30]) and depression (Centre for Epidemiological Studies Depression Scale, CES-D [31]). Presentation of the self-report measures was counterbalanced.

The CES-D is a 20-item self-report questionnaire widely used as measure of depression in non-clinical samples [6, 31, 32]. The CES-D includes items such as "I thought that my life had been a failure." This measure has been demonstrated to show both a valid factor structure [32] and a consistent relationship to the DSSQ [7]. The short form of the RSQ contains 10 items, such as "I think about a recent

situation wishing it had gone better" and has been employed successfully in the investigation of the dysphoric self-concept showing both construct validity with the longer form of the RSQ [7] and internal validity [23].

RESULTS

Across the sample the mean CESD score was 35.3 (SD = 9.4) and the mean RSQ score was 18.3 (SD = 5.4). CES-D and RSQ were strongly correlated (r = +.61, $p < 0.01$). Initial zero-order correlations indicated that both forms of thinking were associated with i) rumination (TRI: $r = .321$, $p < 0.001$, and TUT: $r = .234$, $p < 0.05$) and ii) dysphoria (TRI: $r = .35$, $p < 0.01$ and TUT: $r = .385$, $p < 0.01$).

Given the statistical overlap between the two independent measures employed in this study, we used multiple regression to examine the predictors of subjective experience. We included the following measures in the regression equation: gender, age, RSQ, and CESD. In addition, consistent with previous research [33] we included the alternate form of subjective experience in the equation. The results of the multiple regressions are presented in Table 1.

Table 1. Predictors of Subjective Experience

Dependent variable	Predictor	Unstandardized coefficients		Standardized coefficients		
		B	Std. error	Beta	*t*	Sig.
TUT	(Constant)	–1.74	4.79		–.36	.717
	Age	.05	.12	.035	.41	.681
	Gender	.09	1.69	.005	.06	.956
	CESD	.20	.08	.291	2.74	.007
	RSQ	–.14	.13	–.117	–1.10	.274
	TRI	.47	.08	.513	5.73	.000
TRI	(Constant)	8.48	5.18		1.64	.105
	Age	–.13	.14	–.080	–.96	.340
	Gender	.07	1.86	.003	.04	.970
	CESD	–.01	.085	–.013	–.12	.909
	RSQ	.30	.14	.224	2.15	.034
	TUT	.56	.098	.513	5.73	.000

Multiple regression employing these predictors yielded an equation which reliably predicted TUT [$F(5, 97) = 10.96$, $p < 0.001$]. Of the variables included two reliably predicted the experience of TUT [CESD, Beta = .20, $t = 2.7$, $p < .010$), and TRI, Beta = .513, $t = 5.73$, $p < 0.001$]. Consistent with previous work the RSQ did not predict the experience of TUT [RSQ, Beta = –.117, $t = –1.10$, $p = .27$]. Multiple Regression also yielded a model which predicted the experience of TRI reliably [$F(5, 98) = 11.0$, $p < 0.01$]. Of the variables included both TUT [Beta = .511, $t = 5.74$, $p < 0.01$] and RSQ [Beta = 2.1, $p < 0.05$] predicted TRI. No relationship was observed between CESD and TRI [Beta = –.01, t = –.11, $p = .91$].

To investigate the hypothesis that rumination acts to amplify the association between TUT and dysphoria we conducted separate correlations between dysphoria and TUT and TRI in the high and low rumination group. Consistent with the postulation that rumination should amplify the association between dysphoria and off task thinking, TUT was only reliably associated with dysphoria in the high rumination group ($r = .37$, $p < 0.01$). While the regression indicated that rumination was not associated with TUT per se, higher levels of rumination were associated with a stronger relationship between dysphoria and TUT.

DISCUSSION

Three conclusions can be drawn from the experiment presented in this article. First, consistent with experimental work, dysphoria was specifically associated with TUT/off-task thinking [6, 7, 28, 33]. Second, despite the strong association between rumination and dysphoria, the results indicate that rumination, as measured by the RSQ, makes no direct contribution to the experience of TUT, with most of the variance accounted for by the measure of dysphoria we employed (CESD). While rumination may not contribute to the experience of task unrelated

Table 2. The Relationship between Self-Reported Dysphoria, Rumination, and Task-Irrelevant Thinking in Experiments One and Two

	Relationship to dysphoria	
Rumination	Task-unrelated thinking (TUT)	Task-relevant interference (TRI)
Low ($N = 53$)	.24 (.08)	.22 (.10)
High ($N = 47$)	.37 (.01)*	.27 (.06)

Note: The number in parentheses describes the level of significance.
*$p < 0.01$

thinking directly, it is possible that the RSQ score may amplify the association between dysphoria and TUT (Table 2) possibly via a method of self-regulation in which the individual is inclined to scrutinize their task performance. This dissociation between, on the one hand, rumination and dysphoria and on the other, the two types of subjective experience (TUT and TRI) replicates previous work [7, 33]. This also implies that the distinction between TUT and TRI routinely employed in studies of ongoing consciousness may have relevance to understanding the process by which rumination amplifies the consequence of a depressed mood.

From a theoretical perspective, the findings of these experiments are consistent with the two mechanisms through which rumination might act to maintain a dysphoric state. First, the multiple regression indicated that when dysphoria is controlled for, rumination is i) not associated with TUT and ii) is more likely to be associated with pre-occupation with how one is performing on the task. This suggests that the phenomenological experience associated with rumination is, in fact, one in which the attentional set of the individual becomes pre-occupied with task relevant material, a position consistent with the attentional rigidity hypothesis [23] and is one possible reason why ruminators benefit from either therapeutic or experimental interventions which provide a source of distraction [9]. Similarly, from a motivational perspective, the association between rumination and TRI suggests that rumination is associated with a tendency to mobilize strategic resources toward task completion. After all, a pre-occupation with how one is performing on a task may reflect a desire to perform more effectively. In the context of encoding verbal information, for example, the experience of TRI during encoding relates to superior retrieval [7, 27]. This association is consistent with the mood-as-input hypothesis because, in terms of subjective experience, rumination corresponds to a method of self-regulation aimed at self-revaluation [25].

It is also possible that the relationship between dysphoria, rumination, and subjective experience may be moderated by the nature of the current task. We did not manipulate the nature of the task in these experiments, however by comparison with other work we can contrast the role of effort in moderating the relationships described in this article. In the context of the undemanding word-fragment task, rumination was uncorrelated with the experience of TUT. In contrast, during encoding and retrieval the same measures (RSQ and TUT) were negatively correlated [7]. Recently, using multiple regression a negative relationship was also observed between RSQ and TUT in the context of a reasonably demanding sustained attention task [33]. If the tendency to ruminate is associated with attempts to appraise one's task performance, then increasing task demands might encourage ruminators to adopt this self-critical approach. Future work should explicitly manipulate the amount of effort directed to the task to shed further light on the role of (perceived) task demands in determining the relationship between rumination and TRI.

Finally, it is worth speculating on how the dissociation between rumination, dysphoria, and the two components of self-referent thinking may help us understand the phenomenology of depression. Recent conceptions of TUT in terms of "zoning out" imply that in certain circumstances the individual lacks momentary awareness that their attention has become dissociated from the current situation [34, 35]. This perspective implies that, subject to individual differences, drifts of attention such as TUT, occur across a wide sample of individuals with reasonable frequency, particularly when the environmental situation does not offer high degrees of environmental support [see also 36, 37]. It is possible that certain individuals will respond to these drifts in attention by attempting to control the direction of thinking, and that this control may be expressed as high frequencies of TRI. This position is consistent with the data indicating that high frequencies of TRI were reported in response to lapses in attention during a sustained attention task. If this is the case then rumination may extend the duration of a depressive episode because the individual employs a self-regulative strategy which attempts to control the haphazard wandering of attention which accompanies emotional states in general [5] and is particularly frequent in dysphoria [7]. As the evidence from studies of thought suppression demonstrate such attempts of cognitive control often lead to rebounds in cognitive interference [38] and it is possible that this strategy is responsible for determining why ruminators experience longer periods of depression. The efficacy of mindfulness based cognitive therapy in reducing the length of depressive episodes by training individuals to identify when their attention has drifted from the current situation and accept this with out attempting to control it [39] provides an important source of evidence to support this notion.

LIMITATIONS AND FUTURE DIRECTIONS

As the data presented in this article are in the form of a correlation, we cannot rule out alternative interpretations of the relationships described in this article. It is plausible, for example, that individuals with central processing problems are at risk for both the experience of dysphoria and rumination, on the one hand, or off task thinking on the other. While our sample contained undergraduate students and our analysis controlled for the age of the individuals, it is possible that further neuropsychological deficits may underlie the relationships which we describe in this article. For example recent research has suggested that the experience of TUT is most frequent in individuals high on Cognitive Failures [33] and these individuals have been demonstrated to show subtle impairments on tasks sensitive to sustained attention [37]. The role that central processing deficits play in moderating the relationship between rumination, dysphoria, and subjective experience should be examined in future experiments.

Moreover, it is important to note that while the factor structure of the RSQ has been criticized due to overlap with measures such as the BDI [40], this argument cannot explain the pattern of correlations presented in this article. Given that the overlap between the two questionnaires (RSQ and CESD) is high (e.g., +.61), one would expect few differences in the relationship between rumination and depression and the measures of subjective experience employed in this study. The results of the multiple regression indicated that despite the shared variance, only the RSQ predicted the experience of TRI, while only dysphoria accounted for any of the variance in the measure of TUT. It seems unlikely that this pattern of correlations is merely a statistical artefact, particularly when one considers that this finding is replicable using both the long and short forms of the RSQ and two different measures of thinking [7], consistent across two different tasks [7, 33] and broadly consistent with the consequences of a rumination induction procedure [6]. In fact, one way to interpret the findings described in this article is that it provides a source of content validity for the utility of the RSQ, because, relative to the measure of dysphoria, it can distinguish between two components of subjective experience. Irrespective of the overlap between the measures employed, it seems likely that whatever is being measured by the RSQ does not relate to the two measures of subjective experience routinely employed in studies of ongoing consciousness [7, 26, 27] in the same manner as the measure of dysphoria we have employed. This distinction may ultimately be important in understanding how rumination amplifies the duration and or intensity of a negative mood [30].

Overall, the limitations of this research notwithstanding, the most important conclusions of the research presented in this article are concerned with the specificity of the two components of subjective experience (TUT and TRI) to the respective constructs of dysphoria and rumination. This dissociation between thinking styles is broadly replicable [6, 7] and provides a new methodology for the assessment and investigation of the cognitive-affective cycle. Irrespective of how the attentional capacity of the individuals or the explicit mood of the participants is involved in this process, we can distinguish the phenomenological experiences of rumination, as defined by the RSQ, from those associated with dysphoria. This dissociation allows future research to explicitly investigate how different components of subjective experience might contribute to enhanced vulnerability to psychological problems [4].

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