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Transcultural, transdiagnostic, and concurrent validity of a revised Metacognitions about
Symptom Control Scale

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Abstract

Anxiety and depression add to the burden of Chronic Fatigue Syndrome (CFS), Fibromyalgia (FM), and Type 1 Diabetes Mellitus (T1DM). Metacognitions play a role in this distress. The Metacognitions about Symptom Control Scale (MaSCS) measures metacognitive beliefs regarding symptoms but has weaknesses. The current study created a revised MaSCS (MaSCS-R) in English, German, and Arabic versions using CFS, FM, and T1DM samples, and examined the transcultural, transdiagnostic, and concurrent validity of metacognitions about symptom control. This study used data from a total of 563 participants clinically diagnosed with CFS (n = 124; English), FM (n = 348; German), or T1DM (n = 91; Lebanese). CFS and FM data had been used in earlier published studies but were subjected to new analyses. CFS data was used to create the English version of the MaSCS-R, and FM and T1DM data for German and Arabic versions. Metacognitions about worry, anxiety, depression, and symptom severity were measured. The three MaSCS-R versions, consisting of two factors (each with four items), had adequate psychometric properties, possessing configural and metric invariance. Metacognitive factors were associated with distress and symptom severity in all three samples. Metacognitions about symptom control have transcultural, transdiagnostic, and concurrent validity.

Keywords: Long-term Health Conditions; Distress; Metacognitions; Transcultural.

1. Introduction

1.1 Anxiety and depression in long-term health conditions

The burden of long-term health conditions (LTHCs) is increased by anxiety and depression symptoms, affecting individuals and increasing treatment costs for health care systems (Naylor et al., 2012). LTHCs are a global problem (World Health Organization, 2017), requiring the development of effective treatments to reduce the, often co-occurring, distress (i.e. an amalgamation of anxiety and depression symptoms). Identifying targets for psychological intervention is an important step in treatment development. Given the global nature of this problem, identifying transculturally valid targets has even greater utility. The current study focusses on three different LTHCs: Chronic Fatigue Syndrome (CFS), Fibromyalgia (FM), and Type 1 Diabetes Mellitus (T1DM), with samples drawn from three countries (UK, Germany, and Lebanon).

CFS is a debilitating condition characterized by profound, disabling fatigue, accompanied by numerous rheumatologic, flu-like, and neuropsychiatric symptoms. Anxiety and depression often add to the disease burden (Afari & Buchwald, 2003). FM refers to a type of chronic non-inflammable soft-tissue rheumatism, characterised by chronic widespread pain, sleep disturbances, and fatigue. The prevalence of emotional distress is high in FM (Thieme, Turk, & Flor, 2004). Diabetes mellitus results from an autoimmune response that destroys insulin-producing cells. There are several types of diabetes mellitus, with types 1 and 2 being most common. People living with T1DM have elevated levels of anxiety and depression (Barnard, Skinner, & Peveler, 2006; Shaban, Fosbury, Kerr, & Cavan, 2006).

1.2 Transcultural limitations of Western models of psychotherapy

Applying 'Western-developed' psychotherapy in other cultures is argued to be problematic (see Koç & Kafa, 2019 for a discussion), lacking transcultural validity. For example, Rathod, Kingdon, Smith, and Turkington (2005) found that, in an RCT using CBT

to improve insight in schizophrenia, African-Caribbeans had significantly poorer outcomes and significantly more drop-outs than Caucasians participants. Also, Lester, Artz, Resick, and Young-Xu (2010) looked at the impact of ethnicity on CBT for PTSD and found that twice as many African-Americans dropped out of treatment than Caucasians (although they found no differences in treatment outcomes between these ethnicities). Some authors have suggested that adapting psychotherapeutic approaches can address this issue. For example, Wampold (2015) presented a 'contextual model', consisting of three 'pathways', and proposed that, because it utilises common factors shared by psychotherapies, it maximises their transcultural validity. However, attempting to restructure (what the therapist has formulated to be) maladaptive cognitions may be inappropriate in certain cultural contexts. Culture plays a significant role in shaping cognitions (Dowd, 2003). The extent to which cognitions are adaptive or maladaptive is likely to vary as a function of cultural context. For example, cognitions relating to the maintenance of family structures, compared to those concerning an individual's well-being, might be more adaptive for people from collectivistic than individualistic cultures (Hays & Iwamasa, 2006). Therefore, identifying suitable targets for cognitive restructuring needs to be repeatedly re-calibrated when working with people from different cultures. Alternatively, identifying transcultural targets might bypass this requirement, as well as having (potentially) many other benefits. For example, it is arguable that a good fitting, transculturally valid psychological model would describe more fundamental mechanisms underlying psychological distress. More accurate and efficient interventions could be derived from such models. Also, psychotherapists trained in one country could use their knowledge and skills to help patients in another, and equitable treatment effects might be achieved across cultures, because interventions could be derived from transcultural psychological models.

1.3 Metacognitive Therapy

Over the last 20 years has seen the development of Metacognitive Therapy (MCT; Wells, 2009), which offers a novel way of conceptualising and treating psychological distress. Metacognitions are a key focus of MCT and refer to a type of higher-order beliefs that can be defined as ‘beliefs about thinking’. According to MCT, metacognitions act as “general plans for processing and coping” (Wells, 2002, p. 18) that govern cognitive processes: they influence the choice of maladaptive coping strategies for the management of unpleasant cognitions, emotions, and physical feelings. These coping strategies typically include rumination, symptom focus (an attentional strategy), and worry. Several types of metacognitions have been found to be important in LTHCs (Brown & Fernie, 2015; Cook, Salmon, Dunn, & Fisher, 2014; Cook et al., 2015, 2015; Fernie, Maher-Edwards, Murphy, Nikcevic, & Spada, 2015; Fernie, Murphy, Wells, Nikcevic, & Spada, 2016; Fernie, Spada, & Brown, in press; Fernie, Spada, Ray Chaudhuri, Klingelhofer, & Brown, 2015; Fisher et al., 2018; Fisher, McNicol, Young, Smith, & Salmon, 2015; Fisher, Reilly, & Noble, 2018; Kollmann, Gollwitzer, Spada, & Fernie, 2016; Maher-Edwards, Fernie, Murphy, Nikcevic, & Spada, 2012; Maher-Edwards, Fernie, Murphy, Wells, & Spada, 2011; Purewal & Fisher, 2018). For example, positive metacognitive beliefs about the usefulness of a particular coping strategy (e.g., “Monitoring my symptoms enables me to better control them”) and negative metacognitions that refer to beliefs concerning uncontrollability and danger of a particular strategy (e.g., “When I experience symptoms, it’s impossible to focus on anything else”). MCT seeks to modify unhelpful metacognitions, disrupting perseverative maladaptive coping strategies.

MCT focuses on cognitive (such as rumination and worry) and attentional processes (and their perseveration). Arguably, the role of these processes in distress is shared across cultures. For example, just as sustained high blood pressure is not healthy for humans regardless of their cultural background, ‘thinking too much’ causes distress to everyone

(Kaiser et al., 2015). Although ‘thinking too much’ does not map on to a discrete Western psychiatric diagnosis (Kaiser et al., 2015), it seems to be an idiom for distress across the world (including Africa, Australia, Central America/Caribbean, the Middle East, South America, South Asia, Southeast Asia, and the United States/Europe). ‘Thinking too much’ seems to describe a perseverative cognitive process, which is a key component of clinical formulations using MCT. It is possible, therefore, that metacognitions may be transcultural targets for treatment development.

1.4 Existing metacognitive measures

The Metacognitions Questionnaire 30 (MCQ; Wells & Cartwright-Hatton, 2004) is the most often used measure of metacognitions in psychological research. Its items focus on positive and negative beliefs about worry, need to control thoughts, cognitive self-consciousness, and cognitive confidence. More recently, the Metacognitions about Symptom Control Scale (MaSCS; Fernie et al., 2015) has been developed to measure beliefs about symptom focus, rumination, and worry, first in CFS and later in other LTHCs (Fernie et al., in press; Fernie et al., 2015; Kollmann et al., 2016). The key difference between the MaSCS and the MCQ lies in the nature and specificity of the metacognitions they are designed to measure. The MCQ’s items reflect how it was originally developed (i.e., they mainly describe worry-related metacognitions prevalent in people living with Generalized Anxiety Disorder). The MaSCS contains items that also refer cognitive and attentional processes, although they focus on symptoms (specifically their role in the appraisal, management and control of physical symptoms). For example, whereas the MCQ has the item “My worrying thoughts persist, no matter how I try to stop them”, the MaSCS has the item “I am not able to stop thinking about my symptoms once I start”. Both refer to beliefs about the uncontrollability of a cognitive process but, whereas the MCQ item refers to worry in general, the MaSCS item

specifically refers to thinking about symptoms. The greater specificity of the MaSCS should increase its face validity (compared to the MCQ) in LTHCs.

However, after using the MaSCS in clinical and research settings for a number of years, the current authors have identified weaknesses in some of its items. The seeds of concerns about the MaSCS were sowed by clinical and research experience and nurtured by theoretical reflection. For example, some participants/patients have reported that four of the MaSCS items were difficult to understand (particularly those negatively framed). Regarding theoretical concerns, some items (four) refer to metacognitions that describe anticipated emotional consequences of engaging in cognitive and/or attentional processes (e.g., the item “Thinking about my symptoms makes me feel frustrated” refers to an emotional consequence about symptom rumination). These metacognitions do not unpick the relationship between cognitive and/or attentional processes with distress, limiting their utility for developing theoretical models of distress in LTHCs. Additionally, one MaSCS item does not clearly refer to an ongoing cognitive and/or attentional strategy, and instead appears to indicate a momentary response to a trigger (“If I focus on the symptom, I can take the appropriate action to get better”). This also obfuscates attempts to model the role of metacognitions (and their relationships with perseverative cognitive and attentional processes) in LTHC-related distress.

1.5 Study aims

This study is in two parts and its overall objective is to create three versions of a revised MaSCS (i.e., English, German, and Arabic language versions of the MaSCS-R), which address the weaknesses of the original MaSCS. Part 1 presents the development of a revised (English language) version of the MaSCS-R and used data from a sample of people living with CFS (Sample A) from an earlier study (Fernie et al., 2015). Part 2 details the creation of German and Arabic versions of the MaSCS-R. As well as using Sample A data,

analyses in Part 2 also used data from two different samples (B and C). Data from Sample B consisted of a German-speaking people living with FM, also from an earlier study (Kollmann et al., 2016). Sample C gathered new data from an Arabic-speaking people living with T1DM. The Arabic-speaking sample was recruited out of convenience (i.e., the second author is a native Arabic speaker and was able to access this population). The current study also aimed to generate evidence for the transcultural validity of the concept of metacognitions about symptom control.

Part 1: Developing an English version of the MaSCS-R

2. Methods

2.1 Participants

Sample A comprised of data from 124 participants, all with a formal diagnosis of CFS according to the Oxford Criteria (Sharpe et al., 1991). This data was originally obtained for an earlier study, which has been published and provides a detailed description of the participants (see Fernie et al., 2015). Table 1 shows basic participant characteristics.

2.2 Measures and procedure

The MaSCS-R was created by removing problematic items from the (17-item) MaSCS, resulting in eight items. The rationales for removing items are shown in Table 2. The MaSCS-R retains the same response format as the MaSCS, using a four-point Likert-type response format (i.e., “Do not agree”, “Agree Slightly”, “Agree moderately”, and “Agree strongly”). Higher scores indicate stronger endorsement of metacognitions. The procedure used for collecting data for Sample A is detailed in Fernie et al. (2015). Ethics approval was obtained from the local research ethics committee and paper copies of questionnaire booklets were sent to participants through the post.

2.3 Data analysis

A principal component analysis was conducted on the proposed eight items of the MaSCS-R. Indicators of the latent variables were assessed using a Promax rotation with a Kappa of four. A Promax rotation was used because different types of metacognitions (e.g., positive and negative) have been found to be associated with each other (Caselli et al., 2018). This oblique rotation allows assessment of the correlation between factors. Item selection was based on the following criteria: (1) if an item loaded less than .4 on a factor it was discarded, (2) if an item loaded more than .4 on more than one factor it was discarded, and (3) if an item loaded 0.4 or greater on a factor but its loading on another factor was within .2 it was discarded. This is the same criteria used to develop the original MaSCS (Ferne et al., 2015).

3. Results

3.1 Principal components analysis

Scree tests for the MaSCS-R suggested a two-factor solution with Eigen values of 3.15 and 1.80. The two factors combined accounted for 61.85% of the variance (factor loadings are shown in Table 3). Factor 1 is labelled 'positive metacognitions about somatic hypervigilance' (P-MASH) and factor 2 'negative metacognitions about the uncontrollability and physical repercussions of cognitive and attentional processes' (N-MUR). This factor labelling is more specific than the original MaSCS, which also identified two factors but named them positive and negative metacognitions about symptom control (Ferne et al., 2015). Both the P-MASH and the N-MUR factors consisted of four items.

Part 2: Translations of the MaSCS-R

4. Methods

4.1 Participants

Part 1 briefly outlines participant details for Sample A. Sample B consisted of 348 participants who reported receiving their FM diagnosis by a physician. The data was

originally used in an earlier published study, which provides further participant details (see Kollmann et al., 2016). Sample C recruited new participants for the current study. The Chronic Care Centre in Lebanon and six clinics of endocrinologists (also in Lebanon) were recruitment sources. 91 people with a clinical diagnosis of T1DM took part in the current study. Eligible criteria required participants: (1) were Lebanese, (2) were at least 16 years old, (3) could read and write in Arabic, and (4) could provide informed consent to participate in the study. Parental consent was attained for participants aged 16 or 17 to respect Lebanese culture norms.

4.2 Measures

4.2.1 *Symptom severity*

The Chalder Fatigue Questionnaire (CFQ; Chalder et al., 1993) consists of 14 items assessing mental (eight items; e.g., “Do you need to rest more?”) and physical (six items; e.g., “Do you have problems with tiredness?”) fatigue over the previous month. The CFQ uses four-point Likert-type response format and the current study scores each as either 1, 2, 3, or 4, summing them to create a total fatigue score. Higher totals indicate greater fatigue severity. The CFQ possesses good psychometric properties with Cronbach’s Alphas of 0.9 (physical) and 0.8 (mental), as well as a sensitivity of 75.5 and specificity of 74.5 based on a ROC cut-off of $\frac{3}{4}$ (Chalder et al., 1993). Only Sample A provided CFQ data.

The Fibromyalgia Impact Questionnaire (FIQ; Burckhardt, Clark, & Bennett, 1991) is a self-report instrument that assesses the impact of FM on an individual’s life. An algorithm was used to generate a total score, with higher scores indicating a greater impact of FM symptoms and symptom severity. The current study used data from the German version of the FIQ, which possesses acceptable psychometric properties with an internal consistency of $\alpha = .9$, test-retest reliability of .85 and convergence validities with pain and physical

functioning scales of between .37 and .65 (Offenbaecher, Waltz, & Schoeps, 2000). Only Sample B were administered the FIQ.

Two measures were used to identify symptom severity in Sample C (consisting of people living with T1DM). Firstly, latest glycosylated haemoglobin (HbA1c) test results were used to indicate glycaemic control for the past 6 to 8 weeks. In the UK, HbA1c target levels are 6.5% for adults living with T1DM (National Institute of Clinical Excellence, 2015). Higher levels indicate poorer control of T1DM. Secondly, the 20-item Problem Areas in Diabetes (PAID) questionnaire (Polonsky et al., 1995), which uses a five-point Likert-type response format, was administered. The current study used the Arabic version of the PAID, which has an internal consistency of $\alpha = .9$ (Alragum, 2008), however its validity has not been clearly established. Higher scores reflect greater difficulty living with T1DM.

4.2.2 Anxiety and depression

The Depression Anxiety Stress Scale 21 (DASS; Lovibond & Lovibond, 1995) is a 21-item self-report measure designed to assess depression, anxiety, and stress and was administered to Sample A and B. The current study utilized the anxiety and depression subscales of the English and German versions of the DASS, with internal consistencies for the anxiety and depression subscales for the English version (Henry & Crawford, 2005) of $\alpha = .8$ and $\alpha = .9$ (respectively) and, respectively, for the German version of $\alpha = .8$ and $\alpha = .9$ (Nilges & Essau, 2015). Sample C were given the Arabic version of the 14-item Hospital Anxiety and Depression Scale (HADS) to measure anxiety and depression, which has internal consistencies of $\alpha = .7$ and $\alpha = .8$ respectively (Al Aseri et al., 2015; Zigmond & Snaith, 1983). The HADS has a four-point Likert-type response format. Seven items measure anxiety and seven depression symptoms. The HADS has been used with people with T1DM (Santos, Bernardo, Gabbay, Dib, & Sigulem, 2013; Strandberg, Graue, Wentzel-Larsen, Peyrot, & Rokne, 2014).

4.2.3 Metacognitions

The Metacognitions Questionnaire 30 (MCQ; Wells & Cartwright-Hatton, 2004) is a 30-item self-report measure that assesses five factors pertaining to metacognition: (1) positive beliefs about worry (PW; e.g., “Worrying helps me cope”); (2) negative beliefs about thoughts concerning uncontrollability and danger (UNC; e.g., “When I start worrying I cannot stop”); (3) cognitive confidence (CC; e.g., “My memory can mislead me at times”); (4) beliefs about the need to control thoughts (NCT; e.g., “Not being able to control my thoughts is a sign of weakness”); and (5) cognitive self-consciousness (CSC; e.g., “I pay close attention to the way my mind works”). Respondents are required to indicate the extent of their agreement with the metacognitions using a four-point Likert-type response format. Higher scores indicate higher levels of unhelpful metacognitions. The English version of the MCQ was used with Sample A, the German version with Sample B (Möbius & Hoyer, 2003), and the Arabic version with Sample C (Seleem & Saada, 2015). All three versions of the MCQ have been shown to possess acceptable psychometric properties (Möbius & Hoyer, 2003; Seleem & Saada, 2015; Wells & Cartwright-Hatton, 2004). Note that Sample A’s MCQ data has not been reported in earlier published studies. The development of the MaSCS-R is described in Part I.

The MaSCS and the MCQ have been used in several studies, all reporting that metacognitions play a role in distress and/or symptom severity in a wide range of LTHCs. For example, metacognitions (as measured by the MCQ) are associated with distress in cancer (e.g., Fisher et al., 2018), epilepsy (Fisher et al., 2018), multiple sclerosis (Heffer-Rahn & Fisher, 2018), HIV (Strodl, Stewart, Mullens, & Deb, 2015), Parkinson’s disease (Allott, Wells, Morrison, & Walker, 2005; Brown & Fernie, 2015), and T1DM (Purewal & Fisher, 2018). MaSCS factors have been shown to be associated with symptom severity in CFS (Fernie et al., 2015; Maher-Edwards et al., 2011) and functional impairment in FM

(Kollmann et al., 2016), as well as (tentatively) with distress in Parkinson's disease (Ferne et al., 2015).

4.3 Translations of the MaSCS-R

German and Arabic versions of the MaSCS-R were created using the backward-forward translation approach and tried to adhere to guidelines described by the International Test Commission (2017). The forward translations (English to German and Arabic) were carried out by two independent professional translators, both native speakers of German or Arabic and proficient in English. The research teams reviewed the two translations and agreed on a combined version. Two other independent translators, both native speakers of English, fluent in German or Arabic, and blind to the original English version, back-translated the combined version into English. These English translations were compared with the original English MaSCS/MaSCS-R items to check that their meanings were congruent.

4.4 Procedure

The procedure used to gather data from Sample A is described in Part 1. Experimental procedures for gathering data from Sample B is described in an earlier published study (see Kollmann et al., 2016). The research with Sample B was conducted in accordance with the declaration of Helsinki. The questionnaires administered to Sample B were administered online. Potential participants for Sample C were informed about the study during routine clinical appointments. Sample C participants were given paper versions of the questionnaires.

4.5 Data analysis.

4.5.1 Translations and psychometric, transcultural, and transdiagnostic properties of the MaSCS-R

German and Arabic versions of the MaSCS-R were created using the back-forward translation process to enhance conceptual equivalency (Beaton, Bombardier, Guillemin, & Ferraz, 2000). Confirmatory factor analyses (CFA), using the Lavaan package (Rosseel,

2012), were conducted on the datasets to test model fit of the two-factor structure of the MaSCS-R across all three versions. The data obtained from the eight items of the MaSCS-R for all datasets were assessed (separately) to identify deviations from univariate and multivariate normal distribution. The result of these analyses determined the method of estimation used in the CFAs or whether to approach the analysis with Item Response Theory (CFA is better able to deal with non-normal factors). The Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Residual (SRMR), Comparative Fit Index (CFI), and the Chi-square test were employed to evaluate model fit and measurement invariance. Thresholds to indicate acceptable model fit used were: RMSEA \leq .08, SRMR \leq .08, CFI \geq .95, and nonsignificant Chi-square values (Browne, Cudeck, Bollen, & Long, 1993; Schermelleh-Engel, Moosbrugger, & Müller, 2003). Measurement invariance was examined using the procedure described by Xu and Tracey (2017), which involves three progressive steps that assess configural, metric, and scalar invariance. If configural variance is supported, then it would suggest that the latent constructs are indicated by the observations (i.e., the responses to MaSCS-R items) across samples. For this study, configural invariance would suggest that the latent constructs P-MASH and N-MUR are measured by a stable pattern of MaSCS-R items across English-speaking people living with CFS, German-speaking people living with FM, and Arabic-speaking people living with T1DM (providing initial evidence to suggest that the N-MaSCS-R and metacognitions have transcultural and transdiagnostic validity). Support for metric invariance would suggest that the psychological meanings of P-MASH and N-MUR hold across samples (providing further evidence that the MaSCS-R and metacognitions possess transcultural and transdiagnostic validity). While support for scalar invariance would suggest that equivalent mean scores are found across samples. Findings indicating scalar variance might be a result of transdiagnostic and/or transcultural differences.

4.5.2 Concurrent validity

The following analyses were computed using version 24 of SPSS (International Business Machines Corporation, 2017). The distributions of P-MASH, N-MUR, all the five MCQ factors, CFQ, FIQ, HbA1c, and PAID scores were examined for each sample separately. Anxiety and depression scores (measured by the DASS and HADS) were converted into z-scores for each sample separately. This created standardised anxiety (stA) and depression (stD) scores but did not alter their distributions in each sample's dataset (i.e., nonnormally distributed variables do not become normal). These two new variables were used to provide standardized anxiety and depression scores across samples despite the different measures used (this was needed for the later multiple imputation). The patterns of missing values for the variables shared across samples (i.e., P-MASH, N-MUR, all the five MCQ factors, stA, and stD) were examined and five iterations of multiple imputation were used to predict missing data. To examine concurrent validity for each version of the MaSCS-R, the dataset from the final iteration of the multiple imputation was used to compute correlation analyses between study variables.

5. Results

5.1 Participant characteristics

Table 1 shows basic demographic details for all three samples. For measures of symptom severity, Sample A had a mean CFQ score of 41.6 (SD = 10.1; range 14 to 56) and Sample B had a mean FIQ score of 67.1 (SD = 14.6; range 6.2 to 96.9). Sample C's mean HbA1c was 8.2% (SD = 1.5; range 5.9 to 14.0) and mean PAID score was 28.6 (SD = 18.8; range 0 to 69).

5.2 Factor structure, measurement invariance and internal consistencies

The data from each three groups were found to be multivariate non-normal. Accordingly, all CFAs were estimated with Diagonal Weighted Least Squares. The two-

factor structure of the MaSCS-R developed in Part 1, and its German and Arabic versions (see Supplemental material 1), were a good fit of the data obtained from all three samples (see Table 4 – note that this table reports an n of 79 rather than 91 because the analyses used complete datasets). This also indicates that the MaSCS-R possesses configural invariance: i.e., MaSCS-R items measure the latent factors stably across all three samples. To examine metric invariance, data from all three samples was combined to contribute to the analysis. First, a model that allowed for loadings to be freely estimated was built and tested (Model A). This was compared to a second model that constrained loadings to be equal across all groups (Model B). Both of these models fits were good fits of the data (Table 4). A Chi-square test revealed a nonsignificant difference in model fit between Model A and Model B (Chi-square = 17.963, $df = 12$, $p = .1168$), and the difference in CFIs between models was less than .01. This suggests that the psychological meaning of the metacognitive constructs (represented by the latent factors) were invariant across the three samples. The configural and metric invariance found in the MaSCS-R data provides evidence that the measure possesses transcultural and transdiagnostic validity. The data for MaSCS-R was not scalar invariant: i.e., the different samples scored on average different levels for the latent variables (Chi-squared = 121.186, $df = 4$, $p < .001$). The English, German, and Arabic language versions of the MaSCS-R had mostly acceptable and good internal consistencies for both factors (Cronbach's alpha = 0.7 to 0.8), apart from the N-MUR factor from the Arabic version of the MaSCS-R, which was questionable (Cronbach's alpha = 0.6). Note that Cronbach's alphas of $0.6 < 0.7$ are considered questionable, $0.7 < 0.8$ acceptable and $0.8 < 0.9$ good (DeVellis, 2016). Table 4 also shows the means, SDs and ranges of P-MASH and N-MUR for each sample.

5.3 Concurrent validity

Kolmogorov-Smirnov tests indicated that the distributions of study variables were non-normal. Study variables shared across all three samples (i.e., MaSCS-R, MCQ, stA, and stD) had missing values that were assessed as MAR or MCAR. Multiple imputation was used to predict missing values. Spearman's rho correlation analyses were conducted on the study variables resulting from the fifth iteration of the multiple imputation (Table 5). P-MASH was positively associated with anxiety in CFS, whereas N-MUR was significantly related to anxiety and depression in all samples. In most samples, all MCQ factors were associated with anxiety (except for NCT in T1DM) and depression (the exceptions again were in the T1DM sample, i.e., with PW, NCT, and CSC). P-MASH was significantly related to PW in the CFS and FM, but not the T1DM, samples. However, P-MASH was associated with metacognitive factors (measured by the MCQ) in T1DM (i.e., with CC and CSC), suggesting some convergence in the measurement of metacognitive constructs (hinting at concurrent validity). The N-MUR was significantly related to nearly all MCQ factors in all samples – the exceptions being with PW and CSC in T1DM. All metacognitive factors were associated with symptom severity in CFS and FM (bar CSC in CFS and P-MASH in FM). In T1DM, only N-MUR, UNC, and NCT were significantly related to HbA1c levels. Similar significant associations between metacognitive factors and PAID were found, with the addition of relationships with PW and NCT.

6. Discussion

This study sought to create revised versions of an existing metacognitive questionnaire (the MaSCS-R) in three languages. All versions of the MaSCS-R comprised of eight items equally distributed over two factors. The first factor consisted of items that described positive metacognitions about symptom hypervigilance (P-MASH), and the second negative metacognitions about the uncontrollability and physical repercussions of engaging in symptom focus, rumination, and/or worry (N-MUR). The current study provides

preliminary evidence that the English, German, and Arabic versions of the two-factor, eight-item MaSCS-R possesses acceptable psychometric properties. The findings also suggest that the psychological meanings behind the construct of metacognitions are shared across three countries (and two cultures: i.e., Western and Lebanese Arabic) as evidenced by the findings that supported the configural and metric invariance of the MaSCS-R. This provides evidence to support the contention that metacognitions, as measured by MCQ, as well as the metacognitions about symptom control, as measured by MaSCS-R, have transcultural and transdiagnostic validity.

The current study's findings align with those from earlier research that examined the relationship between distress in LTHCs and metacognitions. For example, all MCQ factors were significantly associated with anxiety and depression in CFS, mirroring the results reported by Maher-Edwards et al. (2011). The results presented here also align with those reported by Purewal and Fisher (2018), who found that UNC and CC were significantly associated with anxiety and depression, in a sample of people living with T1DM in the UK. The current study's findings identified additional relationships between two MCQ factors (PW and CSC) and anxiety, and between NCT and both anxiety and depression, in an Arabic-speaking sample of people living with T1DM. This suggests that metacognitions play a role in LTHC-related distress, and that it is possible this role possesses a degree of stability transculturally.

The CFS and FM samples were both drawn from Western countries and have LTHCs, where the aetiologies of their conditions are not currently understood, nor can they be diagnosed with a specific test (Rollnik, 2017; Wolfe & Häuser, 2011). Unlike the T1DM sample, which was drawn from a non-Western country (i.e., Lebanon, with a 'Middle-Eastern/Lebanese Arabic' culture) with LTHC that can be diagnosed with a series of specific tests. Western and Arabic samples showed a similar pattern of relationships with anxiety and

MCQ metacognitions, except NCT was significant in samples A and B but not C. This pattern was nearly identical for depression relationships, with addition of PW being significant in samples A and B but not C. MCQ metacognitions showed similar pattern of significance across all three samples with measures of symptom severity, apart from HbA1c levels whose only significant relationship was with UNC. However, overall the current study's finding suggests that the MCQ possesses transcultural and transdiagnostic concurrent validity.

The current study's offered mixed support for the transcultural and transdiagnostic concurrent validity of the MaSCS-R. While N-MUR was significantly associated with anxiety, depression, and measures of symptom severity in all samples, P-MASH was related to anxiety and symptom severity only in CFS. This suggests that the P-MASH has concurrent validity only in CFS, while the N-MUR has transcultural and transdiagnostic concurrent validity. However, P-MASH was significantly associated with at least two MCQ factors across each sample, suggesting that, to an extent, P-MASH has some transcultural and/or transdiagnostic concurrent validity.

The current study did not find a significant relationship between P-MASH with either anxiety or depression in the FM and T1DM samples, nor with FIQ, HbAc1 or PAID. In terms of FM, this finding is similar to that found by Kollmann et al. (2016) who used the original MaSCS. In their study, positive metacognitions about symptom control was also not significantly related to anxiety, depression and total FIQ scores (but were related to some FIQ and MCQ subscales). In terms of T1DM, regular (but not continuous) symptom focus (as measured by P-MASH) is an adaptive strategy that helps to monitor blood glucose levels and providing alerts to hyper/hypoglycaemia. Such alerts act as stop signals to symptom focus that require discrete action (e.g., an injection of insulin). This contrasts with CFS, where symptom focus appears not to have a clear stop signal or defined goal other than identifying

fatigue: this might be responded to with activity reduction (fear-avoidance) in response, which is hypothesised to help maintain fatigue (e.g., Deale, Chalder, & Wessely, 1998).

Brown and Fernie (2015) suggested that using the full spectrum of CBT interventions to treat distress in Parkinson's disease (also a LTHC) might not be possible. For example, some thoughts and beliefs about symptoms may represent accurate appraisals of living with a LTHC (e.g., 'there is no cure for this disease') and therefore would be inappropriate for reality-testing. However, the validity of thoughts and belief about living with the symptoms of a LTHC is not relevant to metacognitions. Thus, if metacognitions are later shown to have a causal effect on LTHC-related distress, future treatment packages could be designed by selecting from the entire 'menu' of MCT interventions, including those that involve the reality-testing of metacognitions. This prospect is made more attractive considering the reported effectiveness of MCT over CBT in treating anxiety and depression (Normann & Morina, 2018; Normann, van Emmerik, & Morina, 2014).

The current study is subject to several limitations. First, study variables were vulnerable to response biases (e.g., retrospective and social desirability biases). Second, the current study relied on cross-sectional data meaning that causality cannot be determined. Third, the current study did not clearly establish the concurrent transcultural and/or transdiagnostic concurrent validity of P-MASH. Fourth, missing HbA1c and PAID data in Sample C meant that only 69 cases were used in the correlation analyses. Consequently, statistical power was impaired, and the analyses may have failed to identify relationships between metacognitions and symptom severity in T1DM. Additionally, the validity of the Arabic PAID has not been clearly established, and therefore might not measure problem areas associated with living with diabetes in this population. Fifth, factors that could affect HbA1c levels were not controlled for (e.g., lifestyle changes and new medications). This restricts the confidence in interpretations of HbA1c results. Sixth, the transcultural validity of

the MaSCS-R requires further testing in other cultures and languages (e.g., Japanese, Spanish, etc.). Seventh, the N-MUR factor of the Arabic MaSCS-R had questionable internal consistency. This could be the result of the relatively smaller sample size; this explanation needs to be tested in future studies. Eighth, the validity of the Arabic PAID has not been clearly established, meaning that is uncertain whether it measures problem areas in diabetes in the Lebanese sample (C). Finally, the samples used in the current study meant there was limited control of transcultural and transdiagnostic factors. As a result, differences in the relative contribution of metacognitions to distress across LTHCs and cultures could not be clearly established (i.e., does P-MASH have a stronger relationship with distress depending on the cultural background of the sample, the sample's LTHC, or a combination of both?). Future studies could use the MaSCS-R with samples living with the same LTHC drawn from different cultural populations and samples drawn from a specific population living with different LTHCs.

The current study produced three versions of the MaSCS-R and its findings support the contention that the construct of metacognitions has transcultural validity. The MaSCS-R offers a new method for identifying transcultural targets for psychological intervention that seek to ameliorate distress in LTHCs. Further research is required to confirm the psychometric properties of the MaSCS-R.

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Table 1: Participant characteristics for all samples

	CFS (Sample A)	FM (Sample B)	T1DM (Sample C)
N	124	348	91
Data source	PD	PD	OD
Females: N (%)	97 (75.8%)	316 (90.8%)	52 (57.1%)
Mean age (range) in years	41.7 (18 to 70)	49.9 (23 to 74)	30.0 (16 to 39)
Standardized anxiety range	-1.11 to 3.02	-1.86 to 2.43	-1.42 to 3.68
Standardized depression range	-1.21 to 1.98	-1.94 to 2.28)	-1.24 to 2.77

Note. CFS = Chronic Fatigue Syndrome.; FM = Fibromyalgia; T1DM = Type 1 Diabetes Mellitus; PD = Published Data; OD = Original Data; $n = 563$.

Table 2: Rationale for item removal to create the MaSCS-R

Original MaSCS items	Rationale
When I experience symptoms, it's impossible to focus on anything else	N/A: retained for MaSCS-R
If I focus on the symptom, I can take the appropriate action to get better	Belief seems to refer to a nebulous behaviour instigated in response to a trigger.
Ruminating about my symptoms helps me to figure out how to deal with them	Some patients and research participants have difficulty understanding the meaning of 'rumination'.
Thinking about my symptoms makes me feel frustrated	Refers to an emotional consequence.
If I don't pay attention to my symptoms, I could push myself too far	Feedback from patients and participants reported that this item was not clear/difficult to understand.
Monitoring my symptoms helps me to predict how they will develop	N/A: retained for MaSCS-R
Thinking about my symptoms makes me feel negative and down	Refers to an emotional consequence.
I monitor my symptoms, so I can figure out my physical limitations	N/A: retained for MaSCS-R
Thinking about my symptoms makes me feel exhausted	N/A: retained for MaSCS-R
Monitoring my symptoms enables me to better control them	N/A: retained for MaSCS-R
Focusing on my symptoms makes me feel anxious or stressed	Refers to an emotional consequence.
Monitoring my symptoms helps to keep me safe	N/A: retained for MaSCS-R
I am not able to stop thinking about my symptoms once I start	N/A: retained for MaSCS-R
By focusing on my symptoms, I can detect when I am getting better	Feedback from patients and participants reported that this item was not clear/difficult to understand.
Not paying attention to my symptoms could lead to my illness getting worse	Feedback from patients and participants reported that this item was not clear/difficult to understand.
Focusing on my symptoms makes me feel down	Refers to an emotional consequence.
Thinking about my symptoms could make them worse	N/A: retained for MaSCS-R

Note. MaSCS(-R) = Metacognitions about Symptom Control Scale (- Revised); Bold text indicates items retained for the MaSCS-R; n = 124.

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Table 3: Factor loadings for principal components analysis

MaSCS-R items	1	2
Monitoring my symptoms enables me to better control them	0.862	-0.029
Monitoring my symptoms helps me to predict how they will develop	0.827	0.049
I monitor my symptoms, so I can figure out my physical limitations	0.824	-0.036
Monitoring my symptoms helps to keep me safe	0.751	0.026
Thinking about my symptoms makes me feel exhausted	-0.133	0.807
I am not able to stop thinking about my symptoms once I start	0.049	0.800
Thinking about symptoms could make them worse	0.037	0.712
When I experience symptoms, it's impossible to focus on anything else	-0.066	0.667

Note. MaSCS-R = Metacognitions about Symptom Control Scale – Revised; n = 124.

Table 4: P-MASH and N-MUR descriptive statistics and configural and metric invariance across the three study samples

Model	n	P-MASH	N-MUR	Chi-squared	df	CFI	RMSEA		SRMR
		Mean (SD); range					Estimate	95% CI	
CFS English (Sample A)	124	9.43 (3.17); 4-16	8.58 (3.09); 4-16	6.807	19	1.000	0.000	[0, 0]	0.040
FM German (Sample B)	347	7.94 (2.72); 4-16	8.86 (2.94); 4-16	44.250	19	0.963	0.062	[0.038, 0.086]	0.060
T1DM Arabic (Sample C)	79	11.91 (2.30); 5-16	8.03 (2.65); 4-15	11.327	19	1.000	0.000	[0, 0.039]	0.070
Model A: all loadings freely estimated	550	N/A		62.384	57	0.995	0.023	[0, 0.052]	0.052
Model B: factor loadings invariant	550	N/A		83.499	69	0.988	0.034	[0, 0.057]	0.060

Note. CFS = Chronic Fatigue Syndrome.; FM = Fibromyalgia; T1DM = Type 1 Diabetes Mellitus; All Chi-square values were non-significant.

Table 5: Multi-group Spearman's rho correlation matrix

Variables/Sample	1			2			3			4			5			6			7		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1. P-MASH				.40**	-.02	-.04	.33**	.33**	-.10	.29**	-.04	-.12	.23**	.03	-.24*	.38**	.06	-.05	.30**	.18**	.24*
2. N-MUR							.35**	.32**	-.02	.54**	.62**	.31**	.34**	.37**	-.33**	.48**	.50**	.26*	.42**	.49**	-.08
3. PW										.54**	.38**	.29**	.27**	.26**	.05	.79**	.47**	.04	.46**	.50**	.03
4. UNC													.47**	.46**	.21*	.65**	.71**	.09	.57**	.69**	-.30**
5. CC															.41**	.48**	-.08	.21*	.41**	-.07	
6. NCT																			.56**	.67**	.17
7. CSC																					
8. stA	.21*	-.01	-.18	.37**	.57**	.31**	.49**	.37**	.21*	.54**	.72**	.55**	.52**	.49**	.30**	.62**	.58**	.14	.33**	.56**	.21*
9. stD	.12	-.04	-.07	.43**	.58**	.31**	.42**	.32**	.08	.52**	.68**	.45**	.55**	.50**	.23*	.53**	.56**	.03	.35**	.53**	.12
10. CFQ	.24**			.35**			.19*			.30**			.53**		.31**			.15			
11. FIQ		-.03		.45**			.18**			.51**			.41**			.36**			.34**		
12. HbA1c			-.12			.26*			.06			.21*		.01			.25*				-.19
13. PAID			-.05			.50**		.26*			.42**			.26*			.27*				-.04

Note. A = Sample A (Chronic Fatigue Syndrome); B = Sample B (Fibromyalgia); C = Sample C (Type 1 Diabetes Mellitus); P-MASH = positive metacognitions about somatic hypervigilance; N-MUR = negative metacognitions about the uncontrollability and physical repercussions of cognitive and attentional processes; PW = positive metacognitions about worry; UNC = uncontrollability and danger metacognitions about worry; CC = lack of cognitive confidence; NCT = need to control thoughts; CSC = cognitive self-consciousness; stA = standardized anxiety; stD = standardized depression; CFQ = Chalder Fatigue Questionnaire; FIQ = Fibromyalgia Impact Questionnaire; HbA1c = glycosylated haemoglobin levels; PAID = Problem Areas in Diabetes ; * = $p < .05$; ** = $p < .01$, Sample A: $n = 122$ (symptom severity variables) to 144; Sample B: $n = 347$; Sample C: $n = 69$ (symptom severity variables) to 91.

<i>English</i>	<i>German</i>	<i>Arabic</i>	<i>Factor</i>
When I experience symptoms, it's impossible to focus on anything else	Wenn sich die Symptome bemerkbar machen, kann ich mich unmöglich auf irgendetwas anderes konzentrieren	عندما اواجه أعراض، يستحيل أن أركز على أي شيء آخر	N-MUR
Monitoring my symptoms helps me to predict how they will develop	Meine Symptome zu beobachten hilft mir dabei, ihre Entwicklung vorherzusehen	مراقبة أعراضي تساعدني على توقع كيف ستطور	P-MASH
I monitor my symptoms, so I can figure out my physical limitations	Ich beobachte meine Symptome genau, damit ich meine körperlichen Grenzen erkenne	أراقب أعراضي لأكتشف حدودي الجسدية	P-MASH
Thinking about my symptoms makes me feel exhausted	Über meine Symptome nachzudenken erschöpft mich	التفكير في أعراضي يشعرني بالإرهاق	N-MUR
Monitoring my symptoms enables me to better control them	Auf meine Symptome zu achten hilft mir, sie besser in den Griff zu bekommen	مراقبة أعراضي تسمح لي السيطرة عليها بشكل أفضل	P-MASH
Monitoring my symptoms helps to keep me safe	Auf meine Symptome zu achten gibt mir Sicherheit	مراقبة أعراضي تساعدني على البقاء سليمًا	P-MASH
I am not able to stop thinking about my symptoms once I start	Wenn ich einmal damit anfange, über meine Symptome nachzudenken, kann ich nicht mehr aufhören	عندما أبدأ في التفكير بأعراض، لا أستطيع التوقف.	N-MUR
Thinking about my symptoms could make them worse	Über meine Symptome nachzudenken könnte sie verschlimmern	التفكير في أعراضي قد يجعلها أسوأ	N-MUR

Response format

English	German	Arabic	Score
Do not agree	Trifft nicht zu	لا توافق	1
Agree slightly	<i>trifft eher zu</i>	توافق قليلا	2
Agree moderately	trifft zu	توافق باعتدال	3
Agree very much	<i>trifft stark zu</i>	توافق كثيرا	4

AUTHOR ACCEPTED MANUSCRIPT