

# Extension of the Transdiagnostic Model to Focus on Intolerance of Uncertainty: A Review of the Literature and Implications for Treatment

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**This study reviews research on the construct of intolerance of uncertainty (IU). A recent factor analysis (*Journal of Anxiety Disorders*, 25, 2012, p. 533) has been used to extend the transdiagnostic model articulated by Mansell (2005, p. 141) to focus on the role of IU as a facet of the model that is important to address in treatment. Research suggests that individual differences in IU may compromise resilience and that individuals high in IU are susceptible to increased negative affect. The model extension provides a guide for the treatment of clients presenting with uncertainty in the context of either a single disorder or several comorbid disorders. By applying the extension, the clinician is assisted to explore two facets of IU, "Need for Predictability" and "Uncertainty Arousal."**

**Key words:** cognitive behavior therapy, control theory, intolerance of uncertainty, transdiagnostic, treatment. [*Clin Psychol Sci Prac* 21:280–300, 2014]

The construct of "Intolerance of Uncertainty" (IU) was initially conceptualized as a potentially significant dimension of worry by Canadian researchers in the mid-1990s (Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994). Although recognized by the Obsessive-Compulsive Cognitions Working Group (1997),

IU did not receive much attention aside from research conducted by the scale authors in Quebec (Dugas, Freeston, & Ladouceur, 1997; Dugas, Gagnon, Ladouceur, & Freeston, 1998; Ladouceur, Talbot, & Dugas, 1997). In recent years, it has been analyzed and discussed in relation to a broad number of psychological constructs. Research is now at a point where IU is postulated to be a transdiagnostic maintaining factor underlying a range of psychological disorders (McEvoy and Mahoney, 2011, 2012).

With the overriding aim of informing model development, the current article aims to review research into the development of the construct, its measurement and underlying dimensions, its presence in clinical populations, and our current understanding of the relationship of IU with other psychological variables. The research reviewed suggests that it is an important explanatory construct across disorders; however, until now, treatments have received little attention and IU has only been specifically addressed within the generalized anxiety disorder (GAD) and obsessive-compulsive disorder (OCD) populations (Robichaud & Dugas, 2006; Whittal & McLean, 2002). More recent research (McEvoy and Mahoney, 2011) has been used to guide an in-depth focus of one aspect of the transdiagnostic model based on Perceptual Control Theory (PCT) and proposed by Mansell (2005). PCT has been used as a basis for this model due to evidence that goal identification is abnormal in psychological disorders (see further Watkins, 2011) and emerging evidence that promotion/prevention goals may be supported by

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differential neural patterns (Eddington et al., 2009; Klenk, Strauman, & Higgins, 2011).

The model extension provides a guide for the treatment of clients presenting with uncertainty in the context of either a single disorder or several comorbid disorders. It emphasizes an ideographic approach in which the client's recognition and understanding of low levels of emotional arousal become the focus of treatment. In addition to stronger emotional reactions that therapists and clients more readily recognize, the model highlights the importance of identifying lower-level arousal and a metacognitive belief that, in general, uncertainty should be avoided. By applying the model, the clinician is assisted to explore the presence of IU either in the form of the "Need for Predictability" or "Uncertainty Arousal."

Uncertainty is identified as an essential component of cognitive models of anxiety disorders which focus on elevated perceptions of threat as central to the manifestation of anxiety (Lovibond, 2006). In this respect, it could be argued that the identification of uncertainty as a construct, present across a range of disorders that feature anxiety, is not novel. Uncertainty is only one aspect of several variables conceptualized within cognitive models. As such, some treatment manuals for internalizing disorders do not emphasize the role of uncertainty (e.g., Curry et al., 2005; Rapee et al., 2006). It is assumed to be present within modules addressing negative automatic thoughts and the experience of anxiety; however, it is not necessarily independently labeled. Uncertainty may be encountered during cognitive restructuring, exposure, problem solving, or assertiveness and while experienced therapists may focus on it, novice therapists may not. Here, it is argued that explicitly acknowledging and normalizing uncertainty arousal (UA) is an important aspect of treatment.

Buhr and Dugas (2009) define IU as a dispositional characteristic reflecting a "tendency to react negatively on an emotional, cognitive, and behavioral level to uncertain situations" (p. 216). When analyzing the factors underlying the English translation of the IU Scale (IUS; Freeston et al., 1994), Buhr and Dugas (2002) explained IU in terms of four dimensions. These were that people (a) find uncertainty upsetting and stressful, (b) believe it is negative and should be avoided, (c)

perceive being uncertain as unfair, and (d) feel it leads to an inability to act. Thus, measures of IU assess metacognitive beliefs, cognitions, emotional arousal, and avoidance that arise when presented with uncertainty. An exploration of the construct of IU suggests that human reactions to uncertainty may be explained by two separate psychological factors that can be targeted within treatment, namely, need for predictability (NP) and uncertainty arousal.

#### **REVIEW OF CURRENT CONCEPTUALIZATIONS OF UNCERTAINTY AND IU**

Prior to proposing the model extension for IU, a review of our current understanding of individuals' reactions to uncertainty, research into individual differences in IU, dimensions of IU which relate to its measurement, and recent empirical research into the presence of IU across disorders is summarized. Although the review is not exhaustive, it has been presented in sufficient detail to brief the interested clinical researcher and lay the groundwork for the proposed model of IU (Figure 1).

#### **Uncertainty Intensifies Affect**

Psychologists have demonstrated that uncertainty is associated with an increased fear response since the 1960s. Fear conditioning paradigms provided evidence that the magnitude of the fear response to the unconditioned stimulus (UCS) is reduced when the UCS occurs predictably. Therefore, aversive events that occur under conditions of uncertainty have a more negative impact than certain negative events. In support of this association, participants were shown to prefer immediate electric shocks to unpredictable ones. Participants reported unpredictable shocks as noticeably stronger. Participants also felt more anxious when exposed to unpredictable shocks (Badia, McBane, Suter, & Lewis, 1966; Lanzetta & Driscoll, 1966).

Bar Anan, Wilson, and Gilbert (2009) hypothesized that uncertainty intensifies both positive and negative affect. By gaining information, individuals learn to predict and control their environment. Consequently, the reduction of uncertainty confers an adaptive advantage on the individual. Thus, in a negative context, uncertainty is experienced as aversive; however, when the context is positive, it is experienced as rewarding. An

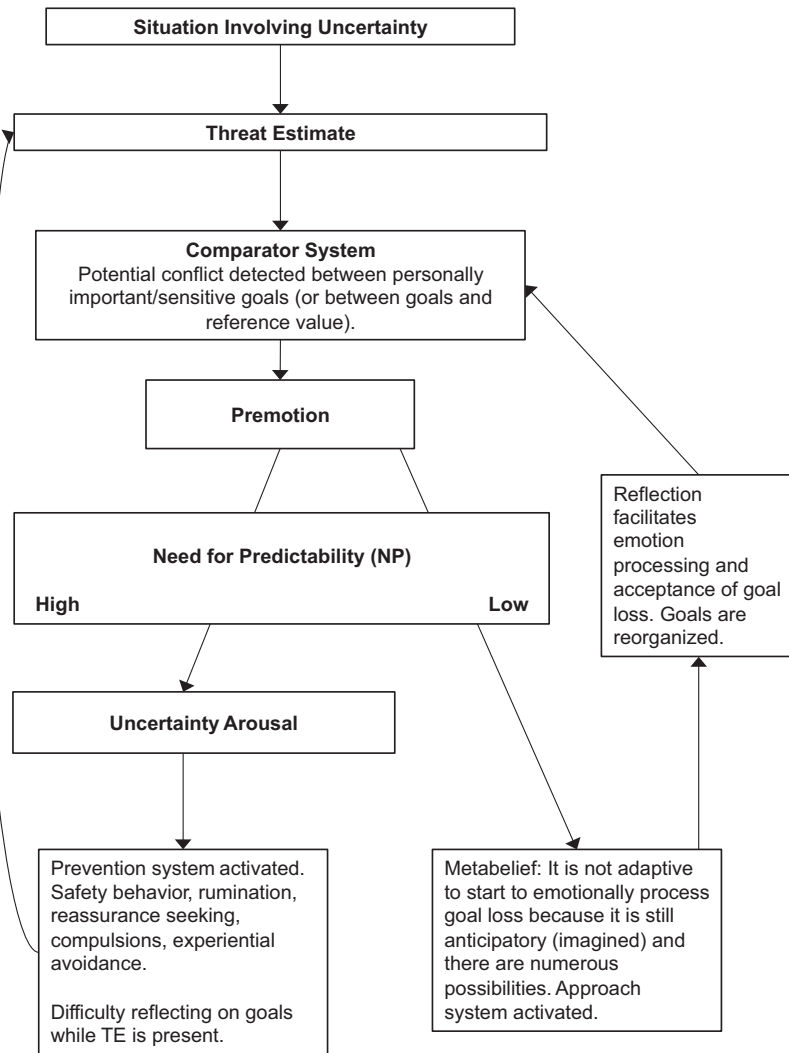


Figure 1. Model of intolerance of uncertainty.

explanation for this effect is that uncertainty may heighten attention and increase curiosity. This causes individuals to become more emotionally engaged with the uncertain event (Bar Anan et al., 2009).

In support of the idea that uncertainty can increase both positive and negative affect, Bar Anan et al. (2009) conducted a series of four studies. In their manipulation, participants uttered either certain or uncertain phrases while watching positive and negative film segments. Participants who uttered uncertain phrases demonstrated increased curiosity and produced more intense emotional reactions compared with participants who uttered phrases reflecting certainty (Bar

Anan et al., 2009). In a second study examining attractiveness using Facebook profiles, uncertainty was manipulated in female college students (Whitchurch, Wilson, & Gilbert, 2010). In the uncertain condition, participants were told that attractive male college students may or may not have liked them. In the certain condition, participants were told that the men had liked them. It was found that participants in the uncertain condition were more attracted to the men than participants in the certain condition. These results suggest that positive affect may be enhanced by uncertainty and reduced by certainty. Anecdotally, this experience may be similar to reduced enjoyment expe-

rienced when one views a movie that was made from a book, or vice versa. When an accurate reproduction has been made, the predictability may lessen the interest of the story.

#### **Individual Differences in IU**

While uncertainty has been found to elicit negative affect, this effect has been found to be greater in individuals high on IU. Greco and Roger (2003) presented undergraduate students with neutral and distressing images in either a predictable or unpredictable condition. In the anticipatory period, higher arousal levels were observed in the unpredictable condition, compared with the predictable condition. The results showed individual differences in the subjective stress experienced by participants. Specifically, those scoring high on a measure of IU demonstrated significantly higher systolic and diastolic blood pressure during the anticipation period compared with the low IU group.

In another experiment, Buhr and Dugas (2009) manipulated fear of anxiety and observed changes in worry scores between participants with low IU compared with high IU. In this study, nonclinical participants ( $N = 139$ ) were asked to complete three memory tasks. Then, they viewed an excerpt from a psychology lecture and were subsequently asked to present information from the initial memory task to a panel for evaluation. Although worry scores rose in both fear of anxiety conditions, the clients with high IU demonstrated significantly increased worry scores. In summary, research has demonstrated that in anticipating a threat, individuals with high IU demonstrate (a) increased blood pressure (Greco & Roger, 2003) and (b) increased worry (Buhr & Dugas, 2009), compared to individuals with low IU.

#### **The Relationship Between IU and Worry**

Research investigating the adverse effects of high IU has primarily focused on worry. In a range of studies, IU has been found to be the most salient predictor of worry. This is reflected by larger correlations between IU and worry compared with correlations obtained between worry and (a) positive beliefs about worry, (b) negative problem orientation (e.g., "I often see problems as bigger than they really are"), (c) cognitive

avoidance (Buhr & Dugas, 2002), and (d) anxiety sensitivity (Dugas, Gosselin, & Ladouceur, 2001). Worry and IU continued to be significantly correlated after controlling for intolerance for ambiguity, perfectionism, and perceived control (Buhr & Dugas, 2006). Most importantly, Dugas and Ladouceur (2000) observed that changes in IU often preceded changes in worry over the course of treatment. These findings provide support for the cognitive model of excessive worry developed by Dugas et al. (1998), in which IU was posited to play the central role in the development and maintenance of worry (Laugesen, Dugas, & Bukowski, 2003).

Is IU the same construct as worry? IU has been argued to reflect the overall tendency to find it unacceptable that a negative event might occur (however small the probability), whereas worry is a mental act (Buhr & Dugas, 2002). Accordingly, Figure 1 depicts worry as a behavior that manifests downstream of IU. Buhr and Dugas (2002) sum this up by stating that if an individual finds uncertainty unacceptable, when faced with it, he or she may worry to excess. In support of IU and worry being separate constructs, there is a higher incidence of worry reported by females, whereas there are no gender differences in IU (Buhr & Dugas, 2002).

#### **The Ability of IU to Predict Variance in Axis 1 Disorders**

Across a range of disorders (e.g., anxiety disorders, eating disorders, depressive disorders, and hypochondriasis), IU has been observed to be higher in clinical groups than in nonclinical control groups (Deacon & Abramowitz, 2008; Dugas et al., 2001; Gentes & Ruscio, 2011; Holaway, Heimberg, & Coles, 2006; de Jong-Meyer, Beck, & Riede, 2009; Sternheim, Startup, & Schmidt, 2011; Tolin, Abramowitz, Brigidi, & Foa, 2003). In the Holaway et al. (2006) study, individuals with comorbid GAD and OCD demonstrated the highest levels of IU, slightly higher than a GAD group (although this difference failed to reach significance,  $p < .07$ ) and higher than individuals with OCD alone and non-anxious controls. Yook, Kim, Suh, and Lee (2010) found that individuals with comorbid GAD and major depressive disorder (MDD) reported greater IU compared to individuals with MDD or GAD alone. In support of these findings, the number of diagnoses pre-

dicted IU in a sample of individuals seeking treatment for anxiety and depression (Mahoney & McEvoy, 2011a), such that IU increased with increasing comorbidity.

In an exploration of IU within a similar sample ( $n = 463$ ), McEvoy and Mahoney (2011) found that IU explained unique variance in all symptoms after controlling for neuroticism and other theoretically related constructs. Symptom variables included symptoms of depression, panic/agoraphobia, worry, social anxiety, obsessions, and compulsions. The constructs controlled for were metabeliefs, anxiety sensitivity, neuroticism, fear of anxiety, and positive/negative affect. As expected, neuroticism was highly correlated with IU ( $r = .55$ ). Interestingly, extraversion was negatively correlated with IU ( $r = -.18$ ). Respectively, IU accounted for most unique variance in symptoms of social anxiety and worry, followed by depression, panic disorder and agoraphobia, and OCD.

Although not a clinical population per se, Boelen and Reijntjes (2009) investigated the presence of IU in a sample of adults who had experienced a loss more than 18 months prior. Hierarchical regression analyses revealed the following results. First, neuroticism was the strongest predictor of social anxiety. Second, after controlling for neuroticism, two of seven potential cognitive correlates were significantly able to predict variance in social anxiety symptoms. These were fear of negative evaluation (FNE) and anxiety sensitivity. Constructs that failed to predict unique variance at this step were low self-esteem, perfectionism, and pathological worry. In the next step, IU independently predicted a further 4% of the variance in symptoms. An additional analysis examined the relative contribution of IU and FNE to social anxiety symptoms. This demonstrated that FNE explained 6.6% of variance in social anxiety symptoms over and above neuroticism and IU, whereas IU explained 5.4% of variance over and above neuroticism and FNE when a similar analysis was conducted. Finally, Boelen and Reijntjes (2009) examined specific relationships after controlling for shared variance in symptoms and demonstrated that IU had the strongest link with OCD, followed by social anxiety, GAD, and finally depression.

In summary, studies of IU within Axis 1 disorders show that IU is present across eating disorders, anxiety

disorders, and depressive disorders. IU appears to be higher with escalating comorbidity (Holaway et al., 2006; Yook et al., 2010). It has a strong presence in social anxiety and OCD (Boelen & Reijntjes, 2009; McEvoy and Mahoney, 2011). Multiple studies have examined its association with symptoms after controlling for theoretically relevant concepts. These studies support the argument that IU is an independent contributor to psychological symptoms (Boelen & Reijntjes, 2009; McEvoy and Mahoney, 2011).

### The Measurement of IU

Researchers have defined IU as a single construct made up of multiple dimensions. The original IUS was designed as a broad measure to assess an individual's emotional, cognitive, and behavioral reactions to uncertainty in everyday life situations (Freeston et al., 1994). The IUS is a 27-item self-report measure developed in French and translated into English and used by members of both this research group and others in the majority of early and many recent studies of IU (Boelen & Reijntjes, 2009; Buhr & Dugas, 2002, 2006, 2009; Dugas et al., 1997, 1998, 2001; de Jong-Meyer et al., 2009; Ladouceur et al., 1997; see Gentes & Ruscio, 2011, for a more complete list of studies using the IUS).

Numerous factor analyses conducted with large sample sizes have suggested a complex structure of between four and five factors underlying IU. Cross-over factorial loadings on several items mean that dimensions are difficult to interpret clearly. The complexity appears to arise from redundancy and the lack of a close relationship between items on the original IUS and items on the back-translated English version of the scale (Buhr & Dugas, 2002; Carleton, Sharpe, & Asmundson, 2007; Gosselin et al., 2008; Norton, 2005). Maack, Deacon, and Abramowitz (2005) argued that some items on the IUS do not exhibit face validity and instead measure presumed consequences associated with IU rather than IU directly (cited by Gosselin et al., 2008).

In an effort to remove item redundancy and optimize internal consistency, Carleton, Norton, and Asmundson (2007) developed a 12-item version of the IUS. The short IUS (IUS-12) contains two dimensions: *Prospective Anxiety* and *Inhibitory Anxiety*. These dimen-

sions are further described in the section below. This measure was developed through confirmatory factor analysis and careful psychometric reasoning (Carleton, Norton, et al., 2007).

A third measure, the IU Inventory (IUI; Gosselin et al., 2008), was developed in response to the limitations identified on the IUS and thus separated items examining IU from items measuring the consequences of IU (e.g., doubt, reassurance seeking, or avoidance). This 45-item self-report scale was developed using a French-speaking sample.

Mahoney and McEvoy (2011) developed a situation-specific measure of IU that is the IUS-Situation-Specific Version (IUS-SS). This measure assesses state-based uncertainty. The measure is comprised of 12 items emphasizing uncertainty that has arisen in a current situation (e.g., “Unforeseen events associated with this situation upset me greatly”; “I always want to know what the future has in store for me for this situation”; “I should be able to organize everything in advance for this situation”). The IUS-SS was completed by 218 clients seeking treatment for anxiety and depression, and was shown to have excellent internal consistency and a unitary factor structure. The authors compared the new measure with the IUS. They found that participants reported more situation-specific IU than trait IU. The measure adds to the literature by providing a method of assessing state IU during treatment and experimental research.

Thus, four measures currently assess IU, namely, the IUS, the IUI, the IUS-12, and the IUS-SS. These have been briefly described to provide readers with an overview of available measures and to introduce the subsequent analysis in which underlying dimensions of IU can be considered to form a basis for the expanded transdiagnostic approach to IU proposed in this article.

#### **Understanding the Dimensions of IU Found on the IUSs**

Using the IUS (Freeston et al., 1994), Berenbaum, Bredemeier, and Thompson (2008) examined how IU factors related to other known constructs in the social psychology and personality literature. The study was conducted in a nonclinical population. A factor analysis on the original IUS revealed four factors. These were as follows: (a) desire for predictability (e.g., “I always want to know what the future has in store for me”);

(b) uncertainty paralysis (e.g., “When it’s time to act, uncertainty paralyzes me”); (c) distress experienced in the face of uncertainty (e.g., “Uncertainty makes me vulnerable, unhappy, or sad”); and (d) inflexible uncertainty beliefs (e.g., “It’s unfair having no guarantees in life”). Relationships between these factors, the five-factor model of personality, and the “need for cognitive closure” scale (defined as an “individual’s desire for a firm answer to a question and an aversion toward ambiguity”; Kruglanski & Webster, 1996, p. 264) provide a deeper level of explanation of how aspects of IU may relate to clinical presentations.

Uncertainty *paralysis* demonstrated the highest correlation with worry ( $r = .63$ ) and a moderate correlation with anhedonic depression ( $r = .31$ ). Neither *inflexible uncertainty beliefs* ( $r = .04$ ) nor *desire for predictability* ( $r = .03$ ) obtained significant correlations with anxious arousal despite both demonstrating strong correlations with worry ( $r_s = .50$  and  $.46$ , respectively). *Desire for predictability* was associated with both conscientiousness ( $r = .29$ ) and neuroticism ( $r = .29$ ) and was less strongly associated with extraversion ( $r = .06$ ) than *uncertainty paralysis* ( $r = -.23$ ).

The authors concluded that our understanding of IU would be enhanced by a focus on two of the four factors: *uncertainty paralysis* and *desire for predictability*, theorizing that *desire for predictability* may directly increase worry whereas *uncertainty paralysis* would contribute to avoidant behavior, which would maintain a pattern of worrying and be an obstacle to exposure treatments (Berenbaum et al., 2008).

Interestingly, subscales on IUS-12 (Carleton, Norton, et al., 2007) demonstrated support for an emphasis of two of the four factors identified on the IUS in the aforementioned study by Berenbaum et al. (2008), as designated by the Prospective Anxiety Scale and the Inhibitory Anxiety Scale. Items on the IUS-12 reflecting a preference for certainty are incorporated into the Prospective Anxiety Scale. Example items include “I always want to know what the future has in store for me,” “One should always look ahead to avoid surprises,” “I can’t stand being taken by surprise,” and “Unforeseen events upset me greatly.” The items suggest that unexpected events spoil everything and stop an individual from being prepared. Items on the Inhibitory Anxiety Scale refer to the

ideas that uncertainty is (a) paralyzing (e.g., “When it’s time to act, uncertainty paralyzes me”), (b) compromises individual functioning (e.g., “When I am uncertain I can’t function very well”), and (c) prevents the individual from moving forward and from living a full life (e.g., “Uncertainty keeps me from living a full life”). Later, confirmatory factor analyses have also settled on two factors (Carleton, Norton, et al., 2007; Sexton & Dugas, 2009), namely, prospective anxiety and inhibitory anxiety.

In support of this distinction, McEvoy and Mahoney’s (2011) results suggest that the relative importance of inhibitory anxiety and prospective anxiety may vary across disorders. In their hierarchical regressions, neuroticism was entered at Step 1, and the two IUS subscales were entered at Step 2. The criterion variables in each of the seven models were symptoms of the various disorders. The authors found that prospective anxiety (discussed here as need for predictability) explained unique variance in worry and obsessive-compulsive symptoms but did not explain unique variance in the remaining symptom groups (i.e., panic disorder and agoraphobia, depression, and social anxiety). In contrast, *inhibitory anxiety* explained unique variance in these latter groups but not in worry or obsessive-compulsive symptoms. Thus, the two types of IU explained unique variance in different presenting symptoms. This finding was replicated in a second study by these authors (McEvoy and Mahoney, 2012). In a large treatment-seeking sample, the need for predictability partially mediated the relationship between neuroticism and symptoms of GAD and OCD, whereas *inhibitory anxiety* partially mediated the relationship between neuroticism and symptoms of panic disorder and agoraphobia, depression, and social anxiety.

In summary, two domains appear to underlie IU, namely, *need for predictability* (NP) and *Inhibitory Anxiety*. These emerge from factor analyses of the initial IUS and are supported by further scale development (IUS-12; Carleton, Norton, et al., 2007). Additional support for the importance of these two dimensions is drawn from studies investigating the relationship between IU and other psychological constructs (Berenbaum et al., 2008; McEvoy and Mahoney, 2011, 2012). In the present model, an alternative name has

been given to *Inhibitory Anxiety*. This is the term *Uncertainty Arousal*. UA emphasizes the somatic component believed to be responsible for its inhibitory effect.

#### THE EXTENDED TRANSDIAGNOSTIC MODEL OF IU

Comorbidity is a frequent challenge for clinicians, and transdiagnostic approaches may assist the clinician to emphasize underlying processes which may be shared across disorders (Fairburn, 2011; Mansell, Harvey, Watkins, & Shafran, 2009). The recent renewed interest in IU provides an opportunity to explore ways in which a focus on IU may expand transdiagnostic approaches and enhance treatment. The primary aim of the model proposed in the current article is to provide the clinician with a transdiagnostic formulation to integrate treatment techniques. The model is useful because uncertainty has been shown to be present and central across disorders and to increase with comorbidity. Using this model, clinicians can assist their clients to recognize emotional responses to uncertainty and reduce their fear of these. The model also suggests that the client’s general desire for predictability become a target in treatment. In addition, as suggested by most existing cognitive behavior therapy (CBT) approaches, emotional responses that arise from exaggerated previews should be addressed. The model is not unique when compared to ideas advocated within both the acceptance and commitment therapy (ACT) hexaflex (Hayes, Levin, Plumb-Villardaga, Villatte, & Pistorello, 2011) or traditional CBT models of anxiety and other disorders (e.g., Clark, 1996; Salkovskis, 1996). However, it is unique in drawing on a range of strategies within these approaches to specifically address IU. The model aims to provide the clinician with a conceptual understanding of why IU is important and should be specifically targeted within treatment. For instance, a clinician may use exposure in the treatment of an anxiety disorder, but may overlook uncertainty as an important part of the rationale and target for the intervention. This clinician may instead emphasize increased ability to cope, reduced expectations of catastrophic outcomes, or habituation. The proposed techniques for targeting different dimensions of IU (i.e., the Desire for Predictability and Inhibitory Anxiety) draw from both traditional CBT and ACT approaches. Within treatment, the model extension for IU and treatment

review emphasize recognizing and altering uncertainty using existing empirically supported strategies and also refer to some more novel treatment strategies. Treatment directions based on the new transdiagnostic model of IU extend, rather than negate, existing treatments. The purpose of the model extension is to ensure that IU is clearly understood and targeted as a maintaining factor across disorders.

#### **DESCRIPTION OF THE EXTENDED TRANSDIAGNOSTIC MODEL INCORPORATING IU**

Figure 1 describes the proposed model of uncertainty with three possible paths. When faced with uncertainty, the individual makes a threat estimate (TE). This estimate is an imagined aversive consequence. Gilbert and Wilson (2009) describe the TE as a mental simulation or preview of the future. Multiple previews may be generated. Consistent with cognitive models of danger expectancy, each preview may involve exaggerated estimates of one or more of three factors (i.e., probability, cost, or coping inability). These estimates may be drawn from cognitive biases in our memories of past experiences (see further Gilbert & Wilson, 2009). The first path predicts that if the threat expectancy is low, no arousal is experienced despite the presence of uncertainty.

The TE activates emotional arousal if the uncertainty is in an area of personal importance and/or sensitivity for the individual (e.g., the threat of negative social evaluation for an individual with social anxiety disorder). Estimates of personal importance are held within a comparator system. The comparator system was originally outlined by Gray (1982) and further elaborated by McNaughton and Gray (2000). In their exposition on the neuropsychology of anxiety, they outline a “comparator of inputs” which compares what is perceived (actual events) to what is desired (expected events). When a discrepancy is noted, the comparator system may halt the current program in an attempt to resolve the mismatch and alter the individual’s actions.

Mansell (2005) described a comparator system based on PCT (Powers, 1973). Within PCT, the comparator system is a self-regulatory system in which layers of control are hierarchically arranged. In short, higher-order goals set reference values for lower order goals within the system. The lower-order goals then manip-

ulate the environment. Within this system, the higher-order levels are not always available to awareness. The theory proposes that psychological distress arises from unresolved conflict between goals. These goals may exist within different levels of the system (Higginson, Mansell, & Wood, 2011). The comparator described in Figure 1 refers to the “imagination mode” of a control hierarchy. The “imagination mode” conducts a comparison process, whereby higher-level control systems provide feedback perception internally “as if” it is being perceived, and yet short-circuit the lower-level systems that would be required to enact this mental simulation within the real world.

Heine, Proulx, and Vohs (2006) proposed that the superordinate goal of humans is to generate a life with meaning. Sense of meaning is comprised of multiple domains (e.g., self-esteem and belonging). When a sense of meaning is threatened, the individual may compensate for an inability to reach one set of goals by shifting effort toward another set (known as fluid compensation; Heine et al., 2006; Proulx, 2012). This parallel literature postulates layers of goals, compatible with PCT.

Returning to Figure 1, each preview is associated with emotional arousal described as a “premotion”. The premotion occurs as a direct consequence of the preview the individual has made (Gilbert & Wilson, 2009).

Individuals also possess a metabelief about their willingness to experience uncertainty. This is referred to as the need for predictability (as described in detail earlier). Factors hypothesized to influence an individual’s NP are (a) high standards (perfectionism), (b) rigidity, and (c) perceived need for control.

In response to NP, the paths diverge. For those with high NP, recognition of a discrepancy within the comparator system creates a second level of arousal described as UA (IU Factor 2). The UA is unpleasant and leads to a range of behaviors (e.g., reassurance seeking, safety behaviors, compulsions, and/or avoidance). The behavior attempts to manage the arousal without returning to the comparator system to reflect and reorganize goals. Attention remains focused on the TE.

The high NP cycle is maintained by the metabelief that it is useful to anticipate multiple previews. Multi-



ple previews have associated actions which may conflict. The inhibition of these conflicting actions may contribute to UA. The UA is usually experienced at a low intensity and there is a lack of insight into its presence. UA is viewed to have an ecological basis, as it prevents an escalation of arousal if the feared event were to occur. Moreover, the individual has a higher chance of survival if he or she is prepared for the worst (Thayer & Lane, 2009). Boelen and Reijntjes (2009) argue that safety behaviors and self-focused attention decrease the intense feelings of uncertainty that occur in social evaluative situations. Similarly, worry reduces uncertainty experienced by participants with GAD when imagining a future catastrophe (Boelen & Reijntjes, 2009). Over time, the avoidance behavior may become so automatic and habitual that the previews (TEs) are no longer accessible to awareness.

The low NP group encounter minimal or no UA. Individuals in this group endorse the metabelief that it is not adaptive to start to emotionally process goal loss because it is still anticipatory (imagined) and there are numerous possibilities. To process early would be a waste of their resources. Therefore, these individuals exert attentional control over the TE. They demonstrate patience, accepting that the situation will not be resolved shortly.

In the individual with a low Need for Predictability, arousal acts as a signal for drawing attention to shift psychological change to the systems in conflict and the superordinate goal that drives them. When individuals exert attentional control over their environment, they are able to reflect on their goals and reorganize them in a way that is compatible with fluid compensation, by transferring their effort to a different, previously less valued set of goals. This process is utilized effectively during cognitive reappraisal, problem solving and imagery restructuring in therapy. Reflection facilitates emotion processing of the promotion and the consideration of new information. Thus, actions are enabled that allow the individual to remain in a promotion-motivated system (Tritt, Inzlicht, & Harmon-Jones, 2012). McNaughton and Gray (2000) suggest this mechanism within their model of a behavioral inhibition system.

At a neurological level, it is proposed that the danger expectancy and consequent conflict within a level

of the comparator system has the propensity to move the individual from being in a promotion-motivated system to a prevention-motivated system. Evidence supporting the fundamental tenets of the model can be inferred from the research in the preceding review, with more specific evidence for key aspects of the model summarized in Table 1.

### **The Neural Underpinnings of IU**

Neuroscience has not yet reached a point where definitive conclusions can be made regarding neurological bases of uncertainty. Studies can be divided into two categories. The first category includes studies in which uncertainty has been manipulated (i.e., research investigating the neural correlates of state uncertainty). These studies are summarized below and placed in the context of additional research explaining the putative roles of identified neurological structures. The second category is comprised of studies that have manipulated uncertainty and identified its neural correlates after administering an IUS. As such, these studies examine the neural correlates of both state and trait uncertainty. The most impressive findings have focused on the role of the insula cortex. Singer, Critchley, and Preusschoff (2009) have postulated a model for the integration of feelings, empathy, and uncertainty. Their model shares facets of the framework put forward in the current model. A review of potential neural underpinnings of the current model is presented. While the evidence is preliminary, the interested clinical reader may further understand the current ability of neuroscience research to inform the proposed model. Including this brief review allows further predictions to be made about the model.

**Neural Structures Related to State Uncertainty.** Current research suggests several structures which are activated in the presence of state uncertainty. These include the dorsal anterior cingulate cortex (dACC), the rostral ACC (rACC), and the amygdala. Studies in both normal and anxious individuals point to an active role of the dACC and the amygdala when ambiguous facial expressions are presented (Kim, Somerville, Johnstone, Alexander, & Whalen, 2003; Kim et al., 2004), and in response to a small financial decision-making task (Critchley, Mathias, & Dolan, 2001). Neuroscience reviews suggest that the amygdala provides the emo-

**Table 1.** Summary of key evidence for model

Model segment	Evidence for model	Source	Limitations of evidence/Inherent difficulties for model predictions
Interaction of Need for Predictability with danger expectancies	High trait anxious individuals failed to learn significance of a safety signal accompanying an electric shock. Increased arousal was shown to be present only when danger expectancies were elevated and to disappear for those participants who were certain of contingency	Chan and Lovibond (1996)	It is impossible to manipulate uncertainty without manipulating danger expectancy; however, danger expectancy can be manipulated with or without an uncertainty manipulation
Separation of IU into Uncertainty Arousal and Need for Predictability	Results summarized under heading: Understanding dimensions of IU found on the IU scales In a treatment-seeking sample, after controlling for Neuroticism, <i>NP</i> obtained significant partial correlations with OCD and GAD symptoms, whereas <i>IA</i> obtained significant partial correlations with social anxiety, depression, and agoraphobia/panic	Multiple; see text McEvoy and Mahoney (2011)	Investigation within specific disorders required to support this differentiation
Uncertainty Arousal precedes worry	IU was shown to mediate the relationship between repetitive negative thoughts and major depressive disorder Changes in IU preceded reductions in worry in response to treatment	Yook et al. (2010) Dugas and Ladouceur (2000)	Replication required
Uncertainty Arousal is modulated by Need for Predictability Insula cortex processes prediction errors	Greater IU scores were related to elevated affective responses to uncertainty in a decision-making task The anterior insula signals probabilities of risk and prediction errors when processing uncertain cues	Krain et al. (2008) Sarinopoulos et al. (2010), Preuschoff, Quartz, and Bossaerts (2008)	
Anterior insula may integrate somatic sensations with prediction errors	Degree of insula activation during ambiguous situations relates to the subjective degree of aversion involved in affective uncertainty Insula responses are sensitive to changes in heart rate, galvanic skin response, and vagus nerve stimulation	Singer et al. (2009) Refer to text Simmons et al. (2008)	Hyperactivity in neural structures does not explain pathogenesis.
ACC combines somatic sensations in response to higher risk	Influence of delay was examined in a decision-making task representing financial gain or loss. Uncertainty manipulated through the amount of risk in the task. As participants awaited outcome feedback, ACC activity reflected anticipatory arousal (measured by galvanic skin response). While activity in the bilateral anterior cingulate and lateral orbitofrontal cortex was modulated by outcome uncertainty, activity in the right anterior cingulate, right dorsolateral prefrontal, and parietal cortices was modulated by degree of anticipatory arousal. A discrete region of the anterior cingulate showed effects common to both the degree of risk and the degree of arousal in the task	Critchley et al. (2001)	Hyperactivity may represent a correlate, a complication or a risk factor High risk equated to difficulty guessing higher versus lower subsequent card that translated into loss of money. Unable to differentiate between threat expectancy and IU. Small <i>N</i> ( <i>N</i> = 8)
Promotion system activated, leading to less arousal and increased attentional control in low NP paths	Voluntary sustained attention reduces excessive emotional reactivity following treatment with mindfulness meditation	Chiesa and Serretti (2010)	IU was not measured in this study. Speculation that the promotion system is activated
Role of the pre frontal cortex (PFC)	Evidence that short allele attentional biases in the prefrontal cortex are due to overactivity of the threat detection mechanism or underactivity of the attentional control mechanism (or both). Short allele linked to <ul style="list-style-type: none"> <li>• attentional biases toward threat in psychiatric patients and healthy women,</li> <li>• difficulty in disengaging attention from threat,</li> <li>• amygdala hyperactivity toward threat, and</li> <li>• decreased functional connectivity between the amygdala and the ACC.</li> </ul> Employing reappraisal as an emotion regulation strategy leads to increased PFC activity and reduced amygdala activity while watching aversive films	[Beevers, Gibb, McGeary, and Miller (2007), Beevers, Wells, Ellis, and Miller (2009), Osinsky et al. (2008)] cited by Cisler and Koster (2010)	

(Continued)

Table 1. (Continued)

Model segment	Evidence for model	Source	Limitations of evidence/Inherent difficulties for model predictions
Prevention system activated in individuals with a high NP	Worry heightens negative emotionality such that no further increases in negative affect or physiological responding are observed in response to fear exposure	Llera and Newman (2010), Newman and Llera (2011)	Inclusion of an IU measure required to establish NP assertion. Experiment compared GAD to nonanxious controls. IU not measured Need to replicate finding while measuring associated neural activity
	IU predicted emotional responding to uncertain threat	Nelson and Shankman (2011)	
	IU was negatively correlated with context-potentiated startle responses in a temporally unpredictable context IU only related to startle during unpredictable threats. Perceived control over anxiety-related events mediated the relation between IU and startle to uncertain threat		

Note. ACC = anterior cingulate cortex; GAD = generalized anxiety disorder; IU = intolerance of uncertainty; NP = need for predictability; OCD = obsessive-compulsive disorder; UA = uncertainty arousal.

tional response to a stimulus as it responds reliably and preferably to stimuli that predict threat (Shin & Liberzon, 2010; Whalen et al., 2001). The finding is also based on experimental studies in which participants are presented with emotionally conflicting information. For instance, in a widely cited study, participants were asked to identify fearful or happy facial expressions from a photograph. The words “happy” or “fear” were written across the faces, and these words were either congruent or incongruent with the expressions (Etkin, Egner, Peraza, Kandel, & Hirsch, 2006). The results showed that during an anticipatory period, the dACC and amygdala were activated, and then once conflict had been detected, the rACC was activated and it was believed to suppress the amygdala and associated physiological responses.

Thus, results suggest that the dACC detects conflict, while the rACC evaluates emotional information and is potentially involved in emotion regulation (Beaudreau, Brandt, & Reynolds, 2013; Bishop et al., 2004; Etkin et al., 2006; Mohanty et al., 2007; Moser, Moran, & Jendrusina, 2012). Moreover, higher dACC activity has been associated with greater levels of anxious apprehension (Silton et al., 2011). Anxious groups demonstrated hypoactivation of the rACC compared with nonanxious controls in an emotional Stroop task (Engels et al., 2007). Hyperactivity in the ACC, the amygdala, and the insula in participants with spider phobia diminished two weeks after intensive exposure sessions (Goossens, Snaert, Peeters, Griez, & Schruers, 2007).

The interaction of the aforementioned structures has been further investigated under conditions of pro-

longed uncertainty in participants with GAD. Yassa, Hazlett, Stark, and Hoehn-Saric (2012) used a gambling paradigm, with one condition including noncontingent monetary loss. Participants with GAD were found to demonstrate decreased activity in the amygdala and increased activity in the bed nucleus of the stria terminalis (BNST) during a prolonged uncertainty task compared to a nonanxious control group. Thus, the researchers proposed that under conditions of ongoing uncertainty, having been activated initially, the amygdala may disengage to allow the BNST to maintain a continuous anxious state.

The role of the ACC is complex. An in-depth analysis of the Critchley et al. (2001) results implicated a discrete region of the anterior cingulate involved in both somatic responses and representations of outcome uncertainty in the anticipatory period. The authors concluded that this region integrated cognitive representations of uncertainty with arousal mediated by the autonomic nervous system.

Altered insula activation has been observed in numerous anxiety disorders (Rauch, Savage, Alpert, Fischman, & Jenike, 1997). Simmons and colleagues observed greater activation in the insula for young adults with high anxiety (nontreatment-seeking) when matching emotional faces (Stein, Simmons, Feinstein, & Paulus, 2007) and during anticipation of a negative image (Simmons, Strigo, Matthews, Paulus, & Stein, 2006). Sarinopoulos et al. (2010) examined prediction errors when processing uncertain cues in anticipation of viewing a neutral or aversive picture. In their study, insula and amygdala responses were larger after an

uncertain cue than a certain cue. Insula responses are sensitive to changes in heart rate, galvanic skin response, and vagus nerve stimulation (Simmons et al., 2008). The insula has been postulated to be a key area for processing the individual's physiological state. Connectivity analyses suggest the presence of greater coupling in patients with GAD between the amygdala and the insula (McClure et al., 2007).

**Neural Correlates of Self-Reported IU.** Adolescents diagnosed with anxiety disorders displayed different patterns of neural responsiveness according to their self-report of IU (using the IUS; Freeston et al., 1994). Adolescents reporting low IU demonstrated deactivation of frontal and limbic regions (including the ACC, OFC, and bilateral amygdala), whereas those with high IU demonstrated activation of these areas when making decisions involving 50% uncertainty. Of note, the uncertainty task did not involve threat, and anxiety ratings were low during the task. Krain et al. (2008) suggested that amygdala deactivation may be a key component of emotion regulation facilitating lower levels of task-related anxiety. While individuals with low IU exhibit this neural deactivation when faced with situational uncertainty (in this case, in a decision-making task), individuals with high IU may exhibit the opposing neural response.

In a second study, IUS scores correlated positively with activation in the bilateral insula during affective ambiguity (Simmons, Matthew, & Paulus, 2008). This study entailed a distinction between affective uncertainty and nonaffective uncertainty by providing a discrimination task in which participants were presented with a wall of faces. In the task, participants decided whether more faces were “Angry or Happy” (affective trials) or “Female or Male” (nonaffective trials). Ambiguous ratios resulted in longer response latencies. Analyses revealed that activation in the posterior cingulate, left insula, right superior temporal gyrus, and right putamen during affective uncertainty was significantly related to IUS scores. Within the insula, subregions were identified that displayed significant correlations with IUS scores. The authors concluded that the degree of insula activation during ambiguous situations related to the subjective degree of aversion involved in affective uncertainty.

Singer et al. (2009) have put forward a model in which the insula cortex is proposed to support different levels of current and predictive emotional states. It is responsible for predicting emotions and for processing error-based learning. Within the Singer et al. model, environmental information is integrated in a general subjective feeling state modulated by risk aversion and context appraisal. The anterior insula is responsible for the “premotion” by simulating forward representations of bodily states in response to emotional stimuli. As a part of their review, they explain that as uncertainty possesses a motivational value, it is reflected in a distinct feeling state. The anterior insula is proposed to integrate uncertainty with bodily, affective, and sensory information to improve learning and decision-making in the presence of physiological reactivity. Bodily and affective responses to uncertain stimuli are argued to facilitate behavioral responses aimed at avoiding uncertainty. Interestingly, their model (based on the role of the insula cortex) shares many similarities with the model of IU proposed here.

A preliminary neural proposal arising from the previous review follows. The dACC may be an initial component of the comparator system, detecting mismatch between expectations and actual events. In a situation of uncertainty, both the dACC and amygdala may be activated. The insula cortex is also proposed to be activated and to integrate somatic arousal (Uncertainty Arousal), with Threat Expectancy. The rACC may be activated at the next step and be involved in attentional control together with the insula cortex. The dACC, amygdala, and BNST are proposed to be more active in individuals who do not reflect and reorganize, leading to sustained arousal in individuals with high NP.

#### **Predictions Arising From the Extended Transdiagnostic Model**

Several predictions stemming from the model can be empirically evaluated. Chief among these, the three pathways of the model can be verified using experimental and applied experimental methods. The three pathways predict:

1. If there is no elevated threat expectancy, there will be no emotional response in the face of uncertainty.
2. If an elevated TE is present:

- a. In individuals with a high need for predictability, uncertainty arousal will be sustained for a period of time. They will describe the preemption but show no evidence of accepting it. When prompted to reflect, they will focus on ways of eliminating the TE. These individuals exhibit safety behaviors, rumination, or reassurance seeking.
- b. In individuals with a low need for predictability, uncertainty arousal will be absent or fleeting. On this path, the individual will recognize the preemption and over time be able to report reduced arousal when considering the preview. When prompted to reflect, the individual will demonstrate evidence of reorganizing threatened goals.

To test the role of Need for Predictability, studies must measure NP independently of Uncertainty Arousal. UA should be measured both pre and post the uncertainty manipulation. An empirical test of the role of NP and the three pathways in the model can be achieved through manipulating threat expectancy for two groups of individuals with high versus low NP. This can be conducted in a range of paradigms. Electric shock paradigms allow detection of physiological arousal and collection of self-report data, thereby demonstrating the predicted relationships between the threat expectancy and uncertainty arousal for the three paths. Other applied experimental paradigms, conducted over a one-week time period, allow for observation of behavioral approach or avoidant behavior, and permit assessment of insight and goal reorganization. In response to an uncertainty manipulation that produces an elevated threat expectancy, the two latter pathways predict that those with high NP will engage in avoidant behavior and fail to report changes in goals. In contrast, individuals with low NP will exhibit approach behavior and report changes in goals.

#### **Application of the Transdiagnostic IU Model Across Disorders**

As well as lending itself to empirical testing, the proposed model has potential clinical implications across a wide range of internalizing disorders.

Examples of an individual who experiences the left pathway (High NP, High TE) across various clinical scenarios are given below.

**Social Anxiety.** The individual seeking social acceptance may respond to leaving a social situation by inflating her interpretation of how badly the evening has been (postevent filtering). She may either inflate the chance that her friend will now dislike her or inflate the cost of this occurring and/or she may underestimate her ability to cope with this scenario (TE). Her goal of having this person as a close friend may be threatened (CS). There are several actions she could take to reduce her danger expectancy (e.g., call another friend to discuss or communicate with the friend concerned in a range of ways). All have the potential for resolution or may magnify the damage from the evening before. The feared scenario makes her feel sad and disappointed (preemption); however, she is aware that she may be engaging in an excessively harsh interpretation and therefore that she needs to wait to find out whether the anticipated negative social consequences will occur (i.e., there is an awareness that she needs to wait for disconfirmatory evidence). The realization that these actions may be unhelpful and the sense that it is premature to dwell on the disappointment, at this stage, leads to uncertainty. The uncertainty arousal is unpleasant. She seeks to reduce it through her behavior (e.g., seeking reassurance from others). In the case of worry, she may respond to her safety behavior by generating further incorrect previews.

#### ***Awaiting Diagnosis of a Life-Threatening Illness.***

Another example of uncertainty may manifest when an individual awaits a diagnosis and associated prognosis of a severe health threat. In this case, the individual will imagine a range of diagnoses with terrifying prognoses (TE). These prognoses will render many goals insignificant and require new goals to be established. Again, either the probability, cost, or belief in coping may be exaggerated negatively (TE). In response to these previews, the individual with high NP will start to experience intense fear and sadness (preemption). However, once again NP will influence the conflict in her awareness as she must await test results and knows it is premature to begin to grieve or process the situation. Thus, there is separate emotional arousal that directly arises from the uncertainty of the situation. In contrast,

once an individual has a specific diagnosis and prognosis (even if the prognosis is bad), the uncertainty arousal disappears. If the prognosis is accepted, the grieving process can begin and goals can be reorganized.

**Panic Disorder.** Earlier in this article, the finding that UA mediated the relationship between panic disorder and neuroticism, whereas NP did not, was reported (McEvoy and Mahoney, 2012). Thus, in panic disorder, NP is less likely to be a necessary contributor to the path taken. It is proposed that an inflated TE may be sufficient. When an individual with panic disorder is faced with some physiological signs of panic (e.g., dizziness), he is concerned that this means he may be going crazy and inflates the chance that this symptom represents an emerging psychosis (TE). His goals may be threatened as he becomes preoccupied with his symptoms although he is unlikely to reflect on them. In response to TE, he experiences fear and inadvertently triggers the fight/flight response (premotion). However, he is also aware that he has had this symptom before and that it has not yet led to psychosis. Therefore, he experiences uncertainty arousal as a result of not knowing the outcome at this stage. He exhibits safety behaviors (e.g., checking his breathing rate) in an attempt to remove the panic symptoms and TE. He is also attempting to remove the uncertainty arousal. Anxiety sensitivity has been defined as IU when experienced in relation to uncertain physical consequences that may occur with a state of arousal specifically (Carleton, Sharpe, et al., 2007). This suggests that in the case of panic, anxiety sensitivity may be an alternative description synonymous with uncertainty arousal.

**Obsessive-Compulsive Disorder.** As an example of a case of OCD, a highly superstitious woman with a fear of being poisoned refuses to drink from open water bottles and exhibits rituals when buying water from a shop. If she were to leave her drink unattended and return to it, the uncertainty would surround the imagined idea that someone may have spiked the contents. The image of her drink being spiked and her subsequent collapse (TE) creates fear (premotion). However, it also creates doubt and consequent UA. She is unwilling to experience the uncertainty arousal that the situa-

tion creates and therefore engages in both rituals and avoidance behavior prior to drinking. These decrease the TE and UA. Need for predictability predicts the strength of the relationship between uncertainty arousal and her compulsions/avoidant behavior.

**Eating Disorders.** A qualitative study of eating disorder patients found that anorexia nervosa patients experienced uncertainty as stressful and wished to avoid it at all costs. Sources of uncertainty reported were FNE and evaluating oneself as imperfect. Individuals also reported experiencing uncertainty regarding both the number of calories in food they were eating, as well as being unable to have fun due to a concern of what may happen next. They felt that uncertainty created anxiety and a sense of being “out of control,” which they sought to redress through extreme organization and planning (Sternheim, Konstantellou, Startup, & Schmidt, 2011). In the case of an eating disorder, uncertainty may be perceived in a range of situations, from food to social evaluation. The predictability of events is highly desired (NP). A preview of weight gain subsequent to eating a novel food (TE) may be exaggerated, leading to emotional arousal (premotion) congruous with the imagined consequence. Previews may or may not be conscious. It is possible that the avoidant reaction has become so automatic over years of repetition that previews are not able to be easily described by individuals. Once again, the model predicts awareness that the preview (TE) and premotion may be premature and incorrect. This creates uncertainty arousal. There is a reaction to remove the uncertainty arousal by avoiding foods of uncertain caloric content or through eating rituals.

#### **ADDRESSING COMPONENTS OF THE IU MODEL WITHIN TREATMENT**

Each aspect of the model can be specifically addressed in treatment. The following section outlines specific techniques to address the various components of the model. Some of these methods are well known and are widely used in cognitive behavioral treatments. However, the focus here is the emphasis on *uncertainty* within the method. Where methods have been described well elsewhere, they are mentioned only briefly here.

### **Desire for Predictability**

The desire for predictability refers to a metabelief that can reinforce avoidant behaviors (e.g., safety behaviors, reassurance seeking, compulsions, worry, and/or avoidance). It is a belief that life is better when there is no uncertainty. It refers to a drive to avoid all uncertainty in life. Interestingly, de Jong-Meyer et al. (2009) found correlations of .74 and .67 between negative metabeliefs and IU in their two samples.

Einstein and Menzies (2007) targeted the desire for predictability within their treatment for magical ideation. In this program, clients are introduced to the idea that uncertainty is all around and that many industries are designed to exploit the credulous individual's uncertainty and therefore make money. A clear example of this is in an article that is reviewed by Harry Edwards. He responds to a clairvoyance advertisement under six pseudonyms with six pseudoaddresses. He writes a summary report of his experience with the clairvoyant. All six individuals (and addresses) receive identical letters claiming that the clairvoyant could see:

horoscopes with special promise such as your own (*and the other five?*) that I often feel that I am reading the horoscope of a close friend, and I become quite concerned when I see either troublesome events on the horizon, or, perhaps even more importantly, wonderful opportunities that you may not yet have achieved (*usual ploy—instill fear or create a need, then offer a solution or appeal to greed*) . . . (Edwards, 1992, p. 23; italicized text indicates Harry Edwards's own thoughts as he reads the responses from the clairvoyant)

The article then goes on to offer a free Inca crystal if an amount of money was paid for a more detailed horoscope. Three weeks later, another letter was sent offering additional free gifts including a special Inca crystal. The author bought the more detailed horoscope and received the "free" gifts. He submitted the Inca crystal for analysis by a professor at the School of Earth Sciences, Melbourne University. The crystal was found to be costume jewelry "worth at most a few cents."

ACT targets this desire for predictability by drawing on fundamental tenets of Buddhism. In ACT, practitio-

ners reflect on the fact that life is full of both significant and insignificant unpleasant events. Individuals will encounter sickness, separation, death, financial difficulties, interpersonal challenges, traffic, errors, breakages, burglaries, and the consequent negative feelings of loss, frustration, disappointment, to name a few, as part of being alive. Therefore, it is important for individuals to learn to be flexible when faced with unexpected negative events. This fundamental tenet of ACT captures the essence of the problem for those struggling with a strong Need for Predictability.

### **Challenging the Previews: Inflated TEs**

These can be challenged using cognitive therapy or behavioral experiments, where individuals are encouraged to identify their inflated previews and engage in either cognitive restructuring (drawing evidence from the past) or behavioral experiments to draw evidence from the present. Psychoeducation regarding how the "mind" gets our predictions wrong can be helpful as a precursor to this. Beck, Rush, Shaw, and Emery's (1979) list of cognitive errors can also provide a short-hand guide for how individuals commonly make incorrect predictions.

### **Premotion and Uncertainty Arousal**

The ACT and mindfulness emphasis on accepting emotions is similar to the idea of panic and worry surfing described in self-identified CBT packages (Baillie & Rapee, 1998; Schniering, Lyneham, Wignall, & Rapee, 2006). Both imply a need to allow emotions to be present and cease any efforts to try to remove them. The model proposed here suggests that therapists should assist clients to differentiate between the premotion and uncertainty arousal. In recognizing UA, the therapist is directing attention to somatic sensations that are a direct consequence of discomfort with uncertainty. Therapists can explore the inhibitory effect of UA with Socratic questions.

Compared with the premotion, it is proposed that Uncertainty Arousal is less intense. It is therefore an area of focus that CBT therapists routinely overlook. In fact, this low level of arousal may be present in a range of areas that are helpful for the client to recognize and target.

### **Comparator**

Discussing the reorganization of goals within the comparator is beyond the scope of this article. Higginson et al. (2011) suggest that the reason many psychotherapies are effective (the “dodo” effect) is that they all lead to the development of insight. Insight is theorized to be accompanied with a reorganization of goals. The alteration of goals is explicitly addressed in several treatments. For example, in ACT, the identification of values naturally leads to the reorganization of goals. Motivational Interviewing is designed to alter goals, and there are explicit goal-setting modules within CBT. The proposed model suggests therapists consider how goals are balanced within the client’s life, as opposed to only considering specific measurable goals that may be the identified target of treatment.

### **Behaviors**

The behavioral targets for therapeutic intervention include safety behaviors, rumination, reassurance seeking, compulsions, and/or avoidance. In fact, all of these behaviors are forms of avoidance (of emotion) and ways in which the client is seeking to reduce the threat expectancy or the uncertainty arousal. Exposure with response prevention has commonly been advocated as a technique for reducing these behaviors. According to the current model, when exposure, behavioral experiments, or exposure with response prevention is conducted, focus should be placed on the client’s habitual use of their feeling of uncertainty to guide their behavior (Payne, Bolton, & Perrin, 2011). The aim is to reinterpret the feeling of uncertainty as one that is not indicative of real contingencies in the environment. This interpretation assists the client to resist associated avoidant behaviors.

### **Desire for Predictability and Uncertainty Arousal**

Two treatments discussed in the literature target both the desire for predictability and uncertainty arousal. Robichaud and Dugas (2006) have outlined a treatment for GAD in which uncertainty is identified and targeted through an extensive range of behavioral experiments. Similar to the present model, Robichaud and Dugas (2006) describe IU as a background contributor to other factors feeding worry. These include positive beliefs about worry, “what if” thoughts, cogni-

tive avoidance, anxiety, and negative problem orientation. IU is described as the “fuel” for the engine of worry (p. 293). They use an allergy metaphor, the idea being that even a small amount of uncertainty can precipitate an extreme reaction. The reaction that manifests in the face of a tiny amount of uncertainty is one of worry and anxiety. The treatment rationale is that because it is impossible to avoid uncertainty, it is essential to develop a resistance to it. Clients should demonstrate to themselves that, in fact, they can cope with uncertainty. Once they have shown themselves that they can tolerate it, they no longer need to be scared of it. Thus, clients are encouraged to seek out situations in which uncertainty is part of their daily life and conduct behavioral experiments, improving their confidence and self-efficacy beliefs, when they encounter uncertainty. The list of situations described is as follows: avoiding carrying out certain activities when the outcome is uncertain, procrastinating and finding imaginary obstacles for not doing certain things, refusing to delegate tasks to others, only partially committing to a relationship or a project, seeking reassurance and a great deal of information prior to making a decision, engaging in exaggerated optimism to provide oneself with reassurance, overcorrecting oneself or double checking, and doing things for others or overprotecting them. Taking a step back from this list, it is interesting to note that most of these activities would be advocated as behavioral experiments which are useful in the treatment of (a) perfectionism, or in individuals with unrelenting standards, and/or (b) obsessive-compulsive personality disorder.

In a second program, Whittal and McLean (2002) describe an intervention for IU within a group treatment of OCD. They normalize uncertainty by asking clients to find out how many of their friends or acquaintances are “certain” when they walk away from locking their front door. Clients predict the results of a survey on this topic, prior to carrying out the survey. They describe clients being surprised that uncertainty is common among their friends and does not indicate danger.

These treatments importantly address both desire for predictability and Uncertainty Arousal. Robichaud and Dugas (2006) differentiate between the two in their model. If applying the current model to their explana-



tion of GAD, the “fuel” would be the equivalent of an individual’s desire for predictability, whereas the “allergic reaction” would be the Uncertainty Arousal.

## CONCLUSION

The present model and review has emphasized the clinical implications of current research into IU. Future research will need to test the components of the model and examine how IU changes across treatment in response to the recommended therapeutic interventions. According to the model, the Need for Predictability is an overarching factor that can increase Uncertainty Arousal. Both elements of IU should be targeted in treatment. It may be that specific treatments of the Need for Predictability can be evaluated across disorders. Moreover, it is possible that targeting the Need for Predictability could increase resilience and be included in preventative mental health interventions. The proposed model intends to inform future research, building on the recent increase in empirical research on IU, thereby providing the opportunity to further understand a potentially important transdiagnostic factor underlying a diverse range of psychological disorders.

## ACKNOWLEDGMENTS

I would like to thank several colleagues for feedback on earlier drafts of this article. I am grateful to Elizabeth Rieger, Michelle Moulds, Maree Abbott, Karen Fisher, Peter Lovibond, Peter McEvoy, Angela Nickerson, and Ron Rapee. I am also grateful to countless clients and to Ariel, Eadie, Miranda, and David Einstein for their inspiration.

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Received March 18, 2012; revised November 9, 2013; accepted November 28, 2013.