



Referential focus moderates depression-linked attentional avoidance of positive information



Julie Lin Ji ^{a, b, *}, Ben Grafton ^{b, c}, Colin MacLeod ^{b, c}

^a Medical Research Council Cognition & Brain Sciences Unit, University of Cambridge, United Kingdom

^b Centre for the Advancement of Research on Emotion, School of Psychology, University of Western Australia, Australia

^c School of Psychology, Babes-Bolyai University, Romania

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ABSTRACT

While there is consensus that depression is associated with a memory bias characterized by reduced retrieval of positive information that is restricted to information that had been self-referentially processed, there is less agreement concerning whether depression is characterized by an attention bias involving reduced attention to positive information. However, unlike memory research, previous attention research has not systematically examined the potential role of referential processing focus. The present study tested the hypothesis that evidence of depression-linked attentional avoidance of positive information would be more readily obtained following the self-referential processing of such information. We assessed attentional responding to positive information (and also to negative information) using a dot-probe procedure, after this information had been processed either in a self-referential or other-referential manner. The findings lend support to the hypothesis under scrutiny. Participants scoring high in depression score exhibited reduced attention to positive information compared to those scoring low in depression score, but only when this information had been processed in a self-referential manner. These findings may shed light on the mechanisms that underpin attentional selectivity in depression, while potentially also helping to account for inconsistencies in previous literature.

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Cognitive theories of depression posit that systematic biases in the processing of emotional information distort subjective reality in ways that elevate negative emotional disposition (Beck, 1976; Ingram, 1984; Teasdale, 1988). For example, Beck argues that depressed individuals possess schemas that guide the operation of memory and attention in ways that result in processing advantages for schema congruent information (Beck, 1976). Considerable research effort over the past three decades has sought to determine whether biases in attention and memory are characteristic of elevated vulnerability to depression (Mathews & MacLeod, 1994, 2005). While clear experimental evidence of a depression-linked memory bias has been obtained, there has been debate concerning whether or not depression is characterized by an attentional bias (Mineka, Watson, & Clark, 1998; Williams, Watts, MacLeod, & Mathews, 1997).

Depression-linked memory bias is more evident for emotionally

positive information than for emotionally negative information. Specifically, relatively impaired memory for positive information (rather than relative enhanced memory for negative information) has been observed in individuals with clinical levels of depression compared to healthy controls (Breslow, Kocsis, & Belkin, 1981; Burt, Zembar, & Niederehe, 1995; Dozois & Dobson, 2001; McDowall, 1984), as well as individuals experiencing depressed mood (dysphoria) compared to healthy controls (Finkel, Glass, & Merluzzi, 1982; Ingram, Smith, & Brehm, 1983; Murray, Whitehouse, & Alloy, 1999). This pattern of bias has also been observed in individuals with experimentally induced negative mood compared to those with experimentally induced positive mood (Isen, Shalke, Clark, & Karp, 1978; Study 2; Nasby & Yando, 1982; Study 1).

Although there is general agreement that depression is characterized by biased memory processing (c.f. Matt, Vázquez, & Campbell, 1992; Mathews & MacLeod, 2005), it is important to note that such effects are only reliably observed under a very particular processing condition (Blaney, 1986; Matt et al., 1992). Critically, several reviews have noted that depression-linked memory selectivity is robustly observed only after emotional

* Corresponding author. Medical Research Council Cognition & Brain Sciences Unit, 15 Chaucer Road, CB2 7EF Cambridge, United Kingdom.

E-mail address: julie.ji@mrc-cbu.cam.ac.uk (J.L. Ji).

information has initially been processed in a self-referential manner (Blaney, 1986; Gaddy & Ingram, 2014; Matt et al., 1992). In a typical experimental paradigm, referential processing focus is manipulated by having participants rate a list of positive and negative personality attribute words according to whether or not each attribute is descriptive of the self (self-referential condition) or descriptive of a familiar other (other-referential condition). Participants' memory for the stimuli is subsequently tested using explicit recall paradigms. In studies where referential focus has been left unconstrained during encoding, evidence of depression-linked memory bias has been mixed. While some studies do find memory impairment for positive information in clinically depressed individuals compared to non-depressed controls (Breslow et al., 1981), others fail to observe any memory differences between depressed and non-depressed controls (Hasher, Rose, Zacks, Sanft, & Doren, 1985). However, when investigators have experimentally elicited self-referential processing of the stimuli prior to the memory test, a depression-linked bias reflecting reduced memory for positive information has been observed. No such effect is evidenced when the stimuli initially has been processed in an other-referential manner (Bradley & Mathews, 1983; Kuiper & Derry, 1982). Such findings have led investigators to conclude that this memory bias is driven by a distorted self-schema in depressed individuals that is characterized by a lack of positive information about the self (Dozois & Dobson, 2001).

Evidence of this depression-linked memory bias has generally been consistent across studies (Mathews & MacLeod, 2005). In contrast, while meta-analytic investigations have revealed that across studies, on average, there is evidence of a depression-linked attentional bias (Peckham, McHugh, & Otto, 2010; Winer & Salem, 2016), whether or not such attentional bias is observed in an individual study has been highly variable (Gotlib & Joormann, 2010; Mathews & MacLeod, 2005). Some studies using variants of the attention probe task (MacLeod, Mathews, & Tata, 1986) to assess attention bias report findings that individuals experiencing depressed mood (Bradley, Mogg, Falla, & Hamilton, 1998; McCabe & Toman, 2000), or clinical levels of depression (Gotlib, McLachlan, & Katz, 1988), exhibit reduced attention to positive information compared to healthy controls. However, many more studies using similar attentional assessment approaches have failed to find any depression-linked individual differences in the attentional processing of positive (or negative) information (Mogg, Bradley, & Williams, 1995; Bradley, Mogg, & Lee, 1997; for a review see; Mogg & Bradley, 2005).

Researchers have speculated about the precise processing conditions under which depression-linked attentional bias may be observed. The idea that has received most experimental scrutiny is that depression-linked attentional bias may be more evident at longer stimulus exposure durations (e.g. 1000 ms) than shorter stimulus exposure durations (e.g. 500 ms; Mogg & Bradley, 1998), perhaps reflecting increased attentional disengagement from positive information, rather than reduced attentional engagement with such positive emotional information (Sanchez, Vazquez, Marker, LeMoult, & Joormann, 2013; Koster, De Raedt, Goeleven, Franck, & Crombez, 2005). Consistent with this idea, the majority of attentional probe studies reporting evidence of depression-linked attentional bias have employed stimulus exposure durations of 1000 ms or above (c.f. Gotlib & Joormann, 2010; Mogg & Bradley, 2005), while failures to demonstrate this effect have employed stimulus exposure durations of 500 ms or shorter (Donaldson, Lam, & Mathews, 2007). However, this hypothesis cannot fully account for the observed inconsistencies, given that several studies employing stimulus exposure durations of 1000 ms or more have failed to obtain evidence of a depression-linked attention bias (Mogg, Millar, & Bradley, 2000; Neshat-Doost,

Moradi, Taghavi, Yule, & Dalgleish, 2000), and on occasions, evidence of depression-linked attentional bias has been obtained using 500 ms stimulus exposure durations (Mathews, Ridgeway, & Williamson, 1996; Shane & Peterson, 2007). Hence, cross-study variation in the use of shorter and longer stimulus exposure durations cannot suffice to explain the observed inconsistency concerning depression-linked bias in attentional responding to emotional information.

Intriguingly, despite evidence that depression-linked memory impairment for positive information is restricted to conditions in which information has been processed in a self-referential manner (Blaney, 1986; Gaddy & Ingram, 2014; Matt et al., 1992), no research has tested the possibility that evidence for a depression-linked reduction in attention to positive information may be more readily obtained following self-referential processing of such information. Indeed, if depression-linked information processing bias is driven by the operation of a depressogenic self-schema that lacks positive information, as previous theorists have argued, then reduced attention to positive information in high-depression compared to low-depression participants would be disproportionately evident when this self-schema has been activated by having participants process this emotional information in a self-referential rather than other-referential manner. Importantly, the degree to which participants have engaged in the self-referential processing of stimulus information is likely to have varied in an uncontrolled manner across prior experiments assessing depression-linked attentional bias, because referential processing focus had not been systematically constrained or manipulated. Such variability may have contributed to the pattern of inconsistent findings observed within this literature to date.

The present study was designed to directly test this referential processing focus hypothesis. Using the well-established dot-probe task, we contrasted patterns of attentional bias to emotional information in participants who scored either high or low on the 21-item Depression subscale of the Depression, Anxiety & Stress Scale (DASS-21; Lovibond & Lovibond, 1995). To dissociate selective attentional responding to positive information from selective attentional responding to negative information, it is necessary to pair each type of emotional stimulus with an unemotional stimulus. While some researchers carrying out such attentional assessment have employed neutral words as the unemotional stimulus, others have expressed concern that words intended to be neutral may, for some participants, have emotional significance due to past associations and experience (Grafton, Southworth, Watkins, & MacLeod, 2016), particularly in depressed individuals who are known to display negatively biased interpretations of neutral information (Lawson & MacLeod, 1999). Thus, to eliminate this possibility, these investigators have used meaningless non-words as the non-emotional stimulus, and have successfully dissociated biased attentional processing of positive information from biased attentional processing of negative information (e.g. Grafton, Watkins, & MacLeod, 2012; Grafton et al., 2016). Hence, we adopted this approach in the current dot-probe task, by presenting emotionally positive and negative words that each were paired with a non-word letter string, for 500 ms or 1000 ms, and inferring the resulting attentional distribution between members of the stimulus pair from relative discrimination latencies for probes that then appeared in the locus of either stimulus. Of critical importance, to determine whether depression-linked attentional bias is more evident when stimuli have initially been processed in a self-referential rather than an other-referential manner, this attentional bias assessment was carried out *after* participants had first judged whether each stimulus word was descriptive of the self (self-referential condition) or was descriptive of another specified individual (other-referential condition). In keeping with the approach

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