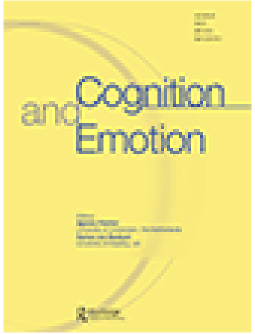

Cognition and Emotion

ISSN: 0269-9931 (Print) 1464-0600 (Online) Journal homepage: http://www.tandfonline.com/loi/pcem20

Dysphorics cannot ignore unpleasant information

Christian Frings , Dirk Wentura & Maike Holtz

To cite this article: Christian Frings , Dirk Wentura & Maike Holtz (2007) Dysphorics cannot ignore unpleasant information, Cognition and Emotion, 21:7, 1525-1534, DOI: 10.1080/02699930601054042

To link to this article: http://dx.doi.org/10.1080/02699930601054042

COGNITION AND EMOTION
2007, 21 (7), 1525–1534

Psychology Press
Taylor & Francis Group

Dysphorics cannot ignore unpleasant information

Christian Frings, Dirk Wentura, and Maike Holtz
Saarland University, Saarbrücken, Germany

Using a negative affective priming (NAP) design that allows the disentanglement of NAP for unpleasant and pleasant information, we found significant NAP only for unpleasant information for low scorers on the BDI, whereas high scorers showed significant but reversed NAP for unpleasant information and a significant NAP effect for pleasant information. The result is compatible with the hypothesis that depression is associated with an inability to suppress task-irrelevant negative information.

In a recent review on attentional biases in generalised anxiety disorder and depression, Mogg and Bradley (2005, p. 39) concluded on the basis of several studies that "there [is] no general attentional bias for external negative cues in clinical depression". However, following Joormann (2004), this general conclusion might be premature, because a specific aspect of selective attention has been largely ignored in research on attentional biases in depression. Typically, the modified ("emotional") Stroop task and the dot-probe task are used to test for attention-grabbing effects of negative stimuli. That is, the momentary distractibility by negative stimuli is assessed. Yet, it might be the case that negative information influences information processing of depressives in a more subtle way. Joormann (2004) suggested that the ability of depressives to inhibit negative task-irrelevant information may be limited.

With respect to this hypothesis, Joormann (2004) suggested using the negative affective priming (NAP) paradigm (Wentura, 1999) to analyse selective attention in dysphoric individuals. This paradigm is essentially a merger of the negative priming paradigm (for reviews see, e.g., Fox, 1995; Neill & Valdes, 1996; Tipper, 2001) with the affective priming paradigm (see Klauer & Musch, 2003; Wentura & Rothermund, 2003, for reviews). In the

Correspondence should be addressed to: Christian Frings, Saarland University, Faculty of Behavioral Sciences, Department of Psychology, Building A24, PO Box 15 11 50, D-66041 Saarbrücken, Germany. E-mail: c.frings@mx.uni-saarland.de

We want to thank Jan De Houwer for helpful comments on a previous version of this manuscript.

www.psypress.com/cogemotion DOI: 10.1080/02699930601054042

negative priming paradigm, usually two consecutive displays (the first called prime, the second called probe) are presented, each comprising a distractor and a target stimulus. Participants are instructed to respond to targets, while ignoring distractors. Reactions to targets are typically decelerated when the distractor of the previous trial is repeated as the target of the current trial (the ignored repetition condition), when compared to a control condition with unrepeated stimuli. One explanation is that the mental representation of the distractor is temporarily inhibited. Please note that there are several theories on negative priming that explain the negative priming effect by different mechanisms (see the reviews mentioned above). For now, however, it can be assumed that the effect indeed reflects the ignoring of the prime distractor. We will return to this issue in more detail in the general discussion.

In the NAP paradigm, valent stimuli are used as targets and distractors. Participants have to classify targets according to their valence. Wentura (1999) found that ignoring a prime trial distractor leads to a slower response in the probe trial, if the probe target matches the valence of the prime distractor. Joormann (2004) hypothesised that dysphoric individuals should show no NAP effects for negative words compared to nondysphoric individuals, due to their limited ability to ignore irrelevant, but negatively valenced information (see also, Goeleven, DeRaedt, Baert, & Koster, 2006). She reported preliminary results compatible to her hypotheses. However, she acknowledged several confounds in her design that prevent a safe interpretation of the results as a moderation of NAP effects for unpleasant information by dysphoric status. To be more specific, NAP for negative stimuli is calculated as the difference between mean response time (RT) to negative probe targets following a prime trial with a positive target and a positive distractor (i.e., the control condition) and mean RT to negative probe targets following a prime trial with a positive target and a negative distractor (i.e., the ignored repetition condition). Beside the confound of NAP for unpleasant information with the difference "congruent vs. incongruent prime trial", it is most important that there is a confound of NAP for unpleasant information with prime distractor valence. It might simply be the case that non-depressives are more irritated by task-irrelevant negative information and thus show a general (i.e., unspecific) slowing of responses, which is, however, only assessable in a subsequent trial. This reasoning is not far-fetched, since Fox (1994) as well as McKenna and Sharma (2004) found such a lag effect for negative information. To conclude, the exciting idea of reduced NAP for unpleasant information in depressives put forward by Joormann (2004) has hitherto not been tested in a confound-free design since it might be that NAP effects are differentially biased due to unspecific effects of prime distractor valence. To overcome this problem, we added a third, neutral, category to the response set; thus, in our design valence specific NAP effects can be compared with a neutral condition.

In this design, we can analyse valence-specific NAP effects (see Table 1). To do so, for unpleasant words, we compare RTs to negative probe targets following a negative prime distractor with RTs to negative probe targets following a positive prime distractor. Prime targets as well as probe distractors are always neutral. This difference score, however, is ambiguous. Differences might be due to an nonspecific effect of prime distractor valence. For example, any response following a negative prime distractor may be prolonged (see also Joormann, 2004). Therefore, we adjusted the difference score by an independent measure of this nonspecific effect, which is given by the neutral probe target trials (see Table 1 for the calculation of the PD score). A measure of NAP for positive valence can be analogously calculated by using the trials with positive probe targets for the primary difference, which is adjusted in the same way as the difference for negative valence. Note that the trials needed for the calculation of valence-specific NAP were embedded into filler trials. That is, overall we established a 3 × 3 (both prime and probe target valence: positive vs. negative vs. neutral) design. In accordance with other negative priming studies, distractor valence was always incongruent to target valence, for both the prime and the probe.

If variance in depression, as assessed by the Beck Depression Inventory (BDI) in a student sample, is associated with a difference in the processing of negative information, we should obtain a correlation between NAP for negative information and the BDI but no correlation between NAP for positive information and the BDI. Thus (relatively more) nondysphoric

TABLE 1
Essential experimental conditions in the modified NAP paradigm

	Prime distractor			
Probe target	*Negative*	*Positive*	*PD*	*NAP*
Negative	IR neg	C pos		(C − IR) − PD
Positive	C neg	IR pos		(C − IR) + PD
Neutral	neg	pos	pos−neg	

Note: The table comprises the description of those prime-probe sequences that were included into the analyses; for those sequences, prime target was always neutral and probe distractor was always incongruent to the probe target and the prime target (i.e., it was neutral for valent targets and positive or negative for neutral targets; see text for further explanations). IR = ignored repetition condition; C = control condition; neg, pos = potential, unspecific influences of negative vs. positive prime distractors; *PD* = unspecific effect of prime distractor valence; *NAP* = negative affective priming.

participants should be able to ignore negative distractors quite easily, whereas (relatively more) dysphoric participants should not be able to ignore negative distractors. Thus, for negative words, we expected NAP effects for (relatively more) nondysphoric participants, but no NAP effects for (relatively more) dysphoric participants.

METHOD

Participants

Forty-two undergraduate students took part in the experiment for course credit. All of them were German native speakers. Their median age was 21 years (range 19 to 44 years). Data of two further participants were excluded due to missing values on more than half the trials.

Material

In a pre-test with an independent sample ($N = 43$), we assessed the valence of thirty nouns from each valence category with a rating scale ranging from 1 (*very negative*) to 7 (*very positive*). We then chose eight German nouns for each valence category. These words had comparable word frequency (CELEX, 1993, Nijmegen, Netherlands, six million entries) and had four to six letters each. Moreover, in each category there were an equal number of concrete and abstract stimuli. The negative stimuli had an overall rating of $M = 1.86$ ($SD = 0.35$; ranging from 1.44 to 2.28). Neutral words had an average rating of $M = 4.12$ ($SD = 0.11$; ranging from 3.98 to 4.28), and positive stimuli had an average rating of $M = 6.08$ ($SD = 0.43$, ranging from 5.44 to 6.81).

Design

Essentially, the design comprised four within-subject factors. The Valence (positive vs. neutral vs. negative) of prime distractors, prime targets, probe distractors, and probe targets was varied, respectively (without using congruent conditions). Thus, there were 36 possible prime–probe sequences, including the sequences of interest (see above; see Table 1).

We expected a NAP effect for negative valence for nondysphoric participants (below median BDI scorers), whereas dysphoric participants (above median BDI scorers) should show no or even a positive NAP effect for negative words. For positive words, NAP effects should not differ across groups.

Procedure

Participants were tested individually in sound-proof chambers. Instructions for the NAP task were given on the screen. The NAP task was conducted with standard PCs using the Eprime software. Participants were instructed to categorise target stimuli according to valence as quickly and as accurately as possible by pressing one of three keys on a standard keyboard (H/K/Space for positive/negative/neutral, using the right index, middle finger and thumb). Each prime–probe sequence was as follows: First, an orientation marker was presented for 1000 ms at the screen centre. Then the prime display was presented, consisting in a target and distractor word with interleaved letters. Target words were presented in red, whereas distractor words were presented in green. Participants were instructed to categorise targets with respect to their valence and to ignore distractors. After the prime display response a blank screen was presented for 1000 ms before the probe display (also consisting of a red target and a green distractor interleaved) was shown, until participants had categorised the target. Overall, 360 experimental trials were conducted, in randomised order. That is, each prime–probe sequence was realised ten times. Word stimuli were randomly assigned to the roles of distractor or target (without replacement until a set was exhausted). Note, that a prime–probe sequence was always comprised of four different words. After the NAP-task, participants filled out a standard questionnaire on depression, namely the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; German version by Hautzinger, Bailer, Worall, & Keller, 1994).

RESULTS

Depression scale

Participants had an average BDI index of $M = 8$ raw points ($SD = 6$ raw points). The median was at $M = 6$ with a range of 1 to 24 raw points.

We analysed depression-moderated NAP effects in two different ways. Most appropriate is a correlational analysis correlating individual valence-specific NAP effects with depression. Most illustrative, however, is to introduce a median split of depression as a between-participants variable in the ANOVA, allowing for the calculation of mean NAP effects for low scorers (average BDI index $M = 3$ raw points, $SD = 2$ raw points) and high scorers (average BDI index $M = 12$ raw points, $SD = 5$ raw points).

Negative affective priming

Only correct probe reaction times that were above 200 ms and below three interquartile ranges above the third quartile of the overall reaction time distribution (i.e., 1473 ms; Tukey, 1977) and that followed correct reactions to the prime display were analysed. On this basis, 11.9% of all trials were discarded (probe error rate 4.6%). We restricted our analyses to those trials depicted in Table 1. That is, we only analysed trials with neutral prime targets (accompanied by either positive or negative distractors) followed by positive, negative, or neutral probe targets (accompanied by neutral distractors for positive and negative targets and positive/negative distractors for neutral targets, respectively). Mean RTs and error rates are given in Table 2.

In a 2 (Dysphoric Status: dysphoric vs. nondysphoric) $\times$ 2 (Prime Distractor Valence: positive vs. negative) $\times$ 3 (Probe Target Valence: positive vs. negative vs. neutral) mixed-factors ANOVA with mean RTs as the dependent variable, a significant three-way interaction was found, $F(2, 80) = 5.59$, $p = .005$. Thus, it can be concluded that the moderation of the difference between negative and positive prime distractors by probe target valence (i.e., NAP effects) depends on dysphoric status.

In the next step, we calculated NAP differences as outlined above (see Table 1). That is, we first subtracted the difference between the positive and negative prime-distractor condition for the positive and negative probe-target RTs, respectively, to obtain preliminary indices of NAP for negative and positive valence, respectively. Second, we adjusted these indices for the unspecific effect of prime-distractor valence, which is indexed by the difference between the positive and negative prime-distractor condition for neutral probe targets. Negative values indicated suppression of irrelevant negative (positive) distractors (see Table 2).

NAP for negative valence significantly correlated with the BDI, $r = .44$, $p = .003$, $t(40) = 2.95$, $p = .005$ for the difference in mean NAP between the median split samples. For nondysphorics, there was significant NAP, $t(18) = 1.74$, $p < .05$ (one-tailed), $d = 0.40$, whereas a significantly positive mean was found for dysphorics, $t(22) = 2.48$, $p < .05$, $d = 0.52$.

The pattern was almost reversed for positive valence, $r = -.30$, $p = .05$, $t(40) = 1.63$, $p = .11$ for the difference in mean NAP between the median split samples. There was significant NAP for dysphorics, $t(22) = 2.42$, $p < .05$, $d = 0.47$, whereas a null effect was found for nondysphorics, $t(18) = 0.14$, $p = .89$.

Analysis of errors revealed only a significant main effect of probe target valence, $F(2, 80) = 5.44$, $p < .01$, showing that participants made more errors when reacting to negative probe stimuli; no other significant effects were observed.

Finally, we also analysed whether the unspecific effect of prime distractor valence (PD) was significant. Over all participants, there was an average PD effect of $M = -18$ ms ($SD = 74$ ms) indicating numerically longer RTs after negative prime distractors; this effect was not significantly different from zero, $t(41) = 1.57$, $p = .12$. However, there was evidence that the PD effect

TABLE 2
Reaction times (in milliseconds) and error rates (in percentage) as a function of valence of probe target, priming condition, and dysphoric status for prime-probe sequences with neutral prime targets

	Nondysphorics prime distractor				*Dysphorics prime distractor*			
Probe target	*Negative*	*Positive*	*PD*	*NAP*	*Negative*	*Positive*	*PD*	*NAP*
Negative	788 (7.4)	732 (6.8)	–	−48*[a] [28]	708 (5.7)	748 (5.7)	–	+67* [27]
Positive	741 (2.6)	736 (5.3)	–	−3 [18]	695 (5.2)	721 (4.8)	–	−52* [23]
Neutral	754 (1.3)	746 (2.4)	−8 [19]	–	757 (3.0)	730 (4.6)	−27*[a] [14]	–

Note: Prime target is always neutral; probe distractor is always incongruent to the probe target and the prime target (i.e., it is neutral for valent targets and positive or negative for neutral targets). *PD* = unspecific effect of prime distractor valence (see Table 1); *NAP* = negative affective priming; standard error in squared brackets (see Table 1). [a]one-tailed. *$p < .05$.

correlated with the BDI, $r = -.25$, $p = .11$, but Spearman's $\phi = -.31$, $p < .05$. Dysphoric participants showed the PD effect, though not in a parametric test, $M = -26$ ms ($SD = 66$ ms), $t(22) = 1.90$, $p = .07$, but in a sign test, $p < .01$ (18 outof 23 participants showed a negative effect), whereas nondysphorics did not, $t(18) = 0.40$, $p = .70$, 12 of 19 participants showed this effect, $p = .36$, in a sign test.

DISCUSSION

The results are clear cut: NAP effects for negative words are modulated by dysphoric status. Dysphoric individuals probably could not ignore negative prime distractors and therefore showed no NAP effects. In contrast, nondysphoric participants showed significant (though small) NAP effects for negative words. Note, we corrected the NAP effects for unspecific effects of the prime distractor valence and thereby hedged against this alternative explanation. In fact, in our experiment, there was some evidence for a correlation of PD effect and dysphoric status. Hence without correcting for this effect, NAP and PD effects could not have been separated. Furthermore, the individual differences in PD (i.e., that especially dysphorics had a general slowing following a negative distractor) decrease individual differences in the NAP-index of the confounded design. Thus, using the confounded design might potentially result in a failure to replicate Joormann (2004). With the correction, however, our NAP effects for negative words can safely be interpreted as the ability to ignore negative stimuli, which is obviously modulated by dysphoric status. Our results therefore confirm the previous findings of Joormann (2004) and Goeleven et al. (2006) in a confound-free design.

Yet, even more meaningful than a median split for dysphoric status was the correlation between the depression scale and the NAP effect for negative words. The BDI was significantly correlated with NAP for negative words, whereas the correlation with NAP for positive words was reversed (albeit low). Moreover, correlations between NAP effects for positive and negative words with the BDI were significantly different; we see this as clear convergent and divergent validity for measuring an attentional bias regarding negative information in dysphoria.

It should be noted that we also observed different NAP effects for positive words as a function of dysphoric status. We found a significant negative effect for dysphoric participants, whereas for nondysphoric subjects a null effect was observed. It may be hypothesised that activated, but task-irrelevant, positive information is less likely to be ignored by nondysphoric individuals than neutral or negative information (see, e.g., Matlin & Stang, 1978; Peeters, 1971; Peeters & Czapinski, 1990), whereas dysphoric individuals tend to ignore activated, task-irrelevant, positive information. This result pattern clearly confirms our hypothesis that the lack of a NAP effect for negative stimuli is indeed a valence-specific phenomenon in dysphorics.

As mentioned above, there are several theories on negative priming that differ in their explanations of underlying mechanisms. Without going into detail, a coarse-grained taxonomy is to differentiate between inhibition and retrieval theories. Inhibition theories (e.g., Houghton & Tipper, 1994) assume that active inhibition of the prime distractor leads to slowed probe responses in the case of distractor-to-target repetition, since the representation of the distractor is suppressed when the stimulus is encountered in the probe. In contrast, retrieval theories (Milliken, Joordens, Merikle, & Seiffert, 1998; Neill, 1997; Rothermund, Wentura, & De Houwer, 2005) assume that in the probe display a stimulus retrieves its latest response information. In the case of distractors repeated as targets, this response information will interfere with the actually demanded response (since distractors are encoded with a do-not-respond tag) and will thus lead to slowed reactions. Obviously, both accounts could explain the present findings. Dysphoric individuals process negative distractors in a different way to nondysphoric participants: inhibition theory will assume that dysphoric individuals cannot inhibit negative information, retrieval theory will assume that negative information is not encoded with a do-not-respond tag. Thus, it should be clear that the theoretical debate on negative priming prevents a clear interpretation of the NAP effect as tapping into an inhibitory phenomenon (see Joormann, 2004).

Overall, although it remains unclear whether encoding or inhibition in selective attention tasks is modulated by dysphoric status, it seems safe to say that dysphoric status does matter in processing negative information.

Manuscript received 12 April 2006
Revised manuscript received 5 October 2006
Manuscript accepted 6 October 2006
First published online 26 June 2007

REFERENCES

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*, 561–571.

E-Prime (Version 1.1) [computer software] (2003). Pittsburgh, PA: Psychology Software Tools, Inc.

Fox, E. (1994). Attentional bias in anxiety: A defective inhibition hypothesis. *Cognition and Emotion*, *8*, 165–195.

Fox, E. (1995). Negative priming from ignored distractors in visual selection: A review. *Psychonomic Bulletin & Review*, *2*, 145–173.

Goeleven, E., DeRaedt, R., Baert, S., & Koster, E. H. W. (2006). Deficient inhibition of emotional information in depression. *Journal of Affective Disorders*, *93*, 149–157.

Hautzinger, M., Bailer, M., Worall, H., & Keller, F. (1994). *Becks-Depressions-Inventar (BDI)*. Bern, Switzerland: Huber.

Houghton, G., & Tipper, S. P. (1994). A model of inhibitory mechanisms in selective attention. In D. Dagenbach & T. H. Carr (Eds.), *Inhibitory processes in attention, memory, and language* (pp. 53–112). San Diego, CA: Academic Press.

Joormann, J. (2004). Attentional bias in dysphoria: The role of inhibitory processes. *Cognition & Emotion*, *18*, 125–147.

Klauer, K. C., & Musch, J. (2003). Affective priming: Findings and theories. In J. Musch & K. C. Klauer (Eds.), *Psychology of evaluation: Affective processes in cognition and emotion* (pp. 7–49). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Matlin, M., & Stang, D. (1978). *The Pollyanna principle. Selectivity in language, memory and thought*. Cambridge, MA: Schenkman.

McKenna, F. P., & Sharma, D. (2004). Reversing the emotional Stroop effects reveals that it is not what it seems: The role of fast and slow components. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *30*, 382–392.

Milliken, B., Joordens, S., Merikle, P. M., & Seiffert, A. E. (1998). Selective attention: A reevaluation of the implications of negative priming. *Psychological Review*, *105*, 203–229.

Mogg, K., & Bradley, B. P. (2005). Attentional bias in generalized anxiety disorder versus depressive disorder. *Cognitive Therapy and Research*, *29*, 29–45.

Neill, W. T. (1997). Episodic retrieval in negative priming and repetition priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *23*, 1291–1305.

Neill, W. T., & Valdes, L. A. (1996). Facilitatory and inhibitory aspects of attention. In A. F. Kramer, M. Coles, & G. D. Logan (Eds.), *Converging operations in the study of visual selective attention* (pp. 77–106). Washington, DC: American Psychological Association.

Peeters, G. (1971). The positive–negative asymmetry: On cognitive consistency and positivity bias. *European Journal of Social Psychology*, *1*, 455–474.

Peeters, G., & Czapinski, J. (1990). Positive–negative asymmetry in evaluations: The distinction between affective and informational negativity effects. *European Review of Social Psychology*, *1*, 33–60.

Rothermund, K., Wentura, D., & De Houwer, J. (2005). Retrieval of incidental stimulus–response associations as a source of negative priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *31*, 482–495.

Tipper, S. P. (2001). Does negative priming reflect inhibitory mechanisms? A review and integration of conflicting views. *Quarterly Journal of Experimental Psychology*, *54A*, 321–334.

Tukey, J. W. (1977). *Exploratory data analysis*. Reading, MA: Addison Wesley.

Wentura, D. (1999). Activation and inhibition of affective information: Evidence for negative priming in the evaluation task. *Cognition & Emotion*, *13*, 65–91.

Wentura, D., & Rothermund, K. (2003). The "meddling-in" of affective information: A general model of automatic evaluation effects. In J. Musch & K. C. Klauer (Eds.), *Psychology of evaluation: Affective processes in cognition and emotion* (pp. 7–49). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.