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# Change in interpersonal problems and metacognitive beliefs as predictors of improvement in patients with generalized anxiety disorder

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## Abstract

**Introduction:** Generalized anxiety disorder (GAD) is characterized by persistent worry and anxiety, often with a chronic course. We tested the role of two suggested underlying factors in GAD, interpersonal problems and negative metacognitive beliefs, as predictors of trait-worry and trait-anxiety.

**Methods:** The sample consisted of 56 patients with a primary diagnosis of GAD from a randomized controlled trial. We first estimated the proportion of variance lying between the higher level of the data structure to account for potential therapists' effects. Two hierarchical regression analyses were conducted testing change in interpersonal problems and negative metacognitive beliefs as predictors of change in trait-worry and trait-anxiety following treatment. Change in depression and anxiety symptoms was controlled.

**Results:** Change in negative metacognitive beliefs was the strongest predictor of improvement of both trait-worry and trait-anxiety. Change in interpersonal problems was not a unique predictor of change in trait-worry but did make a significant and unique contribution to trait-anxiety.

**Conclusions:** Negative metacognitive beliefs may be important targets to improve trait-worry and trait-anxiety in GAD. Interpersonal problems may be relevant for trait-anxiety but could also be a surface marker of higher order vulnerability factors. Implications for treatment are discussed.

## KEYWORDS

generalized anxiety disorder, interpersonal problems, metacognition, metacognitive therapy, trait-anxiety, worry

## 1 | INTRODUCTION

Generalized anxiety disorder (GAD) is characterized by persistent worry experienced as uncontrollable by the individual, with corresponding anxiety and somatic symptoms leading to functional impairment (American Psychiatric Association, 2013). GAD is one of the most prevalent anxiety disorders seen in primary care (Wittchen, 2002), and a chronic course is often observed

(Weisberg, 2009). GAD significantly disrupts quality of life at the individual level and is associated with substantial cost for society due to poorer work ability and high medical resource use (Hoffman et al., 2008). In addition, these patients often struggle with comorbid depression and other psychiatric conditions with as many as 66.0% meeting criteria for an additional concurrent psychiatric diagnosis and 90.0% with a lifetime history of another psychiatric diagnosis (Wittchen et al., 1994). The tendency to experience negative state

emotions over time for patients with GAD indicates they have a more general proneness to negative affectivity which has been operationalized and measured as trait-anxiety (Rapee, 1991). More knowledge about the core features and underlying sustaining factors of GAD are therefore of great importance.

In recent years, we have seen a surge in innovative and important clinical trials within empirically supported treatments for GAD (Carl et al., 2020). This is of great importance given that GAD has been considered one of the least successfully treated anxiety disorders (Newman et al., 2013). Previous research has shown that 50.0% of patients treated with Cognitive Therapy have been categorized as recovered after treatment and at 6- and 12-month follow-up (Hanrahan et al., 2013). Further, a recent long-term follow-up study of Cognitive Behavioural Therapy (CBT) only classified 38.0% of patients with GAD as recovered at approximately 9 years after treatment (Solem et al., 2021). These results indicate a need to better understand factors underlying GAD pathology such as trait-worry and vulnerability (i.e., trait-anxiety) with an aim to improve formulation, treatment, and long-term effects. This could further be of help to other patient groups given that trait-worry is found across psychiatric disorders (Visla et al., 2022).

Differing theories and models such as the Cognitive Avoidance Theory of Worry (Borkovec, 1994; Borkovec et al., 2004), the Contrast Avoidance Model of Worry (Newman & Llera, 2011), the Intolerance of Uncertainty model (Dugas et al., 2004), interpersonal theories (Newman & Erickson, 2010), and the Metacognitive model (Wells, 1995) propose different sustaining factors for GAD. In the current study, we explored the importance of essential factors posited by the two latter perspectives of GAD, namely, the interpersonal and metacognitive. As pointed out in extension from the most updated systematic reviews and meta-analyses in the area, there is especially a need for studies investigating possible predictors of change in GAD (Newman et al., 2022).

## 2 | AN INTERPERSONAL MODEL

Interpersonal problems have been hypothesized as an aetiological factor underlying trait-worry (Borkovec et al., 2002; Sibrava & Borkovec, 2006) and a general sustaining factor (Malivoire et al., 2020; Newman et al., 2013) for GAD. Indeed, interpersonal problems co-occur with trait-worry in patients with GAD (Crits-Christoph et al., 2005) and with trait-anxiety (Dimaggio et al., 2018). Recent interpersonal theories of GAD (Newman & Erickson, 2010) assert that interpersonal problems may stem from non-adaptive attachment relationships leading to biased interpersonal cognitions, interpersonal skills deficits, and rigid ways of relating to others, such as self-sacrificing behaviours instead of tending to one's own needs. In line with this, worry has been hypothesized to compensate for an insecure attachment and a resulting state of perceived danger and inability to cope, where the worry is interpreted as a way of trying to anticipate one's own and others future (Sibrava & Borkovec, 2006). However, the excessive worry may lead persons with

### Key Practitioner Message

- We explored the role of change in interpersonal problems and negative metacognitive beliefs as predictors of change in trait-worry and trait-anxiety in patients with GAD.
- Metacognitive change uniquely correlates with both change in trait-worry and trait-anxiety, while change in interpersonal problems only correlated uniquely with trait-anxiety.
- Negative metacognitive beliefs rather than interpersonal problems may be important to formulate and target as a maintenance factor of trait-worry in patients with GAD.
- Both negative metacognitive beliefs and interpersonal problems could constitute more general psychological vulnerability in GAD.
- Future research should determine which factors underly and direct interpersonal problems.

GAD to be overly nurturing or intrusive in their interpersonal relationships which then also becomes a sustaining factor for continued worry.

Inadequate targeting of interpersonal problems in the treatment of GAD patients has been suggested as a possible reason for unsatisfactory remission rates and recovery (Malivoire et al., 2020). Furthermore, interpersonal problems predict differential response to cognitive versus behavioural treatment (Newman et al., 2017) where they also found baseline levels of being overly nurturant to be associated with higher levels of GAD symptoms at baseline, post, and follow-up time points regardless of therapy condition. In a similar vein, Penedo et al. (2019) found baseline interpersonal agency to moderate the indirect effect of treatment on long-term worry. Coyne et al. (2019) further found that interpersonal change mediated the association between alliance quality and worry reduction at the within-patient level, but not at the between-patient level.

Patients with GAD typically report more total interpersonal problems as well as higher scores on nonassertive, exploitable, overly nurturant, and intrusive problems relative to non-anxious controls (Eng & Heimberg, 2006). However, patients with GAD have reported other elevated interpersonal problems too, such as coldness, domineeringness, and vindictiveness (Borkovec et al., 2002; Przeworski et al., 2011), suggesting that the types of interpersonal problems experienced by patients with GAD are heterogenous. Irrespective of the type of interpersonal problems, according to an interpersonal understanding of GAD, reduction of interpersonal problems should be an important predictor of improvement in trait-worry and trait-anxiety in patients with GAD.

Another component linking the interpersonal domain to treatment outcome could further be the therapist itself. Therapists Facilitative Interpersonal Skills (FIS) as defined in example by the therapist's ability to convey empathy and warmth, building hope, as well as alliance bond capacity, have been found to predict better outcomes for

patients (Anderson et al., 2009). As demonstrated by Del Re et al. (2021) in their multilevel meta-analysis examining therapist effects in the alliance–outcome relationship, even after controlling for other factors that may impact on this relationship including rater of alliance and outcome, alliance measure, and personality disorder, the therapist contribution to the alliance was still a significant moderator of the alliance–outcome correlation. Heinonen and Nissen-Lie (2020) further found in a systematic review of psychotherapy research that more effective therapists are characterized most consistently by professionally cultivated interpersonal capacities. Overall, several studies have supported interpersonal problems and factors to be of importance in relation to treatment outcome through different paths either at the patient and/or therapist level. Thus, therapist factors are important to account for when investigating the relationships between interpersonal problems and outcome in patients with GAD.

### 3 | A METACOGNITIVE MODEL

The metacognitive model of GAD (Wells, 1995) places dysfunctional metacognitions at the centre of emotional disorder maintenance (Wells, 1995). The model asserts that worry in GAD is maintained by metacognitive beliefs and in particular negative metacognitive beliefs about the uncontrollability and dangers of worry (e.g., “I cannot control my worrying” and “worry can make me insane”). Negative metacognitive beliefs have been found to be elevated in patients with GAD relative to healthy controls (Sun et al., 2017), and they correlate significantly and positively with trait-worry and trait-anxiety in non-clinical samples (e.g., Yilmaz et al., 2008). Negative metacognitive beliefs further prospectively predict worry and trait-anxiety (e.g., Nordahl et al., 2019; Thielsch et al., 2015). According to the metacognitive model of GAD, a reduction in negative metacognitive beliefs should be the most important predictor of improvement in trait-worry and trait-anxiety. These beliefs are in themselves considered as vulnerability markers (trait variables) which underly and direct maladaptive self-regulatory strategies such as worrying (state level) (Nordahl et al., 2022; Wells, 1995).

In the current study, our aim was to evaluate change in interpersonal problems and change in negative metacognitive beliefs as predictors of improvement in GAD pathology, operationalized as trait-worry and trait-anxiety. We utilized data from a randomized controlled trial of GAD (Nordahl et al., 2018) where trait-worry was the primary outcome measure and trait-anxiety was a secondary outcome measure. To evaluate the relative contribution from interpersonal problems and negative metacognitive beliefs to the outcome variables, we also controlled change in anxiety and depression symptoms as improvement in them may merely reflect general symptom improvements following treatment. Thus, we hypothesized that change in trait-worry and trait-anxiety was significantly intercorrelated and positively correlated with change in interpersonal problems, negative metacognitive beliefs, and anxiety and depressive symptoms. In line with an interpersonal understanding of GAD (Newman & Erickson, 2010), we expected interpersonal problems to be a

significant and unique predictor of improvement in trait-worry and trait-anxiety. In accordance with the metacognitive model of GAD (Wells, 1995), we expected negative metacognitive beliefs to be a significant predictor of improvement in trait-worry and trait-anxiety.

In addition, as variations in therapist effectiveness, for instance, through their interpersonal capabilities (Heinonen & Nissen-Lie, 2020) or contribution to the alliance (Del Re et al., 2021), have been shown to impact on treatment outcomes, we estimated the proportion of variance lying between the higher level of the data structure to account for therapists' effects to investigate the suitability for conducting multilevel analysis including the therapist level in our analyses.

## 4 | METHOD

### 4.1 | Participants and procedure

We used data from a randomized controlled trial comparing Cognitive Behavioural Therapy (CBT) with Metacognitive Therapy (MCT) including 60 patients with a primary diagnosis of GAD (Nordahl et al., 2018). Only participants with complete data on the variables of interest pre- and post-treatment were included ( $N = 56$ ). The mean age of the current sample was 37.13 years ( $SD = 12.0$ ), 41 were female (73.2%), 40 (70.1%) were in a relationship, 9 (15.8%) were separated or single, whilst the remaining 7 participants (11.0%) did not report on their civil status.

### 4.2 | Study design of the original RCT study

Patients in the original study were randomized into three treatment conditions: CBT ( $n = 28$ ), MCT ( $n = 32$ ), and a wait-list control ( $n = 21$ ). The wait-list control group received treatment after 12 weeks post-randomization. The study utilized a crossover design of therapists to control for therapist factors where three therapists used CBT and the other three used MCT on the first half of the patients before delivering the other treatment condition to new patients halfway into the trial. Published manuals of CBT (Borkovec & Costello, 1993) and MCT (Wells, 2009) were used. Results of ordering of treatment condition by therapist were conducted, but no main effect of order or interaction order \* time or group \* order \* time were found such that it did not seem to make a difference to the outcome. The six therapists were clinical psychologists and received training and supervision from the originators of the treatments (Borkovec and Wells) and were randomized into delivering either CBT or MCT first before swapping. They treated between 9 and 12 patients each. All of the therapists were Norwegian males with a mean age of 42.50 ( $SD = 4.6$ ). The therapists further had a mean of 13.3 years ( $SD = 2.2$ ) of experience as clinical psychologists. Adherence and competency rates were obtained by independent assessors trained by the originators of the treatments and were good for both groups. There was a small difference in competency ratings in favour of CBT but no

difference in adherence between the groups. For more information regarding demographic information, comorbidity, inclusion and exclusion criteria, assessments, randomization and masking, treatment content, measures of non-specific factors in therapy, and so forth, see Nordahl et al. (2018).

### 4.3 | Measures

The Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990) is a self-report measure of trait-worry developed to distinguish GAD from other anxiety disorders (Brown et al., 1992). It has 16 items rated on a 1 to 5 Likert scale and has shown good psychometric properties with Cronbach's alpha values of between .91 and .95 (Meyer et al., 1990) and test-retest reliability ranging from 0.74 to 0.93 (Molina & Borkovec, 1994). In the current study, the Cronbach's alpha was good ( $\alpha = .82$ ).

The State-Trait Anxiety Inventory (trait version) (STAI-T; Spielberger et al., 1983) is a self-report measure of general distress proneness. It reflects the general tendency individuals have to experience negative affect and anxiety in terms of frequency, intensity, and duration of episodes. It contains 20 items each rated on a 4-point Likert scale. Its psychometric properties are good with Cronbach's alpha's ranging from .86 to .95 and test-retest correlations ranging from 0.73 to 0.86 (Spielberger et al., 1983). In the current study, the Cronbach's alpha was excellent ( $\alpha = .90$ ).

The Beck Depression Inventory (BDI; Beck et al., 1961) is a 21-item self-report scale and measures levels of depression symptoms during the last week on a scale from 0 (*low intensity*) to 3 (*high intensity*). It has shown high internal consistency with a Cronbach's alpha of .86, whereas the test-retest reliability is acceptable ( $r = .60$ ; Beck et al., 1988). In the current study, the Cronbach's alpha was excellent ( $\alpha = .93$ ).

The Beck Anxiety Inventory (BAI; Beck et al., 1988) is a 21-item self-report measure of anxiety symptoms over the last week. Items are rated from 0 (*not at all*) to 3 (*severely*), on a Likert scale. It has shown high levels of internal consistency with a Cronbach's alpha of .94 and acceptable test-retest reliability ( $r = .67$ ; Fydrich et al., 1992). In the current study, the Cronbach's alpha was excellent ( $\alpha = .96$ ).

The Inventory of Interpersonal Problems 64 (IIP-64; Alden et al., 1990) is a 64-item self-report measure of interpersonal problems. In this measure, items are scored on 5-point Likert scale ranging from 0 to 4. In the current study, we used the sum score of all items indicating a global or general score of interpersonal problems and distress. The IIP-64 has shown high internal consistency with a Cronbach's alpha of .93 (Horowitz et al., 2000; Nysæter et al., 2009) and good test-retest reliability for the total score ( $r = .79$ ). In the current study, the Cronbach's alpha was excellent ( $\alpha = .95$ ).

The Metacognitions Questionnaire 30 (MCQ-30; Wells & Cartwright-Hatton, 2004) consists of 30 items assessing dysfunctional metacognitive beliefs rated on a 4-point scale from 1 (*do not agree*) to 4 (*agree very much*). The measure has five subscales, and for the current study, we used the second subscale that assesses beliefs about

the uncontrollability and dangerousness of worry since this is the subscale most consistently related to GAD in the literature (Sun et al., 2017). The scale has shown high internal consistency with a Cronbach's alpha of .91 and acceptable test-retest reliability ( $r = .59$ ; Wells & Cartwright-Hatton, 2004). In the current study, the Cronbach's alpha for this subscale was acceptable ( $\alpha = .77$ ).

### 4.4 | Overview of statistical analyses

In the current study, our main aim was to assess the relative importance of change in interpersonal problems and change in negative metacognitive beliefs as predictors of change in trait-worry and trait-anxiety in patients with GAD. To account for the hierarchical structure of our data, we performed an intercept only model in the multilevel regression framework to determine the proportion of variance lying between the higher level of the data structure to account for therapists' effects (i.e., the assessment of patients nested within therapists). We calculated the intraclass correlation coefficients (ICC), which are interpreted as the expected correlation between any two randomly chosen patients nested within therapists. Our further analytic strategy was based on these results. To evaluate the magnitude of change in the variables from pre- to post-intervention, paired samples t-tests were applied. Change scores for all variables were calculated by subtracting the participants pre-scores from their post-scores, and their associations were tested using bivariate correlations. IBM SPSS version 27 was used for all analyses.

## 5 | RESULTS

### 5.1 | Intraclass correlation coefficients

The ICC for trait-worry and trait-anxiety were .02 and .07, respectively. With an average cluster size of 19.33, this translates to a design effect of 1.37 and 2.28, respectively. As the ICC values were trivial and the design effect, which is a function of both the ICC and average cluster size quantifying the extent of lack of independence in clustered sampling design, was also not substantially greater than 2.0 according to the threshold by Muthén (1994) and Muthén and Satorra (1995), the data structure was not considered hierarchically differentiated. Thus, we performed a single-level analysis instead of multilevel analyses (Hox et al., 2017). Two separate hierarchical multiple linear regression analyses were conducted to test the contribution from change in interpersonal problems and change in negative metacognitive beliefs as predictors of change in trait-worry and trait-anxiety, respectively, whilst also controlling the overlap with change in anxiety and depression symptoms in both models. Given disagreements as to employing change scores in regression analyses (e.g., Allison, 1990), we also included secondary analyses to investigate if the results from the regressions replicated using a different model approach where we used the post-treatment scores for trait-worry and trait-anxiety and controlled the pre-treatment level in step 1.

## 5.2 | Treatment effects

Pre- and post-treatment scores together with the results of paired samples *t*-tests are shown in Table 1. Effect sizes are calculated with Cohen's (1988) *d*. Change in trait-worry, trait-anxiety, depression and anxiety symptoms, interpersonal problems, and negative metacognitive beliefs all showed large reductions from pre- to post-treatment.

## 5.3 | Correlational analyses

All of the change scores were significantly and positively correlated with the exception of negative metacognitive beliefs and interpersonal problems. Change in trait-worry correlated strongly and significantly with change in trait-anxiety. Regarding the dependent variables and the predictors, change in trait-worry correlated the strongest with change in negative metacognitive beliefs, followed by change in anxiety symptoms, interpersonal problems, and depressive symptoms. Change in trait-anxiety correlated the strongest with change in negative metacognitive beliefs followed by change in interpersonal problems and anxiety symptoms and, finally, depressive symptoms. The bivariate correlations are presented in Table 2.

## 5.4 | Regression analyses

For the first regression analysis, change in trait-worry was used as the dependent variable. In step 1, change in depressive symptoms was a significant predictor accounting for 14.9% of the variance. In step 2, change in anxiety symptoms was entered and significantly explained an additional 17.3%. In step 3, change in interpersonal problems was non-significant as a predictor of change in trait-worry. In step 4, change in negative metacognitive beliefs significantly accounted for an additional 26.5% of the variance. In the final equation, only change in anxiety symptoms and change in negative metacognitive beliefs were unique and significant predictors of change in trait-worry, with change in negative metacognitive beliefs as the strongest predictor.

In the second regression analysis, change in trait-anxiety was used as the dependent variable. In step 1, change in depressive symptoms was significant as a predictor and accounted for 19.0% of the variance.

Measure	Pre-treatment (M, SD)	Post-treatment (M, SD)	$\Delta$ (SD)	<i>t</i>	<i>d</i>
PSWQ	66.16 (7.64)	47.18 (14.18)	18.98 (12.82)	11.077*	1.48
STAI-T	56.41 (8.94)	43.59 (11.88)	12.82 (10.74)	8.940*	1.19
BDI	16.30 (9.54)	7.52 (8.88)	8.78 (7.48)	8.787*	1.17
BAI	23.23 (12.44)	7.27 (10.16)	15.96 (12.72)	9.388*	1.25
IIP	1.23 (0.53)	0.79 (0.54)	0.44 (0.44)	7.488*	1.00
MCQneg	2.84 (0.55)	1.61 (0.66)	1.22 (0.73)	12.610*	1.68

Abbreviations:  $\Delta$ , change score; BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; *d*, Cohen's *d*; IIP, Inventory of Interpersonal problems; M, mean; MCQneg, negative metacognitive beliefs; SD, standard deviation; STAI-T, State-Trait Anxiety Inventory—trait version.

\**p* < .001.

In step 2, change in anxiety symptoms was non-significant as a predictor. In step 3, change in interpersonal problems was entered and significantly explained 6.9% of change in trait-anxiety. In step 4, change in negative metacognitive beliefs was entered and significantly accounted for an additional 11.2% of the variance. In the final equation, only change in interpersonal problems and change in negative metacognitive beliefs were unique and significant predictors of trait-anxiety with negative metacognitive beliefs as the strongest predictor. The results from the regressions are presented in Table 3.

### 5.4.1 | Secondary analyses

Two additional regression analyses were conducted to investigate if the results from the regressions presented above replicated when post-treatment scores of trait-worry and trait-anxiety were used as the dependents, respectively, and pre-treatment scores were controlled in step 1. On the following steps, the same predictors as in the previous regressions were entered. In the final equation, when predicting post-treatment levels of trait-worry, pre-treatment levels of trait-worry ( $\beta = .47$ ,  $p < .001$ ), change in anxiety symptoms ( $\beta = .33$ ,  $p < .01$ ), and change in negative metacognitive beliefs ( $\beta = .49$ ,  $p < .001$ ) were significant and unique predictors of worry post-treatment. In the final equation, when predicting post-treatment trait-

**TABLE 2** Bivariate correlations between pre- and post-change scores for all variables ( $N = 56$ ).

	1	2	3	4	5
1. PSWQ-change					
2. STAI-T-change	.67**				
3. BDI-change	.38**	.43**			
4. BAI-change	.56**	.44**	.58**		
5. IIP-change	.42**	.44**	.30*	.42**	
6. MCQneg-change	.68**	.51**	.34*	.32*	.22

Abbreviations: BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; IIP, Inventory of Interpersonal Problems; MCQneg, negative metacognitive beliefs; PSWQ, Penn State Worry Questionnaire; STAI-T, State-Trait Anxiety Inventory—trait version.

\**p* < .05. \*\**p* < .01.

**TABLE 1** Paired samples *t*-tests for all included variables with Cohen's *d* effect sizes and change scores ( $N = 56$ ).

**TABLE 3** Two hierarchical linear regression analyses with change in trait-worry (PSWQ) and change in trait-anxiety (STAI-T) as dependent variables and change in depressive symptoms, anxiety symptoms, interpersonal problems, and negative metacognitive beliefs as independent variables ( $N = 56$ ).

PSWQ					
Step		F cha	R <sup>2</sup> cha	$\beta$	t
1		9.418	.149**		
	BDI-change			.38	3.069**
2		13.468	.173**		
	BDI-change			.09	0.622
	BAI-change			.51	3.670**
3		3.214	.040		
	BDI-change			.07	0.498
	BAI-change			.43	2.994*
	IIP-change			.22	1.793
4		35.981	.265**		
	BDI-change			-.06	-0.538
	BAI-change			.35	3.123*
	IIP-change			.17	1.781
	MCQneg-change			.56	5.998**
STAI-T					
Step		F cha	R <sup>2</sup> cha	$\beta$	t
1		12.639	.190**		
	BDI-change			.43	3.555**
2		3.803	.054		
	BDI-change			.27	1.822
	BAI-change			.29	1.950
3		5.222	.069*		
	BDI-change			.24	1.716
	BAI-change			.18	1.207
	IIP-change			.29	2.285*
4		9.947	.112**		
	BDI-change			.16	1.207
	BAI-change			.13	0.918
	IIP-change			.26	2.187*
	MCQneg-change			.36	3.154**

Note: Method: Enter.

Abbreviations: BAI, Beck Anxiety Inventory; BDI, Beck Depression Inventory; IIP, Inventory of Interpersonal Problems; MCQneg, negative metacognitive beliefs; PSWQ, Penn State Worry Questionnaire; STAI-T, State-Trait Anxiety Inventory—trait version.

\* $p < .01$ . \*\* $p < .001$ .

anxiety, pre-treatment trait-anxiety ( $\beta = .53$ ,  $p < .001$ ), change in interpersonal problems ( $\beta = .21$ ,  $p < .05$ ), and change in negative metacognitive beliefs ( $\beta = .36$ ,  $p < .001$ ) were significant and unique predictors of post-treatment trait-anxiety. In sum, the main results from the regressions did not differ between these two model approaches.

## 6 | DISCUSSION

In this study, we aimed to evaluate change in interpersonal problems and negative metacognitive beliefs as predictors of change in GAD

pathology, operationalized as trait-worry and trait-anxiety. In addition, we evaluated the amount of outcome variation in the higher level data structure to account for therapists' effect as patients were nested within therapists from a multilevel perspective. However, the results did not support our data to be hierarchically differentiated as demonstrated by ICC values and design effects, and thus, a single-level analyses approach was selected. Change in interpersonal problems did not predict improvement in trait-worry but was a significant predictor of change in trait-anxiety. Change in negative metacognitive beliefs significantly predicted change in trait-worry and change in trait-anxiety and was a stronger predictor of trait-anxiety compared with interpersonal problems.

In the current sample of patients with GAD undergoing treatment, trait-worry, trait-anxiety, interpersonal problems, negative metacognitive beliefs, and symptoms of anxiety and depression improved significantly from pre- to post-treatment with large to very large effect sizes demonstrated for all variables. Correlation analyses further supported the expected significant and positive associations between the outcome and predictor variables. Change in trait-worry showed a large correlation with change in trait-anxiety and negative metacognitive beliefs, a moderate correlation with change in anxiety and interpersonal problems, and a small to moderate correlation with change in depression. Change in trait-anxiety showed moderate correlations to all other variables.

In the regressions, change in depression and anxiety symptoms was controlled as it is necessary to control for the overlap between interpersonal problems and metacognitions and emotional distress, as the potential associations with these predictors and trait-worry and trait-anxiety might merely reflect elevated psychopathology. However, when the overlap between all the predictors were controlled, only a unique association between change in anxiety and change in trait-worry remained. Temporal precedence could not be determined with the current data, but we would expect a robust association between anxiety and worry, as worry is considered a maintenance factor of anxiety (Sibrava & Borkovec, 2006; Wells, 1995). However, even though change in anxiety accounted for independent variance in change in trait-worry, change in negative metacognitive beliefs accounted for substantial more variance, which is in line with the metacognitive model of GAD (Wells, 1995) and a previous prospective study (Thielsch et al., 2015). Large improvements in trait-worry in patients with GAD after Metacognitive therapy where metacognitions are modified have also been reported (Haseith et al., 2019; Normann & Morina, 2018).

The finding that change in interpersonal problems did not contribute significantly to change in trait-worry stands in contrast to the suggested role of interpersonal problems in contributing to the persistence of worry in patients with GAD (e.g., Malivoire et al., 2020; Newman & Erickson, 2010). However, this is in line with previous research which has shown limited additional benefit from adding focus on interpersonal problems in cognitive behavioural interventions for GAD (Newman et al., 2011). Change in interpersonal problems did however make a unique contribution to change in trait-anxiety, a finding that aligns with a recent study where trait-anxiety and interpersonal problems have been found to be positively and significantly associated (Dimaggio et al., 2018). Interpersonal problems and trait-anxiety describe perceived difficulties both internally (e.g., feelings of insecurity) and in relationship to others (e.g., self-confidence and problematic behaviour) and could therefore overlap as stable self-knowledge structures held by the individual stored in long-term memory constituting psychological vulnerability in GAD. Interpersonal problems are thought to be formed in response to early experiences in close attachment relationships (Hayden et al., 2017). In example, being regularly rejected and criticized by attachment figures can lead to an insecure attachment where the child adapts behaviour to regulate anxiety and interpersonal distress, such as withdrawing

and isolating. This can further result in interpersonal problems later in life (Newman & Erickson, 2010).

The unique association between change in negative metacognitive beliefs and change in trait-anxiety in the current study is also in line with the metacognitive model (Wells & Matthews, 1994) which proposes that metacognitive knowledge constitutes a core underlying mechanism in explaining psychological vulnerability as well as state negative affect. A recent study by Nordahl et al. (2019) found negative metacognitive beliefs to be a significant predictor of trait-anxiety both cross-sectionally and prospectively. It could be, as delineated by Wells and Matthews (1994), that trait-anxiety and other vulnerability factors for psychopathology are topological markers for both the activation of the Cognitive Attentional Syndrome (CAS: consisting of worry, rumination, threat monitoring, and maladaptive coping) and of dysfunctional metacognitive beliefs (e.g., negative metacognitive beliefs; Nordahl et al., 2019) and that intervening on the CAS and metacognition therefore also reduces vulnerability. In support of this notion, one recent study reported that MCT for GAD led to significant and large positive effects in several subdomains of Neuroticism (Kennair et al., 2021), which is a frequently used general indicator of psychological vulnerability (Kotov et al., 2010).

An alternative explanation for the finding that interpersonal problems contributed to trait-anxiety (i.e., vulnerability) is that interpersonal problems may be a result of underlying metacognitions not assessed in the current study. According to the metacognitive model (Wells & Matthews, 1994), interpersonal problems can be understood either as a part of the CAS or as the result of the CAS. They can represent top-down regulatory strategies to regulate cognition in absence of perceived control (e.g., being overly nurturing to reduce worry) and to deal with external stressors (e.g., avoid social confrontation), or they can be the result of CAS strategies in the sense that worrying, ruminating, and threat monitoring can culminate in difficulties with being self-assertive with others. Metacognitive beliefs could therefore be a driving mechanism leading to interpersonal problems. In line with this suggestion, a recent study by Nordahl et al. (2021) found that four out of the five domains of metacognitive beliefs as measured with the MCQ-30 accounted for significant and unique variance in interpersonal problems even when controlling for attachment styles and Big-5 personality traits. However, due to a limited sample size, we only tested change in negative metacognitive beliefs in the current study since this domain is considered the most influential for vulnerability according to metacognitive theory (Wells & Matthews, 1994) and has been most robustly linked to GAD pathology in the literature (Sun et al., 2017). Further research could explore if dysfunctional metacognition plays a role in the development of interpersonal problems. It could be that attachment and other early formative experiences are an important source of information in the formation of metacognition which then determines resulting coping strategies such as worry and interpersonal strategies (Myers & Wells, 2015). Alternatively, interpersonal schemas or skills could account for the presence of interpersonal problems in individuals with GAD, but in this study, we could not look into the relative contribution to interpersonal problems from underlying metacognitive beliefs versus cognitive beliefs (schemas) and interpersonal skills.

Even though therapist factors such as their interpersonal capabilities (Heinonen & Nissen-Lie, 2020) and their contribution to a good alliance to the patient (Del Re et al., 2021) have been consistently linked to better treatment outcomes, we did not find the outcome variation in the higher level data structure to be substantial enough to warrant a multilevel model including the therapist level in our dataset. This suggests that the differences between the therapists in their ability to modify the relationships in question were not relevant, which could be explained by the high and similar adherence and competence in delivering the therapies (Nordahl et al., 2018). Further, it could be that the effects of the therapists are mainly exerted indirectly through other factors not included in the current analyses. However, with these elements taken into consideration, there is also the possibility that successful targeting and treatment of the essential sustaining factors is most imperative to facilitate improvement for patients with GAD.

There are several potential clinical implications of these results. First, negative metacognitive beliefs rather than interpersonal problems might be more important to formulation and treatment of trait-worry in GAD. Second, both interpersonal problems and negative metacognitive beliefs could be important targets to reduce psychological vulnerability in patients with GAD. Metacognitive therapy which targets metacognitive beliefs has demonstrated effects on both trait-anxiety (van der Heiden et al., 2013; Wells et al., 2010) and interpersonal problems (Johnson et al., 2017; Strand et al., 2018) without any explicit focus on attachment or schemas and might be especially suitable to reduce emotional distress and psychological vulnerability in patients with GAD.

Although the present study had several strengths, including thorough diagnostic assessments of the participants, several limitations should be considered when interpreting the results. The sample size was limited which restricts the number of other potential predictors that could be investigated. The data were solely based on self-report. The design of the study further prohibits any causal inferences. Although the present study used change scores, we were not able to secure that predictors of GAD pathology indeed preceded the pathology itself. Future studies should preferably use several measuring points to be able to discern the temporal ordering of within-person change in predictors and outcomes. Furthermore, future studies could explore therapist factors shown to be related to treatment outcome (e.g., facilitative interpersonal skills) and how these interact with treatment conditions and theory-based predictors of the outcome. Finally, future studies could investigate more specific relationships between several metacognitive belief domains and more specific domains of interpersonal problems and if these relationships hold when controlling for competing variables such as interpersonal schemas and skills.

## 7 | CONCLUSIONS

In summary, negative metacognitive beliefs rather than interpersonal problems may be important to formulate and target as a maintenance

factor of trait-worry in patients with GAD. Furthermore, both negative metacognitive beliefs and interpersonal problems could constitute more general psychological vulnerability in GAD, but further research should determine which factors underly and direct interpersonal problems. If metacognition cause and/or maintain interpersonal problems in GAD, treatment could focus on metacognitive change rather than having an additional focus on interpersonal factors.

### AUTHOR CONTRIBUTIONS

HMN was the PI of the RCT. ERS wrote the first draft of the manuscript. ERS, HN, OH, and FA ran the data analyses, and all authors contributed substantially to the finalized version of the manuscript.

### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

### DATA AVAILABILITY STATEMENT

Data are available without undue reservation.

### ETHICS STATEMENT

The original study was conducted in accordance with and approved by the Regional Committee for Medical and Health Research Ethics (SAK: 4/2006/2369) and was further conducted in agreement with the 1964 Helsinki Declaration and its later amendments. [ClinicalTrials.gov](https://doi.org/10.1186/1745-2974-4-1) identifier: NCT00426426. Participants had to provide written informed consent to be included in the trial.

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