

## Empirical Article

**Metacognitive beliefs predict interpersonal problems in patients with social anxiety disorder**EIVIND R. STRAND,<sup>1,2</sup>  HENRIK NORDAHL,<sup>1</sup>  ODIN HJEMDAL<sup>1</sup>  and HANS M. NORDAHL<sup>3,4</sup> <sup>1</sup>Department of Psychology, Norwegian University of Science and Technology, Trondheim, Norway<sup>2</sup>St. Olav's Hospital, Nidaros DPS, Trondheim, Norway<sup>3</sup>Department of Mental Health, Norwegian University of Science and Technology, Trondheim, Norway<sup>4</sup>Division of Psychiatry, St. Olav's Hospital, Trondheim, NorwayStrand, E. R., Nordahl, H., Hjemdal, O. & Nordahl, H. M. (2023). Metacognitive beliefs predict interpersonal problems in patients with social anxiety disorder. *Scandinavian Journal of Psychology*.

Patients with Social Anxiety Disorder (SAD) typically report interpersonal problems, and these are important targets in treatment beyond social anxiety symptoms as they impair quality of life, maintain emotion symptoms and effect on social functioning. What factors contribute to interpersonal problems? In the current study we set out to explore the role of metacognitive beliefs as correlates of interpersonal problems in patients treated for SAD when controlling for the effect of social phobic cognitions and symptoms. The sample consisted of 52 patients with a primary diagnosis of SAD participating in a randomized controlled trial comparing cognitive therapy, paroxetine, pill placebo, or the combination of cognitive therapy and paroxetine in treating SAD. Two hierarchical multiple linear regression analyses were conducted to explore change in metacognitions as predictors of change in interpersonal problems when controlling for change in social phobic cognitions and social anxiety. Change in metacognitions accounted for unique variance in interpersonal problems improvement beyond change in cognitions. Furthermore, change in cognitions overlapped with change in social anxiety symptoms, and when controlling the overlap between these three predictors, only change in metacognitions was uniquely associated with improvement in interpersonal problems. This finding indicates that metacognitions are linked to interpersonal problems in patients with SAD with the implication that treatment should aim to modify metacognitive beliefs to alleviate interpersonal dysfunction.

**Key words:** Interpersonal problems, social anxiety disorder, metacognition, metacognitive beliefs, S-REF model, social phobic beliefs.

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## INTRODUCTION

Interpersonal problems are prevalent in patients with Social Anxiety Disorder (SAD) and typically observed as avoidance of social interaction and low assertiveness (Alden & Taylor, 2004). However, the scope of interpersonal problems are also heterogenous within this group and other interpersonal problem domains such as vindictiveness or being overly accommodating and self-sacrificing have been found to be relevant for some SAD patients and associated with the severity of social anxiety symptoms (Kachin, Newman & Pincus, 2001; Swee, Butler, Ross, Horenstein, O'Day & Heimberg, 2021). This underlines the importance of investigating interpersonal problems in SAD patients as they may contribute to more severe presentations of disorder. Detrimental interpersonal consequences such as fewer close relationships than average and low occupational functioning are common for individuals with SAD (Dahl & Dahl, 2010; Moitra, Beard, Weisberg & Keller, 2011). Alleviating difficulties experienced in interpersonal settings beyond social anxiety symptoms is therefore an important target in the treatment of SAD.

Interpersonal problems in SAD could be related to disorder severity or other frequently occurring symptoms. The severity of social anxiety symptoms has been found to be related to interpersonal problems (Swee *et al.*, 2021). In addition, patients with SAD often experience co-occurring depressive symptoms, which are also associated with increased levels of interpersonal problems (Huprich, Lengu & Evich, 2016). Social anxiety and

depressive symptoms could therefore be hypothesized to lead to interpersonal problems in SAD, but this relationship can also be reciprocal where interpersonal problems maintain emotional distress (Grant *et al.*, 2013). Hence, it is important to take emotional distress symptoms into account when investigating the basis of interpersonal problems as they can be both the cause and the effect of an individual's interpersonal functioning.

Central to prominent cognitive models of SAD (Clark & Wells, 1995; Rapee & Heimberg, 1997) is the emphasis on schemas and negative automatic thoughts (Beck, 1976) as underlying factors of maladaptive behaviors and symptoms. Social phobic cognitions have been found to correlate with symptoms of social anxiety (see Gkika, Wittkowski & Wells, 2018, for a review) and change in social phobic cognitions predict change in social anxiety symptoms (Gregory, Wong, Marker & Peters, 2018). In the cognitive framework, interpersonal problems can be viewed as linked to belief in social phobic cognitions in SAD as these beliefs according to theory will lead to self-processing and maladaptive behaviors to deal with perceived social threat. For example, the belief "I am boring" may lead to avoidance of social interactions or in-situation self-processing and safety behaviors such as saying little in an attempt to compensate in line with the belief.

In contrast, the metacognitive model of psychological disorders (Wells, 2019; Wells & Matthews, 1996) hypothesize beliefs about

cognition (i.e., metacognitions) as central to self-regulation and psychological problems in general. Metacognitions correlate with social anxiety (Gkika, Wittkowski & Wells, 2018) and have been found to be a better predictor of social anxiety than social phobic beliefs cross-sectionally (Nordahl & Wells, 2017). In prospective data, metacognitive beliefs seem to underly both social anxiety and also social phobic beliefs (Nordahl, Anyan, Hjemdal & Wells, 2022). Dysfunctional metacognitions are proposed to give rise to a negative and repetitive thinking style named the Cognitive Attentional Syndrome (CAS). The CAS consists of worry/rumination, threat monitoring, and maladaptive coping strategies. In this perspective, interpersonal problems can be formulated either as part of the CAS or as an output from the CAS. For example, interpersonal problems may represent top-down controlled strategies aiming to regulate cognition (e.g., seeking reassurance in order to reduce worry) and attempts to deal with stressors (e.g., avoiding social interaction). They may also reflect output from CAS strategies. For example, worry, rumination and threat-monitoring may lead to difficulties with feeling safe or self-confident, causing a person to be overly inhibited in social interactions. In line with these suggestions, Nordahl, Hjemdal and Wells (2021) reported that several domains of metacognitive beliefs were significantly associated with interpersonal problems even after controlling for the overlap with other relevant predictors such as attachment styles, personality traits, and anxiety and depressive symptoms. This finding indicates that metacognitive beliefs may be relevant to interpersonal problems and could have implications for formulation and treatment interventions for these problems.

Based on the above, the main aim of the current study was to investigate for the first time metacognitions as predictors of interpersonal problems in patients with SAD. With this aim we decided to control for social phobic cognitions derived from cognitive models of SAD as a relevant influence on interpersonal dysfunction in SAD. As change in interpersonal problems following treatment could merely reflect change in emotional disorder symptoms, we also wanted to control for the overlap with social anxiety and depression. In addition, metacognitions have been linked to both social anxiety (Nordahl & Wells, 2017) and depression symptoms (Cano-López, Salguero, García-Sancho & Ramos-Cejudo, 2021), so controlling them would allow us to evaluate the more unique relationships between metacognitions and interpersonal problems. We hypothesized that change in interpersonal problems would significantly correlate with change in social anxiety symptoms, depression symptoms, social phobic cognitions, and metacognitions. In line with the metacognitive model (Wells & Matthews, 1996), we expected that change in metacognitions would be a unique and significant predictor of change in interpersonal problems, even after controlling for change in social phobic cognitions and emotional distress symptoms.

## METHOD

### *Participants and procedure*

The present study utilized data from a randomized controlled trial where patients with primary Social Anxiety Disorder (DSM-IV-TR; American Psychiatric Association, 2000) were treated with cognitive therapy,

paroxetine, pill placebo, or the combination of cognitive therapy and paroxetine (Nordahl, Vogel, Morken, Stiles, Sandvik & Wells, 2016). Clinical assessments were conducted using the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Di Nardo, Brown & Barlow, 1994) and Structural Clinical Interview for DSM-IV axis II personality (SCID-II; First, Gibbon, Spitzer, Williams & Benjamin, 1997). The total sample in the original RCT study consisted of 102 patients (Nordahl *et al.*, 2016). As our goal in the current study was to evaluate cognitive and metacognitive belief change as correlates of improvement in interpersonal problems following treatment, only participants with complete data on all the relevant assessment tools pre- and post-treatment were included ( $N = 52$ ). In the sample, the mean age was 30.4 ( $SD = 9.9$ ) years, 28 reported to be male (53.8%), and 25 (48.1%) were in a relationship. Twenty-seven (51.9%) of the participants met the diagnostic criteria for comorbid Avoidant Personality Disorder. Of the included participants 10 (19.2%) received paroxetine, 16 (30.8%) cognitive therapy, 14 (26.9%) the combination of cognitive therapy and paroxetine, and 12 (23.1%) received the pill placebo and clinical management. In the current analyses our main aim was to test hypothesized important correlates of change in interpersonal problems across these interventions. If a predictor is important for improvement, its relationship with the outcome should emerge irrespective of intervention type or effectiveness.

### *Measures*

The Inventory of Interpersonal Problems (IIP) developed by Horowitz, Rosenberg, Baer, Ureño & Villaseñor (1988) is a self-report measure of interpersonal problems and exists in several versions. In the current study we used the IIP-64 (Alden, Wiggins & Pincus, 1990) consisting of 64 items asking participants about things they do too much (e.g., “confront people”) and things they find hard to do (e.g., “say my opinion”). Items are scored on a 0 (“not at all”) to 4 (“extremely”) scale. It has eight subscales which can be arranged around a circumplex, and these are: (1) domineeringness; (2) vindictiveness; (3) coldness; (4) socially avoidant; (5) non assertiveness; (6) exploitable; (7) overly nurturant; and (8) intrusiveness. We used the sum score of all items indicating a global score of interpersonal problems and distress across subscale-domains which is especially relevant to capture the total amount of interpersonal problems and distress experienced by the individual (Horowitz, Rosenberg, Baer, Ureño & Villaseñor, 1988). The IIP-64 has demonstrated good test-retest reliability for the total score ( $r = 0.79$ ) and high internal consistency ( $\alpha = 0.93$ ) (Horowitz, Alden, Wiggins & Pincus, 2000; Nysæter, Langvik, Berthelsen & Nordvik, 2009). In the current study, Cronbach’s alpha for the total score was 0.90.

The Fear of Negative Evaluation scale (FNE; Watson & Friend, 1969) contains 30 items with a true-false scale concerning dread and anxiety over certain social situations with higher scores indicating higher levels of social fears and anxiety. It has demonstrated good internal consistency ( $\alpha = 0.94$ ) and test-retest reliability ( $r = 0.78$ ; Watson & Friend, 1969). In the current study, Cronbach’s alpha for the total score was 0.87.

The Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock & Erbaugh, 1961) is a 21-item self-report scale measuring levels of depression symptoms over the last week on a scale from 0 (low intensity) to 3 (high intensity). The BDI has shown high internal consistency ( $\alpha = 0.86$ ) and acceptable test-retest reliability ( $r = 0.60$ ; Beck, Steer & Carbin, 1988). In the current study, Cronbach’s alpha for the total score was 0.89.

The Social Phobia Rating Scale (SPRS; Wells, 1997) is a self-report scale that measures social anxiety severity and cognitive-behavioral maintenance factors over the last week. For the current study we used a sum score of the fifth item of the scale, which assesses 14 common social phobic cognitions. A higher score indicates stronger endorsement of negative cognitions related to social anxiety. In the current study, Cronbach’s alpha for the included scale was 0.90.

The Metacognitions Questionnaire 30 (MCQ-30; Wells & Cartwright-Hatton, 2004) contains 30-items assessing dysfunctional metacognitive beliefs rated from 1 (“do not agree”) to 4 (“agree very much”). In the current study we used the total sum score of all items indicating a global

score of dysfunctional metacognitions. It has shown good psychometric properties with Cronbach's alpha of 0.93 and test-retest reliability of 0.75 for the total score (Wells & Cartwright-Hatton, 2004). In the current study, Cronbach's alpha for the total score was 0.89.

### Overview of statistical analyses

All analyses were run using IBM SPSS version 27. First, a series of paired samples *t* tests were conducted to evaluate change in the variables following intervention. Second, change scores were calculated for all variables and the relationships between these were evaluated using bivariate correlations. Finally, two hierarchical multiple linear regression analyses were conducted with the first testing the relative importance of social phobic cognitions and metacognitions to change in interpersonal problems, and the second testing whether these unique associations remained after controlling for symptoms.

## RESULTS

### Treatment effects

Table 1 shows pre- and post-treatment scores, and the results from paired sample *t*-tests. Assessed with Cohen's *d* (Cohen, 1988), change in interpersonal problems was moderate to large, while it was large for social anxiety, moderate for depression, large for social phobic cognitions, and moderate for metacognitions.

### Correlational analyses

Change in interpersonal problems correlated significantly and most strongly with change in metacognitions, followed by change in social anxiety symptoms, and change in social phobic cognitions. However, change in interpersonal problems did not significantly correlate with change in depressive symptoms. The bivariate correlations are presented in Table 2.

### Regression analyses

In the first regression, post-treatment levels of interpersonal problems were used as the dependent, and the regression model is presented in Table 3. In step 1, pre-treatment levels of interpersonal problems were a significant predictor of change in post-treatment interpersonal problems and accounted for 50.4% of the variance. In step 2, change in social phobic cognitions was entered and significantly accounted for 5.1% of the variance. In the final step, change in metacognitions was entered and accounted for an additional 10.3% of the variance. In this

Table 2. Bivariate correlations between change scores in interpersonal problems, social anxiety, depression, social phobic beliefs, and metacognitions (*N* = 52)

|               | 1      | 2      | 3      | 4    |
|---------------|--------|--------|--------|------|
| 1. IIP-change |        |        |        |      |
| 2. FNE-change | 0.46** |        |        |      |
| 3. BDI-change | 0.26   | 0.28*  |        |      |
| 4. SPC-change | 0.31*  | 0.55** | 0.09   |      |
| 5. MCQ-change | 0.53** | 0.42** | 0.43** | 0.15 |

Notes: IIP = inventory of interpersonal problems; FNE = fear of negative evaluation; BDI = Beck Depression Inventory; SPC = social phobic cognitions; MCQ = Metacognitions Questionnaire 30.

\**p* < 0.05, \*\**p* < 0.01.

regression model, we also tested the reversed entry of the belief domains and found that change in metacognitions entered in step 2 accounted for 12.4% of the variance and change in social phobic cognitions entered in step 3 accounted for an additional 3.0% of the variance. In the final equation when all the predictors were added, both change in social phobic cognitions and metacognitions were significant as unique predictors of interpersonal problems at post-treatment, however, change in metacognitive beliefs was a stronger predictor ( $\beta = 0.33$ ,  $P < 0.001$ ) compared to change in social phobic cognitions ( $\beta = 0.18$ ,  $p < 0.05$ ). Also in the second regression, post-treatment levels of interpersonal problems were used as the dependent, and the regression model is presented in Table 4. As change in depression symptoms did not significantly correlate with change in interpersonal problems, these were not included in the regression. After controlling for pre-treatment levels of interpersonal problems in step 1, change in social anxiety symptoms was entered in step 2 and significantly accounted for an additional 12.5% of the variance. In step 3, change in social phobic cognitions was entered but was non-significant as a predictor. In the final step, change in metacognitions was entered and accounted for an additional 5.1% of the variance. In the final equation when all the predictors were added, only pre-treatment levels of interpersonal problems and change in metacognitions were significant as unique predictors of post-treatment levels of interpersonal problems.

## DISCUSSION

This study aimed to explore change in metacognitions as a predictor of change in interpersonal problems among SAD-

Table 1. Paired samples *t* tests for all included variables with Cohen's *d* effect sizes and change scores for the predictors (*N* = 52)

| Measure | Pre-treatment ( <i>M</i> , <i>SD</i> ) | Post-treatment ( <i>M</i> , <i>SD</i> ) | $\Delta$ ( <i>SD</i> ) | <i>t</i> | <i>d</i> |
|---------|--|---|------------------------|----------|----------|
| IIP     | 79.79 (34.30)                          | 59.23 (36.85)                           | 20.56 (27.20)          | 5.451*   | 0.76     |
| FNE     | 24.50 (4.16)                           | 14.85 (7.77)                            | 9.65 (7.95)            | 8.761*   | 1.22     |
| BDI     | 10.90 (5.90)                           | 7.94 (5.70)                             | 2.96 (5.00)            | 4.270*   | 0.59     |
| SPC     | 705.10 (283.11)                        | 307.50 (328.02)                         | 397.60 (360.82)        | 7.946*   | 1.10     |
| MCQ     | 54.80 (13.40)                          | 47.96 (10.64)                           | 6.84 (11.14)           | 4.431*   | 0.61     |

Notes: *M* = mean; *SD* = standard deviation;  $\Delta$  = change score; *d* = Cohen's *d*; IIP = inventory of interpersonal problems; FNE = fear of negative evaluation; BDI = Beck Depression Inventory; SPC = social phobic cognitions; MCQ = metacognitions questionnaire 30.

\**p* < 0.001.

Table 3. Hierarchical linear regression with post-treatment interpersonal problems as the dependent variable controlling for pre-treatment interpersonal problems, change in social phobic cognitions and metacognitions ( $N = 52$ )

| Step       | $F$ cha | $R^2$ cha | $\beta$ | $t$      |
|------------|---------|-----------|---------|----------|
| IIP        |         |           |         |          |
| 1          | 50.803  | 0.504***  |         |          |
| IIPpre     |         |           | 0.71    | 7.128*** |
| 2          | 5.606   | 0.051*    |         |          |
| IIPpre     |         |           | 0.71    | 7.468*** |
| SPC-change |         |           | 0.23    | 2.368*   |
| 3          | 14.530  | 0.103***  |         |          |
| IIPpre     |         |           | 0.79    | 9.084*** |
| SPC-change |         |           | 0.18    | 2.057*   |
| MCQ-change |         |           | 0.33    | 3.812*** |

Notes: IIP = inventory of interpersonal problems; SPC = social phobic cognitions; MCQ = metacognitions questionnaire 30. Method: stepwise. \* $p < 0.05$ , \*\*\* $p < 0.001$ .

Table 4. Hierarchical linear regression with post-treatment interpersonal problems as the dependent variable controlling for pre-treatment interpersonal problems, change in social anxiety symptoms, social phobic cognitions and metacognitions ( $N = 52$ )

| Step       | $F$ cha | $R^2$ cha | $\beta$ | $t$      |
|------------|---------|-----------|---------|----------|
| IIP        |         |           |         |          |
| 1          | 50.803  | 0.504***  |         |          |
| IIPpre     |         |           | 0.71    | 7.128*** |
| 2          | 16.472  | 0.125***  |         |          |
| IIPpre     |         |           | 0.69    | 7.909*** |
| FNE-change |         |           | 0.35    | 4.059*** |
| 3          | 0.192   | 0.001     |         |          |
| IIPpre     |         |           | 0.69    | 7.856*** |
| FNE-change |         |           | 0.33    | 3.127**  |
| SPC-change |         |           | 0.05    | 0.438    |
| 4          | 7.441   | 0.051**   |         |          |
| IIPpre     |         |           | 0.76    | 8.796*** |
| FNE-change |         |           | 0.20    | 1.818    |
| SPC-change |         |           | 0.08    | 0.786    |
| MCQ-change |         |           | 0.26    | 2.728**  |

Notes: IIP = inventory of interpersonal problems; FNE = fear of negative evaluation; SPC = social phobic cognitions; MCQ = metacognitions questionnaire 30. Method: stepwise. \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

patients undergoing treatment. To evaluate a role for metacognitive change in interpersonal change, two regressions were run. In the first, change in social phobic cognitions was added as a covariate, and in the second change in social anxiety together with change in social phobic cognitions were included as covariates. Change in depression symptoms did not significantly correlate with change in interpersonal problems and was therefore not included in the regression. Both change in social phobic cognitions and metacognitions were unique predictors of change in interpersonal problems. However, change in metacognitions was the strongest predictor, and when including change in social anxiety as a covariate, only pre-treatment levels of interpersonal problems and change in metacognitions were significant as independent predictors of post-treatment levels of interpersonal problems.

In the current sample consisting of SAD patients undergoing one out of four different treatment interventions, interpersonal problems decreased significantly showing a moderate to large effect size from pre- to post-treatment across treatment conditions. All the other variables were also significantly improved with large effects demonstrated for social anxiety symptoms and social phobic cognitions, and moderate effect sizes for depression symptoms and metacognitions.

Change in interpersonal problems showed a moderate to large correlation with change in social anxiety symptoms, a moderate correlation with change in social phobic cognitions, a non-significant association with change in depressive symptoms, and a large correlation with change in metacognitions. The finding that changes in depressive symptoms and changes in interpersonal problems was not significantly correlated was not expected given that depression symptoms have been associated with interpersonal problems in previous studies (Huprich, Lengu & Evich, 2016), but indicates that these problem domains do not overlap or account for each other in the present sample.

In the first regression analysis, pre-treatment levels of interpersonal problems accounted for a significant amount of variance in step 1. In step 2, change in social phobic cognitions further significantly explained variance in the outcome which indicates that they in alignment with cognitive models (e.g., Clark & Wells, 1995) may be important targets in patients with SAD to change in interpersonal problems. In step 3, change in metacognitions significantly explained additional variance in the outcome and was a stronger predictor of change in interpersonal problems compared to social phobic cognitions. This finding is in line with the metacognitive model (Wells & Matthews, 1996), where dysfunctional metacognitions are considered central in maintaining psychological problems in general. Further, reversing the entry of the belief domains in the regression did not change the main results which implicated that metacognitions were more strongly related to improvement in interpersonal problems compared to social phobic cognitions, although social phobic cognitions did explain a small amount of unique variance above and beyond change in metacognitions. The findings overall support that metacognitive change is more strongly associated with interpersonal change compared to cognitive belief change, which is in line with several studies indicating that metacognition may be relatively more important to social anxiety compared to social phobic cognitions. For example, metacognitive but not cognitive beliefs contribute to depression symptoms in those with SAD (Nordahl, Nordahl, Vogel & Wells 2018) and correlate with work status in highly socially anxious individuals (Nordahl & Wells, 2020). While we here observed that change in social phobic beliefs did account for unique variance in interpersonal problems improvement, this effect disappeared when controlling change in social anxiety symptoms in the second regression. This finding might suggest that there is a high overlap between social phobic beliefs and social anxiety symptoms and that they are not robust unique correlates of interpersonal dysfunction compared to metacognitions. This finding aligns with a recent study by Nordahl, Anyan, Hjemdal & Wells (2022) which reported that social phobic beliefs and social anxiety had a reciprocal relationship in longitudinal data and that none of them emerged as the

dominant influence on the other, while metacognitions impacted on both social phobic beliefs and social anxiety. In other words, metacognitive beliefs might be the more central belief domain contributing to social anxiety and related problem areas, including interpersonal problems and dysfunction.

In accordance with our findings suggesting a role for metacognitive change in interpersonal problems improvement, treatment studies evaluating the effects of Metacognitive therapy (Wells, 2009), which directly aim to modify metacognitions, have reported substantial reductions in interpersonal problems among patients with Generalized Anxiety Disorder (Nordahl, Borkovec, Hagen *et al.*, 2018), Major Depressive Disorder (Strand, Hagen, Hjemdal, Kennair & Solem, 2018), and Borderline Personality Disorder (Nordahl & Wells, 2019). Moreover, while symptom improvement (i.e., improved social anxiety) is linked to improvement in interpersonal problems it might be that this relationship is explained by improvement in dysfunctional metacognitions which are also associated with interpersonal problems. If treatment reduces symptoms but does not successfully modify metacognitions these may maintain or constitute vulnerability to poor interpersonal functioning and corresponding problems. The same goes for social phobic cognitions; changing them may be related to symptom improvement but not impact directly on interpersonal problems. However, as metacognitions are linked to a range of emotional disorder symptoms and psychological problems, modifying them in treatment has the potential to create broad effects, for example reduction of social anxiety and interpersonal problems and distress in parallel.

There are limitations that should be recognized and considered when interpreting these findings. First, the variables included in the study were based on self-report alone. Second, the design of the current study limits inferences regarding causal associations between predictors and interpersonal problems. In our analyses we did not investigate the associations separately for the different treatment conditions. Although different mechanisms of change may be more relevant for different treatments, the metacognitive model hypothesizes the underlying mechanism of change in psychopathology to be the same, namely related to change in metacognition, and our main focus in the analyses was therefore not tied to the specific interventions but more to metacognitive theory. A strength worth mentioning is that the participants in the current study underwent thorough assessment which gives a higher degree of certainty regarding the validity of the results in terms of specificity for patients with SAD as their primary diagnosis. To remedy some of the limitations and to build on the current findings, future studies should include a larger number of participants to address issues of statistical power and the possibility for using more comprehensive statistical methods. Interpersonal problems could in addition to self-report include reports from significant others to the participant in addition to clinical assessments. The study utilized a total score on both metacognitions and interpersonal problems due to limited sample size, and to test for a reliable association between these factors. Future studies could therefore investigate more specific domains of metacognitive beliefs and their relationships to more specific domains of interpersonal problems. Future studies could further control for different hypothesized explanatory factors underlying interpersonal problems. In example, Nordahl, Hjemdal & Wells (2021) reported

that avoidant attachment and conscientiousness contributed to interpersonal problems in addition to specific domains of metacognitions. Furthermore, it could be that other domains of cognitive beliefs or schemas are more related to interpersonal problems in SAD than social phobic cognitions.

## CONCLUSIONS

This study is the first to report an association between metacognitive and interpersonal change in patients with SAD. Metacognitive change were related to improvement in interpersonal problems beyond change in social phobic cognitions and social anxiety symptoms which when controlling for the overlap with metacognitions did not account for unique variance. One pathway to alleviate interpersonal problems among patients with SAD in treatment may therefore be to modify dysfunctional metacognitions. Future research could explore more specific domains of metacognitive beliefs to more specific domains of interpersonal problems with the aim to further enhance formulation and treatment for patients with SAD.

## AUTHOR CONTRIBUTIONS

Hans M. Nordahl conducted the RCT-trial. Eivind R. Strand wrote the first draft of the manuscript. Eivind R. Strand, Henrik Nordahl and Odin Hjemdal ran the data analyses and all authors contributed substantially to the finalized version of the manuscript.

## FUNDING INFORMATION

The original study was conducted in accordance with and approved by the Regional Committee for Medical and Health Research Ethics of Central Norway (No. REK-018-03), the Norwegian Medicines Agency (SN 04-01998), the Norwegian Data Inspectorate, and was further conducted in agreement with the 1964 Helsinki Declaration and its later amendments. [ClinicalTrials.gov](https://clinicaltrials.gov) identifier: NCT00184106. Participants had to provide written informed consent to be included in the trial.

## DATA AVAILABILITY STATEMENT

Data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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