Psychological Medicine, 2007, **37**, 393–402. © 2006 Cambridge University Press
doi:10.1017/S003329170600910X First published online 1 November 2006 Printed in the United Kingdom

Attentional biases for angry faces in unipolar depression

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ABSTRACT

Background. Past research has demonstrated that depression is associated with dysfunctional processing of emotional information. Recent studies demonstrate that a bias in the attentional processing of negative information may be an important cognitive vulnerability factor underlying the onset and maintenance of depression. However, to date, the nature of this attentional bias is still poorly understood and further exploration of this topic to advance current knowledge of attentional biases in depression seems imperative.

Method. This study examined attentional biases for angry facial expressions presented for 1000 ms in 20 patients with major depressive disorder (MDD) and 20 non-depressed control participants (NC) matched for age and gender using an emotional modification of the Exogenous Cueing task.

Results. Patients with MDD showed maintained attention for angry faces compared with neutral faces. In comparison with non-depressed participants they showed a stronger attentional engagement for angry faces. In contrast, the NC group directed attention away from angry faces, more rapidly disengaging their attention compared with neutral faces.

Conclusions. This pattern of results supports the assumption that MDD is characterized by deficits in the attentional processing of negative, interpersonal information and suggests a 'protective' bias in non-depressed individuals. Implications in relation to previous research exploring cognitive and interpersonal functioning in depression are discussed.

INTRODUCTION

In recent years, cognitive theories of depression have emphasized the role of a biased processing of emotional information in the development and maintenance of depression (Clark *et al.* 1999; Alloy *et al.* 2000; Chamberlain & Sahakian, 2004; Beevers, 2005). Indeed, several empirical studies within the field of depressive pathology have provided strong evidence to support the existence of negative biases in several aspects of information-processing: (1) memory biases with enhanced recall of negative information but reduced specificity of autobiographical memory (Williams & Broadbent, 1986; Taylor & John, 2004); (2) interpretation biases with ambiguous information being interpreted in a negative way (Nunn *et al.* 1997; Rude *et al.* 2002); and (3) ruminative thinking over negative information (Donaldson *et al.* 2006). It has been argued that this dysfunctional processing of negative information might partially explain the problem of therapy resistance. It seems that when patients recover, they frequently relapse into a pattern of negative, ruminative thoughts when confronted with stressors in their environment (Hammen, 1995; Ingram, 2003).

A disturbed attentional processing of negative information could be a potential factor linked

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https://doi.org/10.1017/S003329170600910X Published online by Cambridge University Press

to the aforementioned information-processing biases. Recent empirical evidence has offered support for the existence of a distinct pattern of attentional biases in depressive pathology. A considerable number of studies have demonstrated attentional biases in depression at longer presentations of negative information (1s or more), but no early automatic attentional bias (Bradley *et al.* 1997*a*; Mogg *et al.* 1995; Mathews *et al.* 1996; Gotlib *et al.* 2004*a*, *b*). In addition, several studies found that depression was characterized by the absence of a 'protective bias'. This is the tendency to avoid negative information, which is commonly found in non-depressed individuals (McCabe *et al.* 2000).

In recent years, it has been increasingly recognized that attention should not be considered as a unitary phenomenon (Posner & Peterson, 1990). Given the cognitive characteristics of depression and the demonstration of attentional biases at longer stimuli exposure durations, theorists proposed that depression might be characterised by attentional biases in the elaborative stages of information-processing (Williams *et al.* 1997). In other words, depressive persons will show an enhanced capture by (attentional engagement) and longer holding of attention (impaired disengagement) toward negative information but only occurring within later stages of information-processing (Bradley *et al.* 1997*a*). Unfortunately, in most paradigms used to study attentional bias in depression such as the emotional Stroop task (Williams *et al.* 1996), the Dot Probe task (MacLeod *et al.* 1986) or the deployment-of-attention task (Gotlib *et al.* 1988) both neutral and emotional stimuli are presented within the same stimulus presentation, making it complicated to determine whether the emotional information draws attention or, when detected, becomes difficult to inhibit (Fox *et al.* 2002; Koster *et al.* 2004*a*).

The Exogenous Cueing task (Posner, 1980), used in this study, allows the disentangling of attentional engagement and disengagement components. In this reaction time (RT) task, a target stimulus appears at one of two spatial locations, cued by an emotional stimulus preceding at the same ('valid trial') or the opposite spatial location of the target ('invalid trial'). At short intervals between cue onset and target onset (Stimulus Onset Asynchrony; SOA $<$300 ms), participants are typically faster to respond to the valid compared with the invalid trials. This is the 'cue validity effect'. It may be expected that in the case of emotionally relevant stimulus material, the time course of the cue validity effect will be extended (hereafter referred to as the 'enhanced cue validity effect' or maintained attention), leading to a larger cue validity effect compared with neutral information (Fox *et al.* 2002). Secondly, the emotional modification of attentional engagement and disengagement can be analysed by comparing the speed of responding on valid and invalid emotional *versus* neutral trials. The emotional valence of the cue may (*a*) facilitate attentional engagement compared with a neutral cue, leading to response benefits on valid trials and/or (*b*) delay the disengagement of attention compared with the neutral cue, leading to delayed responding on invalid trials (Fox *et al.* 2001; Koster *et al.* 2004*b*).

To date a few studies have applied this task in order to investigate attentional biases in depression. In a recent study by Ellenbogen *et al.* (2006), masked (17 ms) and unmasked (750 ms) dysphoric, threatening and neutral scenes were presented as cues to a sample of depressed and anxious out-patients and normal controls. Participants were tested in a stressful or a neutral condition and cortisol measures were included to examine emotional reactivity to stress. The depressed individuals did not show any specific patterns of attentional bias. One problem of this experiment may be that the stimulus material was not shown long enough to elicit attentional biases in depressed individuals. In two other experiments, Koster *et al.* (2005) examined attention for positive and negative self referring words in dysphoric *versus* non-dysphoric students. In these experiments, the dysphoric individuals showed maintained attention for negative words presented at the 1500 ms presentation duration, which was related to impaired attentional disengagement. No attentional bias was observed when words were presented for 250 ms.

Providing these mixed findings, the present study aimed to advance the current knowledge on elaborative attentional biases in depression. A first aim of the present study was to examine attentional biases for negative information

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in a carefully selected sample of diagnosed depressive patients because the use of non-clinical, dysphoric samples or a negative mood induction has frequently been criticized for not being representative for clinical states (e.g. Rinck & Becker, 2005). A second aim of this study was to examine whether attentional biases in depression can be observed for stimuli that have an interpersonal relevance, such as angry facial expressions. Previous research on attentional biases in depression has mainly employed verbal stimuli as cues although this might have some drawbacks (Murphy *et al.* 1999; Erickson *et al.* 2005; Koster *et al.* 2005). Pictures of facial expressions are more ecologically valid in depicting interpersonal evaluation and have privileged access to the affective system (Bradley *et al.* 1997*b*). In most studies, attentional biases have been investigated for mood-congruent stimuli such as sad faces (Gotlib *et al.* 2004*a*, *b*). However, a sad face signals the emotional state of another person and may not bear direct relevance to the observer. It seems more likely that 'mood-electing' stimuli such as angry faces are more relevant to depressed patients, given that they signal personal rejection (Gilboa-Schechtman *et al.* 2004). Gotlib & Hammen (2002) provided abundant evidence to support the view that depressed individuals are less socially skilled compared with non-depressed people. Recurrence of interpersonal failure may cause a higher sensitivity for stimuli which can be important in accurately appraising one's own actions.

In sum, based on the assumption that depression is characterized by attentional biases for negative information at later stages of information-processing, several specific hypotheses will be examined:

(1) Depressed individuals will show maintained attention for angry faces compared with non-depressed individuals.
(2) Depressed individuals will show maintained attention for angry faces compared with neutral faces.
(3) Maintained attention for angry faces in depression will be related to enhanced attentional engagement with and delayed disengagement from angry compared with neutral faces.

METHOD

Subjects

Participants were 40 adults (29 females, 11 males) ranging in age from 20 to 64 years (mean age 44·35 years, S.D. = 11·19). Two groups of participants volunteered to take part in this study: 20 participants diagnosed with major depressive disorder (MDD) and 20 non-depressed control participants (NC) matching with the MDD group on age and gender.

Selection criteria

Participants included in the MDD group were selected from a larger pool of ambulant or residential patients ($n = 38$) recruited at a psychiatric clinic in Terneuzen. Non-depressed control participants were recruited at the Department of Product Development, Brussels, Belgium, a Government institution. In order to obtain a reliable diagnosis of major depression, all participants were screened using three different clinical measures. First, all participants were interviewed using the Dutch version of the Mini International Neuropsychiatric Interview (Pinninti *et al.* 2003). This interview schedule assesses current and lifetime psychiatric disorders based on DSM-IV criteria and succeeds in reliable and valid selection of symptom criteria (Sheehan *et al.* 1998). The patient sample consisted of individuals who all had a primary diagnosis of MDD. Three patients also met diagnostic criteria for current bipolar disorder and were removed from the initial sample. Secondly, participants were interviewed using the 17-item version of the Hamilton Rating Scale for Depression, a standard interview to asses severity of depression (HRSD; Hamilton, 1967). Only patients scoring above a cutoff score of 14, indicating a mild to severe depression, were further included in the MDD sample ($n = 30$). Finally, participants completed the Beck Depression Inventory-II-NL (BDI-II-NL; Beck *et al.* 1961; Van Der Does, 2002), a reliable and valid self-report measure of intensity of depression. Based on cut-off score guidelines (Beck *et al.* 1996), only participants scoring above 19 were included in the MDD group ($n = 26$). Of the remaining patient group six participants had to be removed from analyses due to a large number of outliers, caused by delayed responding on the Exogenous Cueing

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task (>750 ms), implicating a loss of more than 25% of their data. The non-depressed group had no diagnosis of a current or past Axis I disorder on the diagnostic interview and showed no depressive symptoms on the HRSD and BDI-II-NL. Within the non-depressed group no participants had to be removed due to excessive outliers.

In addition, participants of both groups also completed the Dutch trait version of the State-Trait Anxiety Inventory (STAI-T), a self-report questionnaire measuring intensity of anxiety. (Spielberger *et al.* 1983; Van der Ploeg *et al.* 2000).

Materials

Pictures of Facial Affect were taken from the Karolinska Directed Emotional Faces (KDEF) database (Lundqvist *et al.* 1998). Before selection for the experiment, all pictures were first adjusted to exclude interference of background stimuli (hair, clothing) and were adjusted to the same size (326 × 326 pixels). A total of 20 neutral and 20 angry faces were selected from a validation study of the KDEF picture set (Goeleven *et al.*, unpublished observations). Pictures of angry faces were selected if more than 75% of the participants categorized them as angry with an average intensity rating higher than 6 (intense). Pictures of neutral faces were selected if more than 75% of the raters categorized them as neutral and if they had an average intensity rating that was moderate (<4). Five neutral and five angry faces were presented in the practice phase; the remaining pictures of 15 neutral and 15 angry faces were presented in the test trials.

Procedure

At the beginning of the experiment, written informed consent of all participants was obtained. Thereafter, participants completed the clinical interviews, the BDI-II-NL, and STAI-T. In order to perform the spatial cueing task, participants were seated at ±50 cm in front of an IBM-compatible laptop with a 60-Hz, 15-inch colour monitor. Inquisit software (Millisecond Software, 2001, Version 1.33) was used to record response accuracy and latency. Participants were instructed to determine as quickly and accurately as possible the location of a target (a black square of 1·1 × 1·1 cm) which could appear on the left or right side of the computer screen by pressing one of two keys ('q' and 'm') on a standard keyboard (AZERTY). Before the target appeared, a picture of an angry or neutral face was presented. Participants were asked to attend to the face. The location of the picture cued the spatial location of the target on 50% of the trials (valid trial) and incorrectly cued the location of the target on the other 50% of the trials (invalid trial).

Each trial started with the presentation of two white frames (8·5 cm high by 7 cm wide) located on both sides of a black background. These remained on the screen throughout the entire trial. After 2700 ms, a fixation cross appeared in the middle of the screen for the remainder of the trial. Two thousand milliseconds after presentation of the fixation cross, a picture of a neutral or angry face was presented for 1000 ms replacing one of the two white frames. Next, after a mask of 50 ms, the target appeared. A trial ended when a participant responded or 1800 ms had elapsed (Fig. 1). Selected pictures of facial affect were presented at random, and neutral and angry faces appeared equally often on the left and right sides of the screen. Valid and invalid trials were also presented randomly. Participants first completed 20 practice trials, followed by 144 test trials. At the end of the experiment all participants were fully debriefed. This study was approved by the local ethics committee.

Design

A mixed analysis of variance (ANOVA) factorial design with group (MDD, NC) as a between-subjects factor and cue validity (valid, invalid) and cue valence (neutral, angry) as within-subjects factors was used on the response latencies. In order to examine our hypotheses, index scores for cue validity, attentional engagement and disengagement were calculated using the following formulas:

(1) Cue validity: RT invalid cue − RT valid cue (a positive score indicates maintained attention)
(2) Attentional Engagement: RT valid/neutral cue − RT valid/angry cue (a positive score indicates attentional capture by angry faces);

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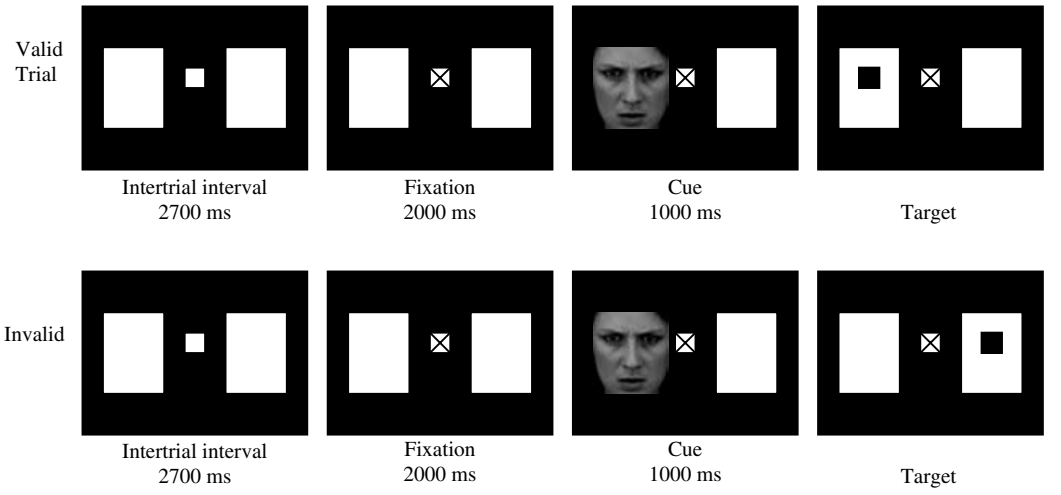


FIG. 1. Stimulus presentation on valid and invalid trials.

(3) Attentional Disengagement: RT invalid/angry cue − RT invalid/neutral cue (a positive score indicates difficulties in detracting attention from angry faces)

On these index scores, one-tailed *t* tests were performed to examine our directional predictions within the depressed group and between the depressed and non-depressed groups. The significance level was set at $p \leqslant 0{\cdot}05$ for all analysis.

RESULTS

Group characteristics

Characteristics of the two participant groups are presented in Table 1. The two groups did not differ with respect to age ($p > 0{\cdot}5$) and gender ($p > 0{\cdot}7$). Of the selected MDD group, seven participants (35%) were residential in-patients and 13 participants (65%) were out-patients, all receiving the same amount of psychotherapy. As is shown in Table 1, a greater proportion of MDD participants compared with the NC group were currently taking psychotropic medication [χ^2 $(1, n = 40) = 26{\cdot}67$, $p < 0{\cdot}001$]. Both participant groups also differed in their history of depression [χ^2 $(1, n = 40) = 25{\cdot}66$, $p < 0{\cdot}001$]. All control participants and four MDD participants (21%) reported no previous depressive episodes; the remaining MDD participants reported one (26%), two (16%), three (11%) or more previous depressive episodes (26%). One-way ANOVAs showed the expected significant differences between groups on the clinical measures: HRSD [$F(1, 39) = 421{\cdot}34$, $p < 0{\cdot}001$], BDI [$F(1, 39) = 210{\cdot}99$, $p < 0{\cdot}001$] and STAI-T [$F(1, 39) = 31{\cdot}46$, $p < 0{\cdot}001$].

Table 1. *Group characteristics*

Variable	Group	
	MDD	NC
n	20	20
Age	45·50 (11·05)	43·20 (11·48)
Gender ratio (male/female)	5/15	6/14
Percentage currently on psychotropic medication*	80%	0%
Percentage with history of depression*	79%	0%
HRSD score*	21·80 (4·01)	1·60 (1·82)
BDI score*	34·90 (8·83)	3·75 (3·74)
STAI-T score*	55·20 (13·48)	34·05 (10·12)

Standard deviations are shown in parentheses.
HRSD, Hamilton Rating Scale for Depression; BDI, Beck Depression Inventory; STAI-T, State-Trait Anxiety Inventory.
* Indicates a significant difference ($p < 0{\cdot}001$) between the depressed and non-depressed groups.

Reaction time data

Preparation of the data

First, before analysis of the data, all trials with errors were omitted. Across groups, participants made few errors (0·78%) and erroneous responding did not differ between depressed and

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Table 2. *Mean RTs and standard deviations (in ms) of the modified exogenous cueing task*

		Group			
		MDD		NC	
Cue valence	Trial validity	Mean	S.D.	Mean	S.D.
Anger	Valid	437·41	76·60	389·14	72·28
	Invalid	456·70	91·49	400·36	79·18
Neutral	Valid	446·76	82·57	391·33	65·69
	Invalid	455·49	82·82	407·32	72·49

control participants ($p = 0{\cdot}5$). Next, responses shorter than 200 ms and longer than 750 ms were considered as outliers, reflecting anticipatory and delayed responding, respectively, and were also removed from analyses. The number of outliers did not differ between the two groups ($p > 0{\cdot}2$). Data analysis was performed on a remaining 96·5% of the original data.

Attentional effects

The $2 \times 2 \times 2$ repeated measures ANOVA revealed a significant main effect of Cue Valence [$F(1, 38) = 4{\cdot}36$, $p = 0{\cdot}04$]; using *post hoc* tests (LSD) this effect indicated faster responding to angry faces (mean = 421 ms) compared with neutral faces (mean = 425 ms). The main effect of cue validity was also significant [$F(1, 38) = 4{\cdot}18$, $p = 0{\cdot}05$], with faster responding on valid (mean = 416 ms) *versus* invalid trials (mean = 430 ms). Next, a significant main effect of group [$F(1, 38) = 4{\cdot}84$, $p = 0{\cdot}03$] indicated overall faster responding in the NC group (mean = 397 ms) compared with the MDD group (mean = 449 ms). As expected, we found a significant three-way Cue Valence × Cue Validity × Group interaction [$F(1, 38) = 4{\cdot}72$, $p = 0{\cdot}03$]. Other effects did not reach significance (all p's > 0·4). Mean RTs and standard deviations for each condition are presented in Table 2.

In order to further corroborate the three-way interaction, further analyses were used to examine the interaction between Cue Valence and Cue Validity for each group separately.

First, we calculated Cue validity (CV) indices for angry and neutral cues for the MDD and the NC groups (Fig. 2). In the MDD group, contrast analyses revealed a significantly larger validity effect [$t(19) = 1{\cdot}81$, $p = 0{\cdot}04$] for angry faces (mean CV = 19 ms) compared with neutral

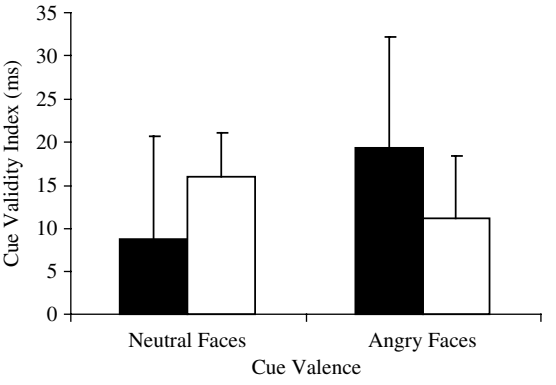


FIG. 2. Mean Cue Validity scores (RT invalid cue − T valid cue) and standard errors as a function of Cue Valence and Group. ■, Major depressive disorder; □, non-depressed controls.

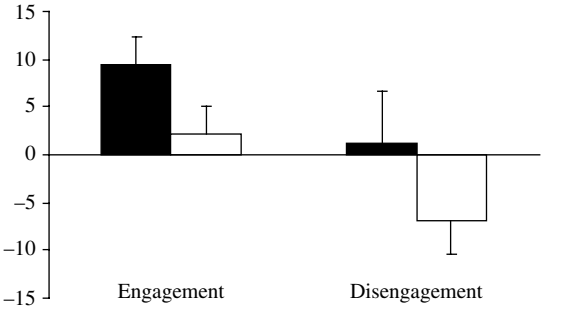


FIG. 3. Mean attentional engagement (RT valid/neutral cue − RT valid/angry cue), disengagement scores (RT invalid/angry cue − RT invalid/neutral cue) and standard errors as a function of Group. ■, Major depressive disorder; □, non-depressed controls.

faces (mean CV = 9 ms), indicating maintained attention towards angry cues. Within the NC group no significant differences ($p > 0{\cdot}1$) were found between cue validity for angry (mean CV = 11 ms) *versus* neutral faces (mean CV = 16 ms). However, using independent t tests, no significant differences were found between groups comparing the cue validity effects for angry and for neutral faces (all p's > 0·3).

Next, we investigated attentional engagement and disengagement indices for angry faces (Fig. 3). Attentional engagement scores for angry faces were significantly different comparing the depressed and non-depressed participants [$t(38) = 1{\cdot}71$, $p = 0{\cdot}05$]. Furthermore, within the MDD group the mean attentional engagement score for angry faces (mean = 9 ms) differed significantly from zero (0 = no

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attentional bias), [$t(19) = 3{\cdot}02$, $p = 0{\cdot}007$], but within the NC group (mean = 2 ms) this could not be demonstrated ($p > 0{\cdot}4$). Contrary to our expectations, depressed and non-depressed individuals showed no significant differences on attentional disengagement for angry faces ($p > 0{\cdot}2$). Nevertheless, the attentional disengagement score was significantly different from zero (mean = −7 ms) in the non-depressed group [$t(19) = 2{\cdot}04$, $p = 0{\cdot}03$], with a negative score indicating a faster shifting of attention away from negative material compared to neutral information. The attentional disengagement score did not differ significantly from zero (mean = 1 ms) in the depressed group ($p > 0{\cdot}4$).

DISCUSSION

In the present study we examined the nature of attentional biases for angry facial expressions in a depressed patient sample. The results of this study are of importance to the research investigating cognitive processing biases in depressive pathology.

In line with previous studies, results indicate that depression is associated with maintained attention for negative information compared with neutral information. Although maintained attentional orienting to angry faces did not significantly differ between the MDD and the NC groups, we could clearly demonstrate a different pattern of attending to neutral and angry faces in depressed *versus* non-depressed individuals. Depressed individuals showed a stronger attentional engagement with angry faces, whereas the non-depressed individuals more rapidly disengaged their attention from angry faces in comparison with neutral faces. The attentional engagement effect suggests that depressed individuals tend to maintain their attention toward angry facial expressions. To our knowledge, this is the first study that could demonstrate an attentional bias for angry facial expressions in depression. These findings contradict the results found in two recent studies by Gotlib *et al.* (2004*a*, *b*). In these studies carefully selected depressed patients showed an attentional bias for sad facial expressions presented for 1s, but this was not observed for angry faces. However, in both studies attentional processing was measured using the emotion face dot-probe task. The null results of a depression-related attentional bias for angry faces can possibly be due to the fact that this paradigm does not allow differentiation between attentional engagement and disengagement processes, only reflecting the focus of attention at the end of the face presentation.

In contrast to the maintained attention for angry faces found in the MDD group, the present study also demonstrated that non-depressed participants were faster to direct attention away from angry facial expressions compared with neutral faces. These findings are consistent with previous research demonstrating the existence of a 'protective bias' for negative information in never-depressed individuals (McCabe & Gotlib, 1995; McCabe *et al.* 2000). Non-depressed individuals seem able to ignore threatening or negative stimuli in order to focus towards more positive information. Based on the findings in the present study, it can be suggested that the co-occurrence of a maintained attention for negative information and the absence of a protective bias may contribute to the further development of the vicious circle of negative emotions which characterizes depressive individuals.

The results of the present study provide additional support for the idea that attentional biases for negative information in clinically depressed participants can be demonstrated at longer stimulus presentations. Similar results found in previous studies (Bradley *et al.* 1997*a*) indicate that a negative attentional bias in depression is not observed at early, automatic stages of information-processing but only at later, more controlled and elaborative stages (Williams *et al.* 1997). This pattern of disturbed attentional processing of emotional information is remarkably different from the pattern of attentional biases observed in the context of anxiety. It could be that, whereas anxiety is characterized by a bottom up analysis of fearful stimulus features, causing an initial vigilance towards and subsequent avoidance of threatening information (Mogg *et al.* 1995), negative information such as sad and angry facial expressions do not directly demand attention but trigger negative schemata in memory that will subsequently guide attention.

The finding of attentional biases for angry faces in this study is of clinical interest in

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several regards. Although depression seems to be characterized by disruptions in the interpersonal domain (Gotlib & Hammen, 2002), most recent research only used sad facial expressions in order to investigate a mood-congruent attentional bias in depression. However, sad facial expressions may lack a direct relevance to the depressed individual. The interpersonal orientation of depressive persons is characterized by dependency and introversion, implying that the evaluation of one's own self-esteem almost exclusively relies on social approval, constantly causing fear of social rejection (Barnett & Gotlib, 1988). Therefore, angry facial expressions may have a stronger signalling value, causing preferential attending to this kind of information within social interactions. Furthermore, it seems reasonable to assume that this bias in attention may lead to improved memory for social rejection and overly negative interpretations of social events.

Finally, some limitations and drawbacks of this study should be noted. First, because the present study focused only on the attentional processing of angry facial expressions and did not include other emotional facial expressions such as sad and happy faces, we were not able to offer further support for the content-specificity hypothesis, demonstrated in previous research investigating attentional biases toward mood-congruent information in depression (Gotlib *et al.* 2004*a*, *b*). Given that no happy facial expressions were included in this study, we were also unable to shed light on differential processing of positive information. Future research should be aimed at replicating these results, also including mood-congruent and happy facial expressions. Secondly, using response latency tasks such as the dot-probe task, but also the exogenous cueing task, it remains impossible to fully explore the pattern of attentional processing during the presentation of emotional cues. In other words, this study could offer only a snapshot of attention 1s after the onset of the image. Future research should allow continuous monitoring of attentional allocation, for instance by using eye movement registration (Eizenman *et al.* 2003). A third drawback of this study concerns the high correlations found between BDI and trait anxiety scores [$r = 0{\cdot}70$, $p < 0{\cdot}001$] and a co-morbid diagnosis of anxiety disorders in eight of the MDD participants. Most previous studies have also reported high correlations between depression and anxiety and this co-morbidity occurs frequently in clinical practice (Mineka *et al.* 1998). In order to check whether the established attentional engagement for angry faces was more related to depression or anxiety symptoms, we conducted a multiple regression analysis. BDI and trait anxiety scores were introduced as predictors and their unique main effects were examined. This analysis revealed that the BDI score was a marginally significant predictor of attentional engagement while controlling for anxiety [$\beta = 0{\cdot}41$, $t(37) = 1{\cdot}88$, $p = 0{\cdot}07$]. Conversely, the main effect of anxiety was not significant [$\beta = -0{\cdot}25$, $p > 0{\cdot}2$]. These findings might therefore suggest that the established attentional bias can be uniquely attributed to the effects of the depressive pathology.

In conclusion, the results of this study may offer new insights into the relationship between attentional biases toward negative information and depression. The findings indicate that depression is associated with maintained attention and longer attentional engagement for angry facial expressions, providing new evidence for the existence of a disturbed attentional processing of mood-electing, interpersonally relevant information in depressive pathology.

ACKNOWLEDGEMENTS

The authors thank G. De Man and T. Leyman from the Department of Product Development, Vlaamse Dienst voor Arbeidsbemiddeling en Beroepsopleiding (VDAB) in Brussels, Belgium, for the gathering of the non-depressed control participants.

DECLARATION OF INTEREST

None.

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