

Title:

Individual Differences in Metacognitive Knowledge Contribute to Psychological Vulnerability more than the presence of a Mental Disorder Does.

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Abstract

Psychological vulnerability can be operationalized as trait-anxiety, the stable tendency to experience anxiety and negative affect when exposed to stress. The current study set out to test whether metacognitive beliefs could be an underlying factor explaining variance in trait-anxiety when the presence of psychopathology is controlled. Participants reported mental health status and completed self-report measures. Our findings showed that multiple domains of metacognitive beliefs accounted for an additional 44.9 per cent of the variance in trait anxiety after the presence of diagnosed psychopathology was controlled. The implication of this finding is that the metacognitive model may advance conceptualization of trait anxiety and provide effective interventions for modifying psychological vulnerabilities.

Key words:

Psychological vulnerability; trait-anxiety; mental health; prevention; metacognition; metacognitive beliefs

1. Introduction

Psychological vulnerability can be assessed at a surface level by a variety of trait constructs and these constructs are positively linked with psychopathology. For example, Neuroticism (Eysenck & Eysenck, 1975) is considered to be a general tendency to experience negative emotions. It has been hypothesized as a core feature of the individual that may be genetically influenced and is reliably associated with psychological disorders (Brown, Chorpita & Barlow, 1998; Clark, Watson & Mineka, 1994; Kendler, Gatz, Gardner & Pedersen, 2006). In a more specific context, and building on the work of Cattell (e.g. Cattell & Scheier, 1961), Spielberger and colleagues developed the State-Trait Anxiety Inventory (STAI: Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) to measure anxiety as a state at a given point in time (state anxiety), and as a trait reflecting proneness to react with anxiety under stressful circumstances (trait anxiety). Substantial psychometric evaluation of the STAI-T (trait anxiety subscale), has indicated that the STAI-T is multifactorial, consisting of factors measuring vulnerability to both anxiety and depression (Bieling, Antony & Swinson, 1998; Bados, Gómez-Benito & Balaguer, 2010; Balsamo, Romanelli, Innamorati, Ciccarese, Carlucci & Saggino, 2013). Trait anxiety should therefore be considered a measure of general vulnerability to emotional disorder rather a specific vulnerability to anxiety as originally proposed by Spielberger and colleagues.

While trait anxiety demonstrates strong prospective positive associations with psychopathology and related constructs such as worry and rumination (e.g. Muris, Roelofs, Rassin, Franken & Mayer, 2005), critics have argued that measures such as trait anxiety or neuroticism do not yield useful information on the etiological mechanisms of psychopathology (Claridge & Davis, 2001; Ormel, Rosmalen & Farmer, 2004). In order to improve assessment, treatment and prevention of psychopathology, the concept of psychological vulnerability needs to be embedded in a theory of what vulnerability is. The

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mechanisms underlying vulnerability markers of trait anxiety and neuroticism must be elucidated in conceptualizing these traits as higher order vulnerability factors (see e.g. Cuijpers et al., 2010). Furthermore, tests of the correlates of trait-anxiety should seek to control confounding factors, particularly the presence of existing psychopathology, so that true relationships with underlying psychological mechanisms can be tested.

The metacognitive model of psychological disorders (Wells & Matthews, 1994; 1996; Wells, 2009) views psychological disorder as positively correlated with the cognitive attentional syndrome (CAS); a perseverative thinking style consisting of worry, rumination, and self-focused attention that intensifies and maintains psychological distress. Wells and Matthews (1994) assert that the CAS is regulated by metacognition, which includes knowledge about thinking, memory and attention (e.g. “worry is uncontrollable”, “I have little confidence in my memory for words and names”). Thus, metacognitive knowledge conceptualized in trait terms has been formulated as a central factor in both state and trait emotion (Wells & Matthews, 1994), and might therefore be a core underlying mechanism in trait anxiety and related constructs such as neuroticism. For example, negative beliefs about the uncontrollability and danger of worry are likely to predict anxiety proneness and negative affect by contributing to the persistence of negative thinking patterns and negative interpretations of internal experience, compromising choice of effective coping strategies when exposed to stress (Wells & Matthews, 1994).

Consistent with this idea, significant positive correlations between psychological vulnerability markers and metacognitive beliefs have been reported. Wells & Cartwright-Hatton (2004) reported that metacognitive beliefs as measured by the total score on the metacognitions questionnaire 30 (MCQ-30) explained 48 % of the variance in trait anxiety, but they did not explore the amount of variance explained by different domains of metacognitive beliefs and they did not control overlaps with the presence of psychological disorder.

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Moreover, van der Heiden, Melchior, Muris, Boumeester, Bos and van der Molen (2010) found a significant positive correlation of .49 between negative metacognitive beliefs about uncontrollability and danger, and a significant correlation of .34 between positive metacognitive beliefs, and neuroticism but with no control for pathology. Other studies of metacognitive belief domains have demonstrated that negative metacognitive beliefs about uncontrollability and danger of thoughts and cognitive confidence show the strongest relationships with trait anxiety (Cartwright-Hatton & Wells, 1997; Wells & Cartwright-Hatton, 2004; Yilmaz, Gencöz & Wells, 2008). However, these studies did not test these associations whilst accounting for the presence or absence of a mental health diagnosis, and it is necessary to control for the presence of pathological states in evaluating the underlying predictors of vulnerability (trait-anxiety), since any association may be the result of the variance that trait-anxiety and metacognition share with psychological disorder.

The present study therefore set out to explore the association between domains of metacognitive beliefs and trait anxiety when the presence/absence of a diagnosed mental disorder is controlled. Our hypotheses, derived from the metacognitive model were as follows; 1) trait anxiety will be positively correlated with metacognitive beliefs; 2) individuals reporting being diagnosed with a psychological disorder will show higher trait anxiety and endorsements of maladaptive metacognitive beliefs; and 3) metacognitive beliefs will positively predict trait anxiety even when disorder/diagnosis is controlled. Finally, we aimed to determine the strongest independent predictors of trait-anxiety amongst the five-factors of the MCQ-30.

2. Methods

2.1 Participants and procedure

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In a cross-sectional design, 393 participants were recruited at convenience. They completed the State-Trait Anxiety Inventory (trait subscale) and the Meta-cognitions questionnaire 30. In addition, they reported if they ever had been diagnosed with a mental illness (no/yes answer). Most of the participants were undergraduate students. The mean age was 23.19 (std: 5.60) years, and 260 (66 %) of the sample were female. In the total sample, 53 (14 %) reported that they had received a diagnosis of a mental illness, 40 (15 %) among the females and 13 (10 %) among the males.

2.2 Measures

2.2.1 The State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (form Y2: trait-anxiety) (STAI-T: Spielberger et al., 1983) is a 20 item self-report questionnaire employed as an index of general anxiety proneness. Respondents are asked to rate how much they agree with each of the statements on a four-point Likert scale. Total scores range from 20 to 80 points, with higher scores reflecting stronger traits of anxiety proneness. The STAI-T has good psychometric properties, with Cronbach's alpha in the range of .86 to .95, and test-retest correlations ranging from .73 to .86 (Spielberger et al., 1983). In the current study, the internal consistency was excellent ($\alpha = .93$).

2.2.2 The Metacognitions questionnaire 30

The MCQ-30 (Wells & Cartwright-Hatton, 2004) is a 30-item self-report scale measuring metacognitive beliefs and processes about thinking. Responses are required on a four-point scale ranging from 1 (do not agree) to 4 (agree very much), and each subscale has a range from 6-24 points. A five-factor structure exists: 1) positive beliefs about worry (pos); 2) negative beliefs about the controllability of thoughts and corresponding danger (neg); 3)

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cognitive confidence (cc); 4) beliefs about need to control thoughts (nc); and 5) cognitive self-consciousness (csc). High scores reflect more reported problems with the item in question.

The measure has shown good internal consistency with Cronbach's alpha ranging from 0.72 to 0.93 (Wells & Cartwright-Hatton, 2004). In the current study, the Cronbach alpha's ranged from .71 to .86 (pos: $\alpha = .86$, neg: $\alpha = .84$, cc: $\alpha = .85$, nc: $\alpha = .71$, csc: $\alpha = .80$).

2.3 Overview of data analysis

Bivariate correlations were used to explore the relationships between trait anxiety and domain specific metacognitive beliefs. Group comparisons (t-tests) were run on trait-anxiety and MCQ-30 between those reporting a present/past diagnosis and those who reported never to have been diagnosed to test if metacognitive beliefs explained variance in trait anxiety over and above the presence of a diagnosed mental disorder, we conducted a hierarchical multiple linear regression. We controlled for gender and age in the first step and the presence/absence of a diagnosed mental disorder in the second step. In the final step, all MCQ-30 subscales were entered as a block of independent predictors, using forced entry.

3. Results

3.1 Correlational analysis

Trait anxiety was positively and significantly associated with each of the metacognitive belief domains, and the strongest correlations were found with negative metacognitive beliefs and need for control. All domains of metacognitive beliefs were also significantly inter-correlated. The correlations are presented in table 1.

Insert Table 1 here

3.2 Group comparison

We found significant differences between the diagnosis/no diagnosis groups in trait anxiety, and in all domains of metacognitive beliefs except positive metacognitive beliefs. Trait anxiety followed by negative metacognitive beliefs and cognitive self-consciousness differentiated the most between the groups. The group comparisons are presented in table 2.

Insert Table 2 here

3.3 Linear regression analysis

A hierarchical linear regression analysis was used to test if metacognitive beliefs could explain variance in trait anxiety after controlling for gender/age (step 1) and the presence/absence of a diagnosed mental disorder (step 2). On the first step of the regression, age was a significant predictor of trait anxiety, and indicated that a younger age was associated with higher levels of vulnerability. On the second step, age remained a significant predictor of trait anxiety. In addition, as expected the presence of a diagnosed mental disorder was a strong predictor of trait anxiety, explaining an additional 9 % of the variance. In the final equation, when metacognitive beliefs were entered in the model, age, gender, and the presence of a diagnosed mental disorder remained as significant independent predictors of trait anxiety. However, four out of five subscales of the MCQ-30 independently explained additional variance in trait anxiety. Negative metacognitive beliefs was the strongest predictor, followed by positive metacognitive beliefs, low cognitive confidence and need for control. Together, as a block metacognitive beliefs explained an additional 44.9 % of the variance in trait anxiety when gender, age and the presence of a diagnosed mental disorder were accounted for. Incidentally, negative metacognitive beliefs and positive metacognitive

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beliefs were each stronger predictors of trait anxiety than the presence of a diagnosed mental disorder in the final equation. The regression summary statistics are presented in table 3.

Insert Table 3 here

4. Discussion

The primary aim of the present study was to explore if metacognitive beliefs accounted for variance in trait anxiety, a marker for psychological vulnerability, when the self-reported past/present status of a diagnosed mental disorder was controlled. Our findings showed a substantial contribution of metacognitive beliefs with four metacognitive factors making independent contributions to trait-anxiety. The strength of these findings was the control of age and gender as well as the self-reported lifetime presence of a diagnosed mental disorder. Thus, the association between metacognition and emotion vulnerability (operationalized as trait-anxiety) appears to involve multiple independent domains of metacognition and this relationship seems not to be an artefact of the lifetime presence of mental disorder. These findings are potentially important because they extend earlier data on positive associations between metacognition and trait-anxiety that have not controlled for mental-health status. These findings are consistent with the hypothesis grounded in S-REF theory that metacognitive beliefs may be an underlying factor in psychological vulnerability, and possibly that trait anxiety is a surface marker of maladaptation in domains of metacognitive beliefs that are the core underlying psychological vulnerability factor. However, it remains to be determined if these factors also emerge with other measures of vulnerability.

All metacognitive belief domains showed significant positive bi-variate correlations with trait anxiety, and individuals reporting to have been diagnosed with a mental disorder

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reported significantly higher levels of trait anxiety, negative metacognitive beliefs, cognitive confidence, need for control and cognitive self-consciousness than controls.

In the final regression equations, gender was a significant predictor of trait-anxiety, indicating that women have elevated psychological vulnerability compared to men. This finding is consistent with previous research which has shown that women report greater trait-anxiety and are more prone to develop psychopathology (e.g., McLean & Anderson, 2009). However, we found that, gender became significant as a predictor of trait-anxiety when metacognitive beliefs were added to the model. While the effect of gender was small in the final model, one possible explanation for this finding could reflect that women on average show a greater tendency to perseverative negative thinking relative to men (Nolen-Hoeksema, 2012), and that there could exist an interaction effect between worry/rumination and metacognitive beliefs. However, gender differences in self-regulation may also be explained by differences in metacognition, and it has been demonstrated that the MCQ-30 is a valid tool to investigate this possibility (Fergus & Bardeen, 2017). Furthermore, age was a significant predictor of trait-anxiety in all steps of the regressions, and lower age was associated with higher levels of trait-anxiety. The effect of age was small, but is in line with previous research which has shown that trait-anxiety is negatively correlated with age (e.g, Spielberger et al., 1983; Nakazato & Shimonaka, 1989). While the effect of age on trait anxiety decreased when metacognitive beliefs were added to the model, it still made an individual contribution to the overall variance explained.

In summary, when gender/age and the presence of a diagnosed mental disorder were controlled, four metacognition variables explained substantial variance in trait-anxiety. Moreover, negative metacognitive beliefs concerning the uncontrollability and corresponding danger of worry was the strongest predictor.

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These data further support the metacognitive model of psychological disorder, and appear to modify an assumption of previous research that gives emphasis to trait anxiety as a core vulnerability factor in psychopathology. According to the metacognitive model (Wells & Matthews, 1994), trait anxiety and the related construct of neuroticism may be markers of maladaptive metacognitive beliefs and the cognitive attentional syndrome (CAS), implying that elevated trait anxiety/neuroticism may be a product of specific metacognitions rather than indicative of a separate, stable and direct (unmodifiable) cause of disorder. This notion is supported by treatment studies, e.g. studies on metacognitive therapy for generalized anxiety disorder which show substantial decrease in trait anxiety following treatment (van der Heiden, Muris & van der Molen, 2012; van der Heiden, Melchior & de Stigter, 2013; Wells & King, 2006; Wells, Welford, King, Papageorgiou, Wisley & Mendel, 2010).

In the metacognitive model, traits are mainly associated with self-knowledge and metacognitive beliefs, and states with the immediate extent and character of the CAS. Traits and states are likely to interact such that maladaptive aspects of personality are enhanced by higher levels of CAS activation. Activation of negative metacognitive beliefs will lead to an increase of CAS-activity which leads to enhanced distress. The presence of maladaptive metacognitive beliefs and the corresponding activation of the CAS may therefore be the true core of psychological vulnerability which is marked by trait anxiety.

There are several implications of these findings. First of all, metacognitive beliefs rather than trait anxiety may be the underlying mechanism of psychological vulnerability. This calls for much needed research on psychological vulnerability and metacognition. Second, while constructs such as trait anxiety have been criticized for limited clinical relevance, the present findings suggest that if they are a marker for maladaptive metacognitive beliefs, these can be conceptualized and treated using metacognitive therapy applications (Wells, 2009). Third, the metacognitive model might be used to inform further research on

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prevention of mental illness. For example, one study by Murray, Theakston and Wells (2016) showed that the attention training technique (e.g., Wells, 2009), a metacognitive therapy intervention targeting inflexible attentional control (a central marker of the CAS), improved children's self-regulatory abilities with the potential implication that the intervention could reduce psychological vulnerability later in life.

This is the first study to investigate the relationship between trait-anxiety and metacognitive beliefs when controlling for the presence of a mental disorder. However, the study has significant limitations; a cross-sectional design, which inhibits causal inferences and no formal assessment of diagnosis. The reliance on self-report of the presence of diagnosed mental disorder can be questioned on the grounds of sensitivity, reliability and validity. However, this approach is justified because the validity of self-reported mental diagnosis has been found adequate in for example individuals with depression (Sanchez-Villegas et al., 2008). In the present study we considered it important to avoid measurement overlap in testing predictors of vulnerability. More specifically, psychological disorder symptom severity measures (e.g. anxiety/mood measures) could have been used to define groups but would cause criterion contamination with trait-anxiety and it is important to avoid this potential confound. The use of dichotomous ratings of diagnosis is non-specific and loses potentially valuable information concerning the nature of the diagnosis but it is likely to offer greater accuracy than individual disorder diagnoses. Further research should replicate the study with a longitudinal design including more detailed data collection on psychopathology. It should also be noted that other traits such as extraversion-introversion may be associated with underlying metacognitive beliefs and greater control over personality factors is required.

In conclusion, the current study suggests that metacognitive beliefs may be an underlying mechanism of vulnerability attributed to trait anxiety. This implies that 'vulnerability' may be conceptualized and modified with approaches such as metacognitive

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therapy, with a view to enhancing psychological resilience by modifying specific dimensions of metacognitive knowledge.

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Table 1: Bivariate correlations for STAI-T and the MCQ-30 subscales (n = 393).

	2	3	4	5	6
1. STAI-T trait anxiety	.407**	.674**	.352**	.487**	.355**
2. MCQ positive beliefs		.282**	.190**	.425**	.318**
3. MCQ negative beliefs			.318**	.530**	.385**
4. MCQ cognitive confidence				.299**	.105*
5. MCQ need for control					.465**
6. MCQ cog. self-consciousness					

*p < .05, **p < .01.

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Table 2: Group comparisons; mean scores, standard deviations and t-values.

	Total Sample (N = 393)	Diagnosed (n = 53)	Not diagnosed (n = 340)	t-value
STAI-T	39.67 (11.11)	49.09 (13.26)	38.19 (10.00)	5.739**
MCQ positive beliefs	9.40 (3.18)	10.02 (3.55)	9.29 (3.12)	1.546
MCQ negative beliefs	10.81 (3.96)	13.17 (4.13)	10.44 (3.81)	4.788**
MCQ cog. confidence	10.10 (3.83)	11.83 (5.39)	9.83 (3.45)	2.612*
MCQ need for control	9.33 (2.96)	10.32 (3.32)	9.18 (2.88)	2.368*
MCQ cog. self-cons.	13.35 (3.94)	14.94 (3.73)	13.09 (3.92)	3.222**

Note. * $p < .05$, ** $p < .001$

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Table 3: Statistics for each step of the regressions and betas on the final step with STAI-T as the dependent variable and gender/age, diagnosed mental disorder and the subscales of the MCQ-30 as predictors (N = 393).

Step		F cha	R² cha	β	t
1		5.303	.027**		
	Gender			.10	1.912
	Age			-.13	-2.552*
2		39.778	.091**		
	Gender			.06	1.247
	Age			-.16	-3.318**
	Diagnosed mental disorder			.30	6.307**
3		79.232	.449**		
	Gender			.09	2.564*
	Age			-.08	-2.520*
	Diagnosed mental disorder			.16	4.646**
	MCQ-30 positive beliefs			.18	4.769**
	MCQ-30 negative beliefs			.47	11.104**
	MCQ-30 cognitive confidence			.11.	3.056**
	MCQ-30 need for control			.11	2.490*
	MCQ-30 cognitive self-cons.			.03	.780

Note. *p< 0.05, **p< 0.01.