Inflated Responsibility and Perseverative Checking: The Effect of Negative Mood

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This article reports the results of 2 experiments designed to test predictions from the mood-as-input hypothesis on the role of inflated responsibility in perseverative checking. Through the use of an analog checking task in both experiments, the authors showed that perseveration, as indicated by a range of measures relevant to compulsive checking, was affected by a combination of the level of inflated responsibility and the valency of mood at the outset of checking. In particular, inflated responsibility significantly facilitated checking perseveration only in the context of a negative mood and was not a sufficient condition for checking perseveration to occur. These effects of the various configurations of inflated responsibility and mood valency are predicted by the mood-as-input hypothesis.

Compulsive checking is an example of a number of perseverative psychopathologies characterized by the dysfunctional perseveration of certain thoughts, behaviors, or activities. Other examples include pathological worrying, which is the current cardinal diagnostic feature of generalized anxiety disorder (GAD) per the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association, 1994), and rumination, which has been recognized as an important maintaining factor in depression (e.g., Nolen-Hoeksema, 2000). In almost all examples of these psychopathologies, the perseveration is viewed as excessive, out of proportion to the functional purpose that it serves, and a source of emotional discomfort for the individual concerned.

One recent theoretical model that has been applied to the understanding of perseverative psychopathologies generally, and compulsive checking in particular, is the mood-as-input hypothesis (Martin & Davies, 1998; Martin, Ward, Achee, & Wyer, 1993). This model explains perseveration at a task by proposing that perseveration is determined by a combination of the stop rules for the task and the individual’s concurrent mood. For example, participants in a negative mood interpret their mood in relation to the task and the individual’s concurrent mood. For example, participants in a negative mood interpret their mood in relation to the task. There is compelling clinical evidence to suggest that this is the configuration of mood and stop rule in which compulsive checkers do approach their checking tasks. For example, compulsive checkers report significantly higher levels of negative mood, both generally (Frost, Sher & Geen, 1986) and while engaging in checking (Salkovskis, 1985), than do noncheckers. In addition, individuals suffering from obsessive–compulsive disorder (OCD) score significantly higher than do control participants on the dispositional characteristic of inflated responsibility. Excessive or inflated responsibility can be defined in terms of the individual’s belief in his or her power to cause negative outcomes (Rheuma, Ladouceur, Freeston, & Letarte, 1994; Wilson & Chambless, 1999). That compulsive checkers possess inflated responsibility beliefs would indicate that they deploy inherent “as many as can” stop rules during a checking task. That is, they would be motivated to ensure that they have successfully completed the checking task in order to avoid any potentially harmful or negative consequences of failing to check.

The present series of two studies is designed to investigate some predictions from the mood-as-input hypothesis. In Experiment 1, we compared checking perseveration in participants who scored either high or low on inflated responsibility measures when undertaking the checking task when they were in either a positive or negative mood; and in Experiment 2, we used an inflated responsibility induction procedure that induced either high- or low-levels of responsibility in nonclinical analog participants. The mood-as-
input hypothesis predicts that high responsibility should only facilitate checking activity when the participants are in a negative mood.

**Experiment 1**

There is now considerable evidence that inflated responsibility is a characteristic that is a central causal feature of OCD generally (Salkovskis et al., 2000; Salkovskis, Shafran, Rachman, & Freston, 1999) and compulsive checking specifically (Bouchard, Rheumae, & Ladouceur, 1999; Foa, Sacks, Tolin, Prezowski, & Amir, 2002; Mancini, D’Olimpio, & Ercole, 2001; Rachman, 2002).

Although there is little doubt that inflated responsibility is critically involved in OCD and has a causal influence (Bouchard et al., 1999; Ladouceur et al., 1995; Lopatka & Rachman, 1995), there has been little speculation about the exact mechanism by which inflated responsibility generates compulsive or perseverative activities.

If the mood-as-input view is applicable to open-ended checking tasks, then the valency of concurrent mood should influence the extent of checking perseveration in individuals who are driven to compulsively check by inflated responsibility. We designed Experiment 1 to investigate this possibility. We asked nonclinical participants who scored either high or low on the Responsibility Attitude Scale (RAS; Salkovskis et al., 2000) to undertake an open-ended analog checking task in either an induced positive or negative mood. The mood-as-input hypothesis predicts that (a) participants with high RAS scores will indulge in more checking activities when they are in a negative mood than when they are in a positive mood, and (b) if negative mood is a necessary condition for perseveration to occur in high RAS participants, there should be no difference in levels of perseverance between high-RAS participants in a positive mood and low-RAS participants generally.

**Method**

**Participants**

The participants were 70 undergraduate and postgraduate students and staff (men: 70; women: 49) from the University of Sussex. Ages ranged from 18 to 62 years ($M = 26.6$). All were volunteers who were paid a small fee for participating in the study.

**Procedure**

**Stage I: Questionnaire completion.** After completing an informed consent form, participants completed the Maudsley Obsessive–Compulsive Inventory (MOCI; Hodgson & Rachman, 1977), which was designed to measure obsessive–compulsive symptoms, and the RAS, which was designed to measure responsibility-related beliefs as they apply to OCD.

**Stage II: Mood Measure 1.** All participants rated their current levels of sadness, anxiety, and happiness on separate visual-analog 100-point scales ranging from 0 (not at all sad/anxious/happy) to 100 (extremely sad/anxious/happy).

**Stage III: Mood induction.** The experimenter randomly assigned participants to either a positive (POS) or negative (NEG) musical mood induction condition. Participants were given a set of headphones that enabled them to listen to a short piece of music. The experimenter asked the NEG mood condition group to listen to 8 min of Gyorgy Ligeti, *Lux Aeterna*. An angle poise lamp produced a subdued lighting effect in the experimental room. The POS mood condition group listened to 8 min of a passage from Vivaldi’s *Four Seasons: Spring*. For the positive condition, the room was fully lit with both overhead lights and the angle poise on the table (see Cavanagh, 1999; Davey, Startup, Zara, MacDonald, & Field, 2003).

**Stage IV: Mood Measure 2.** The experimenter then asked all participants to complete the visual analog mood measures for a second time, as a manipulation check.

**Stage V: Checking task.** The experimenter instructed participants that they would now be reading a piece of text that might be used in future secondary-level mathematics examinations and that the text had not yet been proof read. Approximately 100 random spelling and punctuation errors were added to a passage of 41 lines of text taken from Coolican (1994). The experimenter instructed participants to make a note of any typing, punctuation, or grammatical errors that they might find and to note them on the sheet provided. The experimenter also told them that if necessary they should go back and recheck each line for errors and to note (in tally form) the number of times that they rechecked each line. This instruction was reiterated in written form. Thus, each participant provided a number of tallies for each line (i.e., the number of times they went back to check each line), the total number of lines that they rechecked, and, by totaling all the tallies, the experimenter determined the total number of rechecks in the task. The experimenter used a stopwatch to measure the amount of time spent checking. Participants were to inform the experimenter as soon as they felt that they had completed the task. At the end, the experimenter debriefed and thanked the participants.

**Results**

**Participant Characteristics**

Participants in both the NEG and POS mood groups were split into high- and low-responsibility groups on the basis of a tertile split on RAS scores. This gave rise to four subgroups: NEG mood/high RAS ($n = 10$), NEG mood/low RAS ($n = 10$), POS mood/high RAS ($n = 11$), and POS mood/low RAS ($n = 10$). The mean RAS scores were 4.95 ($SD = .54$) for selected high-responsibility participants and 2.64 ($SD = .56$) for low-responsibility participants. These mean scores compared with mean scores of 3.48 ($SD = 1.01$) for a nonclinical population and 4.69 ($SD = 1.01$) for individuals diagnosed with OCD reported by Salkovskis et al. (2000). A two-way analysis of variance (ANOVA; High/Low RAS × NEG/POS Mood) exhibited a main effect of RAS, $F(1, 37) = 182.0, p < .01$, in which high-responsibility participants scored significantly higher than did low-responsibility participants. There was no significant effect of mood group ($F < 1$), nor was there a significant RAS × Mood Group interaction ($p > 1$).

Participants in the high-responsibility condition also scored significantly higher than did low-responsibility participants on the MOCI subscales measuring checking, $t(39) = 2.93, p < .01$; slowness, $t(39) = 3.09, p < .05$; doubting, $t(39) = 4.55, p < .01$; and obsessiveness, $t(39) = 3.03, p < .05$. There was no significant difference between high- and low-responsibility groups on the MOCI washing subscale, $t(39) = 0.23, p = .81$.

**Mood Induction Procedures**

Ratings for anxiety and sadness exhibited a significant before/after Mood Group interaction (both $F$s > 6.40; both $p$s < .02). Subsequent pairwise comparisons showed that participants in the NEG mood group exhibited a significantly higher rating of anxiety and sadness after the mood manipulation than did participants in the POS mood group (both $t$s > 2.18; both $p$s < .05).
These results suggest that the mood manipulation procedure was effective in making the NEG mood group significantly more anxious and sadder than the POS mood group.

**Checking Perseveration Measures**

Initial analyses indicated that the four checking measures (i.e., the total number of checks in the task, the highest number of rechecks of a single line, the total number of lines checked, and the total time spent checking) were highly intercorrelated (all $r[s] < .89 > .34$; all $p[s] < .05$).

Figure 1 presents the data for a representative dependent measure, the total number of checks performed. The results of a two-way ANOVA (POS/NEG Mood $\times$ High/Low RAS) on total number of checks indicated a significant main effect of responsibility level, $F(1, 37) = 6.04, p < .02$, and a highly significant Mood $\times$ RAS interaction, $F(1, 37) = 31.72, p < .01, r = .6$. The main effect of mood was nonsignificant ($p > 1$). Subsequent multiple Bonferroni comparisons showed that the NEG mood/high RAS group performed significantly more total checks than did the NEG mood/low RAS and POS mood/high RAS groups (both $p < .002$); the POS mood/low RAS group performed significantly more checks than did the NEG mood/low RAS group ($p < .05$). There were no other significant group pairwise comparisons. Analyses of the other three dependent variables showed a similar pattern of perseveration across groups (see Experiment 2 for a full analysis of these dependent variables).

**Discussion**

The results of Experiment 1 are consistent with the predictions derived from the mood-as-input account of perseverative checking: (a) High-responsibility participants showed significantly greater perseveration of checking behaviors when they were in a negative mood than when they were in a positive mood, and (b) high-responsibility participants not in a negative mood (POS mood/high RAS group) showed levels of checking perseveration that were no different from those exhibited by low-responsibility participants. These findings suggest that high levels of inflated responsibility may not be a sufficient condition for compulsive checking to be exhibited but may only generate perseveration in combination with negative mood.

Although the participants in Experiment 1 were not selected to directly represent a group at risk for OCD, the high-responsibility group did exhibit a mean RAS score (and SD) that was very favorably comparable with the mean RAS score found for a group of 83 participants diagnosed as suffering from OCD as measured by the Structured Clinical Interview (SCID; Salkovskis et al., 2000) for the *DSM–IV*.

It is interesting to note that checking perseveration in participants with low responsibility given a positive mood induction was not significantly different from that in the compulsive-checking analog group (high responsibility/negative mood). This is not a comparison that has any direct relevance to clinically defined compulsive checking because individuals with OCD do not normally exhibit low responsibility or durable positive mood. However, it is an effect that is predicted by the mood-as-input hypothesis if it is assumed that low responsibility leads to the deployment of “feel like continuing” rather than “as many as can” stop rules. If such individuals begin the checking task by deciding to stop when they simply “feel” like it, then their positive mood would indicate that they are enjoying the task and they will continue with it. This would also explain why participants in the POS mood/low RAS group performed more checking than did those in the POS mood/high RAS group. This is because positive mood should inform participants that they are enjoying the task and should continue when deploying “feel like continuing” rules but that they have achieved their goals (and so stop earlier) when deploying “as many as can” rules. Nevertheless, it must be pointed out that no direct measures of the type of stop rules used by high- and low-responsibility participants were taken in the present study, and this should be included in future studies that use a suitable stop rule check list prior to the checking task (see Davey, Startup, MacDonald, Jenkins, & Patterson, in press).

Whereas Experiment 1 confirmed mood-as-input predictions about inflated responsibility and checking perseveration, it has done so by using a task that has no obvious negative consequences for failure to check as well as through the use of participant populations that inherently possess either high or low levels of inflated responsibility and who also differ on characteristics other than responsibility (e.g., scores on the checking, slowness, doubting, and obsessiveness subscales of the MOCI). To address some of these issues, in Experiment 2 we adopted a responsibility manipulation procedure prior to assessing performance on a checking task. This allowed an assessment of whether artificially inflated responsibility with explicit negative outcomes for failure to check properly also complies with predictions from the mood-as-input hypothesis.

**Experiment 2**

A number of experimental studies that have manipulated inflated responsibility have appeared to demonstrate a direct effect...
of responsibility on checking performance (Bouchard et al., 1999; Ladouceur et al., 1995; Lopatka & Rachman, 1995).

However, though these studies seem to imply a direct causal relationship, the mood-as-input hypothesis suggests that increases in inflated responsibility should especially facilitate checking performance in the context of a negative mood. Thus, in Experiment 2 we manipulated both responsibility and mood. The mood-as-input hypothesis predicts that induced inflated responsibility should only result in facilitated checking behavior when configured with a negative mood.

Method

Participants

The participants were 52 undergraduate and postgraduate students and staff (men: 27; women: 33) from the University of Sussex who were recruited in pairs and asked to attend the experimental session together. Ages ranged from 18 to 36 years (M = 22.8). All were volunteers who were paid a small fee for their participation.

Procedure

The experimenter told each pair of participants that they would take part in the experiment one after the other. The experimenter then told the first of the pair (P1) that he or she would be asked to listen to an extract of music (the mood induction phase) and then to read and comment on a passage of text (the checking task). After the participants gave their informed consent, they were randomly assigned to one of two groups. These groups were labeled NEG (n = 26) and POS (n = 26), depending on the valency of the mood induction they received. The experimenter asked the second participant (P2) to wait outside the experimental room until it was his or her turn to participate.

Stage I: Pre-mood induction Mood Measure 1. All participants rated their current levels of sadness, happiness, and anxiety on separate 100-point visual analog scales (see Experiment 1).

Stage II: Mood induction. The experimenter randomly assigned P1 participants to one of the two mood induction conditions—negative or positive. These induction procedures were the same as those described in Experiment 1.

Stage III: Mood Measure 2. All participants completed the visual analog mood measures for a second time, as a manipulation check.

Stage IV: Responsibility instructions. P1s received a written instruction advising them that after they finished the checking task and completed the experiment they would be asked to leave the room. Their experimental “partner” (P2) would then undertake the same task on the same piece of text. However, if P2 found any errors that P1 had overlooked, P2 would have to stay behind and continue to look for errors in the text for a further 15 min after completion of the task. This was the high-responsibility manipulation that involved a tangible negative outcome for failure to check properly.

Stage V: Checking task. P1 performed the same proofreading checking task as described in Experiment 1 under the same instructions.

Stage VI: Posttask. After the P1s completed the checking task, the experimenter debriefed, paid, and thanked them for their participation.

Stage VII: P1 procedure. The experimenter then asked P2 to enter the experimental room, and P2 then went through exactly the same stages as P1 except that he or she did not receive the responsibility instructions that P1 received in Stage IV. P2 participants acted as a low-responsibility comparison to P1 participants.

Results

Mood Induction Procedures

Ratings for anxiety and sadness exhibited a significant Before/After × Mood Group interaction (both Fs > 22.84; both ps < .01). Subsequent pairwise comparisons revealed that the NEG group exhibited significantly higher levels of anxiety and sadness than did the POS group after the mood induction (both ts[50] > 3.25; both ps < .05).

These results show that the mood induction procedure was successful in producing significantly higher levels of negative mood in the NEG group than in the POS group.

Checking Perseveration Measures

We conducted analyses to investigate the effects of mood group and high/low responsibility on checking perseveration by using the four checking measures adopted in Experiment 1. Figure 2 shows how participants in each of the four conditions performed on these measures.

Total number of checks. The results of a two-way ANOVA (POS/NEG Mood × High/Low Responsibility) on total number of checks indicated a nonsignificant main effect of responsibility level, F(1, 48) = 3.87, p = .06, and a highly significant Mood × Responsibility interaction, F(1, 48) = 36.10, p < .01, r = .6. The main effect of mood was nonsignificant (p > 1). Subsequent multiple Bonferroni comparisons showed that the NEG mood/high responsibility group performed significantly more total checks than did both the NEG mood/low responsibility group and the POS mood/high responsibility group (both ps < .001); the POS mood/low responsibility group performed significantly more checks than did both the NEG mood/low responsibility group (p < .001) and the POS/high responsibility group (p < .05). There were no other significant group pairwise comparisons.

Highest number of rechecks of a single line. A two-way ANOVA revealed no significant main effects of either responsibility or mood group (ps > .2) but it did reveal a significant Mood × Responsibility interaction, F(1, 48) = 47.59, p < .01, r = .6. Bonferroni comparisons showed that the NEG mood/high responsibility group showed a higher number of rechecks than did both the NEG mood/low responsibility and the POS mood/high responsibility groups (both ps < .001). The POS/low responsibility group showed more rechecks than did both the POS/high responsibility and the NEG/low responsibility groups (both ps < .001). There were no other significant comparisons.

Total number of lines rechecked. A two-way ANOVA showed a significant main effect of responsibility, F(1, 48) = 6.47, p < .02, and a significant Mood × Responsibility interaction, F(1, 48) = 9.52, p < .05, r = .4. There was no significant main effect of mood group. Bonferroni pairwise comparisons showed that the NEG mood/high responsibility group rechecked significantly more lines than did the NEG mood/low responsibility group (p < .002), and the NEG/low responsibility group rechecked significantly fewer lines than did both the POS/high responsibility group and the POS/low responsibility group (both ps < .05). There were no other significant comparisons.

Total time spent checking. A two-way ANOVA exhibited a significant main effect of responsibility, F(1, 48) = 12.31, p < .02, and a significant Mood × Responsibility interaction, F(1, 48) = 62.02, p < .01, r = .7. There was no significant main effect of mood group. Pairwise comparisons revealed that the NEG mood/high responsibility group spent more time checking than did the other three groups (all ps < .01). The POS/low responsibility group spent significantly more time checking than did both the POS/high responsibility group and the NEG/low responsibility group.
These results show that the NEG mood/high responsibility condition resulted in significantly greater checking perseveration than the NEG mood/low responsibility and POS mood/high responsibility conditions. NEG mood/high responsibility participants spent significantly more time checking than participants in all other conditions.

Figure 2. (A) Overall number of checks, (B) Total number of lines rechecked, (C) Highest number of rechecks in a single line, and (D) Total time (in minutes) spent checking as a function of mood induction and stop rule for high and low responsibility and positive and negative mood groups in Experiment 2. Bars show means and error bars show 95% confidence intervals. Solid bars show high-responsibility participants; open bars show low-responsibility participants.
Discussion

The main effect of responsibility found with three out of four measures of checking perseveration suggests that manipulation of this variable does directly influence checking perseveration. However, in individual groups, checking perseveration was significantly influenced by the combination of responsibility and negative mood. In particular, the combination of negative mood and high responsibility appeared to generate most perseveration, and this group spent significantly more time on the checking task than did the three other groups. Similarly, high responsibility was not sufficient to generate checking perseveration because the high responsibility/positive mood condition generated significantly less checking behavior than did the low responsibility/positive mood condition. Clearly, any effect of high responsibility is significantly modulated by the concurrent mood conditions under which checking is performed.

General Discussion

The results of the two experiments reported in this article indicate that though inflated responsibility does appear to influence the perseveration of checking behaviors, its effects are significantly modulated by concurrent mood conditions. In particular, inflated responsibility significantly facilitates checking perseveration in the context of a negative mood. Both Experiments 1 and 2 also demonstrated that high levels of responsibility alone are not a sufficient condition for checking perseveration. These results are quite consistent with a mood-as-input account of compulsive checking (Davey et al., 2003; MacDonald & Davey, in press), which predicts that perseveration at any open-ended task such as checking should be determined by the configuration of stop rule and concurrent mood.

Although conducted on an analog population, these studies demonstrated that the circumstances in which checking perseveration was severest was under conditions that most closely resembled characteristics possessed by clinically diagnosed compulsive checkers—for example, as in instances with high levels of responsibility and significant concurrent negative mood (Frost et al., 1986; Salkovskis, 1985; Salkovskis et al., 2000). In addition, participants possessed levels of inflated responsibility that were favorably comparable with those found in OCD clinical populations (Experiment 1). They undertook checking tasks that had tangible negative outcomes for failure to check properly (Experiment 2), and both studies used dependent variables that measured important aspects of compulsive checking performance (e.g., time spent checking, rechecking of single items).

The present findings have a number of implications for the understanding of the mechanisms that underlie perseverative and compulsive checking. For example, current descriptions of the mechanisms by which inflated responsibility might have its effect on compulsive checking are relatively underdeveloped. They are generally restricted to descriptions of the basic appraisals that might be required to initiate compulsive checking, or to ensure the perceived threat has been removed (Rachman, 2002; Salkovskis et al., 2000). No current model makes clear predictions about the kinds of information that feed into these appraisals to influence decisions about the initiation or termination of a checking bout. However, the mood-as-input hypothesis does make some comparative predictions about perseveration at the task (see Martin & Davies, 1998). The process of how mood is used as information in the context of deployed stop rules for a task may well serve as the basis for an explanation of perseverative psychopathology in general and compulsive checking in particular. Indeed, the mood-as-input hypothesis shares a number of characteristics in common with other psychopathology constructs in which individuals experiencing negative moods are biased toward drawing invalid conclusions from their moods (e.g., emotional reasoning; Arntz, Rauener, & van den Hout, 1995).

Although the results of the two studies described in this article are consistent in supporting predictions from the mood-as-input hypothesis, it must be borne in mind that mood-as-input is still an implied process that has not been directly measured. Further studies are needed to confirm and clarify the cognitive processes operating at a proximal level that influence implicit judgments about whether to continue or to terminate an open-ended task such as checking.

Finally, it has to be considered that the patterns of results found in these experiments might be the result of demand characteristics generated by the mood inductions and the instructions informing participants how to note their checking behavior. However, this is unlikely for a number of reasons: (a) the pattern of results was consistent with those from other mood-as-input studies that have used tasks other than checking (e.g., Davey et al., in press; Martin et al., 1993), and (b) mood inductions had quite differential effects depending on either the dispositional characteristics of the participant (Experiment 1) or a between-participants experimental manipulation of responsibility that would not have been obvious to the individual participant.

References


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