**Abstract**

*Background:* The Metacognitions Questionnaire-30 (MCQ-30) was developed to measure individual differences in metacognitive beliefs and processes, which are central to the metacognitive model of emotional disorders. Although previous research has supported the role of metacognitive beliefs and processes in obsessive-compulsive disorder (OCD), no studies have examined the psychometric properties and factor structure of the MCQ-30 in OCD patients. The present study overcomes this limitation by exploring the factor structure and convergent validity of the MCQ-30 in a sample of OCD patients before and after psychological treatment.

*Method:* The MCQ-30 and the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) were administered to 352 OCD patients at pre-treatment and to 213 of these OCD patients at post-treatment. The factorial structure and convergent validity of the MCQ-30 were assessed using factor analyses and structural equation modelling.

*Results:* Confirmatory and exploratory factor analyses supported the originally hypothesized five-factor structure of the MCQ-30. At both time points, structural equation modelling indicated that dimensions of metacognition were significantly associated with obsessive-compulsive symptoms.

*Conclusions:* The MCQ-30 appears to be a valid and reliable instrument for measuring metacognitive beliefs and processes in OCD.

 *Keywords:* metacognition, MCQ-30, OCD, factor structure, validity

**1. Introduction**

There has been increasing interest in the role of metacognition in obsessive-compulsive disorder (OCD). Metacognition refers to beliefs or knowledge about cognitive processes and strategies that are used to monitor and regulate cognition (Flavell, 1979). Until the advent of the Self-Regulatory Executive Functioning (S-REF) model (Wells & Matthews, 1994; 1996), minimal attention had been paid to the role of metacognition in psychological disorders. The S-REF model is the foundation for several disorder specific metacognitive models, including OCD. The central premise of the S-REF model is that maladaptive metacognitive beliefs determine if an individual responds to negative thoughts and/or feelings with the Cognitive Attentional Syndrome (CAS). The CAS consists of perseverative thinking, threat monitoring, and counterproductive coping strategies. Applying the CAS to OCD, perseveration is typically characterized by worry about the meaning and significance of obsessions. Threat monitoring often involves checking for signs of both internal threat (e.g. monitoring one’s mind for intrusive images) and external threat (e.g. scanning the environment for contaminants), whereas counterproductive coping responses involve the broad range of overt and covert rituals (e.g. mental distraction, reassurance seeking, avoidance of situations, checking, overanalysing).

There are multiple metacognitive belief domains which activate and guide the CAS in OCD. These can be divided into general dysfunctional metacognitive beliefs, which are relevant to all disorders, and OCD specific metacognitive beliefs. General dysfunctional metacognitive beliefs consist of positive and negative beliefs, where positive beliefs concern the perceived benefits of perseverative thinking and threat monitoring (e.g. “Worrying if the door is locked keeps me safe” or “Monitoring my mind for intrusive thoughts keeps me prepared”). Negative beliefs concern the uncontrollability and dangerousness of worry and rumination (e.g. “I have no control over my worrying”). Both sets of beliefs perpetuate psychological disorders as they lead to persistent worry, rumination and threat monitoring, and impair cognitive self-regulation.

The OCD specific metacognitive beliefs as specified in the metacognitive model of OCD (Wells, 1997; 2000) are metacognitive thought fusion beliefs which concern the danger, meaning, and importance of intrusions. There are three types; thought-action fusion (TAF), thought-event fusion (TEF), and thought-object fusion (TOF). TAF is the belief that the occurrence of an obsession can lead to commission of action (e.g. “Thinking of hurting someone will make me do it”). TEF is the belief that thoughts can cause or have caused events (e.g. “If I think about an unpleasant event, it will make it more likely to happen”), and TOF involves the belief that thoughts, memories, images, or feelings can be transferred into objects (e.g. “My negative thoughts can be passed into my books”). The metacognitive model also specifies that metacognitive knowledge determines the use of overt and covert rituals. Such metacognitive knowledge concerns beliefs about the usefulness of rituals in regulating cognition, e.g. “Rituals control my worrying and give me peace of mind”.

Previous research has supported the role of both general dysfunctional metacognitive beliefs (e.g. Solem, Håland, Vogel, Hansen, & Wells, 2009) and metacognitive beliefs specific to OCD (e.g. Grøtte et al., 2015; Myers, Fisher, & Wells, 2009) in the maintenance of the disorder. The current study will focus on the general dysfunctional metacognitive beliefs and the measurement of these in OCD.

Support for the link between general metacognitive beliefs and obsessive-compulsive symptoms have emerged from a wide range of studies. Metacognitive beliefs have been found to be elevated in OCD patients as compared to healthy subjects (Hermans et al., 2008; Moritz, Peters, Larøi, & Lincoln, 2010), and correlational studies have found a significantly positive relationship between metacognitions and obsessive-compulsive symptoms (e.g. Cho, Jahng, & Chai, 2012; Tosun & Irak, 2008; Wells & Cartwright-Hatton, 2004). In several cross-sectional studies, general metacognitive beliefs accounted for greater variance in OCD symptoms compared to beliefs within the cognitive domain, including inflated responsibility (e.g. Gwilliam, Wells, & Cartwright-Hatton, 2004; Sassaroli et al., 2015), intolerance of uncertainty (Myers, Fisher, & Wells, 2008), and perfectionism (e.g. Solem et al., 2009). In a prospective cohort study, Sica, Steketee, Ghisi, Chiri, and Franceschini (2007) found general metacognitive beliefs to predict obsessive-compulsive symptoms in a non-clinical sample four months later. Further support for the causal role of metacognition in OCD comes from experimental manipulations of metacognitive beliefs (e.g. Fisher & Wells, 2005; Myers & Wells, 2013), and that changes in metacognitive beliefs determine if patients recover when treated with psychological approaches (Solem et al., 2009). Overall, most of the research has been conducted on non-clinical samples, which may mean that the generalizability of the results to clinical samples is limited, although the studies which have been conducted on OCD patients (Hermans et al., 2008; Moritz et al., 2010; Sassaroli et al., 2015; Solem et al., 2009) are supportive of the predictions made by the metacognitive model.

An important foundation of research is the use of measurement tools that are psychometrically sound. The first multidimensional self-report measure of general metacognitive beliefs was the Metacognitions Questionnaire (MCQ; Cartwright-Hatton and Wells, 1997). The MCQ had 65 items, divided into five subscales: (1) *positive beliefs about worry*, which measures the extent to which people think worrying is helpful; (2) *negative beliefs about worry*, which measures beliefs about the mental and physical dangers of worrying, plus beliefs about the uncontrollability of worry; (3) *cognitive confidence*, which measures low confidence in one’s own attention and memory; (4) *beliefs about the need to control thoughts*, which measures negative beliefs concerning the consequences of not controlling thoughts; and (5) *cognitive self-consciousness,* which measures the tendency to focus attention on thought processes. Although the MCQ was a valid and reliable questionnaire (Cartwright-Hatton & Wells, 1997), a shorter version consisting of 30 items was developed to enhance its use in routine clinical practice and to reduce the burden on participants. The Metacognitions Questionnaire-30 (MCQ-30) had the same five subscales as the original version and appeared to be psychometrically robust (Wells & Cartwright-Hatton, 2004). The five-factor structure of the MCQ-30 has been replicated in UK samples (Cook, Salmon, Dunn, & Fisher, 2014; Spada, Mohiyeddini, & Wells, 2008) and in several translated versions, including Spanish (Martín et al., 2014; Ramos-Cejudo, Salguero, & Cano-Vindel, 2013), Korean (Cho et al., 2012), and Turkish (Tosun & Irak, 2008; Yilmaz, Gençöz, & Wells, 2008) versions. Furthermore, as predicted by the S-REF model of emotional disorders (Wells & Matthews, 1994; 1996), the MCQ-30 has demonstrated concurrent validity with measures of anxiety, depression, and OCD (e.g. Cho et al., 2012; Solem, Thunes, Hjemdal, Hagen, & Wells, 2015; Spada et al., 2008). Regarding gender and age differences in MCQ-30 scores, the results have been inconsistent, with some studies reporting significant effects of gender and age on the factors (e.g. Spada et al., 2008; Tosun & Irak, 2008), whereas others do not (e.g. Wells & Cartwright-Hatton, 2004).

Examination of a scale’s psychometric properties in non-clinical and clinical samples is integral to construct validity, since the target construct may have different properties in different samples and items may have different response distributions across samples (Clark & Watson, 1995). So far, only three studies have investigated the factor structure and psychometric properties of the MCQ-30 using clinical samples. Cook et al. (2014) used a UK sample of cancer patients. Fisher, Cook, and Noble (2016) investigated a UK sample of epilepsy patients, while Martín and colleagues (2014) used a mixed Spanish sample of patients with anxiety, depression, or eating disorders. All clinical studies replicated the five-factor structure.

Evidently, the MCQ-30 has been widely evaluated, and many studies have found associations between OCD symptoms and general metacognitive beliefs and processes. However, no studies have examined the psychometric properties and factor structure of the MCQ-30 in individuals diagnosed with OCD. The present study aims to overcome this limitation by exploring the factor structure and convergent validity of the MCQ-30 in a sample of OCD patients before and after psychological treatment. Model fit and convergent validity can vary across time (e.g. Cook et al., 2014) due to a broad array of factors, including receipt of psychological treatment. We therefore chose to examine the factor structure and convergent validity of the MCQ-30 using both pre- and post-treatment data. Firstly, we hypothesized that the five-factor structure would be replicated. Secondly, we wanted to explore whether previously observed associations between dimensions of metacognition and obsessive-compulsive symptoms could be replicated in a clinical OCD sample. Across the seven studies that used the five MCQ-30 subscales as predictors in regression analyses with OCD symptoms as the dependent variable (Cartwright-Hatton & Wells, 1997; Cho et al., 2012; Irak & Tosun, 2008; Sica et al., 2007; Solem et al., 2009; Wells & Papageorgiou, 1998; Yilmaz et al., 2008), the most consistent predictor is *negative beliefs about worry* (significant in 6 out of 7 studies). With respect to the other subscales, *positive beliefs about worry* was a significant predictor in five studies, *beliefs about the need to control thoughts* was significant in four studies. *Cognitive self-consciousness* was a significant predictor in two studies, whereas *cognitive confidence* was significant only in the study by Cartwright-Hatton and Wells (1997). On the basis of these previous results, we predicted that *negative beliefs about worry* would emerge as the most significant contributor to obsessive-compulsive symptoms.

**2. Method**

**2.1. Participants and procedure**

The sample consisted of 352 consecutive patients with a current principal diagnosis of OCD who were referred by their GP or by general psychiatric clinics to a specialized anxiety disorder clinic. To be included in the present study, patients had to meet DSM-IV criteria for OCD according to the Anxiety Disorder Interview Schedule (ADIS-IV, Brown, DiNardo, & Barlow, 1994). They also had to score ≥16 on the total Yale-Brown Obsessive Compulsive Scale (Y-BOCS, Goodman et al., 1989) at the assessment interview, which excluded 5 referred patients. A further 12 patients could not be included in the analysis due to missing data on the MCQ-30. Of the 352 participants who completed the MCQ-30 and the Y-BOCS before treatment, 213 also completed the two questionnaires post-treatment. Reasons for lower sample size at post-treatment were treatment refusal (*n* = 61), attrition during treatment (*n* = 27), and non-completion of questionnaires at post-treatment (*n* = 51).

The treatment given was cognitive-behavioural therapy, with exposure and response prevention as the main element. The data was collected through both paper and pencil and internet administration. Of the 352 participants, 63.1 % were female. Mean age was 33.36 (*SD* = 11.41, range 18-67). A total of 62.5 % were single, while 37.5 % were married or cohabiting. A total of 49.7 % were either working or studying.

**2.2. Measures**

**2.2.1. The Metacognitions Questionnaire-30**(MCQ-30; Wells & Cartwright-Hatton, 2004) is a self-report inventory designed to measure individual differences in metacognitive beliefs and processes. It consists of five subscales: (1) *positive beliefs about worry*; (2) *negative beliefs about worry;* (3) *cognitive confidence*; (4) *beliefs about the need to control thoughts*; (5) *cognitive self-consciousness*. A 4-point Likert scale ranging from 1 (*do not agree*) to 4 (*agree very much)* is used to rate the responses. Higher scores indicate higher levels of maladaptive metacognitions*.* The MCQ-30 has shown good psychometric properties in both community and clinical populations, including good internal consistency, concurrent validity, and convergent validity (e.g. Cook et al., 2014; Martín et al., 2014; Spada et al, 2008; Wells & Cartwright-Hatton, 2004). The MCQ-30 was translated from English to Norwegian by one of the authors who is fluent in both languages. The translated version was back-translated into English by a native English speaking colleague for comparisons and adjustments. **2.2.2 The Yale-Brown Obsessive Compulsive Scale** (Goodman et al., 1989) and **The Yale -Brown Obsessive Compulsive Scale Self-Report** (Y-BOCS-SR, Baer, ​​Brown-Beasley, Sorce, & Henriques, 1993) were used to assess obsessive-compulsive symptoms. The respondents rated five aspects of both obsessions and compulsions: frequency, interference, distress, resistance, and control. A 5-point Likert scale ranging from 0 (*none*) to 4 (*extreme*) was used to rate the responses. Higher scores indicate more severe obsessive-compulsive symptoms. The psychometrics of the Y-BOCS is well established, with sound reliability and validity, as well as being sensitive to treatment effects (e.g. Grabill et al., 2008; Steketee, Frost, & Bogart, 1996). In our study, the interview version was used with the first 165 patients recruited for the study. The self-report Y-BOCS was used with the last 187 participants when the OCD clinic switched to electronic assessments. However, there is a strong correlation between the two versions of Y-BOCS (Steketee et al., 1996).

The obsession and compulsion subscale scores were used in this study. The Cronbach’s alpha coefficients for the obsession subscale were .74 at pre-treatment and .84 at post-treatment, whereas the coefficients for the compulsion subscale were .71 at pre-treatment and .86 at post-treatment.

**2.3. Overview of data analysis**

Due to the high rate of internet administration (not allowing missing data), there was minimal missing data overall. Data screening revealed a rate of missing data points below 2 %, and these were confirmed to be missing completely at random. Missing values were replaced using the participant’s mean item score on the remaining MCQ-30 and Y-BOCS items.

The software used was Mplus 7.31 and IBM SPSS Statistics 21. First, possible differences in MCQ-30 and Y-BOCS scores due to differences in administration mode (paper and pencil versus internet administration) were explored through Mann Whitney U tests with Bonferroni correction. Due to eight comparisons, the critical alpha level was set at .006. Second, confirmatory factor analysis (CFA) was performed to test if the factorial structure was consistent with the originally proposed five-factor structure (Wells & Cartwright-Hatton, 2004). To explore the validity of the MCQ-30 across time and different circumstances, a similar data analytic strategy as Cook et al. (2014) was chosen, i.e. data was analyzed separately at two points in time (pre-treatment and post-treatment). Prior to data analysis, a screening to assess multivariate normality and the presence of outliers was performed, whereof the skewness statistics indicated non-normality at both time points. To address the departure from multivariate normality, as well as handling the ordinal categorical level of data, the robust weighted least squares (WLSMV) estimator was used to test the model fit (Muthen, du Toit, & Spisic, 1997). Given that the aim of the CFA was to test the replicability of the five-factor structure rather than to achieve the best possible fit, we chose not to make minor modifications guided by the sample data. According to MacCallum, Roznowski, and Necowitz (1992), such modifications may reflect idiosyncratic characteristics of the data that may be inconsistent and difficult to cross-validate.

At pre-treatment, exploratory factor analysis (EFA) was used as an alternative test of the factor structure and loadings. Models up to and including a five-factor model were tested, each with oblique (Geomin) rotation.

Four of the most recommended (Hu & Bentler, 1999) fit indices were used to evaluate the model, both in CFA and EFA: (1) the standard chi-square test; (2) the Comparative Fit Index (CFI); (3) the Tucker-Lewis Index (TLI); (4) the Root Mean Square Error of Approximation (RMSEA). In addition, the Weighted Root-Mean-Square Residual (WLMR) was used in CFA, whereas the Standardized Root-Mean-Square Residual (SRMR) was used in EFA. According to Hu and Bentler (1999), CLI and TLI close to or above .95, RMSEA close to .06 or lower, and SRMR close to .08 or lower indicate a good fit. However, a CFI or TLI at 0.90 or above is also considered representative of an acceptable fit (Kline, 2005). With regard to WRMR, a value close to 1.0 or lower indicates a good fit (Yu, 2002).

Third, inter-correlations amongst the five latent factors of the published model were examined, and the internal consistency of each subscale was assessed using Cronbach’s alpha coefficients.

Fourth, the properties of the MCQ-30 were explored from different perspectives. The relationship between metacognitive beliefs and age were examined through Spearman’s correlations, whereas gender differences were tested using Mann-Whitney U tests with Bonferroni correction. Due to six comparisons, the critical alpha level was set at .008.

Finally, to examine the convergent validity of the MCQ-30, correlational analysis and structural equation modelling were used. First, the bivariate relationship between the five metacognitive subscales and obsessive-compulsive symptoms were examined using Spearman’s correlations. Second, latent variables for obsessive-compulsive symptoms were regressed onto the MCQ-30 factors. Obsessive-compulsive symptoms were defined as two latent dependent variables, measured by the obsession and compulsion items (five each) from the Y-BOCS. Following the procedure of several previous studies (e.g. Deacon, & Abramowitz, 2005; McKay, Danyko, Neziroglu, & Yaryura-Tobias, 1995), the residuals of question pairs (frequency, interference, distress, resistance, and control) were correlated. The five MCQ-30 factors were defined as latent predictor variables with their respective six items as indicators. Bootstrapping techniques were used to address the non-normal distribution of variables at both time points, as well as a relatively small sample size at post-treatment. To assess the model-data fit, the same fit indices and criteria as described for CFA were used.

**3. Results**

**3.1. Preliminary analyses**

The data was collected through both paper and pencil (*n* =165 at pre-treatment and *n* = 114 at post-treatment) and internet administration (*n* = 187 at pre-treatment and *n* = 99 at post-treatment). Mann-Whitney U tests showed no significant differences in MCQ-30 scores between the two administration modes at pre-treatment or post-treatment. Regarding Y-BOCS scores, a significant difference in pre-treatment obsession subscale score was found. However, the effect size was small, *r* = -.19. A summary of the Mann-Whitney U test results is shown in Table 1.

**3.2. Factorial structure**

**3.2.1. Pre-treatment analyses**

Confirmatory factor analysis of the MCQ-30 five-factor model showed the following fit indices at pre-treatment: *χ2*(395) = 880.87, *p* ˂ .001; RMSEA = .059 (90 % CI = .054 - .064); CFI = .94; TLI = .94; WRMR = 1.23. The chi-square statistic was significant, but this statistic is highly sensitive to sample size and violations of normality (Bentler & Bonett, 1980). The CFI, the TLI, and the RMSEA indicated a good model fit, whereas the WRMR was above the criteria of 1.0. Overall, the fit indices suggested a good fit of the data to the published five-factor model.

 Exploratory factor analysis confirmed that a five-factor solution provided the best model. Even though the *χ2* statistic was significant, a combined assessment of the fit indices indicated a good model fit: *χ2*(295) = 583.36, *p* ˂ .001; RMSEA = .053 (90 % CI = .046 - .059); CFI = .97; TLI = .95; SRMR = .039. As shown in Table 2, the factor structure was highly similar to the published five-factor structure, with all items loading on their original factors. Only two out of 30 items (MCQ-2 and MCQ-6) did not load > .40 on their expected factors, and only one item (MCQ-6) cross-loaded, i.e. had equivalent loadings on both its expected factor *need to control thoughts* and *negative beliefs about worry*.

 **3.2.2 Post-treatment analyses**

At post-treatment, the CFA indicated a good fit of the data to the published five-factor model: *χ2*(395) = 663.01, *p* ˂ .001; RMSEA = .056 (90 % CI = .049 - .064); CFI = .97; TLI = .96; WRMR = 1.03.

Table 3 displays means, standard deviations, and internal consistencies of the five subscales at both time points, as well as correlations among the five latent variables (CFA standardized solution). The Cronbach’s alpha coefficients ranged from .78 - .87 at pre-treatment and from .81 - .91 at post-treatment, indicating good internal consistency. All factors were significantly positively inter-correlated with a range from .32 - .73 at pre-treatment and .58 - .82 at post-treatment.

**3.3. Gender and age differences**

There was no gender differences in the five metacognitive subscales at pre- and post-treatment (see Table 4). Regarding the relationship between metacognitive beliefs and age, a negative correlation was found between age and *beliefs about the need to control thoughts* at pre-treatment. At post-treatment, older participants tended to score significantly higher on *positive beliefs about worry* (*rs* = .14)and *negative beliefs about worry* (*rs* = .20). See Table 5 for a summary of correlations regarding age and MCQ-30 beliefs.

**3.4. Convergent validity**

Pre- and post-treatment correlations between obsessive-compulsive symptoms and metacognitive beliefs are presented in Table 6. All beliefs were significantly and positively correlated with obsessive-compulsive symptoms at both time points.

The hypothesized SEM of the relationship between metacognition and obsessive-compulsive symptoms is described graphically in Figure 1. Overall, the fit indices (see Table 7 for results) indicate an acceptable fit to the data at both time points. At pre-treatment, only *negative beliefs about worry* explained significant variance in both obsessive (*γ* = .36) and compulsive (*γ* = .25) symptoms. At post-treatment, only one domain of metacognition, *cognitive self-consciousness,* predicted obsessive (*γ* = .43) and compulsive (*γ* = .29) symptoms.

**4. Discussion**

The main aim of the study was to explore the factor structure of the MCQ-30 in OCD patients, and the results supported the originally proposed five-factor model (Wells & Cartwright-Hatton, 2004). The MCQ-30 also showed partially evidence of convergent validity at both pre-treatment and post-treatment, as the SEM analysis indicated that two dimensions of metacognition were associated with obsessive-compulsive symptoms. In summary, the results indicated that the MCQ-30 possesses adequate psychometric properties, suggesting that it is a valid and reliable instrument for measuring metacognitive beliefs and processes in adults diagnosed with OCD.

As hypothesized, the results of the factor analyses supported the originally published five-factor structure (Wells & Cartwright-Hatton, 2004), i.e. consisting of 1) *positive beliefs about worry*; 2) *negative beliefs about worry*; 3) *cognitive confidence*; 4) *beliefs about the need to control thoughts*; and 5) *cognitive self-consciousness*. Although there was not complete agreement amongst the fit indices in the CFA’s, a combined assessment of these indices indicated a good fit of the data to the published five-factor model at both pre- and post-treatment. These results were further supported by the EFA at pre-treatment, which also found the five-factor structure to be the best solution. In addition, the Cronbach’s alpha coefficients were within the acceptable range, indicating adequate reliability. These results are in line with previous studies examining the factor structure of MCQ-30 (e.g. Cook et al., 2014; Fisher et al., 2016; Martín et al., 2014; Spada et al., 2008, Wells & Cartwright-Hatton, 2004). However, this is the first study to document the five-factor structure in an OCD sample. Previously, only three studies using clinical samples have been reported, using samples consisting of cancer patients (Cook et al., 2014), epilepsy patients (Fisher et al., 2016), and patients with mixed emotional disorders (Martín et al., 2014). However, the use of mixed clinical samples makes it difficult to detect disorder specific metacognitions, as there may be different metacognitive profiles between different diagnostic groups.

Given the sample size, we were not able to do multiple-group CFA testing fit in different age groups and between genders. There was an overrepresentation of women in our OCD sample, while OCD research has suggested an even gender distribution. Therefore, it was important to address possible gender differences. However, there were no gender differences at pre-treatment or post-treatment, which suggests that metacognitive profiles are similar in women and men diagnosed with OCD.Regarding age differences, younger participants were found to score significantly higher on *beliefs about the need to control thoughts* at pre-treatment, whilst older participants tended to score significantly higher on *positive beliefs about worry* and *negative beliefs about worry* at post-treatment. However, the strength of these correlations was weak, and it remains unclear whether age influences metacognitive beliefs in adults diagnosed with OCD. The results could possibly be different if children and adolescents were included. The results of previous studies investigating gender and age differences in MCQ-30 scores have been inconsistent, with some studies reporting small, but significant effects of gender and age on the factors (e.g. Spada et al., 2008; Tosun & Irak, 2008), whereas others do not (e.g. Wells & Cartwright-Hatton, 2004). Explanations for the differential results may be methodological, such as different sizes of the ratio among males and females, as well as different age ranges between studies. Also, not all studies applied a Bonferroni correction to the test results.

 All metacognitive beliefs were significantly and positively correlated with obsessive-compulsive symptoms at pre- and post-treatment. This is consistent with previous studies (e.g. Cho et al., 2012; Solem et al., 2009; Tosun & Irak, 2008). However, there was a difference in strength of correlations between the two time points, as the correlations between the MCQ-30 subscales and Y-BOCS scores were stronger at post-treatment. Difference in strength of correlations across time is not uncommon (e.g. Cook et al., 2014) and could reflect different factors. Two possible influences are that the participants could be more emotionally stable at post-treatment and that they have learned more about OCD related thoughts and metacognitions during treatment.

The results from the SEM of the relationship of the MCQ-30’s latent factors with obsessive-compulsive symptoms partially support the measure’s convergent validity. As hypothesized, and as shown in previous research (e.g. Cho et al., 2012; Sica et al., 2007; Yilmaz et al., 2008), *negative beliefs about worry* emerged asa significant predictor of both obsessions and compulsions at pre-treatment. *Negative beliefs about worry* have also been consistently found as a significant predictor across emotional disorders and processes, such as worry (e.g. Tosun & Irak, 2008) and symptoms of depression (e.g. Spada et al., 2008) and health anxiety (e.g. Bailey & Wells, 2013). At post-treatment, our hypothesis that *negative beliefs about worry* would predict obsessive-compulsive symptoms was not supported, as beliefs about *cognitive self-consciousness* emerged as the only significant predictor. However, the emergence of *cognitive self-consciousness* as a predictor replicates the findings of three prior studies (Irak & Tosun, 2008; Janeck, Calamari, Riemann, & Heffelfinger, 2003; Wells & Papageorgiou, 1998), suggesting that beliefs about *cognitive self-consciousness* is also an important contributor to obsessive-compulsive symptoms.

Evidently, although all correlations between MCQ-30 subscales and Y-BOCS were significant, there were only two significant pathways in the SEM analysis. There are several possible reasons for this. Measures of OCD specific metacognitive beliefs may be more strongly linked to OCD symptoms specifically, whereas the general dysfunctional metacognitive beliefs are more directly linked to worry and rumination. Thus, future studies should look at the MCQ-30 in relation to worry and rumination in OCD patients. There is also the issue that the strongest predictors in a SEM-analysis will account for more variance, and consequently other paths may not be significant. Further research is needed to explore why there are different predictors at different time points and how this relates to change in severity of symptoms overall. However, the emergence of *cognitive self-consciousness* as a predictor at post-treatment might reflect that some patients are still monitoring for the presence of obsessions, as well as a tendency to still using rituals. This may be a vulnerability factor and would need to be addressed in treatment.

Some limitations of the present study need to be taken into consideration. Firstly, the reliability of the MCQ-30 was evaluated through internal consistency, as measured by Cronbach’s alpha. Further evidence of score stability could be added with a test-retest study. Secondly, there was some variability in the measures used, as both the self-report and interview versions of the Y-BOCS were used. Finally, the gender distribution was uneven with an overrepresentation of women, and all participants were treatment seekers. As such, the current sample may not be representative of all individuals diagnosed with OCD.

In conclusion, the current study suggests that the MCQ-30 possesses adequate psychometric properties, indicating that it is a valid instrument for measuring metacognitive beliefs in OCD. Metacognitive therapy for OCD (Wells, 2009) is developed specifically for the modification of metacognitions, and preliminary results are promising (Fisher & Wells, 2008; Rees & van Koesveld, 2008; van der Heiden, van Rossen, Dekker, Damstra, & Deen, 2016). Therefore, in addition to the scientific gain where confirmation of psychometric properties is necessary to assure the integrity of study findings, the validation of the MCQ-30 for use in individuals diagnosed with OCD could also have clinical implications. The measure, along with other metacognitive measures such as the Thought-Fusion Instrument (Wells, Gwilliam, & Cartwright-Hatton, 2001), could be useful as a guide to which metacognitive beliefs need to be addressed during OCD-treatment. The MCQ-30 could also be used as a tool in evaluating therapy outcome, where recovery would involve reducing worry and rumination, avoidance, coping behaviours, and metacognitions. Metacognitive beliefs can be modified through a range of well specified techniques, including detached mindfulness, exposure and response commission, and through verbal and behavioural reattribution method (Wells, 2009). Although the preliminary results of metacognitive therapy for OCD have been encouraging (e.g. Fisher & Wells, 2008; van der Heiden et al., 2016), controlled clinical trials are an essential next step in evaluating the efficacy of MCT for OCD.

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**References**

Bailey, R., & Wells, A. (2013). Does metacognition make a unique contribution to health anxiety when controlling for neuroticism, illness cognition and somatosensory amplification? *Journal of Cognitive Psychotherapy, 27*(4), 327-337. doi: 10.1891/0889- 8391.27.4.327

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88*(3), 588-606. doi: 10.1037/0033- 2909.88.3.588

Baer, L., Brown-Beasley, M. W., Sorce, J., & Henriques, A. I. (1993). Computer-assisted telephone administration of a structured interview for obsessive-compulsive disorder. *The American Journal of Psychiatry, 150*(11), 1737-1738. doi: [10.1176/ajp.150.11.1737](http://dx.doi.org/10.1176/ajp.150.11.1737)

Brown, T. A., DiNardo, P. A., & Barlow, D. H. (1994). *Anxiety disorders interview schedule* (4th ed.). Boulder, CO: Graywind Publications.

Cartwright-Hatton, S., & Wells, A. (1997). Beliefs about worry and intrusions: The meta- cognitions questionnaire and its correlates. *Journal of Anxiety Disorders, 11*(3), 279- 296. [doi: 10.1016/S0887-6185(97)00011-X](http://dx.doi.org/10.1016/S0887-6185%2897%2900011-X)

Cho, Y., Jahng, S., & Chai, S. (2012). The factor structure and concurrent validity of the Korean version of the Metacognitions Questionnaire 30 (K-MCQ-30). *Journal of Clinical Psychology, 68*(3)*,* 349-361. doi: 10.1002/jclp.20867

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment, 7*(3), 309-319. doi: 10.1037/1040- 3590.7.3.309

Cook, S. A., Salmon, P., Dunn, G., & Fisher, P. (2014). Measuring metacognition in cancer: Validation of the Metacognitions Questionnaire 30 (MCQ-30). *PLoS ONE 9*(9): e107302. doi: 10.1371/journal.pone.0107302

Deacon, B. J., & Abramowitz, J. S. (2005). The Yale-Brown Obsessive Compulsive Scale: Factor analysis, construct validity, and suggestions for refinement. *Journal of* *Anxiety Disorders, 19*(5), 573-585. doi: 10.1016/j.jandix.2004.04.009

Fisher, P. L., Cook, S. A., & Noble, A. (2016). Clinical utility of the Metacognitions Questionnaire 30 in people with epilepsy. *Epilepsy and Behavior, 57,* 185-191*.* doi: 10.1016/j.yebeh.2016.02.004

Fisher, P. L., & Wells, A. (2005). Experimental modification of beliefs in obsessive- compulsive disorder: A test of the metacognitive model. *Behaviour Research and Therapy, 43*(6), 821-829. doi: [10.1016/j.brat.2004.09.002](http://dx.doi.org/10.1016/j.brat.2004.09.002)

Fisher, P. L., & Wells, A. (2008). Metacognitive therapy for obsessive-compulsive disorder: A case series. *Journal of Behavior Therapy and Experimental Psychiatry, 39*(2)*,* 117- 132. doi: 10.1016/j.jbtep.2006.12.001

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive- developmental inquiry. *American Psychologist, 34*(10), 906-911. doi: [10.1037/0003- 066X.34.10.906](http://psycnet.apa.org/doi/10.1037/0003-066X.34.10.906)

Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Fleischmann, R. L., Hill, C. L., . . . Charney, D. S. (1989). The Yale-Brown Obsessive Compulsive Scale I: Development, use, and reliability. *Archives of General Psychiatry*, *46*(11), 1006-1011. doi: 10.1001/archpsyc.1989.01810110048007

Grabill, K., Merlo, L., Duke, D., Harford, K.-L., Keeley, M. L., Geffken, G. R., & Storch, E. A. (2008). Assessment of obsessive-compulsive disorder: A review. *Journal of Anxiety Disorders, 22*(1)*,* 1-17. doi: 10.1016/j.janxdis.2007.01.012

Grøtte, T., Solem, S., Vogel, P. A., Güzey, I. C., Hansen, B., & Myers, S. G. (2015). Metacognition, responsibility, and perfectionism in obsessive-compulsive disorder. *Cognitive Therapy and Research, 39*(1), 41-50. doi: 10.1007/s10608-014-9635-7

Gwilliam, P., Wells, A., & Cartwright-Hatton, S. (2004). Does meta-cognition or responsibility predict obsessive-compulsive symptoms: A test of the metacognitive model. *Clinical Psychology and Psychotherapy, 11*(2)*,* 137-144. doi: 10.1002/cpp.402

Hermans, D., Engelen, U., Grouwels, L., Joos, E., Lemmens, J., & Pieters, G. (2008). Cognitive confidence in obsessive-compulsive disorder: distrusting perception, attention and memory. *Behaviour Research and Therapy, 46*(1), 98-113. doi: [10.1016/j.brat.2007.11.001](http://dx.doi.org/10.1016/j.brat.2007.11.001)

Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1-55. doi: 10.1080/10704419909540118

Irak, M., & Tosun, A. (2008). Exploring the role of metacognition in obsessive-compulsive and anxiety symptoms. *Journal of Anxiety Disorders, 22*(8), 1316-1325. doi: 10.1016/j.jandix.2008.01.012

Janeck, A. S., Calamari, J. E., Riemann, B. C., & Heffelfinger, S. K. (2003). Too much thinking about thinking?: Metacognitive differences in obsessive–compulsive disorder. *Journal of Anxiety Disorders, 17*(2), 181-195. doi: [10.1016/S0887-6185(02)00198-6](http://dx.doi.org/10.1016/S0887-6185%2802%2900198-6)

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guilford Press.

Martín, J., Padierna, A., Unzurrunzaga, A., González, N., Berjano, B., & Quintana, J. M. (2014). Adaptation and validation of the metacognition questionnaire (MCQ-30) in Spanish clinical and nonclinical samples. *Journal of Affective Disorders, 167*, 228-234. doi: 10.1016/j.jad.2014.06.009

McKay, D., Danyko, S., Neziroglu, F., & Yaryura-Tobias, J. A. (1995). Factor structure of the Yale-Brown Obsessive-Compulsive Scale: A two dimensional measure. *Behaviour Research and Therapy, 33*(7), 865-869. doi: 10.1016/0005-7967(95)00014-O

MacCallum, R. C., Roznowski, M., & Necowitz, L. B. (1992). Model modifications in covariance structure analysis: The problem of capitalization on chance. *Psychological Bulletin, 111*(3), 490-504. doi: 10.1037/0033-2909.111.3.490

Muthen, B., du Toit, S. H. C., & Spisic, D. (1997). *Robust inference using weighted least squares and quadratic estimating equations in latent variable modelling with categorical and continuous outcomes* (Technical Report). Los Angeles: University of California.

Moritz, S., Peters, M. J. V., Larøi, F., & Lincoln, T. F. (2010). Metacognitive beliefs in obsessive-compulsive patients: a comparison with healthy and schizophrenia participants. *Cognitive Neuropsychiatry, 15*(6), 531-548. doi: 10.1080/13546801003783508

Myers, S. G., Fisher, P. L., & Wells, A. (2008). Belief domains of the Obsessive Beliefs Questionnaire – 44 (OBQ-44) and their specific relationship with obsessive- compulsive symptoms. *Journal of Anxiety Disorders, 22*(3)*,* 475-484. doi: 10.1016/j.janxdis.2007.03.012

Myers, S. G., Fisher, P. L., & Wells, A. (2009). Metacognition and cognition as predictors of obsessive-compulsive symptoms: A prospective study. *International Journal of Cognitive Therapy, 2,* 132-142. doi: 10.1521/ijct.2009.2.2.132

Myers, S. G., & Wells, A. (2013). An experimental manipulation of metacognition: A test of the metacognitive model of obsessive-compulsive symptoms. *Behaviour Research and Therapy, 51*(4-5),177-184. doi: [10.1016/j.brat.2013.01.007](http://dx.doi.org/10.1016/j.brat.2013.01.007)

Ramos-Cejudo, J., Salguero, J. M., & Cano-Vindel, A. (2013). Spanish version of the Meta- Cognitions Questionnaire 30 (MCQ-30). *The Spanish Journal of Psychology, 16*(E95)*,*  1-8. doi: 10.1017/sjp.2013.95

Rees, C. S., & van Koesveld, K. (2008). An open trial of group metacognitive therapy for obsessive-compulsive disorder. *Journal of Behavior Therapy and Experimental Psychiatry, 39*(4)*,* 451-458. doi: 10.1016/j.jbtep.2007.11.004

Sassaroli, S., Centorame, F., Caselli, G., Favaretto, E., Fiore, F., Galluci, M.,…Rapee, R. M. (2015). Anxiety control and metacognitive beliefs mediate the relationship between inflated responsibility and obsessive compulsive symptoms. *Psychiatry Research, 228*(3), 560-564. doi: 10.1016/j.psychres.2015.05.053

Sica, C., Steketee, G., Ghisi, M., Chiri, L. R., & Franceschini, S. (2007). Metacognitive beliefs and strategies predict worry, obsessive–compulsive symptoms and coping styles: A preliminary prospective study on an Italian non-clinical sample. *Clinical Psychology and Psychotherapy, 14*(4), 258–268. doi: 10.1002/cpp.520

Solem, S., Håland, Å. T., Vogel, P. A., Hansen, B., & Wells, A. (2009). Change in metacognitions predicts outcome in obsessive-compulsive disorder patients undergoing treatment with exposure and response prevention. *Behaviour Research and Therapy, 47*(4)*,* 301-307. doi: [10.1016/j.brat.2009.01.003](http://dx.doi.org/10.1016/j.brat.2009.01.003)

Solem, S., Thunes, S. S., Hjemdal, O., Hagen, R., & Wells, A. (2015). A metacognitive perspective on mindfulness: An empirical investigation. *BMC Psychology, 3*:*24*. doi: 10.1186/s40359-015-0081-4

Spada, M. M., Mohiyeddini, C., & Wells, A. (2008). Measuring metacognitions associated with emotional distress: Factor structure and predictive validity of the metacognitions questionnaire 30. *Personality and Individual Differences, 45*(3), 238-242. doi: 10.1016/j.paid.2008.04.005

Steketee, G., Frost, R., & Bogart, K. (1996). The Yale-Brown Obsessive Compulsive Scale: Interview versus self-report. *Behaviour Research and Therapy*, *34*(8), 675-684. doi: 10.1016/0005-7967(96)00036-8

Tosun, A., & Irak, M. (2008). Adaptation, validity, and reliability of the Metacognition Questionnaire-30 for the Turkish population, and its relationship to anxiety and obsessive-compulsive symptoms. *Turkish Journal of Psychiatry, 19*(1), 67-80.

Van der Heiden, C., Van Rossen, K., Dekker, A., Damstra, M., & Deen, M. (2016). Metacognitive therapy for obsessive-compulsive disorder: A pilot study. *Journal of* *Obsessive-Compulsive and Related Disorders, 9*, 24-29. doi: 10.1016/j.jocrd.2016.02.002

Wells, A. (1997). *Cognitive therapy of anxiety disorders: A practice manual and conceptual guide.* Chichester, UK: Wiley.

Wells, A. (2000). *Emotional disorders and metacognition: Innovative cognitive therapy.* Chichester, UK: Wiley.

Wells, A. (2009). *Metacognitive therapy for anxiety and depression.* New York: The Guilford Press.

Wells, A. & Cartwright-Hatton, S. (2004). A short form of the metacognitions questionnaire: Properties of the MCQ-30. *Behaviour Research and Therapy, 42*(4)*,* 385-396. doi: 10.1016/S0005-7967(03)00147-5

Wells, A., Gwilliam, P., & Cartwright-Hatton, S. (2001). *The thought fusion instrument (unpublished self-report scale).* UK: University of Manchester.

Wells, A., & Matthews, G. (1994). *Attention and emotion: A clinical perspective.* Hove, UK: Lawrence Erlbaum & Associates.

Wells, A., & Matthews, G. (1996). Modelling cognition in emotional disorder: The S-REF model. *Behaviour Research and Therapy, 34*(11-12), 881-888. doi: [10.1016/S0005- 7967(96)00050-2](http://dx.doi.org/10.1016/S0005-7967%2896%2900050-2)

Wells, A., & Papageorgiou, C. (1998). Relationships between worry, obsessive-compulsive symptoms and meta-cognitive beliefs. *Behaviour Research and Therapy, 36*(9), 899- 913. doi: 10.1016/S0005-7967(98)00070-9

Yilmaz, A. E., Gençöz, T., & Wells, A. (2008). Psychometric characteristics of the Penn State Worry Questionnaire and Metacognitions Questionnaire-30 and metacognitive predictors of worry and obsessive-compulsive symptoms in a Turkish sample. *Clinical Psychology and Psychotherapy, 15*(6), 424-439. doi: 10.1102/cpp.589

Yu, C.-Y. (2002). *Evaluating cutoff criteria of model fit indices for latent variable models with binary and continuous outcomes* (Doctoral dissertation). Los Angeles: University of California.

**Tables**

Table 1

*Descriptive and Mann-Whitney test statistics for MCQ-30 and Y-BOCS by mode of administration (online versus paper and pencil)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Mode of administration |  |  |  |
|  | Paper and pencil |  | Online  |  |  |  |
| Measure | *Mdn* | *IQR* |  | *Mdn* | *IQR* |  *U* |  *p* |  *r* |
| **Pre-treatment (*N* = 352)** |
| MCQ-30 |  |  |  |  |  |  |  |  |
|  Positive beliefs about worry |  9.0 |  6.0 - 13.0 |  |  9.0 |  7.0 - 12.0 | 16023.5 | .528 |  .03 |
|  Negative beliefs about worry | 16.0 | 13.0 - 19.0 |  | 16.0 | 13.0 - 19.0 | 14939.5 | .608 | -.03 |
|  Cognitive confidence | 12.0 |  9.0 - 16.0 |  | 11.0 |  8.0 - 16.0 | 14569.5 | .367 | -.05 |
|  Need to control thoughts | 14.0 |  9.0 - 17.0 |  | 13.0 | 10.0 - 17.0 | 15075.0  | .711 | -.02 |
|  Cognitive self-consciousness | 15.0 | 11.0 - 18.0 |  | 15.0 | 11.0 - 18.0 | 14755.0 | .479 | -.04 |
| Y-BOCS |  |  |  |  |  |  |  |  |
|  Obsession subscale | 13.0 | 11.0 - 15.0 |  | 12.0 | 10.0 - 14.0 | 12082.5 | .001\* | -.19 |
|  Compulsion subscale | 13.0 | 11.0 - 15.0 |  | 12.0 | 11.0 - 14.0 | 13191.5 | .018 | -.13 |
| **Post-treatment (*N* = 213)** |
| MCQ-30 |  |  |  |  |  |  |  |  |
|  Positive beliefs about worry | 6.0 |  6.0 - 8.0 |  | 6.0 |  6.0 - 9.0 | 5766.0 | .764 |  .02 |
|  Negative beliefs about worry | 9.0 |  6.0 - 11.0 |  | 8.0 |  6.0 - 12.0 | 5830.5 | .672 |  .03 |
|  Cognitive confidence | 8.0 |  6.0 - 12.0 |  | 9.0 |  6.0 - 12.0 | 5997.5 | .422 |  .06 |
|  Need to control thoughts | 7.0 |  6.0 - 9.0 |  | 7.0 |  6.0 - 9.0 | 5961.5 | .464 |  .05 |
|  Cognitive self-consciousness | 9.0 |  7.0 - 12.0 |  | 10.0 |  7.0 - 12.0 | 5957.5 | .481 |  .05 |
| Y-BOCS |  |  |  |  |  |  |  |  |
|  Obsession subscale | 5.0 |  4.0 - 8.0 |  | 6.0 |  4.0 - 8.0 | 7020.5 | .209 |  .08 |
|  Compulsion subscale | 4.0 |  2.0 - 6.0 |  | 5.0 |  3.0 - 6.0 | 6834.0 | .381 |  .06 |

*Note.* Bonferroni correction was applied in the equations. MCQ-30 = Metacognitions Questionnaire-30; Y-BOCS = The Yale-Brown Obsessive Compulsive Scale; *Mdn* = Median; *IQR* = Interquartile range; *U* = The Mann-Whitney test statistic; *r* = Rosenthal effect size estimate.

\**p* < .006

Table 2

*Published Scale Structure and Factor Loadings from EFA of the Metacognitions Questionnaire-30 at Pre-treatment*

|  |  |
| --- | --- |
| MCQ-30 PUBLISHED SCALE STRUCTURE AND ITEMS | EFA FACTOR LOADINGS |
|  |  | F1 | F2 | F3 | F4 | F5 |
|  *Subscale:* | *Positive beliefs about worry* |  |  |  |  |  |
| MCQ-1 | Worrying helps me to avoid problems in the future | -.03 | -.07 |  **.58** |  .04 |  .34 |
| MCQ-7 | I need to worry in order to remain organized |  .19 |  .17 |  **.65** |  .05 | -.02 |
| MCQ-10 | Worrying helps me to get things sorted out in my mind |  .16 |  .16 |  **.79** |  .01 | -.04 |
| MCQ-19 | Worrying helps me to cope |  .05 |  .11 |  **.65** | -.01 |  .22 |
| MCQ-23 | Worrying helps me to solve problems | -.06 | -.04 |  **.76** |  .08 |  .28 |
| MCQ-28 | I need to worry in order to work well |  .02 |  .21 |  **.63** |  .06 |  .13 |
| *Subscale:* | *Negative beliefs about worry* |  |  |  |  |  |
| MCQ-2 | My worrying is dangerous for me | .39 |  .22 | -.21 |  .11 |  .13 |
| MCQ-4 | I could make myself sick with worrying |  **.47** |  .15 | -.14 |  .15 |  .06 |
| MCQ-9 | My worrying thoughts persist, no matter how I try to stop them |  **.88** |  .01 |  .02 | -.06 | -.09 |
| MCQ-11 | I cannot ignore my worrying thoughts |  **.88** | -.05 |  .10 | -.13 | -.01 |
| MCQ-15 | My worrying could make me go mad |  **.51** |  .07 | -.22 |  .11 |  .28 |
| MCQ-21 | When I start worrying, I cannot stop |  **.81** | -.04 |  .04 |  .03 |  .02 |
| *Subscale:* | *Cognitive confidence* |  |  |  |  |  |
| MCQ-8 | I have little confidence in my memory for words and names | -.07 |  .11 |  -.01 |  **.81** | -.02 |
| MCQ-14 | My memory can mislead me at times |  .17 |  .03 |  .07 |  **.66** | -.02 |
| MCQ-17 | I have a poor memory | -.04 |  .02 | -.05 |  **.83** | -.11 |
| MCQ-24 | I have little confidence in my memory for places | -.05 |  .07 |  .04 |  **.76** | -.02 |
| MCQ-26 | I do not trust my memory |  .08 | -.21 |  .04 |  **.92** |  .06 |
| MCQ-29 | I have little confidence in my memory for actions |  .11 | -.10 |  .02 |  **.76** |  .09 |
| *Subscale:* | *Need to control thoughts* |  |  |   |  |  |
| MCQ-6 | If I did not control a worrying thought, and then it happened, it would be my fault |  .37 | -.01 |  .08 | -.01 |  .37 |
| MCQ-13 | I should be in control of my thoughts all of the time |  .01 |  .10 |  .05 | -.06 |  **.62** |
| MCQ-20 | Not being able to control my thoughts is a sign of weakness | -.04 | -.05 |  .01 |  .02 |  **.78** |
| MCQ-22 | I will be punished for not controlling certain thoughts |  .12 |  .09 |  .22 | -.09 |  **.49** |
| MCQ-25 | It is bad to think certain thoughts |  .05 |  .12 | -.05 | -.02 |  **.65** |
| MCQ-27 | If I could not control my thoughts, I would not be able to function |  .04 |  .17 |  .18 |  .08 |  **.40** |
|  *Subscale:* | *Cognitive self-consciousness* |  |  |  |  |  |
| MCQ-3 | I think a lot about my thoughts |  .25 |  **.43** | -.17 |  .03 |  .25 |
| MCQ-5 | I am aware the way my mind works when I am thinking through a problem | -.04 |  **.79** |  .02 |  .02 | -.10 |
| MCQ-12 | I monitor my thoughts | -.04 |  **.46** |  .37 | -.09 |  .01 |
| MCQ-16 | I am constantly aware of my thinking |  .07 |  **.78** |  .03 | -.10 |  .06 |
| MCQ-18 | I pay close attention to the way my mind works |  .01 |  **.81** |  .09 |  .01 |  .03 |
| MCQ-30 | I constantly examine my thoughts |  .23 |  **.52** |  .07 |  .10 |  .14 |

*Note.* Factor loadings > .40 are in boldface. MCQ-30 = Metacognitions Questionnaire-30, F1 = *Negative beliefs about worry,* F2 = *Cognitive self-consciousness*, F3 = *Positive beliefs about worry*, F4 = *Cognitive confidence*, F5 = *Need to control thoughts*.

Table 3

*Descriptive Statistics, Internal Consistency, and Inter-correlations among the five Latent MCQ-30 Factors (CFA standardized solution) at pre- and post-treatment*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| MCQ-30 | *Mdn* |  *IQR* |  1 |  2 |  3 |  4 |  5 |
| **Pre-treatment (*N* = 352)** |
| 1. Positive beliefs about worry | 9.0 |  7.0 - 12.0 | (.87) |  |  |  |  |
| 2. Negative beliefs about worry | 16.0 | 13.0 - 19.0 |  .44\* | (.82) |  |  |  |
| 3. Cognitive confidence | 12.0 |  8.0 - 16.0 |  .42\* |  .38\* | (.87) |  |  |
| 4. Need to control thoughts | 13.0 | 10.0 - 17.0 |  .65\* |  .71\* |  .38\* | (.78) |  |
| 5. Cognitive self-consciousness | 15.0 | 11.0 - 18.0 |  .63\* |  .61\* |  .32\* |  .73\* | (.83) |
| **Post-treatment (*N* = 213)** |
| 1. Positive beliefs about worry | 6.0 |  6.0 - 8.0 | (.88) |  |  |  |  |
| 2. Negative beliefs about worry | 9.0 |  6.0 - 11.5 |  .73\* | (.83) |  |  |  |
| 3. Cognitive confidence | 8.0 |  6.0 - 12.0 |  .59\* |  .63\* | (.91) |  |  |
| 4. Need to control thoughts | 7.0 |  6.0 - 9.0 |  .81\* |  .82\* |  .58\* | (.81) |  |
| 5. Cognitive self-consciousness | 10.0 |  7.0 - 12.0 |  .68\* |  .81\* |  .60\* |  .75\* | (.89) |

*Note.* Cronbach’s alpha coefficients in parentheses. MCQ-30 = Metacognitions Questionnaire-30; *Mdn* = Median; *IQR* = Interquartile range.

\**p* < .01

Table 4

*Gender Differences in the MCQ-30 Subscales at pre- and post-treatment*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Male |  | Female |  |  |  |
| MCQ-30 | *Mdn* | *IQR* |  | *Mdn* | *IQR* |  *U* |  *p* |  *r* |
| **Pre-treatment (*N* = 352)** |  |
| Positive beliefs about worry | 8.0 |  6.0 - 12.0 |  | 9.0 |  7.0 - 12.0 | 15604.5 | .198 |  .07 |
| Negative beliefs about worry | 15.0 | 13.0 - 19.0 |  | 16.0 | 13.0 - 19.0 | 15352.0 | .316 |  .05 |
| Cognitive confidence | 10.5 |  7.0 - 14.0 |  | 12.0 |  9.0 - 16.0 | 16599.5 | .018 |  .13 |
| Need to control thoughts | 13.0 | 10.0 - 17.0 |  | 13.0 | 10.0 - 17.0 | 14290.0 | .879 | -.01 |
| Cognitive self-consciousness | 15.0 | 12.0 - 19.0 |  | 15.0 | 11.0 - 18.0 | 13586.5 | .359 | -.05 |
| **Post-treatment (*N* = 213)** |  |
| Positive beliefs about worry | 6.0 |  6.0 - 8.0 |  | 6.0 |  6.0 - 9.0 | 5487.0 | .333 |  .07 |
| Negative beliefs about worry | 9.0 |  7.0 - 11.0 |  | 8.0 |  6.0 - 12.0 | 4877.5 | .581 | -.04 |
| Cognitive confidence | 8.0 |  6.0 - 11.5 |  | 8.0 |  6.0 - 12.0 | 5497.0 | .357 |  .06 |
| Need to control thoughts | 7.0 |  6.0 - 9.0 |  | 7.0 |  6.0 - 9.0 | 4749.5 | .384 | -.06 |
| Cognitive self-consciousness | 11.0 |  7.5 - 13.0 |  | 9.0 |  7.0 - 12.0 | 4433.0 | .111 | -.11 |

*Note.* Bonferroni correction was applied in the equations. MCQ-30 = Metacognitions Questionnaire-30; *Mdn* = Median; *IQR* = Interquartile range; *U* = The Mann-Whitney test statistic; *r* = Rosenthal effect size estimate.

\**p* < .008

Table 5

*Spearman’s Correlations between the MCQ-30 subscales and Age at pre- and post-treatment*

|  |  |
| --- | --- |
|  | Age |
|  | Pre-treatment |  | Post-treatment |
| MCQ-30 |  *rs* |  *p* |  |  *rs* |  *p* |
| Positive beliefs about worry | -.06 | .276 |  | .14 | .041 |
| Negative beliefs about worry |  .06 | .267 |  | .20 | .004 |
| Cognitive confidence |  .07 | .199 |  | .05 | .456 |
| Need to control thoughts | -.11 | .034 |  | .03 | .682 |
| Cognitive self-consciousness | -.07 | .220 |  | .06 | .381 |

*Note.* MCQ-30 = Metacognitions Questionnaire-30; *rs*  = Spearman’s correlation coefficient.

Table 6

*Spearman’s Correlations between the MCQ-30 Subscales and the Y-BOCS Obsessions and Compulsions Subscales*

|  |  |  |  |
| --- | --- | --- | --- |
|  | Pre-treatment |  | Post-treatment |
| MCQ-30 | Y-BOCS obsessions | Y-BOCS compulsions |  | Y-BOCS obsessions | Y-BOCS compulsions |
| Positive beliefs about worry |  .13\* | .14\*\* |  | .33\*\* | .22\*\* |
| Negative beliefs about worry | .34\*\* | .24\*\* |  | .50\*\* | .34\*\* |
| Cognitive confidence | .15\*\* | .12\*\* |  | .39\*\* | .31\*\* |
| Need to control thoughts | .24\*\* | .21\*\* |  | .41\*\* | .26\*\* |
| Cognitive self-consciousness | .26\*\* | .13\*\* |  | .55\*\* | .39\*\* |

*Note.* MCQ-30 = Metacognitions Questionnaire-30; YBOCS = The Yale-Brown Obsessive Compulsive Scale.

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

Table 7

*Fit Indices for the SEM of the Relationship between MCQ-30 and Y-BOCS Obsession and Compulsion Subscale*

|  |  |  |
| --- | --- | --- |
| Fit statistics | Pre-treatment | Post-treatment |
| χ2 | 1339.19 | 998.71 |
|  *df* | 714 | 714 |
|  *p* | < .01 | < .01 |
| CFI | .94 | .97 |
| TLI | .94 | .97 |
| RMSEA (90 % CI) | .050 (.046 - .054) | .044 (.037 - .050) |
| WRMR | 1.24 | 0.97 |

*Note.* χ2 = Chi-Square test of model fit; CFI = the Comparative Fit Index; TLI = the Tucker-Lewis Index; RMSEA = the Root Mean Square Error of Approximation; WRMR = the Weighted Root Mean Square Residual.

**Figures**

Figure 1

*Structural Equation Model of the Relationship between the MCQ-30 and Y-BOCS Obsessions and Compulsions*



*Note.* The figure shows standardized path coefficients and their significance at pre-treatment and (in brackets) at post-treatment. Ellipses represent latent variables, and rectangles represent observed variables (indicators). MCQ = Metacognitions Questionnaire – 30; POS = *Positive beliefs about worry*; NEG = *Negative beliefs about worry*; CC = *Cognitive confidence*; NCT = *Need to control thoughts*; CSC = *Cognitive self-consciousness*; YB-O = The Yale-Brown Obsessive Compulsive Scale, obsessions; YB-C = The Yale-Brown Obsessive Compulsive Scale, compulsions.

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