**The association between metacognitions and the impact of Fibromyalgia in a German sample**

Revision 1 (23/01/2016)

Revision 2 (02/02/2016)

*Word count: 6,535 (excluding Tables and References)*

Josianne Kollmann a, c Mario Gollwitzer a Marcantonio M. Spada b\* Bruce A. Fernie c, d

a Philipps University Marburg, Institute of Psychology, Germany, [mario.gollwitzer@uni-marburg.de](mailto:mario.gollwitzer@uni-marburg.de) and [josianne.kollmannj@uni-marburg.de](mailto:josianne.kollmannj@uni-marburg.de)

b Division of Psychology, School of Applied Sciences, London South Bank University, London, UK

c King’s College London, Institute of Psychiatry, Psychology and Neuroscience, Department of Psychology, London, UK

[bruce.fernie@kcl.ac.uk](mailto:bruce.fernie@kcl.ac.uk)

d CASCAID, South London &Maudsley NHS Foundation Trust, London, UK

February 2016

**Acknowledgements**

Author BAF receives salary support from the National Institute for Health Research (NIHR) Mental Health Biomedical Research Centre and Dementia Research Unit at South London and Maudsley NHS Foundation Trust and King’s College London. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.

**Author Notes**

\* Correspondence to: Division of Psychology, School of Applied Sciences, London South Bank University, United Kingdom. Tel. +44 (0)20 7815 5760, e-mail [spadam@lsbu.ac.uk](mailto:spadam@lsbu.ac.uk).

**Abstract**

*Objectives*

Fibromyalgia is a chronic condition of unknown aetiology, characterised by widespread pain, sleep disturbances, and fatigue. In this paper we examined the relationship metacognitions and the impact of Fibromyalgia in a German sample, detailing the translation and validation of a self-report metacognitive instrument.

*Methods*

The Metacognitions about Symptoms Control Scale (MaSCS) was translated into German using the back-forward translation process. A total of 348 patients (316 female and 26 male) with Fibromyalgia contributed data to the study to test the structure and psychometric properties of the MaSCS.

*Results*

Confirmatory factor analyses, informed by modification indices, resulted in a 16-item scale consisting of two factors pertaining to positive and negative metacognitions about symptoms control. Further analyses revealed that both factors had good internal consistency. Correlation analyses established convergent validity, indicating that both factors were significantly associated with: (1) established positive and negative metacognitions scales; and (2) with symptoms severity in Fibromyalgia. Regression analyses revealed that positive metacognitions about symptoms control significantly predicted impairment in physical functioning while negative metacognitions about symptoms control significantly predicted the overall Fibromyalgia impact value, when controlling for stress, anxiety, and depression and a general metacognitions.

*Conclusion*

The findings support the potential relevance of metacognitions, and utility of the German version of MaSCS, in examining the role of metacognitions in FM and other chronic health conditions.

Keywords: Fibromyalgia; Metacognitions; Psychometric Measure; Symptoms Control; Translation.

**1. Introduction**

**1.1 Fibromyalgia**

Fibromyalgia (FM) is chronic non-inflammable soft-tissue rheumatism of unknown aetiology, characterised by chronic widespread pain, sleep disturbances, and fatigue. People with FM also report poor concentration, lack of drive, and forgetfulness (1, 2). With a prevalence of 2.1% to 2.9% in European countries (3, 4), FM is a common condition. In terms of gender, Lawrence, Helmick (5) found a seven-fold higher prevalence of FM in females (3.4%) than in males (0.5%) in the adult U.S. population. Currently FM is a medically unexplained condition and there are no biological tests for establishing diagnosis.

The prevalence of emotional distress is high in FM. For example, Thieme, Turk (6) found that one-third of their FM sample reported anxiety and depressive symptoms, although 22.7% of this sample did not reach the diagnostic threshold for a Diagnostic and Statistical Manual Axis I depression or anxiety disorder (DSM: 7), whilst for 11% met diagnostic criteria for two or more Axis I disorders. This contrasts with an estimated 12-month prevalence of 7.6% for affective disorders and 16.6% for anxiety disorders in the general population (8). Perhaps, in part, due to the high prevalence of anxiety and depression symptoms in FM, higher health care utilisation compared to other rheumatic conditions has been reported (9).

**1.2 Psychological Factors in Fibromyalgia**

FM has been associated with several psychological factors. These include perfectionism (10), neuroticism (11), catastrophic thinking, and vigilance to pain (12). Miró, Lupiáñez (13) found that vigilance (i.e., the readiness of the attentional system to switch focus in response to changes in internal states) and executive control were impaired in FM patients as compared to a healthy control group, and that vigilance was significantly related to depression and anxiety.

Turk, Robinson (14) reported that high levels of fear of pain and activity in FM patients were associated with greater disability and pain severity. It is possible that a reciprocal relationship exists between FM symptoms and psychological factors. For example, Thieme, Turk (6) suggested that this relationship could be mediated by non-adherence to treatment, whilst later Gota, Kaouk (15) found that increasing levels of depression symptoms were significantly associated with the severity of FM symptoms and overall increased disability.

**1.3 Psychological Perspectives on Distress in Long-Term Health Conditions**

Earlier research examined the role of emotional approach coping in chronic health conditions. Stanton, Danoff-Burg (16) distinguished between emotion-focused coping, where an individual attempts to regulate their emotional response to stressors, and problem-focused coping, which refers to attempt to directly address the stressor itself, within emotional approach coping. Emotional approach coping is contrasted with emotional avoidance coping; in the latter case intensely experienced emotions are avoided. In FM, emotional avoidance coping has been found to be associated with high levels of distress, whereas emotional approach coping was minimally associated with better functioning (17).

According to the Self-Regulatory Executive Function (S-REF) model, metacognitions play an important role in psychological distress (18, 19). Metacognitions can be defined as thoughts and beliefs that concern the appraisal and control of cognitions and cognitive processes, attentional strategies, emotions, behaviours, and physical sensations (18). Metacognitions include, but are not exclusive to, the construct of ‘illness perceptions’ that earlier research has implicated in FM (20). Illness perceptions concern beliefs about the cause of symptoms and the degree to which individuals identify bodily sensations as symptoms, as well as beliefs about the consequences of the symptoms, their predicted duration, and the perceived ability to control the outcome of the symptoms or the illness from which they emerge. The construct of metacognitions differs from that of illness perceptions because it also embodies beliefs about cognitive, attentional, and behavioural responses (such as ruminating and worry about symptoms, self-focussed attention, and avoidance) to symptoms.

**1.4 Metacognitions and Metacognitive Therapy**

Metacognitions themselves can be divided into two broad domains: i.e., positive and negative metacognitions. Positive metacognitions are beliefs about the benefits of cognitive, attentional, and behavioural strategies (e.g. ruminating and symptom focus), such as 'If I ruminate, I will be better able to solve my problems' and ‘Worry keeps me safe’. Negative metacognitions concern disadvantages or negative appraisals of such strategies, such as 'Rumination makes me feel worse' or 'I am not able to stop worrying, even if I want to' (21).

Metacognitions have been found to be associated with a range of psychological problems, such as Generalised Anxiety Disorder (22), Obsessive Compulsive Disorder (23), Post-Traumatic Stress Disorder (24), problem drinking (25), gambling (26), and procrastination (27). More recently, metacognitions have also been found to be associated with the severity of symptoms in, and psychological distress comorbid to, physical health conditions such as Chronic Fatigue Syndrome (CFS: 28) and Parkinson’s disease (PD: 29). Both CFS and PD share characteristics with FM. All of these conditions present with an amalgam of physical, psychological, and emotional symptoms. However, to date, it appears that no study has investigated the role of metacognitions in FM.

The S-REF integrates information-processing research and emphasises the role of stimulus-driven, voluntary control of cognition and procedural knowledge in the self-regulation of emotion and play a pivotal role in psychological distress. The S-REF model not only offers a theoretical model as an explanation for psychological distress, but is also the foundation for Metacognitive Therapy (MCT). The central aim of MCT is not to change the content of a person's thoughts but rather to modify their response to them and other ‘activating inner events’ (e.g., emotions and physical symptoms). While traditional CBT focuses on the content of thoughts and beliefs, MCT concentrates on cognitive processes and attentional strategies and the metacognitions about them. According to the S-REF model, psychological disorders are linked to the activation of problematic configurations of maladaptive cognitive processing and attentional strategies, known as the Cognitive Attentional Syndrome (CAS). Maladaptive CAS configurations are characterised by perseverative thinking and attentional processes such as worry, rumination, and self-focused attention, as well as avoidance behaviour, thought suppression, and dysfunctional coping strategies. The model implicates metacognitions in the activation of problematic CAS configurations that lead to the perseveration of maladaptive cognitive processes, behaviours, and attentional strategies associated with distress (19). MCT has been evaluated across different disorders, with a recent meta-analysis indicating that it may have superior outcomes to CBT in treating depression and anxiety disorders (30).

**1.4 Measuring Metacognitions**

Several questionnaires have been developed to measure metacognitions, including the Metacognitions Questionnaire 30 (MCQ-30: 31, 32), which was originally developed for Generalised Anxiety Disorder but has since been used in research for a wide range of psychological and physical conditions (e.g., 29, 33-35).

More recently, another questionnaire has been developed to assess metacognitions related to physical health conditions: i.e., the Metacognitions about Symptoms Control Scale (MaSCS: 36). The MaSCS is a self-report instrument that was developed as a research tool to assess metacognitions about symptoms control (e.g. beliefs about ruminating and worrying about symptoms, as well as symptom focussed attention) in Chronic Fatigue Syndrome (36), though the authors suggested that the scale might be relevant to other chronic health conditions. Indeed, a recent study found, albeit in a sample too small for formal statistical analysis, moderate-to-strong correlations between MaSCS subscales and distress in Parkinson’s disease (37).

**1.5 Study Aims and Hypotheses**

FM is a poorly understood chronic illness and patients often suffer from comorbid anxiety and depression (6, 38). Whilst there is some evidence that has suggested that CBT is a beneficial treatment in FM, a meta-analysis found small effect sizes (39). Examining the role of metacognitions in FM may help to identify potential targets for intervention, with the long-term goal of enhancing current treatment protocols.

For this study, the MaSCS was translated into German and validated against pre-existing metacognitive, emotional, and FM-specific measures. We tested the following hypotheses: (1) the German version of the MaSCS would generate data that was a good fit of the two-factors structure used by the original measure; (2) the German version of the MaSCS would be significantly correlated with pre-existing German-language measures of metacognitions; and (3) the subscales of the German version of the MaSCS would be significantly associated with measures of the impact of FM symptoms.

**2. Methods**

**2.1 Participants**

The study was conducted online. The link to the online questionnaire batch registered 924 ‘clicks’ (i.e., the number of individuals who ‘clicked’ on a link that took them to the first page of the survey) and 479 people began the survey. Eligibility criteria were: (1) individuals who reported receiving their FM diagnosis by a physician; (2) individuals who gave consent to participate; (3) individuals aged 18 and over; and (4) adequate comprehension of the German language. Four hundred and three individuals met these eligibility criteria. Of these, 348 (316 female, with six participants not reporting their gender; mean age=49.9 years; SD=8.5; range 23 to 74 years) completed all study questionnaires and their data was used for this study. One hundred and thirty-one individuals (non-completers) began the survey but did not submit sufficient data to be included in this study's primary analyses.

The sample mostly consisted of German participants (94.5%) with 4.6% reporting another nationality and 0.9% missing this question. 95.7% of the sample reported that German was their first language, 3.4% reported to have another first language, and 0.9% missed this question. 75.8% of the participants reported that they had on going or historic exposure to psychotherapy. 50.9% of participants disclosed that they had received a psychiatric diagnosis, with the majority reporting depression, followed by anxiety, PTSD, and somatoform disorders.

**2.2 Measures**

**2.2.1 Metacognitions about Symptoms Control Scale (36)**

The MaSCS consists of 17 items, nine of which load on the Positive Metacognitions about Symptoms Control (PMSC) factor (e.g., 'Monitoring my symptoms enables me to better control them') and eight on the Negative Metacognitions about Symptoms Control (NMSC) factor (e.g., 'If I experience symptoms, it is impossible to focus on anything else'). The items consist of metacognitions to which respondents can endorse using a four-point Likert-type response format (with the options 'do not agree', 'agree slightly', 'agree moderately', and 'agree strongly'). Higher scores on each factor indicate a stronger endorsement of the metacognitive construct. The MaSCS possesses good internal consistency (α=.89 for PMSC and α=.88 for NMSC) and validity (36).

**2.2.2 Metakognitionsfragebogen / Metacognitions Questionnaire 30 (31, 40)**

The English version of the Metacognitions Questionnaire 30 (MCQ-30) and its German translation, the Metakognitionsfragebogen 30 (MKF-30), are self-report measures that consist of 30 items describing metacognitions. The 30 items measure five factors: (1) positive beliefs about worry (MKF-1: e.g., 'Worrying helps me to get things sorted out in my mind' / 'Sich-Sorgen hilft mir, meine Gedanken zu sortieren'); (2) negative beliefs about uncontrollability and danger of worry (MKF-2: e.g., 'My worrying is dangerous for me' / 'Meine Neigung, mich zu sorgen, ist gefährlich für mich'); (3) cognitive confidence (MKF-3: e.g.,' I do not trust my memory' / 'Ich misstraue meinem Gedächtnis'); (4) need to control thoughts (MKF-4: e.g., 'It is bad to think certain thoughts' / 'Es ist schlecht, bestimmte Gedanken zu hegen'); and (5) cognitive self-consciousness (MKF-5: e.g., 'I am constantly aware of my thinking' / 'Ich bin mir meines Nachdenkens ständig bewusst'). Participants respond on a four-point Likert-type scale with higher scores indicating a greater endorsement of metacognitions.

The MKF-30 has been reported to have adequate-to-good psychometric properties (40), with Cronbach’s alphas ranging from .63 (MKF-4) to .83 (MKF-1) for the five subscales. All subscales correlated positively with German versions of the Generalized Anxiety Disorder Questionnaire-IV (41) and the simplified Beck Depression Inventory (42). Like the MaSCS, higher scores indicate that the respondent more strongly endorses each metacognitive factor.

**2.2.3 Depression Anxiety Stress Scale (43, 44)**

The German version of the Depression Anxiety Stress Scale (DASS) consists of 21 items assessing levels of depression (DASS-D: e.g., 'I was unable to become enthusiastic about anything' / 'Ich war nicht in der Lage, mich für irgendetwas zu begeistern'), anxiety (DASS-A: e.g., 'I was worried about situations in which I might panic and make a fool of myself' / Ich machte mir Sorgen über Situationen, in denen ich in Panik geraten und mich lächerlich machen könnte'), and stress (DASS-S: e.g., ' I found it difficult to relax' / 'Ich fand es schwierig, mich zu entspannen'), with higher scores indicating higher levels of negative affect. The German version of the DASS possesses adequate psychometric properties, with internal consistency reported α=.88 for the depression subscale, α=.76 for the anxiety subscale, and α=.86 for the stress subscale (44).

**2.2.4 Fibromyalgia Impact Questionnaire (45, 46)**

The Fibromyalgia Impact Questionnaire (FIQ) is a self-report instrument that consists of ten subscales that assess the impact of FM on an individual’s life. The first subscale consists of 10 items that measure an individual’s physical functioning (FIQ-PF) over the preceding seven days, focusing on their ability to perform daily tasks (e.g., 'Were you able to do shopping?' / Waren Sie in der Lage, einkaufen zu gehen?'). Single items assess the remaining subscales: the next two ask for the number of days individuals ‘felt well’ and ‘missed work’ over the previous seven days. The first of these (i.e. ‘felt well’) is reverse scored so that higher scores reflect respondents feeling less well. The last seven items measure the degree to which FM symptoms interfere with an individual’s ability to work, as well as their degree of pain, their level of tiredness, whether their sleep was refreshing, their experience of stiffness, and finally their anxiety and depression over the same period. These seven items all used a visual analogue scale. Higher scores indicate a greater impact of FM symptoms. By following an algorithm that combines all FIQ subscales, a total score can be calculated (FIQ-TOT) that represents an indicator of the global impact of FM symptoms. The FIQ possesses adequate reliability: test-retest coefficients ranged from .62 for anxiety to 1 for 'ability to do job' whilst overall internal reliability was α=.92 (46).

**2.3 Procedure**

**2.3.1 Online Survey**

The study was conducted as an online study, hosted by SoSci-Survey (Leiner, 2014), and was available to participants at [www.soscisurvey.de](http://www.soscisurvey.de). Data collection occurred over 101 days from May 22nd to August 30th 2015. Participants were recruited via an appeal in an online Fibromyalgia-board ([www.fibromyalgie-treffpunkt.de](http://www.fibromyalgie-treffpunkt.de)) and via a short article in the German journal 'Fibromyalgie aktuell'. The research was conducted in accordance with the declaration of Helsinki.

**2.3.2 Adaption of the MaSCS**

The adaption of the MaSCS was performed using the back-forward translation process to enhance conceptual equivalency (47). The forward translation (English to German) was carried out by two independent professional translators, both native speakers of German and proficient in English. The research team reviewed the two translations and agreed on a combined version. Two other independent translators, both native speakers of English, fluent in German, and blind to the original English version, back-translated the combined version into English. These English translations were compared with the original. A good congruency with the English original items as regards content was achieved and, as a result, no changes were suggested.

As a further quality assurance, an intelligibility test was conducted. An FM patient and a clinical psychologist with expertise in FM were given the questionnaire and asked their opinions pertaining to comprehensibleness of each item. As a consequence, minor modifications were made that resulted in the version of the German MaSCS used in this study.

**3. Results**

**3.1 Sample Characteristics and Data Distribution**

A series of Kolmogorov-Smirnov tests indicated a non-normal distribution of all study variables except for physical functioning subscale of the FIQ. Further analyses found no significant relationships between those who start the survey but not finished it (non-completers) and exposure to psychotherapy and gender. Further, still, no significant differences were found between completers and non-completers on age and total FIQ scores.

**3.2 Testing Structure with a Principal Components Analysis**

Although the original English-version of the MaSCS consisted of two-factors, we conducted a Principal Components Analysis, with a Promax rotation and a Kappa of four, using the data generated by this study from the German MaSCS to test this structure. Scree plots supported the two-factor structure. These revealed that latent variables were weakly correlated (-.05) and all of the individual items mapped appropriately on to them.

**3.3 Confirmatory Factor Analyses and Internal Reliability**

A confirmatory factor analysis (CFA), using the Lavaan package (48), was conducted on the data using the maximum likelihood method to test the fit of the two-factor structure of the original MaSCS. PMSC and NMSC were defined as latent variables and the 17 items as congeneric indicators of the latent variables. We specified the factors to be uncorrelated (because the original study that developed the English version of the questionnaire found a weak correlation between factors), and we did not allow the item error terms to correlate with one another. The Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI; also known as the Non-Normed Fit Index), and the Chi-square test were employed to evaluate the data fit. An adequate fit is indicated by threshold values of .08 or below for the RMSEA (49) and close to or above .95 for the CFI and TLI (50). The two-factor English version resulted in a RMSEA of .07, a CFI of .90, and a TLI of .89. The Chi-square test reached significance χ2(118)=331.92, p<.001); however, with large sample sizes (such as that recruited for this study), small differences in the data can result in significant Chi-square values (50). Overall, these fit indices suggested a questionable-to-adequate fitting of the data to the model. We tested a re-specified model in which the two latent variables were allowed to correlate with each other. This model resulted in near-identical data fit statistics as the initial model, with the latent variables only weakly correlating (r=.01).

Modification indices suggested a re-specified model that excluded item two from the original MaSCS (i.e., 'If I focus on the symptom, I can take the appropriate action to get better' / 'Wenn ich mich auf ein Symptom konzentriere, kann ich geeignete Maßnahmen ergreifen, damit es mir besser geht'). This re-specified model (with uncorrelated latent variables) was tested and resulted in a better fit (RMSEA=.07; CFI=.92; NNFI=.90). Despite the Chi-square test still reaching significance χ2(103)=279.99, p<.001), overall this model appeared to be acceptable fit of the data; the current study’s sample size and the sensitivity of the Chi-square test, led to the 16-item, two-factor version of the scale being retained.

Cronbach's alpha coefficients were calculated for the two subscales of the MaSCS, resulting in values of .87 for PMSC and .83 for the NMSC, which suggested good internal reliability. Further calculations revealed that the internal reliability of the scale would not be significantly improved by removing any of the items. Additionally, we checked the internal reliabilities of the sub-factors of all the measures used in this study. These revealed that they possessed acceptable-to-excellent internal reliabilities in this German sample: i.e. Cronbach’s alphas for the MKF-30 were calculated as .85 (factor one), .87 (factor two), .89 (factor three), .80 (factor four), and .76 (factor five), whilst those for the DASS were .91 (depression), .80 (anxiety), and .89 (stress). A Cronbach’s alpha was calculated for only the physical function sub-factor of the FIQ (.90) because the other sub-factors consist of too few items. Factor loading for the revised instrument are presented in Table 1.

**3.4 Correlation Analyses**

Due to the non-normal distribution of the majority of study variables, Spearman’s rho correlation analyses were conducted between them all (see Table 2). The PMSC subscale showed significant positive correlations with four factors of the MKF-30: i.e., positive beliefs about worry (strong), cognitive confidence (weak), need to control thoughts (weak), and cognitive self-consciousness (moderate). PMSC also significantly correlated with two of the FIQ subscales: i.e., physical functioning (weak) and ability to do job (weak). A positive significant correlation was also observed between PMSC and the reversed scored ‘feel good’ subscale of the FIQ (weak). This suggests that whilst high PMSC beliefs were associated with impairment in both physical functioning and the ability to work, they were also related to feeling good. The NMSC scale showed significant positive correlations with all MKF-30, all DASS-21, and FIQ subscales. These correlations suggest that the German version of the MaSCS’s subscales measure relevant metacognitions as assessed by a pre-existing scale.

**3.5 Assumptions for Regression Analysis**

In order to establish the viability of using regression analyses, the data was examined against various assumptions. In terms of the presence of multicollinearity in the data set: (1) no correlations greater than r=.9 were identified between the predictor variables used in the regression analyses; and (2) the ranges of the Tolerance Index (0.15-0.88) and the Variance Inflation Factor (1.13-6.86) for all predictor variables were inspected and raised no concerns.

Furthermore, Durbin-Watson tests suggested that the assumption of independent errors is tenable. Histograms and normality plots were generated and these suggested that the residuals were normally distributed. Additionally, regression-standardised residuals against the regression-standardised predicted values were plotted and these suggested that the assumptions of linearity and homoscedasticity were met.

**3.6 Regression Analyses**

To further assess convergent validity, a hierarchical regression analysis (HRA) was conducted to test whether PMSC independently explained additional variance in positive beliefs about worry (MKF-1) when controlling for negative affect and other metacognitive factors. In this model, MKF-1 was the outcome variable with depression, anxiety, and stress entered as predictor variables on the first step, the four remaining MKF-30 variables on the second, and PMSC on the third (see Table 3). In the final step, this model accounted for 40% of the variance of MKF-1 with MKF-4, MKF-5, and PMSC significantly predicting positive beliefs about worry.

To further establish the convergent validity of the translated instrument, another HRA was conducted. This generated a model was identical to the first (see Table 4) but the outcome variable was MKF-2 (negative beliefs about uncontrollability and danger of worry) and PMSC was changed to NMSC as the predictor in the last step. In the final step, the model accounted for 72% of the variance in MKF-2, with positive metacognitions about worry (MKF-1) negatively and significantly predicting the outcome variable. Moreover, MKF-4, MKF-5, DASS-A, and NMSC were positive and independent significant predictors of MKF-2.

To test the hypothesis that PMSC and NMSC independently predict the impact of FM symptoms, two further HRAs were conducted. For the first model, the physical functioning subscale score from the FIQ was the outcome variable. All DASS variables were entered as predictors on the first step, all MKF-30 subscales on the second, and the MaSCS subscales on the third step (see Table 5). The final step in this model accounted for 18% of the variance in physical functioning. DASS-S, MKF-3, MKF-5, and PMSC were positive, independent, and significant predictors of the outcome variable. The second model used the same predictor variables on each step but with the FIQ total score outcome variable (see Table 6). The complete model accounted for 42% of the variance in the outcome variable. In the last step of this model DASS-S, MKF-3, and NMSC were significant predictors of total FIQ scores.

**4. Discussion**

This study presents the translation and validation of an instrument aimed at assessing metacognitions specific to chronic health conditions. Confirmatory factor analyses resulted in a 16-item, two-factor structure for the German version of the MaSCS. The translated scale retained a near identical structure to the original English MaSCS, modified to remove a single PMSC item. It is possible that the meaning of this item did not translate well, leading to a weaker fitting scale. The translated scale was shown to possess good internal consistency.

Convergent validity was established by finding that the subscales of the MaSCS were significantly associated with an existing German measure that was designed to assess metacognitive factors. Specifically positive metacognitions about symptoms control significantly and positively correlated with positive beliefs about worry, while negative metacognitions about symptoms control were positively correlated with negative beliefs about the uncontrollability and danger of worry.

Further evidence for the convergent validity of the translated scale was provided by a series of regression analyses. These indicated that positive metacognitions about symptoms control predicted positive beliefs about worry when controlling for negative affect and other measures of metacognition, including negative metacognitions about symptoms control (which became non-significant in this analysis). Additionally, they revealed that negative metacognitions about symptoms control predicted beliefs about the uncontrollability and danger of worry, also when controlling for negative affect and other metacognitive factors (including positive metacognitions about symptoms control, which was non-significant in this model).

Correlation analyses also revealed significant positive relationships between both positive metacognitions about symptoms control and negative metacognitions about symptoms control and impairment in physical functioning and ability to work, with negative metacognitions about symptoms control significantly correlating the overall impact of FM symptoms. Furthermore positive metacognitions about symptoms control significantly predicted physical functioning and negative metacognitions about symptoms control significantly predicted the overall FIQ value, when controlling for negative affect and other metacognitive measures. These findings suggest that metacognitions about symptoms control may play a role in the subjective impact of FM symptoms.

Interestingly, positive metacognitions about symptoms control seem to have a mixed relationship with the impact of FM symptoms, which will require further research to unravel. The correlation analyses revealed that whilst positive metacognitions about symptoms control was significantly and positively correlated with both impaired physical functioning and the ability to work, it was also positively correlated with the (reversed scored) feeling good subscale of the FIQ, suggesting that higher endorsement of PMSC beliefs are associated with feeling good. This apparently paradoxical relationship might be explained by the difference between perceived and actual feeling of control. Positive metacognitions about symptoms control may lead to increased perceived control (and possibly ‘feeling good’) because the individual is aware that he or she is engaging in cognitive and attentional processes (e.g., worry and rumination about symptoms and symptom focus) appraised as helpful (e.g., 'Monitoring my symptoms enables me to better control them'). However, according to the S-REF model, such processes result in less actual control and increased distress, and (possibly) greater impairment in physical functioning and ability to work.

This study also revealed that negative, but not positive, metacognitions about symptoms control, are positively correlated with the global impact of FM symptoms. However, positive metacognitions about symptoms control correlated with positive beliefs about worry, which in turn were positively correlated to the global impact of FM symptoms. It is possible that there might be a pathway between positive metacognitions about symptoms control, positive beliefs about worry, and the impact of FM symptoms. Future studies could utilise path analyses to examine this relationship.

Perhaps, unsurprisingly, NMSC was significantly associated with measures of negative affect, both from the DASS and the FIQ depression and anxiety subscales. This leads to the question: is the NMSC subscale simply another measure of distress? However, the findings from this study that revealed NMSC remained an independent predictor of FIQ-TOT when controlling for negative affect suggest otherwise, as it would appear that NMSC explains additional variation of the impact of FM symptoms over that accounted for by negative affect. It is possible that NMSC taps into the construct of emotional approach/avoidance coping (16, 51). Some NMSC items refer to beliefs about the negative impact on affect resulting from engaging in rumination and worry about symptoms and symptom focus. Instinctively, endorsement of NMSC items seems to represent the reverse of emotional avoidance, unless such individuals attempt to avoid ruminating and worrying about symptoms and symptom focus to avoid negative emotions. The S-REF model would predict that, if thought suppression and distraction strategies are adopted in an attempt to control these cognitive processes and attentional strategies, then these are likely to fail because of the paradoxical thought suppression effect (52), resulting in further distress.

Like other studies (27, 37, 53), participants were found to possess both positive and negative metacognitions apparently in parallel. According to the S-REF model, this leads to psychological distress. Initially, positive metacognitions, in some cases, are purported to activate maladaptive cognitive processes (e.g. worry and rumination about symptoms) that, in turn, trigger negative metacognitions. Such negative metacognitions may result in distress when they concern appraisals of thinking, attention, and symptoms, and when they pertain to the uncontrollability of worry, rumination, and self-focused attention.

Arguably, the additional assessment of a pain catastrophizing scale might have revealed a correlation with positive metacognitions about symptoms control, although the FIQ measures the impact of FM symptoms including subjective ratings of experience of pain. Research has found that pain catastrophizing (which describes a cognitive process rather than a physical symptom) is increased in FM (12). As such, it is possible this cognitive process may have a stronger relationship with metacognitions about symptoms control than the latter has with pain intensity.

This study is subject to several limitations that will have to be addressed by future research. First, social desirability, context effects, self-report biases, and poor recall may have influenced the results and contributed to errors in the self-report measurements. Second, this study utilises self-report measures to assess subjective experience and meta-awareness and as such, like much cognitive research, there is always doubt whether we are measuring the constructs we intend. Future studies could involve Ecological Momentary Assessment to test whether the MaSCS scores predict real-time impact of FM symptoms. Third, there were issues with the sample characteristics. It has been reported that there is a 7:1 female to male gender ratio in FM (5), however the gender ratio found in the sample was 12:1 female to male. This limits the generalizability of this study’s findings. Fourth, a cross-sectional design was adopted, which does not allow causal inferences. Fifth, the study relied on self-report that individuals have been diagnosed with FM.

Despite these limitations, we believe that the MaSCS is a promising research tool. It is brief and easy to administer; its use is not limited to specific samples (e.g., FM patients) and it strongly correlates with pre-existing measures of metacognitions. Whilst we are not suggesting that metacognitions (as measured by the translated MaSCS) entirely describe emotional distress and symptom severity in FM it would appear that the MaSCS explains additional variance in FM symptoms. This occurs even when controlling for pre-existing measures of metacognitions and negative affect, indicating that metacognitions about symptom control may be a discrete construct in helping us understand metacognitive processes in FM and other chronic health conditions.

# References

1. Bellato E, Marini E, Castoldi F, Barbasetti N, Mattei L, Bonasia DE, et al. Fibromyalgia syndrome: etiology, pathogenesis, diagnosis, and treatment. Pain Research and Treatment. 2012;2012.

2. Häuser W, Zimmer C, Felde E, Köllner V. Was sind die Kernsymptome des Fibromyalgiesyndroms? Der Schmerz. 2008;22(2):176-83.

3. Wolfe F, Brähler E, Hinz A, Häuser W. Fibromyalgia prevalence, somatic symptom reporting, and the dimensionality of polysymptomatic distress: results from a survey of the general population. Arthritis Care & Research. 2013;65(5):777-85.

4. Branco JC, Bannwarth B, Failde I, Carbonell JA, Blotman F, Spaeth M, et al. Prevalence of fibromyalgia: a survey in five European countries. Seminars in Arthritis and Rheumatism. 2010;39(6):448-53.

5. Lawrence RC, Helmick CG, Arnett FC, Deyo RA, Felson DT, Giannini EH, et al. Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. Arthritis & Rheumatism. 1998;41(5):778-99.

6. Thieme K, Turk DC, Flor H. Comorbid depression and anxiety in fibromyalgia syndrome: relationship to somatic and psychosocial variables. Psychosomatic Medicine. 2004;66(6):837-44.

7. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®). Arlington: American Psychiatric Pub; 2013.

8. Bijl R, Ravelli A, Van Zessen G. Prevalence of psychiatric disorder in the general population: results of The Netherlands Mental Health Survey and Incidence Study (NEMESIS). Social Psychiatry and Psychiatric Epidemiology. 1998;33(12):587-95.

9. Wolfe F, Anderson J, Harkness D, Bennett RM, Caro XJ, Goldenberg DL, et al. A prospective, longitudinal, multicenter study of service utilization and costs in fibromyalgia. Arthritis & Rheumatism. 1997;40(9):1560-70.

10. Molnar DS, Flett GL, Sadava SW, Colautti J. Perfectionism and health functioning in women with fibromyalgia. Journal of psychosomatic research. 2012;73(4):295-300.

11. Malin K, Littlejohn GO. Neuroticism in young women with fibromyalgia links to key clinical features. Pain research and treatment. 2012;2012.

12. Crombez G, Eccleston C, Van den Broeck A, Goubert L, Van Houdenhove B. Hypervigilance to pain in fibromyalgia: the mediating role of pain intensity and catastrophic thinking about pain. The Clinical Journal of Pain. 2004;20(2):98-102.

13. Miró E, Lupiáñez J, Hita E, Martínez M, Sánchez A, Buela-Casal G. Attentional deficits in fibromyalgia and its relationships with pain, emotional distress and sleep dysfunction complaints. Psychology & Health. 2011;26(6):765-80.

14. Turk DC, Robinson JP, Burwinkle T. Prevalence of fear of pain and activity in patients with fibromyalgia syndrome. The Journal of Pain. 2004;5(9):483-90.

15. Gota CE, Kaouk S, Wilke WS. The impact of depressive and bipolar symptoms on socioeconomic status, core symptoms, function and severity of fibromyalgia. International Journal of Rheumatic Diseases. 2015.

16. Stanton AL, Danoff-Burg S, Cameron CL, Ellis AP. Coping through emotional approach: Problems of conceptualizaton and confounding. Journal of personality and social psychology. 1994;66(2):350.

17. van Middendorp H, Lumley MA, Jacobs JW, van Doornen LJ, Bijlsma JW, Geenen R. Emotions and emotional approach and avoidance strategies in fibromyalgia. Journal of psychosomatic research. 2008;64(2):159-67.

18. Wells A. Emotional Disorders and Metacognition: Innovative Cognitive Therapy. Chichester, UK: Wiley; 2000. p. 6-10.

19. Wells A, Matthews G. Modelling cognition in emotional disorder: The S-REF model. Behaviour research and therapy. 1996;34(11):881-8.

20. Stuifbergen AK, Phillips L, Voelmeck W, Browder R. Illness perceptions and related outcomes among women with fibromyalgia syndrome. Women's Health Issues. 2006;16(6):353-60.

21. Wells A. Metacognitive Therapy for Anxiety and Depression. New York: Guilford Press; 2009. p. 5-15.

22. Wells A, Carter K. Further tests of a cognitive model of generalized anxiety disorder: Metacognitions and worry in GAD, panic disorder, social phobia, depression, and nonpatients. Behavior Therapy. 2002;32(1):85-102.

23. Fisher PL, Wells A. Experimental modification of beliefs in obsessive–compulsive disorder: A test of the metacognitive model. Behaviour research and Therapy. 2005;43(6):821-9.

24. Roussis P, Wells A. Post-traumatic stress symptoms: Tests of relationships with thought control strategies and beliefs as predicted by the metacognitive model. Personality and Individual Differences. 2006;40(1):111-22.

25. Spada MM, Wells A. Metacognitions across the continuum of drinking behaviour. Personality and Individual Differences. 2010;49(5):425-9.

26. Spada MM, Giustina L, Rolandi S, Fernie BA, Caselli G. Profiling metacognition in gambling disorder. Behavioural and Cognitive Psychotherapy. 2014.

27. Fernie BA, Spada MM. Metacognitions about procrastination: A preliminary investigation. Behavioural and Cognitive Psychotherapy. 2008;36(03):359-64.

28. Maher-Edwards L, Fernie BA, Murphy G, Wells A, Spada MM. Metacognitions and negative emotions as predictors of symptom severity in chronic fatigue syndrome. Journal of Psychosomatic Research. 2011;70(4):311-7.

29. Brown RG, Fernie BA. Metacognitions, anxiety, and distress related to motor fluctuations in Parkinson's disease. J Psychosom Res. 2015;78(2):143-8.

30. Normann N, van Emmerik AA, Morina N. The efficacy of metacognitive therapy for anxiety and depression: a meta-analytic review. Depression and anxiety. 2014;31(5):402-11.

31. Wells A, Cartwright-Hatton S. A short form of the metacognitions questionnaire: properties of the MCQ-30. Behaviour Research and Therapy. 2004;42(4):385-96.

32. Arndt A, Patzelt J, Andor T, Hoyer J, Gerlach AL. Psychometrische Gütekriterien des Metakognitionsfragebogens (Kurzversion, MKF-30). Zeitschrift für Klinische Psychologie und Psychotherapie. 2015.

33. Lindberg A, Fernie BA, Spada MM. Metacognitions in problem gambling. J Gambl Stud. 2011;27(1):73-81.

34. Maher-Edwards L, Fernie BA, Murphy G, Nikcevic AV, Spada MM. Metacognitive Factors in Chronic Fatigue Syndrome. Clinical psychology & psychotherapy. 2012;19(6):552-7.

35. Macbeth A, Gumley A, Schwannauer M, Carcione A, Fisher R, McLeod HJ, et al. Metacognition, symptoms and premorbid functioning in a First Episode Psychosis sample. Comprehensive psychiatry. 2014;55(2):268-73.

36. Fernie BA, Maher-Edwards L, Murphy G, Nikcevic AV, Spada MM. The Metacognitions about Symptoms Control Scale: Development and Concurrent Validity. Clinical psychology & psychotherapy. 2014:n/a-n/a.

37. Fernie BA, Spada MM, Ray Chaudhuri K, Klingelhoefer L, Brown RG. Thinking about motor fluctuations: An examination of metacognitions in Parkinson's disease. J Psychosom Res. 2015(0).

38. Hirsch S, Wallace P. Psychological symptoms, somatic symptoms, and psychiatric disorder in chronic fatigue and chronic fatigue syndrome: a prospective study in the primary care setting. Am J Psychiatry. 1996;153:1050-9.

39. Glombiewski JA, Sawyer AT, Gutermann J, Koenig K, Rief W, Hofmann SG. Psychological treatments for fibromyalgia: a meta-analysis. PAIN®. 2010;151(2):280-95.

40. Möbius J, Hoyer J. Metakognitionsfragebogen (MKF). In: Hoyer J, Margraf J, editors. Angstdiagnostik: Grundlagen und Testverfahren. Berlin: Springer; 2003. p. 220-3.

41. Newman MG, Zuellig AR, Kachin KE, Constantino MJ, Przeworski A, Erickson T, et al. Preliminary reliability and validity of the Generalized Anxiety Disorder Questionnaire-IV: A revised self-report diagnostic measure of generalized anxiety disorder. Behavior Therapy. 2002;33(2):215-33.

42. Schmitt M, Maes J. Vorschlag zur Vereinfachung des Beck-Depressions-Inventars (BDI). Diagnostica. 2000.

43. Lovibond PF, Lovibond SH. The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behaviour research and therapy. 1995;33(3):335-43.

44. Nilges P, Essau C. Die Depressions-Angst-Stress-Skalen. Der Schmerz. 2015:1-9.

45. Burckhardt CS, Clark SR, Bennett RM. The fibromyalgia impact questionnaire: development and validation. J Rheumatol. 1991;18(5):728-33.

46. Offenbaecher M, Waltz M, Schoeps P. Validation of a German version of the Fibromyalgia Impact Questionnaire. Journal of Rheumatology. 2000;27(8):1984-8.

47. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25(24):3186-91.

48. Rosseel Y. lavaan: An R package for structural equation modeling. Journal of Statistical Software. 2012;48(2):1-36.

49. Browne MW, Cudeck R, Bollen KA, Long JS. Alternative ways of assessing model fit. Sage Focus Editions. 1993;154:136-.

50. Schermelleh-Engel K, Moosbrugger H, Müller H. Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. Methods of Psychological Research Online. 2003;8(2):23-74.

51. Stanton AL, Kirk SB, Cameron CL, Danoff-Burg S. Coping through emotional approach: scale construction and validation. Journal of personality and social psychology. 2000;78(6):1150.

52. Abramowitz JS, Tolin DF, Street GP. Paradoxical effects of thought suppression: A meta-analysis of controlled studies. Clinical Psychology Review. 2001;21(5):683-703.

53. Spada MM, Giustina L, Rolandi S, Fernie BA, Caselli G. Profiling Metacognition in Gambling Disorder. Behavioural and Cognitive Psychotherapy. 2014;FirstView:1-9.

**Table 1:** Factor loadings for the revised instrument

|  |  |  |
| --- | --- | --- |
| Items | Factor 1:  PMSC | Factor 2:  NMSC |
| Wenn sich die Symptome bemerkbar machen, kann ich mich unmöglich auf irgendetwas anderes konzentrieren. |  | 1.000 |
| Über meine Symptome nachzudenken hilft mir dabei, herauszufinden, wie ich mit ihnen umgehe. | 1.000 |  |
| Über meine Symptome nachzudenken frustriert mich. |  | 2.325 |
| Nicht auf meine Symptome zu achten kann dazu führen, dass ich mich überanstrenge. | 0.735 |  |
| Meine Symptome zu beobachten hilft mir dabei, ihre Entwicklung vorherzusehen. | 1.116 |  |
| Wenn ich über meine Symptome nachdenke, fühle ich mich schlecht und bin niedergeschlagen. |  | 2.866 |
| Ich beobachte meine Symptome genau, damit ich meine körperlichen Grenzen erkenne. | 1.187 |  |
| Über meine Symptome nachzudenken erschöpft mich. |  | 2.772 |
| Auf meine Symptome zu achten hilft mir, sie besser in den Griff zu bekommen. | 1.317 |  |
| Mich auf meine Symptome zu konzentrieren macht mich ängstlich und stresst mich. |  | 3.042 |
| Auf meine Symptome zu achten gibt mir Sicherheit. | 1.271 |  |
| Wenn ich einmal damit anfange, über meine Symptome nachzudenken, kann ich nicht mehr aufhören. |  | 2.111 |
| Indem ich mich auf meine Symptome konzentriere, erkenne ich, wann es mir besser geht. | 1.248 |  |
| Nicht auf meine Symptome zu achten könnte dazu führen, dass sich mein Krankheitszustand verschlimmert. | 1.402 |  |
| Mich auf meine Symptome zu konzentrieren macht mich traurig. |  | 3.018 |
| Über meine Symptome nachzudenken könnte sie verschlimmern. |  | 2.110 |

*Note.* Lavaan sets the value of the first item of the CFA to 1.

**Table 2:** Correlation Matrix of Study Variables with Means, SDs, and Ranges

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measures | Mean | SD | Range | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 1. PMSC | 17.28 | 4.94 | 8 to 31 | <.01 | .41\*\* | .04 | .11\* | .12\* | .26\*\* | .02 | .06 | .08 | .11\* | -.13\* | .11 | .11\* | .02 | -.03 | -.03 | .06 | .04 | .00 | .05 |
| 1. NMSC | 19.36 | 6.05 | 8 to 32 |  | .29\*\* | .69\*\* | .39\*\* | .54\*\* | .53\*\* | .65\*\* | .62\*\* | .56\*\* | .26\*\* | .18\*\* | .17\* | .28\*\* | .13\* | .28\*\* | .27\*\* | .19\*\* | .37\*\* | .53\*\* | .47\*\* |
| 1. MKF-1 | 8.74 | 3.28 | 6 to 24 |  |  | .38\*\* | .26\*\* | .47\*\* | .50\*\* | .32\*\* | .37\*\* | .36\*\* | .14\*\* | .06 | .12 | .08 | .07 | -.01 | .07 | .06 | .11\* | .24\*\* | .18\*\* |
| 1. MKF-2 | 12.13 | 4.67 | 6 to 24 |  |  |  | .46\*\* | .71\*\* | .69\*\* | .68\*\* | .72\*\* | .67\*\* | .23\*\* | .19\*\* | .15\* | .23\*\* | .19\*\* | .19\*\* | .23\*\* | .21\*\* | .42\*\* | .57\*\* | .50\*\* |
| 1. MKF-3 | 12.95 | 4.94 | 6 to 24 |  |  |  |  | .48\*\* | .41\*\* | .50\*\* | .49\*\* | .48\*\* | .27\*\* | .23\*\* | .18\*\* | .22\*\* | .09 | .26\*\* | .32\*\* | .15\*\* | .25\*\* | .34\*\* | .39\*\* |
| 1. MKF-4 | 10.11 | 3.88 | 6 to 24 |  |  |  |  |  | .67\*\* | .56\*\* | .58\*\* | .56\*\* | .17\*\* | .10 | .18\* | .22\*\* | .16\*\* | .09 | .18\*\* | .08 | .29\*\* | .40\*\* | .36\*\* |
| 1. MKF-5 | 12.48 | 3.91 | 6 to 24 |  |  |  |  |  |  | .53\*\* | .56\*\* | .53\*\* | .12\* | .13\* | .09 | .14\*\* | .14\*\* | .15\*\* | .17\*\* | .15\*\* | .31\*\* | .35\*\* | .33\*\* |
| 1. DASS-D | 16.19 | 4.74 | 7 to 27 |  |  |  |  |  |  |  | .89\*\* | .86\*\* | .33\*\* | .28\*\* | .17\* | .32\*\* | .20\*\* | .36\*\* | .39\*\* | .22\*\* | .46\*\* | .65\*\* | .60\*\* |
| 1. DASS-A | 16.08 | 4.90 | 7 to 28 |  |  |  |  |  |  |  |  | .88\*\* | .34\*\* | .27\*\* | .17\* | .33\*\* | .23\*\* | .31\*\* | .34\*\* | .23\*\* | .53\*\* | .64\*\* | .61\*\* |
| 1. DASS-S | 15.62 | 4.96 | 7 to 28 |  |  |  |  |  |  |  |  |  | .35\*\* | .26\*\* | .19\*\* | .36\*\* | .23\*\* | .33\*\* | .30\*\* | .25\*\* | .54\*\* | .60\*\* | .61\*\* |
| 1. FIQ-PF | 5.03 | 1.91 | 0 to 10 |  |  |  |  |  |  |  |  |  |  | .29\*\* | .40\*\* | .53\*\* | .32\*\* | .30\*\* | .23\*\* | .27\*\* | .20\*\* | .30\*\* | .60\*\* |
| 1. FIQ-FG | 7.98 | 2.12 | 0 to 10 |  |  |  |  |  |  |  |  |  |  |  | .12 | .32\*\* | .22\*\* | .31\*\* | .32\*\* | .27\*\* | .19\*\* | .24\*\* | .49\*\* |
| 1. FIQ-WM | 4.19 | 4.02 | 0 to 10 |  |  |  |  |  |  |  |  |  |  |  |  | .49\*\* | .25\*\* | .19\*\* | .11 | .14\* | .15\* | .20\*\* | .63\*\* |
| 1. FIQ-DJ | 7.28 | 2.32 | 0 to 10 |  |  |  |  |  |  |  |  |  |  |  |  |  | .45\*\* | .37\*\* | .31\*\* | .30\*\* | .22\*\* | .28\*\* | .67\*\* |
| 1. FIQ-P | 6.60 | 2.52 | 0 to 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .18\*\* | .16\*\* | .30\*\* | .15\*\* | .23\*\* | .55\*\* |
| 1. FIQ-F | 8.26 | 1.99 | 1 to 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .57\*\* | .28\*\* | .22\*\* | .27\*\* | .52\*\* |
| 1. FIQ-R | 8.37 | 2.00 | 0 to 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .28\*\* | .22\*\* | .28\*\* | .50\*\* |
| 1. FIQ-S | 7.41 | 2.34 | 0 to 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .23\*\* | .19\*\* | .50\*\* |
| 1. FIQ-A | 5.02 | 3.13 | 0 to 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .50\*\* | .59\*\* |
| 1. FIQ -D | 4.82 | 3.30 | 0 to 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | .66\*\* |
| 1. FIQ - total | 67.13 | 14.63 | 6.22 to 96.89 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

*Note.* PMSC = Positive Metacognitions about Symptoms Control; NMSC = Negative Metacognitions about Symptoms Control; MKF = Metakognitionsfragebogen (-1 = positive beliefs about worry; -2 = negative beliefs about uncontrollability and danger of worry; -3 = cognitive confidence; -4 = need to control thoughts; -5 = cognitive self-consciousness); DASS = Depression, Anxiety and Stress Scale (-D = Depression; -A = Anxiety; -S = Stress); FIQ = Fibromyalgia Impact Questionnaire (-PF = Physical Functioning; -FG = Feeling Good; -WM = Work Missed; -DJ = Do Job; -P = Pain; -F = Fatigue;-R = Rested; -S = Stiffness; -A = Anxiety; -D = Depression; FIQ-total = total score) n=348; \*p<.05; \*\*p<.01

.

**Table 3**: Hierarchical regression model with MKF-1 as the outcome variable

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  | 95% Confidence Interval | |
| Predictor | | *R*2 | Adjusted R2 | B | SE | β | LL | UL |
| Step 1 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | -.10 | .09 | -.14 | -.26 | .07 |
|  | DASS-A |  |  | .21 | .08 | .32\* | .05 | .38 |
|  | DASS-S |  |  | .11 | .08 | .17 | -.04 | .26 |
|  |  | .12\*\* | .12\*\* |  |  |  |  |  |
| Step 2 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | -.15 | .08 | -.21 | -.30 | .00 |
|  | DASS-A |  |  | .12 | .08 | .18 | -.04 | .28 |
|  | DASS-S |  |  | .08 | .07 | .13 | -.05 | .22 |
|  | MKF-2 |  |  | -.16 | .06 | -.23\*\* | -.27 | -.05 |
|  | MKF-3 |  |  | .01 | .04 | .02 | -.06 | .08 |
|  | MKF-4 |  |  | .27 | .06 | .32\*\* | .15 | .38 |
|  | MKF-5 |  |  | .32 | .06 | .38\*\* | .21 | .43 |
|  |  | .30\*\* | .29\*\* |  |  |  |  |  |
| Step 3 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | -.10 | .07 | -.13 | -.23 | .05 |
|  | DASS-A |  |  | .11 | .07 | .16 | -.04 | .25 |
|  | DASS-S |  |  | .04 | .06 | .07 | -.08 | .17 |
|  | MKF-2 |  |  | -.09 | .05 | -.13 | -.19 | .02 |
|  | MKF-3 |  |  | -.01 | .03 | -.02 | -.08 | .06 |
|  | MKF-4 |  |  | .27 | .06 | .32\*\* | .16 | .38 |
|  | MKF-5 |  |  | .20 | .06 | .24\*\* | .09 | .31 |
|  | PMSC |  |  | .22 | .03 | .33\*\* | .16 | 28 |
|  |  | .40\*\* | .39\*\* |  |  |  |  |  |

*Note.* DASS = Depression, Anxiety and Stress Scale (-D = Depression; -A = Anxiety; -S = Stress); MKF = Metakognitionsfragebogen (-1 = positive beliefs about worry; -2 = negative beliefs about uncontrollability and danger of worry; -3 = cognitive confidence; -4 = need to control thoughts; -5 = cognitive self-consciousness); PMSC = Positive Metacognitions about Symptoms Control; SE = standard error; UL = upper limit; LL = lower limit; n = 348; \* p<0.05; \*\* p<.01.

**Table 4**: Hierarchical regression model with MKF-2 as the outcome variable

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  | 95% Confidence Interval | |
| Predictor | | *R*2 | Adjusted R2 | B | SE | β | LL | UL |
| Step 1 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | .15 | .09 | .15 | -.02 | .33 |
|  | DASS-A |  |  | .46 | .09 | .48\*\* | .28 | .63 |
|  | DASS-S |  |  | .11 | .08 | .12 | -.04 | .27 |
|  |  | .53\*\* | .53\*\* |  |  |  |  |  |
| Step 2 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | .04 | .07 | .04 | -.10 | .19 |
|  | DASS-A |  |  | .28 | .07 | .30\*\* | .14 | .48 |
|  | DASS-S |  |  | .07 | .07 | .08 | -.06 | .20 |
|  | MKF-1 |  |  | -.14 | .05 | -.10\*\* | -.25 | -.04 |
|  | MKF-3 |  |  | .02 | .03 | .02 | -.05 | .08 |
|  | MKF-4 |  |  | .35 | .06 | .29\*\* | .25 | .46 |
|  | MKF-5 |  |  | .37 | .05 | .31\*\* | .27 | .47 |
|  |  | .69\*\* | .68\*\* |  |  |  |  |  |
| Step 3 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | -.07 | .07 | -.07 | -.21 | .08 |
|  | DASS-A |  |  | .24 | .07 | .25\*\* | .10 | .38 |
|  | DASS-S |  |  | .10 | .06 | .10 | -.02 | .22 |
|  | MKF-1 |  |  | -.12 | .05 | -.09\* | -.22 | -.03 |
|  | MKF-3 |  |  | .01 | .03 | .01 | -.05 | .08 |
|  | MKF-4 |  |  | .31 | .05 | 26\*\* | .21 | .41 |
|  | MKF-5 |  |  | .31 | .05 | .26\*\* | .21 | .41 |
|  | NMSC |  |  | .20 | .03 | .26\*\* | .14 | .26 |
|  |  | .72\*\* | .72\*\* |  |  |  |  |  |

*Note.* DASS = Depression, Anxiety and Stress Scale (-D = Depression; -A = Anxiety; -S = Stress); MKF = Metakognitionsfragebogen (-1 = positive beliefs about worry; -2 = negative beliefs about uncontrollability and danger of worry; -3 = cognitive confidence; -4 = need to control thoughts; -5 = cognitive self-consciousness); NMSC = Negative Metacognitions about Symptom Control; SE = standard error; UL = upper limit; LL = lower limit; n = 348; \* p<0.05; \*\* p<.01.

**Table 5:** Hierarchical regression model with Physical Functioning as the outcome variable

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  | 95% Confidence Interval | |
| Predictor | | *R*2 | Adjusted R2 | B | SE | β | LL | UL |
| Step 1 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | .00 | .05 | .01 | -.09 | .10 |
|  | DASS-A |  |  | .03 | .05 | .08 | -.07 | .13 |
|  | DASS-S |  |  | .11 | .04 | .29\* | .03 | .20 |
|  |  | .14\*\* | .13\*\* |  |  |  |  |  |
| Step 2 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | .00 | .05 | .00 | -.10 | .10 |
|  | DASS-A |  |  | .03 | .05 | .08 | -.07 | .13 |
|  | DASS-S |  |  | .11 | .04 | .29\* | .02 | ,20 |
|  | MKF-1 |  |  | .03 | .04 | .06 | -.04 | .10 |
|  | MKF-2 |  |  | .02 | .04 | .04 | -.06 | .09 |
|  | MKF-3 |  |  | .05 | .02 | .13\* | .01 | .10 |
|  | MKF-4 |  |  | -.02 | .04 | -.04 | -.10 | .06 |
|  | MKF-5 |  |  | -.07 | .04 | -.14 | -.14 | .01 |
|  |  | .16\*\* | .14\*\* |  |  |  |  |  |
| Step 3 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | -.01 | .05 | -.03 | -.11 | .09 |
|  | DASS-A |  |  | .03 | .05 | .08 | -.07 | .13 |
|  | DASS-S |  |  | .11 | .04 | .29\* | .03 | .20 |
|  | MKF-1 |  |  | .00 | .04 | .00 | -.07 | .07 |
|  | MKF-2 |  |  | .00 | .04 | .01 | -.07 | .08 |
|  | MKF-3 |  |  | .05 | .02 | .12\* | .00 | .09 |
|  | MKF-4 |  |  | -.01 | .04 | -.02 | -.09 | .06 |
|  | MKF-5 |  |  | -.09 | .04 | -.19\* | -.17 | -.02 |
|  | PMSC |  |  | .05 | .02 | .13\* | .01 | .09 |
|  | NMSC |  |  | .04 | .02 | .14 | .00 | .09 |
|  |  | .18\*\* | .16\*\* |  |  |  |  |  |

*Note.* Physical Functioning = FIQ, Physical functioning scale; DASS = Depression, Anxiety and Stress Scale (-D = Depression; -A = Anxiety; -S = Stress); MKF = Metakognitionsfragebogen (-1 = positive beliefs about worry; -2 = negative beliefs about uncontrollability and danger of worry; -3 = cognitive confidence; -4 = need to control thoughts; -5 = cognitive self-consciousness); PMSC = Positive Metacognitions about Symptoms Control; NMSC = Negative Metacognitions about Symptoms Control; SE = standard error; UL = upper limit; LL = lower limit; n = 348; \* p<0.05; \*\* p<.01.

**Table 6:** Hierarchical regression model with FIQ\_TOT as the outcome variable

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  | 95% Confidence Interval | |
| Predictor | | *R*2 | Adjusted R2 | B | SE | β | LL | UL |
| Step 1 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | .32 | .32 | .10 | -.31 | .94 |
|  | DASS-A |  |  | .74 | .31 | .25\* | .12 | 1.35 |
|  | DASS-S |  |  | .89 | .28 | .30\*\* | .34 | 1.45 |
|  |  | .39\*\* | .39\*\* |  |  |  |  |  |
| Step 2 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | .21 | .32 | .07 | -.42 | .84 |
|  | DASS-A |  |  | .65 | .33 | .22\* | .01 | 1.29 |
|  | DASS-S |  |  | .90 | .28 | .31\*\* | .35 | 1.45 |
|  | MKF-1 |  |  | -.23 | .22 | -.05 | -.67 | .21 |
|  | MKF-2 |  |  | .35 | .23 | .11 | -.10 | .81 |
|  | MKF-3 |  |  | .39 | .15 | .13\*\* | .10 | .67 |
|  | MKF-4 |  |  | -.28 | .25 | -.08 | -.77 | .20 |
|  | MKF-5 |  |  | -.16 | .24 | -.04 | -.64 | .31 |
|  |  | .41\*\* | .40\*\* |  |  |  |  |  |
| Step 3 | |  |  |  |  |  |  |  |
|  | DASS-D |  |  | .08 | .33 | .03 | -.56 | .72 |
|  | DASS-A |  |  | .63 | .32 | .21 | -.01 | 1.27 |
|  | DASS-S |  |  | .94 | .28 | .32\*\* | .38 | 1.49 |
|  | MKF-1 |  |  | -.30 | .24 | -.07 | -.77 | .17 |
|  | MKF-2 |  |  | .21 | .24 | .07 | -.28 | .70 |
|  | MKF-3 |  |  | .38 | .15 | .13\* | .09 | .66 |
|  | MKF-4 |  |  | -.27 | .25 | -.07 | -.76 | .22 |
|  | MKF-5 |  |  | -.23 | .25 | -.06 | -.71 | .25 |
|  | PMSC |  |  | .12 | .14 | .04 | -.16 | .40 |
|  | NMSC |  |  | .30 | .15 | .13\* | .01 | .60 |
|  |  | .42\*\* | .41\*\* |  |  |  |  |  |

*Note.* FIQ\_TOT *=* Fibromyalgia Impact Scale, total score; DASS = Depression, Anxiety and Stress Scale (-D = Depression; -A = Anxiety; -S = Stress); MKF = Metakognitionsfragebogen (-1 = positive beliefs about worry; -2 = negative beliefs about uncontrollability and danger of worry; -3 = cognitive confidence; -4 = need to control thoughts; -5 = cognitive self-consciousness); PMSC = Positive metacognitions about symptom control scale; NMSC = Negative Metacognitions about Symptom Control; SE = standard error; UL = upper limit; LL = lower limit; n = 348; \* p<0.05; \*\* p<.01.

****