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ORIGINAL PAPER

Dysphorics can control depressive mood's informational impact on effort mobilization

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Abstract Individuals' level of depression has been shown to systematically determine their amount of effort-related cardiovascular reactivity (see Brinkmann and Gendolla in Motiv Emot, 31:71–82, 2007; J Pers Soc Psychol, 94:146–157, 2008). By means of a mood cue manipulation the present study aimed at providing a conclusive test whether this is due to the informational impact of depressed mood. After habituation, students with low versus high depression scores worked on a memory task under "do-your-best" instructions. Half of them received a cue before the task, suggesting that their current mood may have an impact during task performance. As expected, dysphoric participants showed higher systolic blood pressure reactivity during task performance than nondysphorics when no cue was given. This pattern was reversed in the cue condition, indicating that dysphorics effectively managed to reduce the depressive mood impact on their task demand appraisals and effort mobilization.

Keywords Depression · Dysphoria · Informational mood impact · Cardiovascular reactivity · Effort mobilization

Introduction

Depression has been associated with a negative and pessimistic perception of the self, the world, and the future (Beck 1967). To what extent such negatively colored perceptions can influence and determine one's mental processes and behavior has been demonstrated in many cases and domains. Examples are mood-congruency effects on judgments and estimates and mood-congruent attention and memory biases. Depressed individuals tend to make more pessimistic judgments, pay more attention to negative stimuli, and especially remember and retrieve negative stimuli better (for reviews see Gotlib et al. 2000; Mineka et al. 2003; Mogg and Bradley 2005). Recently, it has been demonstrated that depressed mood also influences people's effort mobilization in terms of their cardiovascular response during execution of various mental tasks (Brinkmann and Gendolla 2007, 2008). These findings have been interpreted as a mood-congruent informational impact on individual's task demand appraisals (see e.g., Gendolla et al. 2001; Kavanagh and Bower 1985; Wright and Mischel 1982), which in turn determine effort mobilization. However, these recent studies cannot provide clear evidence that an informational mood impact is responsible for the effects of depressed mood on cardiovascular reactivity. It is conceivable that depression has an impact on effort mobilization during task performance due to depressive symptoms other than momentary mood like, for instance, fatigue or concentration problems. The present study thus aims to close this gap and to provide a conclusive test

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whether it is indeed depressed mood's informational impact that influences effort mobilization.

Dysphoria, effort mobilization, and cardiovascular reactivity

Based on motivational intensity theory (Brehm and Self 1989) and the mood-behavior-model (Gendolla 2000), we have postulated that individuals with dispositionally depressed mood should perceive mental tasks as more demanding and difficult and should thus mobilize more effort during task performance as long as success is possible and worthwhile (Brinkmann and Gendolla 2007, 2008). In these experiments motivational intensity, that is, effort mobilization was operationalized as participants' cardiovascular reactivity. This operationalization is based on Wright's (1996) integration of motivational intensity theory with the active-coping approach by Obrist (1981) and has been corroborated by a body of research involving different kinds of mental tasks, different task contexts, and varying levels of task difficulty. In most of these studies systolic blood pressure (SBP) has been shown to reliably reflect effort mobilization (for reviews see Gendolla and Brinkmann 2005; Wright 2008; Wright and Kirby 2001).

We tested our predictions with extreme groups of undergraduate students with low scores ("nondysphoric") versus high scores ("dysphoric") on a self-report depression scale. In accordance with our hypotheses, dysphoric participants showed higher SBP reactivity than nondysphoric participants while working on mental tasks without fixed performance standard ("do your best") (Brinkmann and Gendolla 2007). We concluded that dysphoric participants evaluated the task as more difficult, which led to higher cardiovascular reactivity during task performance (see also Gendolla et al. 2001). In the following two studies participants performed either an easy or a difficult mental task (Brinkmann and Gendolla 2008). Both studies revealed the expected crossover interaction pattern that had previously been observed for manipulated negative and positive moods (e.g., Gendolla and Krüsken 2002b; Silvestrini and Gendolla 2009): Compared to nondysphoric participants, dysphoric participants showed stronger SBP reactivity in the easy condition (due to higher subjective task demand) and weaker SBP reactivity in the difficult condition (due to disengagement because of too high subjective task demand). Moreover, task demand appraisals assessed before task performance indicated that dysphoric participants indeed perceived the memory task as more difficult than did nondysphoric participants (Brinkmann and Gendolla 2008, Study 2).

These findings show that task difficulty plays an important role in determining whether depression leads to enhanced or attenuated cardiovascular response. However, these studies can only provide preliminary evidence for the supposed informational mood impact on task demand appraisals. On the one hand, task demand appraisals were only assessed in the latter two studies. On the other hand, these self-report ratings cannot provide causal evidence for an informational mood impact on perceived task demand being responsible for the differential impact on cardiovascular reactivity. Therefore, in the present study we aimed to provide a conclusive test for the informational impact of mood by manipulating mood's diagnostic value.

Mood's informational impact

One means for demonstrating an informational mood impact on judgments and behavior consists in reducing mood's diagnostic value for (behavior-related) judgments and evaluations. Accordingly, mood congruency effects diminish when another source for the mood is made salient (e.g., Schwarz and Clore 1983). This basic idea of reducing mood's diagnostic value has been used in a variety of studies to demonstrate an informational mood impact (e.g., Bohner and Weinerth 2001; Hirt et al. 1997; Scott and Cervone 2002). Interestingly, when people become aware of their mood and its potential biasing effect on evaluations and judgments they may not only "correct" for mood influences but also produce contrast effects, that is, "overcorrect" the impact of their current (negative) mood (see e.g., Abele and Gendolla 1999; Berkowitz et al. 2000; Wegener and Petty 1997).

With respect to behavior-related judgments and effort mobilization, Gendolla and Krüsken (2002a) could show that a cue suggesting mood manipulation eliminated the informational impact of experimentally induced mood. After having watched depressing versus elating video excerpts, half of the participants read a short note explaining that previous research suggested that the video excerpts may have long lasting effects on people's feeling states. Thus, contrary to participants who did not receive this information, participants in the cue condition were expected not to use their mood as diagnostic information when working on a "do-your-best" task. Results corroborated the expected interaction pattern: SBP reactivity was higher in a negative mood than in a positive mood when no cue was provided; this mood effect diminished in the cue condition. In the present study, we used a similar procedure in order to demonstrate the informational influence of depressed mood in a dysphoric sample. Moreover, we were inspired by research by Tillema et al. (2001) who report a cue manipulation that effectively diminished differences in dysphoric and nondysphoric participants' perceptions of performance standards and self-efficacy.

The present research

Taken together, there is evidence that dysphoria influences effort mobilization, presumably because of an informational mood impact (Brinkmann and Gendolla 2007, 2008). There is further evidence that reducing mood's diagnostic value allows for demonstrating an informational mood impact (e.g., Gendolla and Krüsken 2002a; Schwarz and Clore 1983). Therefore, in the present study, we provided half of the dysphoric and half of the nondysphoric participants with a cue making them aware of possible mood influences (see Gendolla and Krüsken 2002a; Tillema et al. 2001). Subsequently we asked them to perform a memory task during which cardiovascular measures were taken.

We expected a crossover interaction effect of dysphoria and cue condition on cardiovascular (especially SBP) reactivity during task performance: Without mood cue we expected to find higher cardiovascular reactivity of dysphoric compared to nondysphoric participants, replicating the results by Brinkmann and Gendolla (2007) and reflecting higher perceived task demand in dysphoria. When a mood cue was provided, we expected to find the opposite pattern, that is, lower cardiovascular reactivity of dysphoric compared to nondysphoric participants, reflecting lower perceived task demand in dysphoria. This latter hypothesis is based on the assumption that our rather strong and directive cue manipulation (see below) should not only effectively reduce the diagnostic value of participants' momentary mood for task demand appraisals and thus the informational mood impact on effort mobilization. Instead, this strong cue manipulation should even lead to overcorrection, that is, to a mood contrast effect rather than a mere reduction of the mood assimilation effect (see Stapel and Suls 2007, for discussion).

Method

Participants and design

The present study was run in a 2 (dysphoric vs. nondysphoric) $\times$ 2 (mood cue vs. no cue) between-persons design. We recruited participants from an introductory psychology class pool of 148 students (124 women, 24 men) by means of their scores on the Center for Epidemiologic Studies—Depression Scale (CES-D; Radloff 1977) that they had completed 1–3 weeks before the experimental session. Students who scored in the lower or upper third of the distribution (i.e., ≤ 9 or ≥ 16) were invited via an anonymous code and participated for partial course credit. Only participants whose scores remained within these limits at the second measurement time during the experiment were retained for analyses. The final sample consisted of 63 students (54 women, 9 men). Because the cell distribution of the few men was unbalanced (i.e., no men in the dysphoric-cue cell) we had to restrict our analyses to the female participants only (mean age 22 years).

Self-report measures

Depression scores were assessed at the beginning of the experimental session by means of the CES-D, a short self-report scale that has been developed for community samples. The French version of the CES-D by Fuhrer and Rouillon (1989) consists of 20 items asking for frequency of depressive symptom experience during the past week on 4-point scales ranging from 0 (*never, very seldom*) to 3 (*frequently, always*). The scale showed high internal consistency (Cronbach's $\alpha = .93$). For measuring participants' momentary mood before and after task performance, we administered a French version of the positive and negative hedonic tone scales of the UWIST mood adjective checklist (Matthews et al. 1990). In order to avoid biased responses due to repeated assessments we split the scale in two parts: Half of the adjectives (i.e., "joyful", "dissatisfied", "cheerful", "depressed") were presented before task performance in order to assess initial mood, the remaining four adjectives (i.e., "contented", "sad", "happy", "frustrated") were presented after task performance to assess whether participants' mood was affected by the mood cue manipulation. Participants indicated the extent to which each adjective reflected their momentary feeling state on 7-point scales ranging from 1 (*not at all*) to 7 (*very much*). Finally, we assessed participants' appraisal of task difficulty and task-related capacity directly after task instructions (i.e., before task performance). Participants indicated how they perceived task difficulty and how they perceived their own task-related capacity on 7-point scales ranging from 1 (*not difficult, low capacity*) to 7 (*very difficult, high capacity*). As both ratings were conceptually similar and moderately correlated, $r(54) = -.37$, $p < .01$, we calculated a difficulty index by averaging the difficulty and the reversed-coded capacity items so that higher scores indicate higher perceived task difficulty.

Physiological measures

SBP, diastolic blood pressure (DBP), and heart rate (HR) were measured noninvasively with a Vasotrac® APM205A monitor (MEDWAVE®, St. Paul, MN). This system uses a pressure sensor placed on the wrist on top of the radial artery. Internal algorithms yield systolic, mean, and diastolic pressure approximately every 12–15 heart beats, which are stored on an internal drive and transferred to a personal computer.[1]

Continuous word recognition task

We used a continuous word recognition memory task (see Kim et al. 2001; Poon and Fozard 1980). To this end, we selected 125 French nouns from the data basis provided by Bonin et al. (2003). As we were not interested in the impact of a specific word type or its hedonic valence, the selection process was guided by the intention to extract those "average" words of medium length, medium subjective frequency in spoken and written French, and especially without strong emotional valence. Therefore, words had to fulfill several criteria to be eligible: word length of 5–7 letters, a subjective frequency and a subjective emotional valence within one standard deviation below and above the mean as indicated in the data basis of Bonin et al. (2003).[2] Finally, the selected words were divided into four groups of equal word length, frequency, and valence (three groups contained 25 words and one group contained 50 words). Based on these groups, the experimental software (E-Prime 2.0, Psychology Software Tools Inc., Pittsburgh, PA) randomly created a list of 200 trials with the restriction that 25 words should be presented a second time after 10 intervening words, another 25 words should be presented a second time after 20 intervening words, still another 25 words should be presented a second time after 30 intervening words, and, finally, 50 words should be presented only once.

Contrary to usual recognition memory tasks, encoding and recognition were embedded in one and the same period by means of the continuous presentation of one trial after the other. Each trial consisted of a fixation cross (1,000 ms) followed by one word (unlimited presentation time). Participants had to indicate with their dominant hand by means of two keys if the word had already been presented in a previous trial ("old") or not ("new"). They were instructed to work as quickly but also as precisely as possible ("do your best"). After participants' response there was a 500 ms inter-stimulus interval before the next trial started. Depending on their reaction times, participants worked on 71–137 trials during the 5-min task period ($M = 112.96$, $SD = 14.18$).

Procedure

Participants attended the experiment individually. Each session took about 30 min and was computerized using a personal computer and experimental software that presented all instructions and stimuli. Participants were greeted by the experimenter, took a seat in front of the computer monitor, read introductory information, and gave informed consent. Afterwards, the experimenter attached four pairs of electrodes for impedance cardiogram recording (see Footnote 1) and fixed the blood pressure sensor on participants' nondominant wrist, left the room, and monitored the experiment from an outside control room. Participants first answered biographical questions and completed the CES-D scale. This was followed by an 8-min habituation period to determine cardiovascular baseline values; meanwhile participants watched an excerpt of a hedonically neutral documentary film. Then, participants rated the first 4 UWIST mood adjectives.

After this habituation period, all participants read the same instructions for the continuous word recognition task followed by an example screen. Afterwards, only participants in the cue condition received the following additional written information in form of an important advice: "Prior research has shown that your current mood, may it be positive or negative, may have an important impact on mental performance. During the following task, you should thus bear in mind that your cognitive performance may be influenced by your current mood." Before starting the continuous word recognition task, all participants rated the extent of perceived task difficulty and task-related capacity. Then the 5-min performance period began during which cardiovascular activity was assessed. Following the task all participants rated the remaining 4 UWIST mood adjectives and learned that the experiment was over. The experimenter entered the room and removed the blood pressure sensor and the electrodes. Finally, participants were thanked, carefully debriefed, and received their course credit.

[1] Recently, cardiac pre-ejection period (PEP; i.e., the time interval in ms between the onset of ventricular depolarization and the opening of the aortic valve) has been assessed in the framework of motivational intensity theory (Brehm and Self 1989) as a reliable measure of myocardial contractility (e.g., Annis et al. 2001; Richter et al. 2008). Therefore, we also assessed and analyzed PEP reactivity by means of the same impedance cardiograph and in the same way as described, for instance, by Brinkmann et al. (2009). Due to a software upgrade the sampling rate was 1,000 Hz without down-sampling—contrary to previous studies. Unfortunately, due to contact problems with the patient cable of the impedance cardiograph, there were no data recordings for a quarter of the sample. Analyses based on the reduced sample revealed no baseline differences between the four cells, $Fs < 2.31$, $ps > .13$, overall $M = 101.85$, $SD = 9.20$. With respect to PEP reactivity during task performance, there were no significant main or interaction effects, $Fs < 3.02$, $ps > .09$. Cell means and standard errors of PEP reactivity were as follows: Dysphoric-no cue $M = -.01$, $SE = .66$; nondysphoric-no cue $M = -2.22$, $SE = 1.07$; dysphoric-cue $M = -3.59$, $SE = 1.63$; nondysphoric-cue $M = -2.31$, $SE = .64$.

[2] Subjective frequency of the selected words ranged from 2.16 to 3.52 and subjective emotional valence ranged from 2.56 to 3.64 on the 5-point rating scales.

Data analysis

SBP and DBP values (in millimeters of mercury [mmHg]) and HR (in beats per minute [bpm]) obtained each 12–15 heart beats were edited for outliers using the following procedure: single measures differing more than 3 standard deviations from the preceding as well as from the following measure were eliminated. Mean values for cardiovascular baseline were determined by averaging the last 5 min of the habituation period (Cronbach's αs > .98). Mean values for the task period were determined by averaging the 5 min of task performance (Cronbach's αs > .98). Change scores were calculated by subtracting mean baseline values from mean performance values (see Llabre et al. 1991). Due to equipment failure of the Vasotrac® monitor there were no blood pressure and HR data from three participants, reducing the sample size for cardiovascular analyses to 51 participants.

We calculated hit rate, false alarm rate, discrimination (i.e., sensitivity), and response bias from participants' responses to the continuous word recognition task in the framework of signal detection theory. Following the recommendations of Snodgrass and Corwin (1988), a corrected hit rate was defined as the number of correct responses given an old word plus .5, divided by the total number of old words plus 1. The corrected false alarm rate was defined as the number of incorrect responses given a new word plus .5, divided by the total number of new words plus 1. Discrimination was calculated as the difference of hit rate minus false alarm rate. Finally, response bias was calculated as false alarm rate divided by 1 minus discrimination. For analyses we subjected all dependent self-report, cardiovascular, and performance variables to 2 (dysphoric vs. nondysphoric) $\times$ 2 (cue vs. no cue) between-person ANOVAs, followed by focused contrasts or post-hoc comparisons, depending on hypotheses.

Results

Self-report measures

Mood

We calculated two pre-task and two post-task mood indices by averaging the positive and negative items, respectively, before and after task performance, $.44 < r(54) < .80$, $ps < .001$. Cell means and standard errors appear in Table 1. 2 $\times$ 2 ANOVAs of the pre-task measures revealed the expected dysphoria main effects reflecting less positive mood, $F(1, 50) = 7.87$, $p < .01$, $\eta^2 = .12$, and more negative mood, $F(1, 50) = 42.97$, $p < .001$, $\eta^2 = .46$, of dysphoric compared to nondysphoric participants. There was also an unexpected cue main effect on positive mood, $F(1, 50) = 5.11$, $p < .03$, $\eta^2 = .08$, indicating more positive mood in the no-cue condition. However, as the cue manipulation had not been given at the time of the first mood assessment, we cannot conceive of a plausible interpretation for this effect. What is more important is that the results of the second assessment time after cue manipulation and task performance still revealed the expected dysphoria main effects, reflecting less positive mood, $F(1, 50) = 10.58$, $p < .01$, $\eta^2 = .17$, and more negative mood, $F(1, 50) = 12.37$, $p < .01$, $\eta^2 = .19$, of dysphoric compared to nondysphoric participants. No other main or interaction effect emerged, $Fs < 1.87$, $ps > .17$, demonstrating that the cue manipulation did not alter participants' current mood.[3]

Task demand appraisals

The expected interaction effects for the single difficulty and capacity items were not significant, $F(1, 50) = 2.70$, $p = .11$, $\eta^2 = .05$, and $F(1, 50) = 2.54$ $p = .12$, $\eta^2 = .05$, respectively. For the difficulty index results of a 2 $\times$ 2 ANOVA revealed a significant interaction, $F(1, 50) = 3.96$, $p = .05$, $\eta^2 = .07$, in absence of significant main effects, $Fs < 3.25$, $ps > .07$. Focused contrasts did not show the expected higher perceived task demand of dysphoric participants in the no-cue condition, $t(50) < 1$. However, as expected, in the cue condition dysphoric participants' task demand appraisals were significantly lower than those of nondysphoric participants, $t(50) = 2.73$, $p < .01$, $r = .36$ (see Table 1).

Cardiovascular baselines

We subjected cardiovascular baseline values to 2 $\times$ 2 ANOVAs that revealed no SBP, DBP, or HR baseline differences between the four cells ($Fs < 2.72$, $ps > .10$). Cardiovascular baseline values can be found in Table 2. Baseline values were not correlated with the respective cardiovascular reactivity scores ($-.14 < r < .04$, $ps > .35$).

[3] These results hold also true when considering the overall mood scores, composed of the positive and reversed-coded negative adjectives (Cronbach's αs > .76): There was a dysphoria main effect, $F(1, 50) = 33.27$, $p < .001$, $\eta^2 = .38$, and a cue main effect, $F(1, 50) = 4.56$, $p < .04$, $\eta^2 = .05$, before task performance and a dysphoria main effect, $F(1, 50) = 17.03$, $p < .001$, $\eta^2 = .25$, after task performance. All positive, negative, and overall mood scores were correlated with the depression score, $r(54)s > |.43|$, $ps < .001$. These correlations replicate previous findings when the CES-D scale was administered in the end, rather than at the beginning of the experimental session (see Brinkmann et al. 2009).

Table 1 Means and standard errors of self-report rating scores

	M					SE				
	1st mood measure		2nd mood measure		Difficulty index	1st mood measure		2nd mood measure		Difficulty index
	Positive	Negative	Positive	Negative		Positive	Negative	Positive	Negative	
No cue										
Nondysphoric	4.86	1.18	4.86	1.68	3.04	.42	.11	.39	.23	.24
Dysphoric	3.83	2.92	4.08	2.50	3.08	.39	.43	.33	.41	.24
Cue										
Nondysphoric	4.03	1.27	4.70	1.33	3.67	.37	.14	.32	.21	.23
Dysphoric	3.00	3.35	3.35	2.69	2.69	.23	.41	.24	.39	.32

All mood and difficulty ratings range from 1 (*not at all*) to 7 (*very much*)

Table 2 Means and standard errors of cardiovascular baseline measures

	M			SE		
	SBP	DBP	HR	SBP	DBP	HR
No cue						
Nondysphoric	121.69	69.03	77.20	2.15	1.01	3.52
Dysphoric	118.65	67.64	79.34	2.48	1.42	3.44
Cue						
Nondysphoric	115.45	64.35	79.55	3.39	2.39	3.16
Dysphoric	123.94	69.56	71.84	5.47	3.75	3.07

SBP and DBP are indicated in millimeters of mercury and HR is indicated in beats per minute

Cardiovascular reactivity

Systolic blood pressure

A 2 × 2 ANOVA of the SBP change scores revealed the predicted interaction effect of dysphoria and cue, $F(1, 47) = 5.45$, $p < .03$, $\eta^2 = .10$, in absence of significant main effects, $Fs < 3.57$, $ps > .06$ (see Fig. 1). Focused contrasts revealed that dysphoric participants' SBP reactivity tended to be higher than that of nondysphoric participants ($M = 8.91$, SE = 2.47 vs. $M = 4.89$, SE = .98), $t(47) = 1.63$, $p < .06$ (one-tailed), $r = .23$, when no cue was given. In further accordance with predictions, this pattern was reversed when participants received the cue with respect to mood influences in the performance period ($M = 1.55$, SE = 1.76 vs. $M = 5.66$, SE = 1.53), $t(47) = 1.68$, $p = .05$ (one-tailed), $r = .24$.

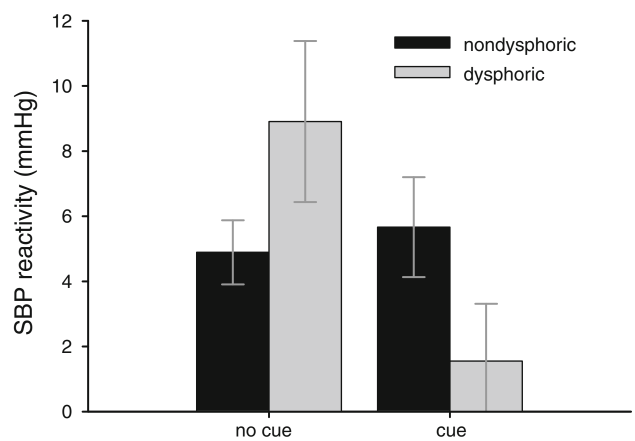

Fig. 1 Cell means and standard errors of systolic blood pressure (SBP) reactivity in millimeters mercury (mmHg)

Diastolic blood pressure

The pattern of DBP change scores roughly mirrored that of SBP reactivity. A 2 × 2 ANOVA revealed a significant cue main effect, $F(1, 47) = 5.18$, $p < .03$, $\eta^2 = .09$, as well as a marginally significant interaction effect of dysphoria and cue, $F(1, 47) = 2.82$, $p < .10$, $\eta^2 = .05$. Cell means and standard errors were as follows: Dysphoric-no cue $M = 5.01$, SE = 1.49; nondysphoric-no cue $M = 3.91$, SE = .71; dysphoric-cue $M = .82$, SE = 1.20; nondysphoric-cue $M = 3.28$, SE = .80.

Heart rate

The analysis of HR change scores revealed no significant main or interaction effects, $Fs(1, 47) < 1.61$, $ps > .21$. Cell means and standard errors were as follows: Dysphoric-no cue $M = 2.28$, SE = 1.17; nondysphoric-no cue $M = 4.18$,

Table 3 Means and standard errors of continuous recognition memory task performance indices

	M				SE			
	Hit rate	False alarm rate	Discrimination	Response bias	Hit rate	False alarm rate	Discrimination	Response bias
No cue								
Nondysphoric	.87	.15	.72	.53	.02	.04	.06	.06
Dysphoric	.89	.20	.69	.56	.03	.08	.09	.08
Cue								
Nondysphoric	.88	.13	.74	.51	.02	.04	.06	.07
Dysphoric	.75	.17	.58	.35	.06	.06	.11	.05

For calculation of hit rate, false alarm rate, discrimination index, and response bias index see "Data analysis" section and Snodgrass and Corwin (1988)

SE = .72; dysphoric-cue $M = 2.52$, SE = 1.63; nondysphoric-cue $M = 1.64$, SE = .87.

Task performance

We subjected the four performance indices hit rate, false alarm rate, discrimination, and response bias to 2 × 2 ANOVAs. Means and standard errors can be found in Table 3. Results revealed no differences in false alarm rate (Fs < 1) and discrimination (Fs < 1.54, ps $> .22$). For hit rate, a significant interaction emerged, $F(1, 50) = 3.90$, $p = .05$, $\eta^2 = .06$, in absence of significant main effects Fs < 3.60, ps $> .06$. Post-hoc comparisons using the Tukey HSD test showed that dysphoric participants in the cue condition tended to have lower hit rates than the other three groups, ps $< .09$ (see Table 3). For response bias, results revealed a marginally significant cue main effect, $F(1, 50) = 3.08$, $p < .09$, $\eta^2 = .06$. Moreover, it is interesting to note that only dysphoric participants in the cue condition differed significantly from the value .5 that is indicative of a neutral response bias (Snodgrass and Corwin 1988), $t(12) = -3.02$, $p < .02$. One might thus conclude that dysphorics receiving a mood cue were more reluctant with regard to their "yes"-responses, leading to a more conservative response bias. Finally, correlation analyses revealed positive correlations between hit rate and both SBP and DBP, $r(51)$s $> .46$, ps $< .001$, as well as between discrimination and both SBP and DBP, $r(51)$s $> .30$, ps $< .03$. Together with the performance decline in the dysphoric-cue cell reported above, these correlations indicate a positive association between effort mobilization and performance outcomes.

Discussion

The aim of the present research was to provide a conclusive test whether an informational mood impact underlies the effect of dysphoria on effort mobilization. Based on previous studies (Brinkmann and Gendolla 2007, 2008) we reasoned that dysphoric participants should show higher cardiovascular reactivity than nondysphoric participants when working on a "do-your-best" task. This pattern should be inversed when participants were provided with a strong mood cue making them aware of possible mood influences during task performance (Schwarz and Clore 1983; Tillema et al. 2001). Results corroborated that dysphoric participants showed higher SBP reactivity than nondysphorics when no cue was provided, but lower SBP reactivity when being aware of possible mood influences. Even though the focused contrast in the no-cue condition just fell short of significance, this SBP reactivity pattern replicates the findings from Brinkmann and Gendolla (2007) using a different type of mental task. Moreover, the present study is also in accordance with the findings from Gendolla and Krüsken (2002a) concerning manipulated mood states under no-cue and cue conditions.

A close inspection of the SBP pattern reveals that the dysphoria × cue interaction was mainly driven by the reduction of SBP reactivity in dysphoric participants, whereas nondysphoric participants' reactivity was not significantly affected by the cue. This resembles findings by Schwarz and Clore (1983), who report a cue effect only in the negative but not in the positive mood condition. The authors concluded that a slightly positive mood state is rather normal and thus not susceptible for searching its source and discounting its effects. Similarly, it is conceivable that participants' implicit theories about mood effects on performance play a role: Whereas dysphoric participants may regard it as necessary to reduce their negative mood's impact during task performance, nondysphoric participants may consider their positive mood as goal-conducive and thus show no changes.

The performance data also demonstrate the particular impact of the cue manipulation for dysphoric participants: There were no significant performance differences between dysphoric and nondysphoric individuals when no cue was given. When provided with the mood cue, however, dysphoric participants had a lower hit rate and a more conservative response bias. It seems that dysphorics receiving the mood cue were more reluctant to affirm that they had already seen the word. Moreover, the positive correlations between SBP reactivity and hit rate and discrimination suggest a positive association between effort mobilization and performance. Even though the relation of effort and performance is complex and the two constructs cannot be equated (see Hockey 1997; Locke and Latham 1990), the results of this study underline the informational influence of mood not only on effort mobilization but also on corresponding performance outcomes.

For the interpretation of our findings it is important to note that the cue manipulation affected blood pressure reactivity, performance, and task demand appraisals but not momentary mood itself. As expected, dysphoric individuals were in a more negative and less positive mood not only at the beginning of the experiment but also after the cue manipulation and task performance. These results demonstrate that the cue effectively reduced mood's diagnostic value for behavior-related judgments without altering participants' current mood. This strengthens the conclusion that mood can be regarded as one piece of information for evaluations and judgments (see Abele and Petzold 1994; Gendolla 2000) and that an informational mood impact on task demand appraisals underlies the influence of dysphoria on cardiovascular reactivity.

Taken together, our study provides evidence that dysphoria effects on effort mobilization are mediated by an informational impact of momentary mood: The replicated pattern of stronger SBP response in dysphoric participants working on mental "do-you-best" tasks can be reversed when asking participants to try not to be influenced by their current mood during task execution. Reducing the influence of one's negative mood is thus possible in a sample of participants with high depression scores. In contrast to our dysphoric sample, studies by Gasper and Clore (1998) have revealed that people with high trait anxiety do not reduce the impact of their current mood when making risk estimates, even if alternative sources for their current feelings are provided. Instead, they rely on their trait-consistent anxious affect that is perceived as relevant for the judgments to be made (see also Gasper and Clore 2000).

Given these differences, the specific nature of our cue manipulation deserves further discussion. We were inspired by research from Tillema et al. (2001), who distinguish between an *attributional* cue—that is, a cue highlighting an external source for the current mood (i.e., the weather, the room, the mood induction method)—and an *awareness* cue—that is, a cue drawing people's attention to the possibility of mood influences on the judgment or task at hand without necessarily suggesting an external source for the current mood. In the present study, we provided participants with a mood awareness cue, which is a rather direct and explicit instruction, in contrast to other studies that provided an attributional cue, which is undoubtedly a more subtle and weaker manipulation. In light of previous studies—especially those on trait-anxiety by Gasper and Clore (1998)—future research should investigate whether our findings are limited to situations where people are made aware of mood influence or whether our findings can be generalized to attributional cues.

An important implication of our findings pertains to the domain of affect control and regulation. It has been shown repeatedly that depressed and dysphoric individuals have problems controlling and regulating their negative affect (e.g., Joormann and Siemer 2004; Josephson et al. 1996; Lyubomirsky et al. 1998). Our findings demonstrate that—in a non-clinical sample—these problems can be overridden by an explicit and direct instruction. Thus, control of mood influences is possible in dysphoric individuals (see also Hertel 2000; Lyubomirsky and Nolen-Hoeksema 1995; Pyszczynski et al. 1989, for examples of overcoming self-regulation deficits in depression and dysphoria).

An obvious limitation of this study concerns our female sample. Because of the few and unequally distributed men in our sample, we had to restrict analyses to women only. However—except for the usual differences in cardiovascular baseline values (Wolf et al. 1997)—previous research has not shown different cardiovascular reactivity to mental tasks in men and women (e.g., Brinkmann and Gendolla 2008). Therefore, we are confident that our conclusions apply to men as well.

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