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Exploring the role of metacognition in obsessive–compulsive and anxiety symptoms

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Abstract

This study tests three hypotheses, predicting first that metacognition is highly correlated with anxiety and obsessive–compulsive (O–C) symptoms, second that it mediates the relationship between O–C symptoms and anxiety, and third that the meta-cognitive predictors of anxiety are different from the meta-cognitive predictors of O–C symptoms. The sample of the present study was 850 students selected from various universities in Turkey. Significant correlations between metacognition, O–C symptoms and anxiety were observed. Also, mediation analysis confirmed that metacognition fully mediated the relationship between O–C symptoms and anxiety. Consistent with our hypothesis, trait anxiety and O–C symptoms had different meta-cognitive predictors. Although, we expected that meta-cognitive beliefs would vary based on the sub-type of O–C symptoms, meta-cognitive beliefs did not differ according to the O–C symptom subtypes. We discussed results with reference to the literature of meta-cognition, anxiety and O–C symptoms.

Keywords: Metacognition; Obsessive–compulsive symptoms; Anxiety; Mediation

1. Introduction

Metacognition is the process of thinking about ''thinking,'' knowing about ''what we know'' and ''what we don't know,'' and the ability to control our own thoughts. It refers to the psychological structures, knowledge, events and processes that are involved in the control, modification and interpretation of thinking itself (Wells & Cartwright-Hatton, 2004). Metacognition has been considered an important factor in the development and maintenance of various psychological disorders (Wells & Mathews, 1996), especially in generalized anxiety disorder (GAD) (Wells, 2005) and obsessive–compulsive disorder (OCD) (Wells & Papageorgiou, 1998). Hence, researchers have developed a number of cognitive models in order to explain the origin and etiology of obsessive–compulsive (O–C) symptoms. They also have emphasized the interpretation or appraisal of intrusive thoughts as well as beliefs about the importance of such thoughts (Jacobi, Calamari, & Woodar, 2006). Salkovskis (1985, 1989) was among the first to propose that individuals with OCD possess dysfunctional beliefs involving blame and responsibility for harm that occurs to themselves and others. Similarly, Rachman (1993, 1997, 1998) argued that obsessions are caused by the catastrophic misinterpretations of the significance of one's intrusive thoughts. Further, Rachman (1993) suggested that some individuals with OCD suffer thought–action fusion (TAF), indicating the belief

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that thoughts can influence events and are equivalent to actions. Clark and Purdon (1995) then refined cognitive formulations of OCD, focusing on meta-cognitive processes. They stressed that individuals with OCD misinterpret the consequences of failure in controlling unwanted intrusive thoughts. First, Wells and Mathews (1994) and then Wells (1997) reformulated the role of metacognition in psychological disorder, especially in OCD. They argued that meta-cognitive belief about thoughts and thought processes is a critical component of the dysfunctional cognitive process that drives OCD symptoms. Besides, there are some models of OCD which do not regard dysfunctional beliefs as playing an important role. Some authors suggested that there are etiologically distinct forms of OCD and dysfunctional beliefs play an etiological role in its one form, and these beliefs are not posited as etiological variable in its other form (Taylor, Abramowitz, & McKay, 2005; Taylor et al., 2006).

The meta-cognitive model of OCD known as ''Self-Regulatory Executive Function (S-REF)'' (Wells & Mathews, 1994) proposes that obsessive thoughts are negatively interpreted as a result of meta-cognitive beliefs about the meaning and/or dangerous consequences of having a specific thought or thoughts. According to these authors, the meta-cognitive system is designed to regulate the self by means of beliefs about the self. Distortions in meta-cognitive beliefs affect the meanings and functioning of cognition. Therefore, distortion of S-REF's control on affective regulation may bring about ruminations and active worry.

Gwilliam, Wells, and Cartwright-Hatton (2004) suggest that there are two broad fields of beliefs in S-REF: (i) beliefs about the importance/meaning and power of thoughts and (ii) beliefs about the need to control thoughts and/or to perform rituals. In the first field, themes are of beliefs about intrusions which may include TAF, thought–event fusion (TEF, i.e., the belief that an obsessional thought or doubt alone can cause a negative external event) and thought–object fusion (TOF, i.e., the belief that thoughts and feelings can be transferred into objects). In the second field, they include beliefs concerning the rituals that need to be used to attenuate the appraised consequences associated with obsessional thoughts.

Using the conceptual framework of the S-REF theory, Cartwright-Hatton and Wells (1997) constructed a 65-item scale (the meta-cognitions questionnaire; MCQ) to assess beliefs about worry and intrusive thoughts. The MCQ assesses a range of metacognitions relevant to worry and intrusive thoughts, although it primarily focuses on beliefs about worry. The questionnaire comprises five correlated but conceptually distinct factors that assess three domains, such as positive and negative meta-cognitive beliefs, meta-cognitive monitoring and judgments of cognitive confidence (Wells & Cartwright-Hatton, 2004). These factors are: (1) positive beliefs about worry (the belief that worrying helps to solve problems and avoid unpleasant situations), (2) negative beliefs about thoughts concerning uncontrollability and danger (the belief that it is necessary to control ones worrying in order to function well as a person, including beliefs about the mental and physical dangers of worrying), (3) cognitive confidence (assessing confidence in attention and memory), (4) negative beliefs about thoughts including themes of superstition, punishment and responsibility (superstitions which imply that the individual could be punished for having or not having certain thoughts) and (5) cognitive self-consciousness (the tendency to focus attention on thought processes) (Cartwright-Hatton & Wells, 1997). Meta-cognitive factors assessed with the MCQ have been found to be positively associated with O–C symptoms (Hermans, Martens, De Cort, Pieters, & Eelen, 2003; Janeck, Calamari, Riemann, & Heffelfinger, 2003; Wells & Papageorgiou, 1998), pathological worry (Wells & Papageorgiou, 1998), predisposition to auditory hallucinations (Baker & Morrison, 1998; Morrison & Wells, 2003) and depression (Papageorgiou & Wells, 2003).

Cartwright-Hatton and Wells (1997) found that GAD and OCD patients were significantly different from a control group consisting of both participants with other emotional disorders (non-anxiety) and normal controls on two subscales of the MCQ, namely the uncontrollability of thoughts and danger, and the negative beliefs about thoughts. They also reported that cognitive self-consciousness (CSC; the tendency to focus attention on thought) was the only subscale on which OCD and GAD participants differed from each other. Similarly, De Bruin, Rassin, and Muris (2005) have shown that CSC was moderately correlated ($r = .57$) with meta-worry, and both were positively associated with the symptoms of worry and obsessional thoughts.

Excessive attention toward one's own process of thinking has been considered to be the characteristic of patients with OCD, if compared to other beliefs about worry and intrusive thoughts. Some researches reported positive associations between dimensions of metacognition and proneness to pathological worry and O–C symptoms (Cartwright-Hatton & Wells, 1997; Wells & Papageorgiou, 1998). Wells and Papageorgiou (1998) found that when overlaps between worry and O–C symptoms were controlled, there was evidence of

specificity and differing patterns of meta-cognitive belief as predictors of worry versus O–C symptoms. They also reported that in each case when compulsions were treated as dependent variables, none of the worry measures contributed to the final regression equations when the MCQ subscales were entered. According to the authors, this result pointed out that bivariate correlations between worry and O–C symptoms are mediated by meta-cognitive beliefs. It seems to emphasize that obsessions may not affect directly anxiety, but to a certain extent, there may also exist an intermediary role of metacognition between obsessions and anxiety.

On the other hand, some clinical observation suggested that some OCD patients have prominent dysfunctional beliefs associated with their O–C symptoms, while other OCD patients do not show that pattern (Taylor et al., 2006). The authors reported that two OCD groups which identified low versus high scores on beliefs did not differ on some O–C measures (contamination, checking, grooming), but the O–C high group had higher scores on measures of harming obsessions. According to the authors, these results indicated that dysfunctional beliefs play a role in only some types of OCD.

In this study, we aimed to investigate the intermediary role of metacognition between O–C symptoms and anxiety, and whether subtypes of O–C symptoms differ on meta-cognition scores in a non-clinical Turkish sample. We predicted first of all that the metacognition would be correlated with O–C symptoms and anxiety, and secondly that metacognition would mediate the relationship between O–C symptoms and anxiety, thirdly meta-cognitive predictors of anxiety are different from the meta-cognitive predictors of O–C symptoms, and lastly that MCQ-30 scores would vary based on the sub-type of O–C symptoms.

2. Method

2.1. Participants

The study was conducted on 850 students (568 females, 282 males) from 17 different universities in Ankara and Istanbul in Turkey. Participants' ages ranged from 17 to 36 years (M = 21.22, S.D. = 1.90) and participation in the study occurred on a voluntary basis.

2.2. Instruments

2.2.1. Meta-cognitions questionnaire-30 (MCQ-30)

The 65-item meta-cognitions questionnaire (MCQ) was constructed by Cartwright-Hatton and Wells (1997) to assess beliefs about worry and intrusive thoughts. An adapted form of the scale (MCQ-30) was later developed by Wells and Cartwright-Hatton (2004). Similar to the original scale, the authors report that the MCQ-30 is comprised of five factors: positive beliefs, uncontrollability and danger, cognitive confidence, need to control thoughts and cognitive self-consciousness. Inter-item correlations in MCQ-30 were higher than .30, and corrected item-total correlations for the full-scale ranged from .31 to .68. Cronbach Alpha coefficient was .93 for the full-scale and ranged from .72 to .93 for factors. Correlations between subscales were significant and consistent with the original form. The comparative fit index was .90 and root mean square residual (RMSR) was .04. These coefficients indicated a good fit. Wells and Cartwright-Hatton (2004) examined correlations between MCQ-30 and three variables, namely trait anxiety, obsessive compulsive symptoms and pathological worry, and subsequently found significant correlations between them.

In the adaptation study of MCQ-30 for Turkish college students (Tosun & Irak, in press), inter-item correlations for the MCQ-30 ranged from .090 to .764, consistent with the original form. The MCQ-30 showed good test–retest reliability for items (.40–.94) and subscales (.70–.85). The Cronbach Alpha coefficient was .86 for the full-scale and supported good internal consistency. An exploratory factor analysis showed that the Turkish form of the MCQ-30 had five-components, which was the same factor structure as the original form. In addition, the fit indices of confirmatory factor analysis (e.g., CFI = .90; RMR = .50) suggested a good fit to a five-factor model consistent with the original MCQ-30. Also significant correlations were observed between MCQ-30 subscales and its total score, trait anxiety and obsessive compulsive symptoms. Results supported the construct and the convergent validity of the Turkish form of the MCQ-30.

2.2.2. State-trait anxiety inventory (STAI)

It was developed by Spielberger, Gorsuch, Luschene, Vagg, and Jacobs (1970) and consists of 40 items which measure state and trait anxiety (from Öner & LeCompte, 1983). The reliability and validity of the Turkish version was demonstrated by Öner and LeCompte (1983) in both healthy and clinical samples. They showed that Kuder-Richardson alpha coefficients ranged from .83 to .87 for trait anxiety and .94–.96 for state anxiety. Item remainder reliability ranged .34–.72 for trait anxiety and .42–.85 for state anxiety. Test–retest reliability ranged .71–.86 for trait anxiety and .26–.68 for state anxiety. In this study, only the trait anxiety subscale (STAI-T) of the STAI was used.

2.2.3. Maudsley obsessive–compulsive inventory (MOCI)

The Maudsley obsessive–compulsive inventory (Hodgson & Rachman, 1977) is a 30-item self-report questionnaire that measures the severity of OCD symptoms on four subscales (cleaning, checking, slowness and doubting). Validity of the Turkish version was demonstrated by Erol and Savaşır (1988) in both healthy and clinical samples. The MOCI showed good test–retest reliability for the full-scale (.88) and moderate reliability for subscales (checking .78, washing .84, doubting .66 and slowness .59). The Cronbach Alpha coefficient was .44 for the full-scale and pointed to poor internal consistency. Principal component analysis showed that the Turkish form of MOCI is comprised of factors of the original form. Results supported the construct and the convergent validity of the Turkish form of the MOCI (Erol & Savaşır, 1988).

2.3. Procedure

The study was conducted with students from 17 different universities in Istanbul and Ankara by obtaining permission from course instructors. Questionnaires were combined in a booklet and their order was balanced in a complete design. The questionnaires were administered in one session. Participants were asked to complete the booklets in 20 min before their lessons.

3. Results

Prior to analyses, data were screened for missing values, as well as univariate and multivariate outliers (Tabachnick & Fidell, 2007). There were no outliers identified as multivariate using Mahalanobis distance with $p < .001$, nor univariate using z-scores ($|z| \geq 3.30$).

3.1. Relations between MCQ-30, STAI-T and MOCI scores

It was predicted that the MCQ-30 would be highly correlated with measures of trait anxiety (STAI-T) and obsessive–compulsive symptoms (MOCI). To investigate the relationship between the MCQ-30, the STAI-T and the MOCI, Pearson's correlations were computed. Results of the Pearson's correlations are presented in Table 1. As shown in Table 1, even though moderate correlations were observed between MCQ-30 subscales, MOCI and STAI-T, each of the MCQ-30 subscales and their total scores were significantly and positively correlated with measures of trait anxiety (all correlations $r > .19$, $p < .01$), and measures of O–C symptoms (all correlations $r > .08$, $p < .05$ or larger). As shown in Table 1, the highest correlation was observed between MCQ-30 uncontrollability and danger subscale and MOCI total score ($r = .46$) and uncontrollability and danger subscale and STA-T total score ($r = .61$).

Partial correlations were carried out to test for the independence of relationships between the MCQ-30, anxiety and O–C symptoms. The relationship between anxiety and O–C symptoms was tested while controlling for measures of metacognition. Results showed that the relationship between anxiety and O–C symptoms was dependent on metacognition ($r = .30$, $p < .001$). In addition, the relationship between metacognition and O–C symptoms was dependent on anxiety symptoms ($r = .32$, $p < .001$).

3.2. The meta-cognitive predictors of trait anxiety and O–C symptoms

Our hypothesis was that the meta-cognitive predictors of anxiety were different from the meta-

Table 1
Relations between MCQ-30 subscales and total score, STAI-T total score and MOCI total score

	Positive beliefs	Cognitive confidence	Uncontrollability and danger	Cognitive self-consciousness	Need to control thoughts	MCQ-30 total	STAI-T total	MOCI total
Positive beliefs	1.00							
Cognitive confidence	.11**	1.00						
Uncontrollability and danger	.31**	.20**	1.00					
Cognitive self-consciousness	.31**	.01	.39**	1.00				
Need to control thoughts	.40**	.10**	.49**	.41**	1.00			
MCQ-30 total	.67**	.49**	.74**	.61**	.72**	1.00		
STAI-T total	.19**	.24**	.61**	.20**	.29**	.48**	1.00	
MOCI total	.29**	.08*	.46**	.29**	.40**	.46**	.45**	1.00

* $p < .05$.
** $p < .01$.

cognitive predictors of O–C symptoms. Two multiple regression analyses were carried out. In the first analysis, the predicted variable was the STAI-T total score, and the predictor variables were the MCQ-30 subscales. The shared variance between MOCI total score and STAI-T total score was 20% ($r = .45$). In order to control overlaps between STAI-T and MOCI, the MOCI total score was entered on the first step, and the MCQ subscales were entered on step two. In the second regression analysis, the predicted variable was the MOCI total score, and the predictor variables were the MCQ-30 subscales. The STAI-T total score was entered on the first step, and the MCQ subscales were entered on step two. Results for the regression equation and overall summaries for the final step are shown in Tables 2 and 3.

As Table 2 shows, the MCQ-30 subscales accounted for a significant 21% of variance in the STAI-T in addition to the MOCI total score. In the final equation, the MCQ-30 cognitive confidence and uncontrollability and danger subscales were significant predictors of anxiety in addition to the MOCI total score. In the second analysis, the MCQ-30 subscales accounted for a significant 21% of variance in the MOCI total score in addition to the STAI-T total score. In the final equation, except the cognitive confidence subscale, MCQ-30 need to control thoughts, uncontrollability and danger, positive beliefs, and cognitive self-consciousness subscales were significant predictors of O–C symptoms in addition to the STAI-T total score (see Table 3). Consequently, results indicated that even though the uncontrollability and danger subscale was the common meta-cognitive predictor for both trait anxiety and O–C symptoms, consistent with our hypothesis, trait anxiety and O–C symptoms had different meta-cognitive predictors.

The meta-cognitive predictors of different O–C symptom subtypes were also tested. Our hypothesis was

Table 2
Stepwise multiple regression analyses with STAI-T total score as predicted variables and MOCI total score and MCQ-30 subscale scores as predictor variables

Block of variables	R	Adj. R^2	Change R^2	F change	d.f.	Sig of F change
MOCI total	.45	.21	.21	217.85	1842	.001
MCQ-30 subscales	.66	.43	.23	66.35	5837	.001
Individual variables in final equation		β	t	95% CI		
MOCI total		.25	8.14***	.25–.40		
Cognitive confidence		.13	4.89***	.14–.33		
Positive beliefs		−.02	−.76	−.15 to .07		
Cognitive self-consciousness		−.05	−1.85	−.29 to .01		
Uncontrollability and danger		.52	15.86***	.91–1.16		
Need to control thoughts		−.05	−1.57	−.26 to .03		

*** $p < .001$.

Table 3
Stepwise multiple regression analyses with MOCI total score as predicted variables and STAI-T total score and MCQ-30 subscale scores as predictor variables

Block of variables	R	Adj. R^2	Change R^2	F change	d.f.	Sig of F change
STAI-T total	.45	.21	.21	217.85	1842	.001
MCQ-30 subscales	.57	.32	.12	28.29	5837	.001
Individual variables in final equation		β	t	95% CI		
MOCI total		.30	8.14***	.17–.28		
Cognitive confidence		−.05	−1.76	−.15 to .01		
Positive beliefs		.10	3.12**	.05–.24		
Cognitive self-consciousness		.07	2.17*	.01–.26		
Uncontrollability and danger		.14	3.33**	.08–.33		
Need to control thoughts		.19	5.49***	.21–.45		

* $p < .05$.
** $p < .01$.
*** $p < .001$.

that the meta-cognitive predictors of different O–C symptom subtypes were different. To test the hypothesis four multiple regression analyses were performed for each MOCI subscale. In the analyses, the MOCI subscales were predicted variables, the MCQ-30 subscales were predictor variables. In general, results showed that the MCQ-30 need to control thoughts subscale was significant and had common meta-cognitive predictors for all O–C symptom subtypes. In detail, meta-cognitive predictors of the MOCI checking subscale were positive beliefs, uncontrollability and danger, and need to control thoughts ($R = .42$, $\beta = .08$, $p < .05$). The need to control thoughts and uncontrollability and danger were significant meta-cognitive predictors of both the MOCI washing ($R = .28$, $\beta = .11$, $p < .01$) and slowness ($R = .39$, $\beta = .18$, $p < .001$) subscales. The MCQ-30 uncontrollability and danger, cognitive self-consciousness and need to control thoughts subscales were significant predictors of the MOCI doubting subscale ($R = .37$, $\beta = .11$, $p < .01$). In sum, even though need to control thoughts was the common factor of different O–C symptoms, these results are consistent with our hypothesis that different O–C symptoms had different meta-cognitive predictors.

3.3. Mediation analysis

We hypothesized that metacognition would mediate the relationship between the independent variable (anxiety) and the outcome variables (O–C symptoms). We tested for mediation using Baron and Kenny's (1986) mediated regression technique, and we used Sobel's (1982) equation to test whether the relationship between the predictor and outcome variables dropped significantly from condition 1 to condition 3.

To test for mediation, we followed procedures recommended by Baron and Kenny (1986). To establish mediation, three conditions must hold: (a) the predictor (anxiety symptoms: STAI-T total score) must be related to the criterion variable (O–C symptoms: MOCI total score; condition 1); (b) the predictor must be related to the mediator (metacognition: MCQ-30 total score; condition 2); (c) the mediator must be related to the criterion variable and when the criterion is regressed on both the predictor and the mediator variables, the strength of the predictor drops relative to the first condition (condition 3). Results indicated that trait anxiety significantly predicted O–C symptoms ($\beta = .45$, $p = .001$, 95% CI = .30–.39) and metacognition ($\beta = .48$, $p = .001$; 95% CI = .65–.84). When O–C symptoms were regressed on trait anxiety and metacognition, both trait anxiety ($\beta = .30$, $p = .001$; 95% CI = .18–.28) and metacognition ($\beta = .32$, $p = .001$; 95% CI = .13–.19) remained significant, suggesting full mediation. Next, we used Sobel's (1982) equation to test whether the relationship between the predictor and criterion dropped significantly from condition 1 to condition 3 (if the beta coefficient in Step 3 was less than in Step 2; see Preacher & Leonardelli, 2006, for an interactive calculation program). Results showed that the drop in beta between the two conditions was significant (Sobel test = 8.22; $p < .001$). Analyses indicated that metacognition fully mediated the relationship between anxiety and O–C symptoms.

3.4. Changes in meta-cognitive beliefs based on O–C subtypes

We hypothesized that meta-cognition scores might vary based on the subtype of O–C symptoms. Following on previous research on the topic, we chose same cut-off scores of previous research with non-clinical populations (e.g., MacDonald, Anthony, MacLeod, & Richter, 1997; Rubenstein, Peynircioglu, Chambless, & Pigott, 1993; Tuna, Tekcan, & Topcuoglu, 2005) for MOCI, which participants who received a subscale score of 4 or more on the checking subscale were classified as checkers, while participants who received a subscale score of 4 or more on the washing subscale were classified as washers. On the other hand, in this study participants who received subscale scores 0 or 1 on all four MOCI subscales were classified as normal control. The mean and standard deviations for the MCQ-30 subscales, its total score based on group status, and the MOCI subscales are presented in Table 4. To compare meta-cognitive belief differences of different O–C subtypes, ANOVAs were carried out for each MOCI subscore separately. In the analyses, group status (sub-clinical and normal control) was the independent variable, while each of the MCQ subscales and its total score were dependent variables. Except for the cognitive confidence subscale, the sub-clinical group's scores were significantly higher than normal controls for all MOCI subscales and its total score (all $ps < .001$). On the other hand, differences between two groups on cognitive confidence subscale were not significant for all MOCI subscales and its total score. Consequently, contrary to our hypotheses, these results indicated that meta-cognitive beliefs did not differ according to the type of O–C symptom.

Table 4
Mean (and standard deviations) for MCQ-30 sub-scales and total score according to group status and MOCI sub-scales

MCQ-30 score	Normal control ($N = 284$)	Sub-clinical			
		Checking ($N = 174$)	Washing ($N = 395$)	Slowness ($N = 138$)	Doubting ($N = 380$)
Cognitive confidence	12.19 (4.29)	12.59 (4.41)	12.40 (4.56)	12.88 (4.57)	12.39 (4.50)
Positive beliefs	12.54 (4.05)	14.84 (3.83)	12.84 (4.18)	14.52 (4.0)	14.15 (4.12)
Cognitive self-consciousness	16.02 (3.22)	17.68 (2.91)	17.39 (3.10)	17.79 (2.98)	17.64 (2.98)
Unaccountability and danger	12.28 (3.78)	15.79 (3.75)	14.34 (3.92)	16.01 (3.76)	14.71 (3.92)
Need to control thoughts	13.75 (3.34)	15.72 (3.13)	15.05 (3.44)	15.78 (3.42)	15.12 (3.38)
Total score	65.78 (12.14)	76.62 (10.0)	73.13 (12.10)	76.98 (10.79)	74.01 (11.68)

4. Discussion

This study was conducted to evaluate the relationship between people's meta-cognitive beliefs, O–C symptoms and trait anxiety in a Turkish university student sample. First of all, we predicted that metacognition would be correlated with anxiety and O–C symptoms. Correlation analysis confirmed that there was a significant relationship between metacognition, O–C symptoms and trait anxiety. We hypothesized that the meta-cognitive predictors of trait anxiety were different from the meta-cognitive predictors of O–C symptoms. Although trait anxiety and O–C symptoms had one common meta-cognitive predictor, namely the MCQ-30 uncontrollability and danger subscale, for the most part, consistent with our hypothesis, trait anxiety and O–C symptoms had different meta-cognitive predictors. In addition, regression analyses indicated that different O–C symptom subtypes had different meta-cognitive predictors. We also hypothesized that metacognition would mediate the relationship between the anxiety and the O–C symptoms. Mediation analysis confirmed that metacognition fully mediated the relationship between anxiety and O–C symptoms. Finally, even though we expected that meta-cognitive beliefs would vary based on O–C symptom subtypes, the results indicated that this was not the case. In fact, meta-cognitive beliefs did not differ according to the O–C symptom subtypes.

Our results appear to support Wells' (2000) meta-cognitive model as meta-cognitive beliefs were positively correlated with O–C symptoms. Also, the present findings corroborate findings (e.g., Cartwright-Hatton & Wells, 1997; De Bruin et al., 2005; Hermans et al., 2003; Janeck et al., 2003; Wells & Papageorgiou, 1998) that have demonstrated correlations between dimensions of the MCQ and measures of obsessions and compulsions.

A main aim of the study was to explore relationships between meta-cognitive beliefs, O–C symptoms and trait anxiety. Pearson's and partial correlations supported previous studies (Cartwright-Hatton & Wells, 1997) showing a positive relationship between meta-cognitive beliefs, O–C symptoms and trait anxiety. In a study by Wells and Papageorgiou (1998), the relationship between meta-cognitive beliefs, proneness to pathological worry and O–C symptoms was explored when controlling for interdependency of worry and O–C compulsive measures in a university student sample. Results showed that specific sets of meta-cognitive beliefs were associated with O–C symptoms and worry proneness. More specifically, they found that when the overlap between worry and O–C symptoms was controlled for, meta-cognitive beliefs emerged as predictors of worry versus O–C symptoms. Finally, the authors showed that consistent with a cognitive model of GAD (Wells, 1995, 1997), positive and negative beliefs about worry concerning themes of uncontrollability and danger were positively correlated with proneness to pathological worry. Consisted with previous results, we found that when the overlaps between trait anxiety and O–C symptoms were controlled there was evidence of specificity and differing patterns of meta-cognitive beliefs as predictors of trait anxiety and O–C symptoms. For instance, even though the cognitive confidence subscale was not associated with any MOCI subscales and its total score, this subscale was significant meta-cognitive predictors of trait anxiety with the uncontrollability and danger subscale. On the other hand, only uncontrollability and danger was the common significant predictor of trait anxiety and O–C symptoms. In the original study of MCQ by Cartwright-Hatton and Wells (1997), they argued that the uncontrollability and danger subscale contained three aspects: the first, beliefs that are necessary to control ones worrying in order to function well as person; the second, beliefs about the mental and

physical dangers of worrying; the third, the beliefs that worry in uncontrollable. In view of this, one might argue that these three aspects of uncontrollability and danger are both common meta-cognitive beliefs of trait anxiety and O–C symptoms.

In addition, mediation analysis showed that meta-cognition fully mediated the relationship between trait anxiety and O–C symptoms. This result support the idea of Wells and Papageorgiou (1998) that obsessions may not affect directly anxiety, but to a certain extent, there may also exist an intermediary role of metacognition between obsessions and anxiety. Also, in the meta-cognitive model of OCD, Wells (1997, 2000) hypothesized that modifying meta-cognitive beliefs activated by obsessional stimuli will cause reduce of anxiety level and distress with a decrease in the urge to neutralize. Thus, treatment based on the model requires modification of thought–fusion beliefs. Taken together, our results pointed that metacognition mediates relations between obsessions and anxiety symptoms, and these two symptoms have a common meta-cognitive belief, namely uncontrollability and danger. So, it can be hypothesized that uncontrollability and danger play a central role in this relation. Based on the association between our results and theoretical perspective of Wells' meta-cognitive model of OCD, it is possible that not all but a specific meta-cognitive belief, uncontrollability and danger, mediates the relationship between anxiety and obsessions. Finally, it may also be argued that modifying meta-cognitive beliefs regarding uncontrollability and danger may result in reduce of anxiety/distress with a decrease in the urge to neutralize. But this argument should be tested in clinical sample.

In the meta-cognitive model of Wells (1997, 2000), two subscales of the MCQ, uncontrollability and danger, and need for control, were markers of the meta-cognitive beliefs and specifically need for control was as a marker for the component of the model concerning beliefs about rituals. In a study by Myers and Wells (2005), it was found that the need to control thoughts and beliefs about harm or danger resulting from thoughts contribute to obsessional symptoms independently of responsibility and other types of anxious disturbance, such as worry. Consistent with this result, our results showed that the MCQ-30 need to control thoughts subscale was the only significant predictor of all O–C symptom subtypes. As discussed earlier, Gwilliam et al. (2004) argued that beliefs about the need to control thoughts and/or to perform rituals is one of the broad of beliefs in S-REF theory. Our results supported this argument and it indicated that the need to control thoughts was the central meta-cognitive factor of O–C symptoms, but our findings also showed that this central factor was not associated with trait anxiety. These findings need to be tested in clinical samples. In addition, we found that although need to control thoughts was the common factor of different O–C symptoms; the meta-cognitive predictors of O–C symptom subtypes were different. The heterogeneity of OCD symptoms hypothesis (Freestone, Rheaume, & Ladouceur, 1996; McKay et al., 2004) suggests that different cognitive domains were associated with different O–C symptoms, and this finding is thought to contribute to this hypothesis at a meta-cognitive level.

Our results indicating the role of metacognition on O–C symptoms and anxiety may have several clinical implications. Psychological treatments of OCD have typically been characterized by behavioral approaches, such as exposure with ritual prevention (ERP). Clark (2000) argued that although there is some evidence for the success of these interventions, some limitations have been highlighted. Mather and Cartwright-Hatton (2004) found that meta-cognitive appraisals (e.g., TAF) and meta-cognitive process (e.g., thought control strategies, selective attention) are significant predictors of O–C symptoms in healthy adolescents; they proposed a more metacognitively enhanced therapy, namely meta-cognitive therapy (MCT). MCT is applicable to all subtypes of OCD, and it differs from standard cognitive behavioral therapy (CBT) or ERP by focusing solely on meta-cognitive beliefs about obsessions and compulsions, and makes no attempt to modify other belief domains, such as inflated responsibility, intolerance of uncertainty or perfectionism (Gwilliam et al., 2004; Wells, 2000). Recently, two studies were reported about success of MCT in treatment of OCD. In the first study, Simons, Schneider, and Herpertz-Dahlmann (2006) reported that MCT to be an alternative psychotherapeutic treatment to ERP in pediatric OCD. Secondly, in a case series study by Fisher and Wells (2008), four adults with OCD treated with MCT and they found that all patients made clinically significant improvement within very short time of therapy (12–14 h). The authors suggested that MCT could be effective and efficient treatment for OCD. These results pointed that future treatment studies may be considered to focus the potential enrichment of interventions of more meta-cognitive.

Two potential limitations in our study should be mentioned. First, for practical reasons, our study was done in a community population, and not with a clinical sample. This makes it difficult to generalize the research

findings to people with OCD. However, analogue studies are thought to be useful in understanding the underlying mechanisms of OCD, since sub-clinical OC symptoms are thought to represent a milder form of OCD (Gibbs, 1996). Although definition of sub-clinical OC symptoms is unclear and there are no universal criteria for selection of analogue populations, sub-clinical obsessions and compulsions are frequent in the population, result in significant distress and are thought to be an important target for investigation (Zucker, Craske, Blackmore, & Nitz, 2006). Second, the MOCI measured obsessional thoughts, rather than compulsive behaviors (Myers and Wells, 2005). The MCQ-30 concerns thoughts rather than behaviors, and this specificity might reduce the strength of the relationships observed. Although MOCI has been used in previous studies (e.g., MacDonald et al., 1997; Rubenstein et al., 1993; Tuna et al., 2005), future studies should investigate these relationships using different clinical measures in clinical samples.

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