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Amelia Gangemi [a], Francesco Mancini [b] & P. N. Johnson-Laird [c]
[a] Dipartimento di Scienze Cognitive, University of Messina, Messina, Italy
[b] Scuola di Psicoterapia Cognitiva, Rome, Italy
[c] Department of Psychology, Princeton University, Princeton, NJ, USA
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# Models and cognitive change in psychopathology

**Amelia Gangemi[1], Francesco Mancini[2], and P. N. Johnson-Laird[3]**

[1]Dipartimento di Scienze Cognitive, University of Messina, Messina, Italy
[2]Scuola di Psicoterapia Cognitiva, Rome, Italy
[3]Department of Psychology, Princeton University, Princeton, NJ, USA



The hyper-emotion theory attributes psychological illnesses to emotions of aberrant intensity, which in turn prompt better reasoning about their causes. Two experiments in which participants drew their own conclusions from syllogistic premises tested this prediction. Individuals from the same populations as the experimental participants rated the believability of likely conclusions. One experiment compared patients with depression with controls, and the other experiment compared students scoring high on anxiety with controls. Controls tended to draw believable conclusions and not to draw unbelievable conclusions, and this belief bias was greater for invalid inferences. The clinical groups were better reasoners than the controls, and did not show belief bias. As our hypothesis predicted, they drew many more valid conclusions concerning their illness than controls drew valid believable conclusions. But, contrary to the hypothesis, they refrained from drawing invalid conclusions about neutral topics more than controls refrained from drawing invalid unbelievable conclusions.

***Keywords:*** Beliefs; Emotions; Hyper-emotion theory; Reasoning; Psychological illnesses; Syllogisms.

The maintenance of psychological illnesses and their resistance to change is a paradox: individuals who fear catastrophe continue to do so despite their survival. Cognitive models of psychopathology therefore focus on the dysfunctional beliefs that help to create and to maintain these illnesses (e.g., Beck, 1976; Harvey, Watkins, Mansell, & Shafran, 2004; Johnson-Laird, Mancini, & Gangemi, 2006). Some clinicians emphasise that cognitive biases may explain why patients fail to revise these beliefs (e.g., Hirsch & Clark, 2004). One such case is the well-established "belief bias" in reasoning: individuals tend to accept believable conclusions and to reject unbelievable conclusions, and the bias is larger for conclusions that do not follow validly from the premises than for those that do (Evans, Barston, & Pollard, 1983). The same bias occurs when individuals draw their own conclusions from premises (Oakhill & Johnson-Laird, 1985). Its systematic occurrence could inhibit mentally ill individuals from giving up pathological beliefs. A study examined the bias in patients with spider phobia (de Jong, Weertman, Horselenberg, & van den Hout, 1997). They and control participants evaluated the validity of given conclusions that were either relevant to the phobia or neutral. The phobics had a greater belief bias than the controls, but it was bigger for neutral syllogisms than for those pertinent to their phobia. Vroling and de Jong (2009) showed that the degree of social anxiety in

Correspondence should be addressed to Amelia Gangemi, Dipartimento di Scienze Cognitive, Università di Messina, Via Concezione, 6–8, 98122-Messina, Italy. E-mail: gangemia@unime.it

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students correlated with the time that it took them to evaluate linear syllogisms with contents relevant to this anxiety, but not with neutral linear syllogisms. These authors concluded that socially anxious individuals reason normally, but have difficulty in evaluating information pertinent to their beliefs.

An alternative view comes from the hyper-emotion theory of psychopathology (Johnson-Laird et al., 2006). It postulates that psychological illnesses are disorders in which individuals have emotions appropriate to the situation but inappropriate in their intensity. The theory is based on a cognitive view of emotions in which conscious or unconscious evaluations predispose individuals to certain courses of thought and action (Oatley & Johnson-Laird, 1987). Hence, when individuals have a hyper-emotion, they are bound to reason about its cause and over the long term to improve their ability to do so. The paradoxical effect is that this improvement in reasoning contributes to the maintenance of psychological disorders, leading to the systematic confirmation of dysfunctional beliefs inherent in these illnesses.

Recent studies imply that when emotions are incidental or irrelevant to the topic of inference, they burden the system and lead to poorer reasoning (e.g., Blanchette & Richards, 2010). But when emotions are integral or relevant to the topic of inference, they improve reasoning (Blanchette & Campbell, 2005; Johnson-Laird et al., 2006). So, how do emotions explain an improvement in reasoning? The model theory of reasoning offers a hypothesis. The theory postulates that reasoning depends on envisaging possibilities (e.g., Bucciarelli & Johnson-Laird, 1999; Johnson-Laird, 2006), and so emotions induced by the topic lead individuals to make a more comprehensive search for possibilities pertinent to their cause than the search they make in other cases (Johnson-Laird et al., 2006). Emotions should therefore dominate beliefs in the case of those suffering from psychological illnesses, and so improved reasoning should be more likely to occur than belief bias.

To test this hypothesis, we compared the reasoning of individuals with clinical and subclinical disorders with the reasoning of control participants. The hypothesis predicts that clinical and subclinical groups should draw valid conclusions from premises relevant to their illnesses to a greater extent than from neutral premises, and this difference should be greater than the corresponding difference for control groups. The clinical and subclinical groups should also perform more accurately than the control groups with syllogisms that do not yield valid conclusions. In contrast, belief bias predicts that individuals should tend to draw believable conclusions rather than unbelievable conclusions, and that they should tend to do so to a greater extent for invalid inferences than for valid inferences. In order to establish an effect on reasoning, the experiments used a task in which the participants had to draw their own spontaneous conclusions rather than to evaluate given conclusions. The inferences were based on syllogisms couched in everyday language, such as:

- In some cases when I go out, I am not in company.
- Every time I am very happy, I am in company.
- What follows?

A valid conclusion is:

- In some cases when I go out, I am not very happy.

The task was sufficiently demanding that a useful measure of performance was accuracy in reasoning. In order to assess belief bias, we carried out a preliminary study of the relative believability of the putative conclusions for clinical, subclinical, and control participants.

## EXPERIMENT 1

Our first experiment investigated the reasoning of patients suffering from clinical depression. A separate preliminary study examined a set of 40 putative conclusions, half of which should be more credible for depressed patients than for non-clinical controls, and half of which should be more credible for non-clinical controls than for depressed patients. In this preliminary study, 20 depressed patients and 32 non-clinical participants, matched for age, gender, and level of education, rated the believability of the 40 conclusions on a seven-point Likert scale (from 1 = completely unbelievable to 7 = completely believable). From their ratings, we selected 20 conclusions that differed reliably in their believability between the two groups: 10 "depressing" conclusions that the patients tended to believe ($M = 3.77$, $SD = .88$) to a greater degree than the

controls did ($M = 2.73$, $SD = .98$, Mann-Whitney $U(52) = 132.5$, $z = 3.53$, $p < .001$), e.g., "Sometimes when I think of my future, I feel very pessimistic", and 10 "neutral" conclusions that the controls tended to believe ($M = 5.03$, $SD = .75$) to a greater degree than the patients did ($M = 4.1$, $SD = .91$, Mann-Whitney $U(52) = 147.5$, $z = 3.25$, $p < .001$), e.g., "Sometimes after I have met new friends, I feel most enthusiastic". These materials can be obtained from the first author. Both groups rated the neutral conclusions as more believable than the depressing conclusions, but the difference was larger for the control group than for the patient group. This difference between the groups enabled us to tease apart the effects of psychopathology from those of belief bias. Previous studies of syllogistic reasoning with neutral contents (e.g., Bucciarelli & Johnson-Laird, 1999; Johnson-Laird & Bara, 1984) enabled us to devise premises for Experiment 1 that were likely to elicit the putative conclusions, both for valid and for invalid syllogisms.

## Method

### *Participants*

The experiment tested two new groups from the same populations as those sampled in the preliminary rating study. One group consisted of 15 depressed patients (five men, 10 women, $M =$ 35 years, $SD = 6.45$, range 26–47) who were under treatment at the Centre for Cognitive Psychotherapy in Pisa, which specialises in cognitive therapy for depression, and so these patients were not on any anti-depressant medication. They were at the starting phase of treatment and were diagnosed using the Structured Clinical Interview and diagnosis for depression in DSM-IV-TR (SCID; First, Spitzer, Gibbon, & Williams, 1996). The other group consisted of 16 non-clinical controls (six men, 10 women, $M = 31$ years, $SD = 6.07$, range 24–42), who were screened in an abbreviated SCID interview. The two groups were similar in ages (Mann-Whitney $U(31) = 79$, $z =$ 1.62, *ns*) and educational level (patients: $M = 15$, $SD = 2$; controls: $M = 16$, $SD = 2$, Mann-Whitney $U(31) = 96.5$, $z = .98$, *ns*). All the participants carried out the Beck Depression Inventory (Beck, Rush, Shaw, & Emery, 1979), a 21-item self-report scale, focused on the cognitive symptoms of depression. Each item is scored on a scale from 0 to 3 with higher scores indicating a greater severity of depression. The score for the depressed group was $M = 22.13$ ($SD = 3.56$), and the score for the control group was $M = 4.81$ ($SD = 4.13$), and this difference was reliable (Mann-Whitney $U(31) = 0$, $z = 4.76$, $p < .001$).

We obtained a written informed consent from participants. None of the participants had received any formal training in logic, and none of them had taken part in a reasoning experiment before.

### *Materials and procedure*

Each participant carried out 20 trials, based on the 10 forms of syllogistic premises presented in Table 1. Four of the 10 forms validly yield definite conclusions interrelating the two end terms in the premises, and six of them do not. Each of the forms of syllogism was presented twice. One presentation was with contents likely to elicit conclusions more credible to the depressed participants than to controls, i.e., depressing conclusions, as in:

- Sometimes when I think of my future, I feel sad.
- Every time I feel sad, I'm very pessimistic.
- What follows?

The predicted and valid conclusion is:

- Sometimes when I think of my future, I'm very pessimistic.

The other presentation was with contents likely to elicit conclusions more credible to the controls than to depressed participants, i.e., neutral conclusions, as in:

- Sometimes when I look back at my life, I find myself smiling.
- Every time I find myself smiling, I feel very satisfied with myself.
- What follows?

The predicted and valid conclusion is:

- Sometimes when I look back at my life, I feel very satisfied with myself.

The resulting 20 syllogisms were presented in a different random order to each participant. The participants were instructed that for each pair of premises they had to state what conclusion, if any, followed of necessity given the truth of the

**TABLE 1**
The 10 forms of syllogism used in Experiments 1 and 2 with their frequent forms of conclusions in previous studies

| *Valid* | *Invalid* |
|---|---|
| Some B are A. | All A are B. |
| All B are C. | Some B are C. |
| [∴ Some A are C.] | [Some A are C; invalid.] |
| All B are A. | Some B are A. |
| Some B are C. | All C are B. |
| [∴ Some A are C.] | [Some C are A; invalid.] |
| Some A are not B. | Some A are B. |
| All C are B. | Some B are C. |
| [∴ Some A are not C.] | [Some A are C; invalid.] |
| All A are B. | Some B are A. |
| Some C are not B. | Some C are B. |
| [∴ Some C are not A.] | [Some C are A; invalid.] |
| | All A are B. |
| | Some B are not C. |
| | [Some A are not C; invalid.] |
| | Some B are not A. |
| | All C are B. |
| | [Some C are not A; invalid.] |

premises. They had to formulate the valid conclusion *in their own words*. If they thought there was no necessary conclusion, then they had to respond: ''nothing follows''.

## Results

Table 2 presents the percentages of the patients' and controls' responses, and for purposes of comparison it shows the mean ratings of believability from the preliminary study. Overall, the depressed patients made a greater percentage of correct responses (42%) than the controls (26%, Mann-Whitney $U(31) = 35.5$, $z = 3.38$, $p < .001$), and, as the table shows, the difference occurred for both the valid and the invalid syllogisms. The mean level of performance was comparable, or even slightly better, than performance in the literature for syllogisms of the 10 forms (see, e.g., Bucciarelli & Johnson-Laird, 1999). The patients were therefore better reasoners than the controls. However, the results reflected two reliable interactions. First, for the valid syllogisms, the patients drew more valid conclusions from premises about depression (77%) than from neutral premises (37%), and this difference was larger than the analogous difference for the control participants (43% neutral conclusions vs. 33% depressing conclusions; Mann-Whitney $U(31) = 15.0$, $z = 4.26$, $p < .001$). Second, for syllogisms with no valid conclusions, the patients responded ''nothing follows'' more often for neutral than for depressing conclusions (56% versus 8% correct rejections), and this difference was reliably larger than the analogous difference for the control participants (7% versus 28% correct rejections; Mann-Whitney, $U(31) = 0$, $z = 4.81$, $p < .001$).

The results make a striking contrast with the ratings of believability in the preliminary study in which both the clinical and control groups rated the neutral conclusions as more believable than the depressing conclusions. If the two groups were equally susceptible to belief bias, they should have tended to draw the neutral valid conclusions more often than they drew the depressing valid conclusions. That happened for the control participants. But it did not happen for the depressed patients: they drew more conclusions from depressing premises than from neutral premises. The outlier is clearly the patients' superior performance with depressing premises. For syllogisms with no valid conclusions, belief bias predicts that both groups should respond ''nothing follows'' more often for depressing

**TABLE 2**
The percentages of responses made by depressed patients and non-clinical controls in Experiment 1 to syllogisms with valid conclusions and to syllogisms with no valid conclusions crossed with ''depressing'' and ''neutral'' contents, and the mean ratings of believability from 1 (completely unbelievable) to 7 (completely believable) in a preliminary study in independent samples from the two populations

| | | *Groups* | | | |
|---|---|---|---|---|---|
| | | *Depressed patients* | | *Control participants* | |
| *Type of syllogism* | *Responses* | *Depressing conclusions* | *Neutral conclusions* | *Depressing conclusions* | *Neutral conclusions* |
| Ratings of believability of the likely conclusion | | 3.77 | 4.1 | 2.73 | 5.03 |
| With valid conclusions | Drew valid conclusion | 77 | 37 | 33 | 43 |
| | ''Nothing Follows'' | 23 | 63 | 67 | 57 |
| With no valid conclusions | Drew invalid conclusion | 92 | 44 | 72 | 93 |
| | ''Nothing Follows'' | 8 | 56 | 28 | 7 |

conclusions than for neutral conclusions. That happened for the control participants: their reasoning showed the usual effects of belief bias. But it did not happen for the depressed patients: they refrained from invalid conclusions more often from neutral premises than from depressing premises. The outlier in this case is the patients' superior performance with neutral premises. This result is at odds with our hypothesis that the patients should examine more possibilities concerning depressing premises and therefore infer that there is no valid conclusion—a point to which we return in the general discussion.



## EXPERIMENT 2

The second experiment examined the effects of anxiety on reasoning. As before, a preliminary study was carried out to select appropriate materials. We created a set of 40 putative conclusions, half of which should be more credible for anxious individuals prone to panic attacks than for non-clinical controls, and half of which should be more credible for non-clinical controls than for anxious individuals. In the preliminary study, two groups of participants (21 anxious individuals and 21 non-clinical controls), matched for age, gender, and education level, rated the believability of 40 putative conclusions on a seven-point scale. We then used their ratings to select a set of 20 conclusions that differed reliably in terms of their believability for the two groups: 10 anxiety-provoking conclusions that anxious individuals believed ($M = 4.54$, $SD = .42$) to a greater degree than non-clinical controls did ($M = 2.66$, $SD = .44$, Mann-Whitney $U(42) = 39$, $z = 4.57$, $p < .001$), e.g., ''Sometimes when I am in an elevator I find it difficult to breathe'', and 10 neutral conclusions that non-clinical controls believed ($M = 4.9$, $SD = .89$) to a greater degree than anxious individuals did ($M = 3.77$, $SD = .84$, Mann-Whitney $U(42) = 61.5$, $z = 3.87$, $p < .001$), e.g., ''Sometimes going in a ski chairlift I enjoy the panorama''. These materials can be obtained from the first author.

### Method

#### *Participants*

The experiment examined anxious individuals at high risk of panic attacks, and it compared them with non-clinical controls. The two groups were derived, as were those in the preliminary rating study, from their scores on the Anxiety Sensitivity Index (Peterson & Plehn, 1999), which provides a reliable and valid measure of anxiety and proneness to panic attacks (for a review, see Peterson & Plehn, 1999). The index, consisting of 16 items scored from 0 to 4, was given to 123 undergraduates at Cagliari University in Sardinia. We selected a group whose scores ($M = 40.5$, $n = 8$) were in the top 5% for anxiety, and a group whose scores ($M = 3.67$, $n = 12$) were in the bottom 5%. The two groups differed reliably in these scores (Mann-Whitney $U(20) = 0$, $z = 3.84$, $p < .001$). The two groups were otherwise similar in age (subclinical participants: $M = 26$, $SD = 8.7$, controls: $M = 24.4$, $SD = 7.2$, Mann-Whitney $U(20) = 46$, $z = .16$, *ns*).

#### *Design, materials, and procedure*

Experiment 2 had the same design and procedure as Experiment 1: the participants formulated their own conclusions or responded that nothing followed from the premises of the same set of 10 sorts of syllogistic premises, presented once with the anxiety-provoking contents and once with the neutral contents.

### Results

Table 3 shows that the pattern of results was the same as those in Experiment 1. The anxious participants made more correct responses (38%) than the control participants (22%; Mann-Whitney $U(20) = 1$, $z = 3.68$, $p < .001$), and the difference occurred both for syllogisms with valid conclusions and for syllogisms without such valid conclusions. Once more, however, there were two reliable interactions. First, for the valid syllogisms, the anxious participants drew more valid conclusions that were anxiety-provoking (75%) than those that were not (38%), and this difference was larger than the analogous difference for the control participants, which in fact was non-existent (33% neutral conclusions vs. 33% anxiety-provoking conclusions; Mann-Whitney $U(20) = 16$, $z = 2.55$, $p < .02$). Second, for syllogisms with no valid conclusions, anxious participants responded ''nothing follows'' more often for neutral than for anxiety-provoking conclusions (42% versus 8% correct rejections), and this difference was reliably larger than the analogous difference for

**TABLE 3**
The percentages of responses made by anxious and control participants in Experiment 2 to syllogisms with valid conclusions and to syllogisms with no valid conclusions crossed with "anxiety-provoking" and "neutral" contents, and the mean ratings of believability from 1 (completely unbelievable) to 7 (completely believable) in a preliminary study in independent samples from the two populations

| | | *Groups* | | | |
|---|---|---|---|---|---|
| | | *Anxious participants* | | *Control participants* | |
| *Type of syllogism* | *Responses* | *Anxiety-provoking conclusions* | *Neutral conclusions* | *Anxiety-provoking conclusions* | *Neutral conclusions* |
| Ratings of believability of the likely conclusion | | 4.54 | 3.77 | 2.66 | 4.9 |
| With valid conclusions | Drew valid conclusion | 75 | 38 | 33 | 33 |
| | "Nothing follows" | 25 | 62 | 67 | 67 |
| With no valid conclusions | Drew invalid conclusion | 92 | 58 | 78 | 94 |
| | "Nothing follows" | 8 | 42 | 22 | 6 |



the control participants (6% versus 22% correct rejections; Mann-Whitney $U(20) = 24$, $z = 2.1$, $p < .05$).

The belief ratings in the preliminary study showed that anxious individuals were slightly more likely to believe the anxiety-provoking putative conclusions than the neutral conclusions, and the control participants ratings switched in the other direction. Inferential performance (as shown in Table 3) reflected these ratings for the control participants, but not for the anxious participants. Once again, their performance with syllogisms lacking valid conclusions was contrary to our hypothesis: they were more likely to refrain from drawing invalid conclusions for the neutral contents.

## GENERAL DISCUSSION

Our experiments compared the syllogistic reasoning of depressed and highly anxious individuals with that of their respective control participants. The preliminary studies established the believability of the likely conclusions. The results showed that overall the depressed patients in Experiment 1 and the anxious participants in Experiment 2 reasoned more accurately than the controls did. In particular, they drew many more valid conclusions than the control groups; and they responded correctly that "nothing follows" from invalid syllogisms more often than the control groups. Even with the neutral contents, the clinical and subclinical groups reasoned no worse than the control participants (*pace* Beck, 1976). The clinical and non-clinical groups were matched for age, gender, and level of education, but it was impossible to obtain measures of the intelligence of the clinical groups. They could have been more intelligent, and therefore better reasoners, than the control groups (see Stanovich, 1999). However, level of education correlates with intelligence, and, moreover, an overall difference in ability fails to explain the same two interactions that occurred in both experiments. Hence, on balance, we doubt whether intelligence was a major factor distinguishing between the groups.

The experiments manipulated the believability of the conclusions that the participants were likely to draw, and so a tempting explanation is that the results merely reflect the well-known biasing effects of beliefs on reasoning (Evans et al., 1983; Oakhill & Johnson-Laird, 1985). Belief bias accounts for the inferential performance of the control participants, not for the clinical groups. The hyper-emotion theory postulates that pathology elicits intense emotions, which in turn improve reasoning about their causes. Hence, if these emotions are integral to reasoning they should enhance inferential performance as we and others have observed (e.g., Blanchette & Richards, 2010; Johnson-Laird et al., 2006). Our hypothesis explaining the effect was that the clinical groups should explore more possibilities in reasoning from premises pertinent to their pathology, and so they should tend to draw more valid conclusions from such premises

and fewer invalid conclusions from them. We corroborated the first of these predictions, but not the second of them: the clinical groups drew fewer invalid conclusions, not from premises relevant to their pathology, but from neutral premises. This result is contrary to our hypothesis about the mechanism, and it is also contrary to the claim that individuals reason correctly about ''protected values''; that is, issues they feel strongly about, more often than they do so about neutral issues (Blanchette & Richards, 2010; Tanner & Medin, 2004). So, what is the explanation?

Since we first designed the present studies, the study of syllogisms has undergone a change that may explain our results. There are 12 current theories of syllogistic reasoning, and they fall into three main categories: (1) heuristic theories based on the assumption that individuals do not reason, but use heuristics such as ''atmosphere'' or other features of the premises to guide their framing of conclusions (e.g., Begg & Denny, 1969); (2) theories based on formal rules of inference akin to those in logic (e.g., Rips, 1994); and (3) theories based on set-theoretic representations (e.g., the mental model theory). A recent meta-analysis has shown that none of these existing theories is satisfactory (Khemlani & Johnson-Laird, 2012). As a consequence, a new dual-process theory has been formulated in which heuristics govern the initial formulation of conclusions (System 1 in Stanovich's, 1999, terminology), and deliberations evaluate whether or not the initial conclusion holds in all models of the premises (System 2). The model theory of syllogisms was originally framed in this way, and the new theory—and its computer implementation of the two systems—reliably outperforms all the theories in the meta-analysis (Khemlani, Lotstein, & Johnson-Laird, 2012). The heuristics in the new theory construct just a single model and govern both the mood and the arrangement of terms in conclusions, and they yield all the predicted conclusions for the valid and invalid syllogisms in the present studies. Deliberation searches for alternative models, and this system is necessary if reasoners are to reject the putative conclusions to the invalid syllogisms.

We propose that emotions, and accordingly psychological illnesses, affect the intuitive system rather than the deliberative system. In particular, they bias System 1 to draw heuristic conclusions from premises pertinent to the individual's illness, and to refrain from doing so from premises with other sorts of content. As a consequence, the clinical and subclinical groups tend to draw heuristic conclusions about their illnesses, but to refrain from drawing conclusions about neutral topics. Belief bias cannot explain this latter phenomenon. In Experiment 1, the putative neutral conclusions were more credible than the depressing conclusions even for the clinical group; in Experiment 2, the difference in their credibility was smaller for the subclinical group than for the control group. In contrast to the depressed and anxious individuals, the control groups are affected by belief bias, which also affects the intuitive system of reasoning. In consequence, they tend to draw believable conclusions and to refrain from unbelievable conclusions. In addition, however, a preposterous conclusion may influence the deliberative stage of reasoning, and lead reasoners to search more assiduously for a model that refutes it (Oakhill & Johnson-Laird, 1985). Hence, the bias has a larger affect on invalid inferences than on valid inferences.

The effects of emotions and of beliefs can be subsumed under a general operating principle for System 1: it tends to draw conclusions from premises with certain contents, and to refrain from drawing conclusions from premises about other contents. This post hoc account obviously stands in need of independent investigation. It also stands in need of further refinement, because the clinical groups were more accurate in drawing valid conclusions than in refraining from invalid conclusions. Skeptics may retort that a mystery exists about how emotions explain reasoning in the present experiments. But the hyper-emotion theory does offer an explanation. It postulates that emotions induced by the topic lead individuals to be more motivated to draw conclusions pertinent to their source, and less motivated to draw conclusions about other contents. This effect coupled with normal inferential ability yields the pattern of inferences in our experiments.

Common sense about psychological illnesses suggests that they should depress cognitive performance in general. In contrast, the hyper-emotion theory postulates instead that an intense emotion produces a cognitive change that enhances reasoning about its potential cause (Johnson-Laird et al., 2006). The present experiments modify this account: emotions enhance the tendency to draw conclusions about their causes, and not about other matters. The result is to improve reasoning overall, but it affects the intuitive processes of System 1 rather than the deliberative processes of System 2. This improvement is consistent with the

growing body of evidence that patients with psychological illnesses can reason better than those who are mentally healthy (e.g., Johnson-Laird et al., 2006; Owen, Cutting, & David, 2007; Vroling & de Jong, 2009). Their increased accuracy may be counterproductive, because it leads to the persistence of dysfunctional cognitions and emotions that sustain their illnesses (e.g., Harvey et al., 2004). The therapeutic goal should accordingly be to undo the transitions from normal life to emotions of pathological intensity, and existing therapeutic procedures, including cognitive therapy, appear to have that effect. In sum, bad reasoning is not a prerogative of those suffering from psychological illnesses (*pace* Beck, 1976), and good reasoning is not a cure for their ills.

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