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Running Heading: INTOLERANCE OF UNCERTAINTY AND META-WORRY

The relationship of meta-worry and intolerance of uncertainty with pathological worry,
anxiety, and depression

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Abstract

This study explored how meta-worry and intolerance of uncertainty relate to pathological worry, generalised anxiety, obsessive compulsive disorder, social phobia, and depression. University students ($n = 253$) completed a questionnaire battery. A series of regression analyses were conducted. The results indicated that meta-worry was associated with GAD, social phobia, obsessive compulsive, and depressive symptoms. Intolerance of uncertainty was related to GAD, social phobia, and obsessive compulsive symptoms, but not depressive symptoms. The importance of meta-worry and intolerance of uncertainty as predictors of pathological worry, GAD, social phobia, obsessive compulsive and depressive symptoms was also examined. Even though both factors significantly predicted the aforementioned symptoms, meta-worry emerged as a stronger predictor of GAD and obsessive compulsive symptoms than did intolerance of uncertainty. Intolerance of uncertainty, compared with meta-worry, appeared as a stronger predictor of social phobia symptoms. Findings emphasise the importance of addressing meta-worry and/or intolerance of uncertainty not only for the assessment and treatment of generalised anxiety disorder (GAD), but also obsessive compulsive disorder, social phobia, and depression.

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Key words: Meta-worry, Intolerance of Uncertainty, Generalised Anxiety Disorder, Obsessive Compulsive Disorder, Social Anxiety and Depression.

Introduction

Generalised Anxiety Disorder (GAD) has been recognised as a debilitating condition with uncontrolled and excessive worry as its unique feature (American Psychiatric Association, 2000). The concepts of meta-worry (Wells, 1995, 1999) and intolerance of uncertainty (Dugas, Gagnon, Ladouceur, & Freeston, 1998) emerged to explain GAD. These cognitive concepts have assisted in understanding the development and maintenance of GAD. Researchers are now starting to examine the role of these two cognitive concepts in the assessment and intervention of GAD (Grayson, 2010; Wells & King, 2006). Some recent investigations are starting to uncover the links of these concepts with other anxiety disorders and depression (Barahmand, 2009; Carleton, Collimore, & Asmundson, 2010; de Bruin, Muris, & Rassin, 2007a). However, these associations need more investigations. Even though investigations are starting to compare the two concepts, more research is required to examine the unique contributions of meta-worry and intolerance of uncertainty in the prediction of worry, anxiety disorders, and depression.

Meta-worry

The concept of meta-worry was introduced as a salient feature of the metacognitive model of worry. Wells (1995), in this model, emphasised the process of worrying. According to this model, external/internal triggers activate positive beliefs (i.e., worry is good for me). Individuals worry about the trigger, which is referred to as Type 1 worry (Wells, 1999; Wells & Carter, 1999, 2001). Negative meta-beliefs are activated during Type 1 worry. Negative beliefs about worry are commonly concerned with the uncontrollability of worrying and its consequences on physical, psychological, and social

functioning (Wells & King, 2006). Such negative beliefs about worry lead to subsequent Type 2 worry, defined as worry about worry (i.e., meta-worry). Meta-worry increases an individual's anxiety and emotional symptoms. Individuals then engage in thought suppression, avoidance, and distraction. This results in a decrease in exposure to external and/or internal worry triggers, and therefore reduces aversive physiological and emotional responses, which supports the use of worry as a coping mechanism. However, when an individual engages in meta-worry the associated increase in anxiety prevents the individual from experiencing an internal state associated with finding solutions (as a result of Type 1 worry). As a result of meta-worry, worry becomes generalised and chronic as the individual fluctuates between engaging in and avoiding worry (Wells, 1999; Wells & Carter, 2001; Wells & King, 2006).

The meta-cognitive model proposes that meta-worry is the primary causal factor in the maintenance of pathological worry and GAD (Wells & Carter, 1999). In support of this, researchers have shown that meta-worry distinguishes normal worry from pathological worry, and that meta-worry predicts pathological worry independently of Type 1 worry and trait anxiety (Davis & Valentiner, 2000; Nuevo, Montorio, & Borkovec, 2004; Wells & Carter, 1999, 2001). This suggests that meta-worry may have independent clinical relevance for the excessive worry that is central to GAD.

Empirical support for the GAD metacognitive model led to the development of measures for meta-worry (Wells, 1994) and metacognitive therapy for generalised anxiety disorder (Wells, 1997). Wells and King (2006) focused on modifying metacognitive factors, including thought control strategies, negative beliefs about the danger uncontrollability of worry (meta-worry), and positive beliefs about the utility of

worry as a coping strategy. Targeting metacognitions in therapy appeared to substantially decrease social worry, health worry, and meta-worry. This suggests that focusing on metacognitions in therapy for individuals with GAD is beneficial, further supporting Wells' (1995) metacognitive model.

Researchers debate the specificity of meta-worry for GAD. While some research supports a specific relationship (Wells & Carter, 2001), other research suggests that meta-worry is not specific to GAD, and suggests that it may have a role in obsessive compulsive thoughts (de Bruin, et al., 2007a; de Bruin, Rassin, & Muris, 2006; Irak & Tosun, 2008; Wells, 2005; Wells & Carter, 2001). Overestimation of threat has been linked with obsessive-compulsiveness (Fergus & Wu, 2009). Barahmand (2009) studied metacognitive profiles of anxiety disorders and depression. The findings indicated health worry to be elevated in GAD patients, while meta-worry was elevated in obsessive compulsive disorder (OCD) patients. Furthermore in this study, depressed patients tended to use worry while OCD patients tended to use distraction as meta-cognitive strategies to control intrusive and distressing thoughts. The associations of meta-worry with other anxiety and depressive symptoms need further investigations.

Intolerance of Uncertainty

Intolerance of uncertainty has received considerable research attention since its conceptualisation (Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994). Dugas, et al. (1998) developed a cognitive behavioural model of GAD based on the premise that individuals with GAD have difficulty dealing with uncertainty in everyday life. The model identifies four main cognitive factors that influence the maintenance of pathological worry: intolerance of uncertainty, positive beliefs about worry, negative

problem orientation, and cognitive avoidance. Intolerance of uncertainty has been supported as the key variable for this model. Its significance led to the development of the Intolerance for Uncertainty scale (Buhr & Dugas, 2002; Freeston, et al., 1994), which has been revised and validated extensively (Khawaja & Yu, 2010; Sexton & Dugas, 2009). Intolerance of uncertainty is now recognised as a dispositional trait reflecting unfavourable outlook toward uncertainty and its consequences (Dugas & Robichaud, 2007). Individuals with high intolerance of uncertainty levels find it difficult to manage uncertain events and circumstances of their lives (Ladouceur, Talbot, & Dugas, 1997). Such individuals cannot tolerate being uncertain about what may happen to them in their life. Moreover, a vague and ambiguous future is perceived as threatening (Dugas, Gosselin, & Ladouceur, 2001b). Such individuals believe that uncertainty hinders and impairs their functioning, and that unpredictability is unfair and problematic (Sexton & Dugas, 2009). Subsequently, these individuals start to respond negatively to uncertain situations on an emotional, cognitive, and a behavioural level (Dugas, Buhr, & Ladouceur, 2004a). Thus, intolerance of uncertainty is considered as a risk factor for the development of anxiety disorders (Norton, Sexton, Walker, & Norton, 2005).

Literature has documented that intolerance of uncertainty has a unique relationship with worry because it consistently emerges as the most salient predictor of worry and GAD in both clinical and non-clinical samples (Berenbaum, Bredemeier, & Thompson, 2008; Buhr & Dugas, 2006, 2009; Dugas, et al., 2001b; Dugas, Marchand, & Ladouceur, 2005; Dugas et al., 2007; Ladouceur, Gosselin, & Dugas, 2000; Tolin, Abramowitz, Brigidi, & Foa, 2003). Dugas, et al. (2007) found that intolerance of uncertainty significantly predicted GAD worry scores over and above the other factors in

the model. Further, experimental manipulations have demonstrated that induced intolerance of uncertainty increases the symptoms of worry (Ladouceur, et al., 2000) and that intolerance of uncertainty predicts worry during uncertain tasks (de Bruin, et al., 2006).

Researchers have proposed a similarity in cognitive processing between GAD and OCD (Comer, Kendall, Franklin, Hudson, & Pimentel, 2004), suggesting that worry in GAD and compulsions function to reduce negative arousal. Moreover, recent studies have also suggested that intolerance of uncertainty is associated with symptoms of OCD (Lind & Boschen, 2009). Problems with tolerating uncertainty have appeared to be associated with symptoms like doubting and compulsive checking behaviours (Boelen & Reijntjes, 2009; Holaway, Heimberg, & Coles, 2006; Miranda, Fontes, & Marroquin, 2008; Routhier, Hébert, Morin, Baillargeon, & Gosselin, 2007). Similarly, the links between intolerance of uncertainty and social phobia is also being investigated. The social-cognitive vulnerability element of intolerance of uncertainty (Koemer & Dugas, 2008) has been shown to be associated with social anxiety (Boelen & Reijntjes, 2009; Carleton, et al., 2010). McEvoy and Mahoney(2011) found that intolerance of uncertainty, compared to other anxiety and depressive symptoms, explained most of the variance in social anxiety. Individuals with social anxiety are concerned about social situations in which there is possibility of them being evaluated and judged negatively (Hofmann & Barlow, 2002). Therefore, due to the threat of being scrutinised, these individuals tend to avoid uncertainty related with social situations.

Research on depression has yielded mixed results. Some studies have failed to find any relationship of intolerance of uncertainty with depression (Boelen & Reijntjes,

2009; Dugas, et al., 2004a), while others have supported an association (de Jong-Meyer, Beck, & Riede, 2009; Miranda, et al., 2008; Sexton & Dugas, 2009; van der Heiden et al., 2010). Yook, Kim, Suh & Lee (2010) found intolerance of uncertainty to be related with depression and ruminations. Additionally, Bredemeier and Berenbaum (2008) found that those who cannot tolerate uncertainty may be at risk to experience depression. Studies indicate that depressed individuals, who dwell on the past negative event, use this thought process to anticipate unpleasant future outcomes (Dupuy & Ladouceur, 2008). Therefore, intolerance of uncertainty appears to be associated with depression and not only specifically to anxiety. Keeping in view the relationship of intolerance of uncertainty with other conditions, its transdiagnostic ability has recently been suggested by McEvoy and Mahoney (2011). Nevertheless, more research examining the links between intolerance of uncertainty and other anxiety and depressive symptoms is required.

In summary, research examining the two models empirically support meta-worry and intolerance of uncertainty as factors that distinguish individuals with GAD from those with other disorders (Dugas, et al., 2005; Dugas, Schwartz, & Francis, 2004b; Ladouceur et al., 1999; Wells & Carter, 2001). Additionally, there is some emerging evidence that these concepts are related to other anxiety disorder as well as depression. While meta-worry and intolerance of uncertainty have been investigated in separate studies, overall, there is a scarcity of research comparing the relative importance of these two factors, and their relationship with other disorders. de Bruin, Rassin, and Muris (2007b) examined neuroticism, meta-worry, and intolerance of uncertainty in a non-clinical sample and found that both of these factors had a unique relationship with trait worry, independent of neuroticism. Stapinski, Abbott, and Rapee (2010) have also

studied these two cognitive concepts in GAD and reported that although meta-cognitive beliefs and inflated perception of threat appeared to be an important cognitive process related to the development and maintenance of worry, intolerance of uncertainty emerged as a significant trait dimension within the broader personality profile of GAD. If meta-worry and intolerance of uncertainty are associated with pathological worry and other psychological disorders, intolerance of uncertainty and/or meta-worry may prove useful targets for treatment interventions for pathological worry, GAD, and other psychological disorders.

The present study endeavored to further clarify the role of intolerance of uncertainty and meta-worry in various anxiety as well as the depressive symptoms. The first goal was to examine the relationship of meta-worry as well as intolerance of uncertainty with GAD, obsessive compulsive, social phobia, and depressive symptoms. Based on the existing literature that highlighted associations (Boelen & Reijntjes, 2009; Carleton, et al., 2010; de Bruin, et al., 2007b) it was hypothesised that intolerance of meta-worry and intolerance of uncertainty would be related with the GAD, obsessive compulsive, social phobia, and depressive symptoms. As the two models have not been compared together extensively, this study had several exploratory goals. It aimed to determine whether intolerance of uncertainty or meta-worry was more strongly associated with pathological worry, GAD, OCD, social phobia, and depression.

Method

Participants

The participants were 253 undergraduate and postgraduate students from Queensland University of Technology. Out of the total participants, 198 were females (78.3%) and 55 were males (21.7%). The age of the students ranged from 17 years to 60 years with a mean age of 25.9 years ($SD = 10.79$). In relation to marital status, 161 were single (63.6%), 41 were married (16.2%), 26 were cohabitating (10.3%), 13 were divorced (5.1%) and data were missing for 12 (4.7%). In relation to education: 107 stated they had completed school (42.3%), 32 had completed TAFE (12.6%), 93 had completed a bachelor degree (36.8%), 12 had completed a postgraduate degree or diploma (4.7%), 5 had completed a masters degree (2%) and 4 had completed a PhD (1.6%).

Measures

A questionnaires battery was used to measure meta-worry, intolerance of uncertainty, pathological worry and the symptoms of GAD, OCD, social phobia and depression.

Penn State Worry Questionnaire (PSWQ)

The PSWQ (Meyer, Miller, Metzger, & Borkovec, 1990) is designed to measure the excessiveness and uncontrollability of pathological worry. The sixteen items are rated on a five-point Likert scale that ranges from 1 (*not at all typical*) to 5 (*very typical*). Meyer, et al. (1990) reported that the PSWQ has good internal consistency (Cronbach's alpha [α] = .91). The PSWQ has good convergent validity; it correlates well with other measures related to worry (Meyer, et al., 1990). Meyer, et al. (1990) reported that the

PSWQ has good discriminant validity when compared with other measures of anxiety and depression.

Anxious Thoughts Inventory (AnTI)

The AnTI (Wells, 1994) measures proneness to worry and assesses social and health worry (Type 1) and meta-worry (Type 2). The 22 items are rated on a four-point Likert scale that ranges from 1 (*almost never*) to 4 (*almost always*). The AnTI demonstrates good internal consistency (subscale $\alpha = .75-.84$) and test-retest reliability (subscale $r = .76-.84$). The AnTI has good convergent validity correlating well with measures of worry (Wells, 1994). Wells (1994) reported that the AnTI has good discriminant validity, discriminating between mood disorders, anxiety disorders, and non-clinical controls. For the purpose of this study meta-worry was measured by the seven item meta-worry subscale of the AnTI (AnTI-MW).

Intolerance of Uncertainly Questionnaire (IUS)

The IUS (Buhr & Dugas, 2002; Freeston, et al., 1994) is designed to measure intolerance of uncertainty, particularly the idea that uncertainty is unacceptable, reflects negatively on the person, and leads to frustration and stress leading to an inability to take action. The 27 items are rated on a five-point Likert scale that ranges from 1 (*not at all characteristic of me*) to 5 (*entirely characteristic of me*). Buhr and Dugas (2002) reported that the IUS demonstrated excellent internal consistency ($\alpha = .94$) and good test-retest reliability ($r = .74$). The IUS has good convergent validity correlating with other measures of worry, anxiety, and depression (Buhr & Dugas, 2002). Buhr and Dugas (2002) reported that the IUS has good discriminant validity, discriminating between

generalised anxiety symptoms, somatic anxiety symptoms, and individuals with no symptoms.

Worry and Anxiety Questionnaire (WAQ)

The WAQ (Dugas et al., 2001a) measures the diagnostic criteria for GAD including worry and somatic symptoms. The first question asks for details of six subjects that cause worry, the other five questions are rated on a five point Likert scale that ranges from 1 (*not at all*) to 5 (*excessively*). The WAQ demonstrates good test-retest reliability ($r = .76$). The WAQ has good convergent validity and excellent discriminant validity (Beaudoin et al., 1997; Dugas, et al., 2001a). Dugas, et al. (2001a) reported that the WAQ discriminated between high, moderate, and low levels of worry. The WAQ also discriminated GAD patients from non-clinical controls.

Obsessive-Compulsive Inventory-Revised (OCI-R)

The OCI-R (Foa et al., 2002) measures obsessive compulsive symptomatology including washing, checking, ordering, obsessing, hoarding, and neutralising. The 18 items are rated on a five-point Likert scale that ranges from 0 (*not at all*) to 4 (*extremely*). The OCI-R demonstrates very good internal consistency ($\alpha = .90$) and good test-retest reliability ($r = .82-.84$) (Foa, et al., 2002). The OCI-R has excellent convergent validity correlating with other measures of obsessive compulsive symptoms (Foa, et al., 2002). Foa, et al. (2002) reported that the OCI-R has good discriminant validity, discriminating well between patients with obsessive compulsive disorder, social phobia, post traumatic stress disorder, and non-clinical controls.

Social Phobia Inventory (SPIN)

The SPIN (Connor et al., 2000) measures fear, avoidance, and physiological symptoms associated with social phobia. The 17 items are rated on a five-point Likert scale that ranges from 0 (*not at all*) to 4 (*extremely*). The SPIN demonstrates good internal consistency ($\alpha = .82 - .94$) and good test-retest reliability ($r = .78$) (Connor, et al., 2000). The SPIN has good convergent validity correlating with other measures of social anxiety and social phobia (Connor, et al., 2000). The SPIN has good discriminant validity (Connor, et al., 2000; Ranta, Kaltiala-Heino, Rantanen, Tuomisto, & Marttunen, 2007). Ranta, et al. (2007) reported that the SPIN discriminates well between social phobia, sub-clinical social phobia, and depression.

The Depression Subscale of the Depression Anxiety Stress Scale (DASS-D)

The DASS-D (Lovibond & Lovibond, 1996) measures depressive symptoms. The seven items are rated on a four-point Likert scale that ranges from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). Scores can be summed to obtain a depression rating. The DASS-D demonstrates good internal consistency ($\alpha = .82$; Henry & Crawford, 2005). The DASS-D has good convergent validity correlating well with other depression (Henry & Crawford, 2005). Henry and Crawford (2005) reported that the DASS-D has good divergent validity when compared with measures of anxiety.

Procedure

Ethical clearance was obtained prior to commencing this study. The study was advertised through lecture announcements, the university website, and noticeboards. First-year psychology students received course credit for participating. Students attended designated group administration sessions, and were informed about the nature of the study and questionnaires. Students were debriefed at the end of the session.

Results

Data Screening and Preliminary Analyses

Data were screened to assess compliance with regression assumptions. Minimal missing data existed for all variables. Missing data were replaced with that variable's mean (Tabachnick & Fidell, 2001). The total scores for the PWSQ, AnTI-MW, IUS, WAQ, OCI-R, SPIN, and DASS-D were mean adjusted and this adjusted mean was used in analyses (Tabachnick & Fidell, 2001). When assessing distributions for normality, skewness was evident for AnTI-MW subscale, IUS, OCI-R, SPIN, and DASS-D. A square root transformation was performed on these variables. Transformed data impacted the results of analyses, and thus was used. Cronbach's alpha coefficients of the PSWQ (.92), AnTI-MW (.86), IUS (.95), WAQ (.89), OCI-R (.92), SPIN (.93), and DASS-D (.89) indicated good internal consistencies of all questionnaires. Table 1 displays Pearson's r correlations amongst the variables.

[Insert table 1 here]

A series of regression analyses were conducted. Firstly, two separate regression analyses examined the specific relationship of and meta-worry and intolerance of uncertainty with GAD, social phobia, obsessive compulsive, and depressive symptoms. Secondly, four separate regression analyses examined the predictive abilities of intolerance of uncertainty and meta-worry to pathological worry, GAD, OCD, and social phobia.

Specificity of Meta-worry to Symptoms of GAD, OCD, Social Phobia and Depression

A regression analysis was conducted to examine the degree to which meta-worry scores were specifically related to the symptoms of GAD, OCD, social phobia, and

depression scores. This analysis indicated that the variables accounted for a significant amount of the variance in meta-worry scores, $R^2 = .675$, $F(4,248) = 128.97$, $p < .001$. The results are presented Table 2.

[Insert table 2 here]

The regression coefficients in Table 4 indicate that GAD symptoms uniquely accounted for 5.48% of the variance in meta-worry scores, $p < .001$. OCD symptoms accounted for 4.67% of the unique variance in meta-worry scores, $p < .001$. Depression symptoms accounted for 4.00% of the unique variance in meta-worry scores. Social phobia symptoms accounted for less than 1% of the variance of meta-worry scores, $p < .05$.

Specificity of Intolerance of Uncertainty to Symptoms of GAD, OCD, Social Phobia, and Depression

A regression analysis was conducted to examine the degree to which intolerance of uncertainty is related to GAD, OCD, social phobia, and depression symptomatology. The results of this analysis indicated that the symptoms of GAD, OCD, and social phobia (but not depression) accounted for a significant amount of the variance in intolerance of uncertainty scores, $R^2 = .605$, $F(4,248) = 94.83$, $p < .001$. The results are presented in Table 3.

[Insert table 3 here]

The regression coefficients in Table 3 indicate that the symptoms of GAD uniquely accounted for 10.18% of the variance in intolerance of uncertainty, $p < .001$. Symptoms of social phobia accounted for 4.80% of the variance of intolerance of

uncertainty scores, $p < .001$. OCD symptoms accounted for 1.30% of the unique variance of intolerance of uncertainty scores, $p < .01$.

Intolerance of Uncertainty and Meta-worry as Predictors of Pathological Worry

Regression analyses were conducted to examine the degree to which pathological worry relates to intolerance of uncertainty and meta-worry. Intolerance of uncertainty and meta-worry accounted for a significant amount of the variance in pathological worry, $R^2 = .592$, $F(2,250) = 181.29$, $p < .001$. This model is presented in Table 4.

[Insert table 4 here]

The regression coefficients in Table 4 indicate that meta-worry uniquely accounted for 13.76% of the variance in pathological worry, $p < .001$. Intolerance of uncertainty uniquely accounted for 6.1% of the variance in pathological worry ($p < .001$).

Intolerance of Uncertainty and Meta-worry as Predictors of GAD

A regression analysis was conducted to examine the degree to which GAD symptoms were specifically related to intolerance of uncertainty and meta-worry scores. This analysis indicated that the variables accounted for a significant amount of the variance in GAD symptoms, $R^2 = .622$, $F(2,250) = 205.46$ $p < .001$. The results are presented in Table 5.

[Insert table 5 here]

The regression coefficients in Table 5 indicate that meta-worry scores uniquely accounted for 10.82% of the variance in GAD symptoms, $p < .001$. Intolerance of Uncertainty scores also accounted for 9.36% of the unique variance in GAD symptoms, $p < .001$.

Intolerance of Uncertainty and Meta-worry as Predictors of OCD

A regression analysis was conducted to examine the degree to which OCD symptoms were specifically related to intolerance of uncertainty and meta-worry scores. This analysis indicated that the variables accounted for a significant amount of the variance in OCD symptoms, $R^2 = .492$, $F(2,250) = 120.45$, $p < .001$. The results are presented in Table 6.

[Insert table 6 here]

The regression coefficients in Table 6 indicate that meta-worry scores uniquely accounted for 15.36% of the unique variance in OCD symptoms, $p < .001$. Intolerance of uncertainty scores also accounted for 2.66% of the unique variance in OCD symptoms, $p < .001$.

Intolerance of Uncertainty and Meta-worry as Predictors of Social Phobia

A regression analysis was conducted to examine the degree to which social phobia symptoms were specifically related to intolerance of uncertainty and meta-worry scores. This analysis indicated that the variables accounted for a significant amount of the variance in social phobia symptoms, $R^2 = .350$, $F(2,250) = 67.23$, $p < .001$. The results are presented in Table 7.

[Insert Table 7 here]

The regression coefficients in Table 7 indicate that intolerance of uncertainty scores uniquely accounted for 10.11% of the unique variance in social phobia symptoms, $p < .001$. Meta-worry scores also accounted for 2.34% of the unique variance in social phobia symptoms, $p < .01$.

Discussion

This study extended the investigation of meta-worry and intolerance of uncertainty by examining their relationship with GAD, obsessive compulsive, social phobia, and depression symptoms. The results indicated that meta-worry was related to all type of symptoms; however, intolerance of uncertainty was associated with all except depressive symptoms. Further, the contribution of meta-worry and intolerance of uncertainty in the prediction of pathological worry, GAD, obsessive compulsive, and social phobia symptoms was examined. Results indicated that both intolerance of uncertainty and meta-worry predicted pathological worry, GAD, obsessive compulsive, and social phobia symptoms. However, a close examination of the unique contributions indicated interesting differences.

Meta-worry was related to the symptoms of GAD, OCD, social phobia and depression. Meta-worry had the strongest relationship with GAD symptoms, followed by OCD symptoms, social phobia symptoms and the symptoms of depression respectively. The findings confirm the results of previous research that has suggested that meta-worry contributes to GAD, OCD, social phobia and depression (Barahmand , 2009; de Bruin et al., 2006; de Bruin, Rassin et al., 2007; Irak & Tosun, 2008; Wells & Carter, 2001). While meta-worry is more closely related to GAD, it is also a salient factor in OCD, social phobia, and depression.

Intolerance of uncertainty had the strongest relationship with GAD symptoms, followed by social phobia symptoms and then by OCD symptoms. The findings are in accordance with previous research indicating that intolerance of uncertainty is more strongly related to GAD (Berenbaum, et al., 2008; Buhr & Dugas, 2006, 2009; Dugas, et

al., 2005; Dugas, et al., 2007). Furthermore, the findings are also consistent with research showing a significant relationship between intolerance of uncertainty, OCD, and social phobia (Boelen & Reijntjes, 2009; Holaway, et al., 2006; Koemer & Dugas, 2008; Miranda, et al., 2008; Steketee, Frost, & Cohen, 1998). Thus, along with GAD, the cognitive process of being unable to manage ambiguity and uncertainty also appears to be a strong predictor of social anxiety (Boelen & Reijntjes, 2009; Carleton, et al., 2010). Similar to McEvoy and Mahoney's (2011) results, intolerance of uncertainty had a strong relationship with social anxiety.

Previous findings regarding intolerance of uncertainty and depression have been mixed. While several studies found a relationship between intolerance of uncertainty and depression (Jong-Meyer, Beck, & Reide, 2009; Miranda, et al., 2008), others have indicated no evidence of a relationship (Boelen & Reijntjes, 2009; Sexton & Dugas, 2009; van der Heiden, et al., 2010; Yook, et al., 2010). The results of the present study did not reveal a relationship between intolerance of uncertainty and the symptoms of depression. It seems that the cognitive processes involving uncertainty did not appear to be associated with pathways leading to depression. The results suggest that intolerance of uncertainty may distinguish individuals with the anxiety disorders (GAD, OCD, and social phobia) from those with depressive disorders.

When examining whether intolerance of uncertainty or meta-worry was most strongly associated with the other symptoms, depression was excluded from the analyses, due to the fact that it had already been established that intolerance of uncertainty was not associated with the symptoms of depression. The findings indicated that both intolerance of uncertainty and meta-worry contributed to pathological worry, with meta-worry

having the strongest relationship with worry (de Bruin, et al., 2007b). In predicting the symptoms of GAD, meta-worry related more strongly to GAD symptoms than intolerance of uncertainty, although the contributions were similar. This outcome is consistent with Stapinski, et al.'s (2010) findings, in which the two concepts were considered to be equally important, but slightly different roles in the development and maintenance of GAD. Meta-worry was more strongly related to OCD symptoms than intolerance of uncertainty. When predicting social phobia symptoms, intolerance of uncertainty was more strongly related to social phobia symptoms than was meta-worry. It is interesting to note that meta-worry appeared to have a more generalised role across anxiety and depressive symptoms, while intolerance of uncertainty played a more significant role in the case of GAD and social anxiety symptoms. The results support the trans diagnostic features of the meta-worry and intolerance of uncertainty (McEvoy & Mahoney, 2011).

This study highlights the significance of targeting intolerance of uncertainty and meta-worry in the assessment and interventions for individuals with high levels of worry. Such steps may be possible to reduce worry and subsequently prevent the development of GAD. Further, these two factors need attention in the assessment, diagnoses, and intervention of other anxiety disorders. Nevertheless, this study identified the importance of addressing meta-worry in depression. While treatments have targeted intolerance of uncertainty and meta-worry separately, there is no treatment that targets both of these factors in therapy.

Additionally, the findings suggest that targeting intolerance of uncertainty and meta-worry in interventions for GAD, OCD, and social phobia may be beneficial.

Further, the strength of association between OCD symptoms and meta-worry, and the strength of the association between social phobia symptoms and intolerance of uncertainty, may influence the focus of interventions and the development of interventions for these disorders.

Limitations and future directions

Despite the interesting findings from the present study, there are several limitations that should be considered when interpreting the results. First, the participants were university students which limit the generalisability of the findings. Future research should examine intolerance of uncertainty and meta-worry in a community and clinical samples. Second, the participants were predominantly single young women. Therefore, future investigations with an even distribution of men and women may allow the possibility of exploring gender differences in meta-worry and intolerance of uncertainty. Further, future researchers could extend the present study by comparing intolerance of uncertainty and meta-worry in older and younger samples. Finally, because the present study was limited to a few anxiety and depressive symptoms, it is vital for future research to examine intolerance of uncertainty and meta-worry in a wide range of emotional problems and psychological conditions. Future research examining other disorders will be useful in determining the importance of meta-worry in other psychological disorders. Further research may highlight the advantage of targeting both intolerance of uncertainty and meta-worry in the assessment and treatment interventions.

In summary, the present study extends existing literature on intolerance of uncertainty and meta-worry by supporting the relationship of these two cognitive concepts not only to the symptoms of GAD, but also to OCD and social phobia

symptoms. Meta-worry also exhibited a strong relationship with the symptoms of depression. Future research is warranted to replicate these findings in clinical populations, because the results would have implications for diagnosis, prevention, and treatment of these disorders.

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Table 1

Correlations for PSWQ, AnTI-MW, IUS, WAQ, OCI-R, SPIN, DASS-D

	2	3	4	5	6	7
1. PSWQ	.716**	.672**	.752**	.475**	.505**	.484**
2. AnTI-MW		.675**	.715**	.677**	.502**	.657**
3. IUS			.715**	.553**	.574**	.566**
4. WAQ				.555**	.466**	.585**
5. OCI-R					.402**	.515**
6. SPIN						.425**
7. DASS-D						

Note - ** $p < .001$. PSQW = Penn Worry State Questionnaire. AnTI-MW = Anxious Thoughts Inventory Meta-worry Subscale. IUS = Intolerance of Uncertainty Questionnaire. WAQ = Worry and Anxiety Questionnaire. OCI-R = Obsessive-Compulsive Inventory- Revised. SPIN = Social Phobia Inventory. DASS-D = The Depression Anxiety Stress Scale

Table 2

Specificity of Meta-worry to Symptoms of GAD, OCD, Social Phobia, and Depression

Variables	<i>B</i>	<i>SE B</i>	β
GAD	.025	.004	.336**
OCD	.102	.017	.286**
Social Phobia	.037	.016	.101*
Depression	.157	.028	.271**

Note - * $p < .001$. GAD = Worry and Anxiety Questionnaire. OCD = Obsessive Compulsive Inventory – Revised. Social Phobia = Social Phobia Inventory. Depression = The Depression Subscale of the Depression Anxiety Stress Scale.

Table 3

Specificity of Intolerance of Uncertainty to Symptoms of GAD, OCD, Social Phobia, and Depression

Variables	<i>B</i>	<i>SE B</i>	β
GAD	.069	.009	.457*
OCD	.111	.039	.151*
Social Phobia	.194	.035	.257*
Depression	.091	.064	.076

Note - * $p < .001$. GAD = Worry and Anxiety Questionnaire. OCD = Obsessive Compulsive Inventory – Revised. Social Phobia = Social Phobia Inventory. Depression = The Depression Subscale of the Depression Anxiety Stress Scale.

Table 4

Regression analysis predicting pathological worry

Variables	<i>B</i>	<i>SE B</i>	β
IUS	3.53	.579	.334*
AnTI-MW	10.91	1.189	.503*

Note - * $p < .01$. IUS = Intolerance of Uncertainty Questionnaire. AnTI-MW = Anxious Thoughts Inventory Meta-worry Subscale.

Table 5

Regression analysis predicting GAD symptoms

Variables	<i>B</i>	<i>SE B</i>	β
IUS	2.76	.351	.415*
AnTI-MW	6.08	.720	.446*

Note - * $p < .001$. IUS = Intolerance of Uncertainty Questionnaire. AnTI-MW = Anxious Thoughts Inventory Meta-worry Subscale.

Table 6

Regression analysis predicting OCD symptoms

Variables	<i>B</i>	<i>SE B</i>	β
IUS	.303	.084	.222*
AnTI-MW	1.49	.172	.532*

Note - * $p < .01$. IUS = Intolerance of Uncertainty Questionnaire. AnTI-MW = Anxious Thoughts Inventory Meta-worry Subscale.

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Table 7

Regression analysis predicting social phobia symptoms

Variables	<i>B</i>	<i>SE B</i>	β
IUS	.570	.092	.431*
AnTI- MW	.563	.188	.208*

Note - * $p < .01$. IUS = Intolerance of Uncertainty Questionnaire. AnTI-MW = Anxious Thoughts Inventory Meta-worry Subscale.