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Verbal worry facilitates attention to threat in high-worriers☆

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ABSTRACT

Background and objectives: Worry is predominantly a verbal-linguistic process with relatively little imagery. This study investigated whether the verbal nature of worry contributes to the maintenance of worry by enhancing attention to threat. It was hypothesised that verbal worry would lead to greater attentional bias to threat than imagery-based worry.
Methods: Fifty high-worriers were randomly assigned to one of two groups, one in which they were instructed to worry in a verbal way and one in which they worried in an imagery-based way, before completing a dot probe task as a measure of attention to threat-related words.
Results: Those who worried in verbal form demonstrated greater attentional bias to threat than did those who worried in imagery-based form. These findings could not be accounted for by group differences in personal relevance of or distress associated with worry topics, state mood following worry, levels of the relatedness of participants' worries to stimuli on the dot probe task, trait anxiety, general propensity to worry, nor adherence to the worry training.
Limitations: The present study only included word stimuli in the dot probe task; inclusion of images would allow for firmly rejecting the hypothesis that the attention effects observed following verbal worry were merely a result of priming verbal threat representations. Also, future studies could include a further control group that does not engage in any form of worry to ascertain that verbal worry increased attentional bias rather than imagery decreasing pre-existing attentional bias.
Conclusions: Possible mechanisms underlying this effect of verbal worry on attention to threat are discussed, together with clinical implications of the current findings.

1. Introduction

Worry is a cardinal feature of generalised anxiety disorder (GAD). Why some people continue to worry excessively when it appears to maintain anxiety with little objective benefit remains an unanswered question. Worry is known to be characterised by verbal-linguistic processing, which becomes more dominant over imagery-based processing as people move from thinking in a relaxed fashion to worrying (Borkovec & Inz, 1990). Borkovec, Alcaine, and Behar (2004) hypothesised that verbal worry might be negatively reinforced as it suppresses aversive mental imagery and associated somatic symptoms of anxiety but that, in doing so, it interferes with the prolonged activation of the relevant "fear structure" stored in memory that is required for habituation and corrective learning about the feared topic (as per Foa and Kozak's (1986) emotional processing theory). This "fear structure" thereby remains unprocessed and, as a result, continues to be activated. In support of this hypothesis, Butler, Wells, and Dewick (1995) showed that participants who had been shown an anxiety-provoking video and who were then instructed to worry about it in a verbal way experienced a greater decrement in anxiety than those who were instructed to generate mental images from the video. However, those who worried in a verbal way reported more frequent intrusions relating to the video they had seen in the days that followed, compared with those who generated images about the video.

Attention is another process that could be affected by the verbal-linguistic nature of worry. Anxiety, which is a major affective component of worry (Andrews & Borkovec, 1988), is known to be associated with attentional bias to threats. MacLeod, Mathews, and Tata (1986) conducted a landmark study into biased attention in people with GAD using a dot probe task. Participants' reaction times (RTs) were quicker when responding to dots replacing threat

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words than to dots replacing non-threat words, taken by the authors to indicate preferential attention to threats relative to neutral words and implying a similar bias to threatening information encountered in daily life.

Researchers have begun to explore the link between worry and attention more directly. For example, Krebs, Hirsch, and Mathews (2010) manipulated attention to threat cues in people without excessive worry using a training task developed by MacLeod, Rutherford, Campbell, Ebsworthy, and Holker (2002) and showed that inducing attentional bias to threat gave rise to more negative thought intrusions on a breathing focus task than facilitating an equivalent bias to neutral stimuli. This suggests that habitual attention to threat has a role in maintaining worry.

To our knowledge, only one study (Oathes, Squillante, Ray, & Nitschke, 2010) has investigated the reverse direction of influence, i.e., whether worry can lead to changes in attention to threats. Oathes et al. (2010) allocated participants scoring in the "low normal" worry range (Penn State Worry Questionnaire scores between 20 and 50; PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) to one of two experimental manipulations, in one of which participants were instructed to worry and another in which they performed an arithmetic task (the control condition). Both groups then completed a dot probe task to assess attention. Participants saw some word pairs consisting of one threat and one non-threat word (valenced trials) and others of two non-threat words (non-valenced trials), followed by a target (dot) in the location of one of the words. Participants were required to pay attention to the word appearing in the upper location. The authors found that, within the worry condition only, responses were quicker to probes appearing in the attended top location on valenced trials than on non-valenced trials. While this is an interesting finding, it does not constitute attentional bias to threat and is not a calculation found in previous research. The authors did not find evidence for biased attention to threat following worry using the traditional measure of MacLeod et al. (1986), i.e., speeded responses to probes in the prior location of threat compared with non-threat words.

The present study was designed to provide a further test of the prediction that worry can augment attention to threat cues. Rather than testing low-worriers (as did Oathes et al., 2010), who often tend to avoid threat cues, we studied non-clinical high-worriers, a group we thought more likely to reveal any effect that worry might have on attentional bias (Hirsch & Mathews, 2012). Furthermore, instead of using an unrelated arithmetic task as a comparison condition, we chose to contrast two different forms of worry, i.e., verbal or mental imagery of the same negative content. As well as providing a comparison condition better matched for exposure to worry content per se, this allowed us to address a specific hypothesis about the mechanism by which worry might facilitate attention to threat, i.e., that the verbal-linguistic nature of worry has a causal role in this regard. More specifically, we propose that verbal-linguistic worry could facilitate attentional bias to threat via the aforementioned mechanism proposed by Borkovec et al. (2004), in which verbal thought interferes with the processing of "fear structures", whereas we would expect imagery-based worry to lead to fuller emotional processing and therefore less attentional bias to threat.

In the present study high-worriers were randomly allocated to one of two groups, one in which the instruction was to worry in the usual verbal manner and another in which the instruction was to worry in an imagery-based way. It was predicted that subsequent attention to threat would be more evident after verbal worry than when people imagined worry-related outcomes.

2. Method

2.1. Participants

Sixty high-worriers who spoke English as a first language attended the experimental session. They were recruited using an advertisement on a website and scored 56 or above[1] on the PSWQ at screening. Ten people who attended the experimental session were excluded from the study at various stages (see Section 2.4 for a summary of the different stages). Five people were excluded due to no longer scoring 56 or above on the PSWQ on attending the experimental session, and two people allocated to the Imagery group chose to discontinue the study during the worry training.[2] Participants were also required to meet two further rating criteria in each 2 min worry period in the worry phase and worry reactivation phase: one criterion required at least 60% of thought content to be negative in valence, and the other required at least 60% of thought content to be in the designated mentation style (i.e., verbal or imagery, depending on group allocation) and/or at most 40% of thought content to be in the non-designated style.[3] Three people were excluded from the study for not reaching one of these criteria during one of the 2 min worry periods in the worry phase and worry reactivation phase, two in the Verbal group and one in the Imagery group.

There were 25 participants in each group in the final sample. No significant difference was found in the number of females in the Verbal and Imagery groups, 20 vs. 21, Fisher's Exact Test $p = 1$. The Verbal and Imagery groups did not differ in age, *Mean* = 26.68, SD = 8.70 vs. *Mean* = 26.08, SD = 8.73, Mann Whitney's *U* Test $p = .86$. As shown in Table 1, the two groups did not differ in their scores on the PSWQ, the trait scale of the State-Trait Anxiety Inventory (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), or the Worry Domains Questionnaire-Short Form (WDQ-SF; Stöber & Joormann, 2001).

2.2. Self-report questionnaires and ratings

2.2.1. Penn state worry questionnaire

The PSWQ (Meyer et al., 1990) comprises 16 statements relating to worry, which participants rate from 1 (not at all typical of me) to 5 (very typical of me). Studies report the PSWQ to have high short-term retest reliability and convergent and criterion related validity (Brown, Antony, & Barlow, 1992; Davey, 1993). Molina and Borkovec (1994) showed the PSWQ to have high internal consistency ($\alpha = .91$).

2.2.2. Trait version of the state-trait anxiety inventory

The STAI-T (Spielberger et al., 1983) consists of 20 statements relating to anxiety, which participants rate from 1 (almost never) to 4 (almost always). The STAI-T has demonstrated good convergent validity (Peterson & Reiss, 1987), concurrent validity (Spielberger, Ritterband, Sydeman, Reheiser, & Unger, 1995), construct validity (Smeets, Merckelbach, & Griez, 1997), and test–retest reliability (Rule & Traver, 1983). Spielberger et al. (1983) reported high internal consistency for the STAI-T ($\alpha = .90$).

2.2.3. The worry domains questionnaire short form

The WDQ-SF (Stöber & Joormann, 2001) is a measure of predominant domains of worry, consisting of 10 items, based on the original Worry Domains Questionnaire (WDQ) of Tallis, Eysenck,

[1] Prior research (Molina & Borkovec, 1994) has found a PSWQ score of 56 to fall one standard deviation below the mean of individuals diagnosed with GAD.

[2] These participants had found the worry training to be distressing.

[3] These criteria of valence and mentation style were chosen on the basis of previous studies, which used similar but slightly less stringent criteria (e.g., Leigh & Hirsch, 2011; Stokes & Hirsch, 2010).