

INTOLERANCE OF UNCERTAINTY: A COGNITIVE VULNERABILITY THAT
PREDISPOSES INDIVIDUALS TO DEVELOP SOCIAL ANXIETY DISORDER?

A Dissertation

Presented to

The Faculty of the Department

of Psychology

University of Houston

In Partial Fulfillment

Of the Requirements for the Degree of

Doctor of Philosophy

By

Jaclyn E. Grad, M.A.

December, 2011

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ABSTRACT

One of the goals in the field of psychology is to identify risk factors that may predispose certain individuals to develop psychological disorders. If psychologists can find such vulnerabilities, they can formulate behavioral interventions targeting those factors. One potential cognitive vulnerability that may be a risk factor for the development of social anxiety disorder is “intolerance of uncertainty” (IU). The primary aim of the current study is to explore the relationship between intolerance of uncertainty and social anxiety. 217 participants were chosen from a selection of individuals seeking services through a university run psychology clinic. Once enrolled in the study, they completed a battery of questionnaires regarding experience of anxiety and intolerance of uncertainty. They were then interviewed using a structured interview schedule based on DSM-IV criteria for diagnosis of anxiety disorders. The current analyses indicated that intolerance of uncertainty is significantly linked with social anxiety. In examining the direct and indirect paths in the model, all pathways were significant at the $<.01$ level. Interestingly, the direct path from intolerance of uncertainty to social anxiety was substantially stronger than any other pathway in the model. This suggests that intolerance of is uniquely related to social anxiety above and beyond the influence of other variables. Overall, the results of this study extend the work of previous research and provide empirical support for intolerance of uncertainty as a cognitive vulnerability impacting social anxiety. Future research should explore behavioral interventions targeted at reducing intolerance of uncertainty to ascertain its utility as a focus of clinical interventions.

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Intolerance of Uncertainty: A Cognitive Vulnerability That Predisposes Individuals to Develop Social Anxiety Disorder?

One of the ultimate goals in the field of clinical psychology is to identify risk factors or vulnerabilities that may predispose certain individuals to develop psychological disorders. It is important to identify such risk factors both for prevention purposes and to help us develop better more efficient treatments that target key components of a psychological disorder. If psychologists can find cognitive vulnerabilities and risk factors of psychological disorders, then they can formulate behavioral interventions targeting those factors.

Anxiety disorders are some of the most prevalent psychological disorders affecting approximately 18.1% of the population each year (Kessler, Chiu, Demler, & Walters, 2005). The National Comorbidity Survey (NCS), a congressionally mandated survey of over 9,000 subjects in the United States, found that 28.8% of all respondents had a lifetime history of an anxiety disorder (Kessler et. al, 2005). Thus it is vital that researchers continue to focus efforts on learning more about these disorders in particular. The more traditional view of these disorders has focused on gaining specificity in order to differentiate between the disorders. This view is reflected in the progressions of the Diagnostic and Statistical Manual of Mental Disorders published by the American Psychiatric Association (American Psychiatric Association, 1952, 1965, 1980, 1987, 1994, 2004). For example in each of these editions, the number of disorders classified as anxiety disorders increased from three in DSM-I and II (American Psychiatric Association, 1952, 1965) to twelve in DSM-IV (American Psychiatric Association,

1994). When taking into consideration specifiers and subtypes, there are over two dozen distinct anxiety-related diagnostic categories in current editions (Norton & Philipp, 2008). Proponents of this model feel that gaining a more refined understanding of these disorders and their subtypes will lead to more focused, efficient, and targeted interventions. However, a recent trend in research has been to focus on models of anxiety that emphasize common higher order-factors that link these disorders rather than more specific factors that differentiate between them (Clark & Watson, 1991; Barlow, 2000). In fact, several studies utilizing structural-modeling techniques have provided support for this view (Zinbarg & Barlow, 1996; Brown, Chorpita & Barlow, 1998; Norton, Sexton, Walker & Norton, 2005). In accordance with this new trend, several research groups have developed treatment protocols that focus on higher order factors cutting across disorders (Allen, Ehrenreich, & Barlow, 2005; Norton, Hayes & Hope, 2004; Erickson, Janek & Tallman, 2007). Advocates of this view argue that identifying higher order risk factors that cut across disorders, will augment the dissemination and treatment accessibility to consumers (Norton & Philipp, 2008).

Previously Identified Risk Factors

The risk factors of anxiety can be environmental or cognitive. For example, there are many well researched environmental risk factors for the development of anxiety such as childhood maltreatment (Maughan & Cicchetti, 2002), stress (Margolin & Gordis, 2000) attachment relationships, and parental overprotectiveness (Thompson, 2001). There are also hypothesized cognitive risk factors such as the neuroticism, also termed negative affectivity (Eysenck, 1957; Clark & Watson, 1991). Clark and Watson (1991) defined negative affectivity as the extent to which a person is feeling upset or

unpleasantly engaged rather than peaceful, and encompasses various aversive states including upset, angry, guilty, afraid, sad, scornful, disgusted, and worried. Considerable evidence has implicated trait dispositional affectivity, particularly negative affectivity in the development of anxiety disorders (Clark & Watson, 1991; Keogh & Reidy, 2000, Barlow, 2002; Norton & Mehta, 2007).

Although high levels of any of these risk factors alone may be sufficient to induce the development of an anxiety, it is likely that a combination of external and internal risk factors interact to produce a collection of symptoms commonly referred to as psychopathology. Barlow (2000) proposes a triple vulnerability model in which general biological vulnerabilities, general psychological vulnerabilities, and specific psychological vulnerabilities interact in the development of psychological disorders. For example, there is a strong consensus that anxiety and other closely related emotional disorders have a common genetic basis (Kendler et al., 1995). However, there has been no strong evidence of a specific “anxious gene”. Instead, it is thought that many genes contribute to fundamental traits which are generalized biological vulnerabilities (Barlow, 2000). Similarly, early life experiences under certain conditions can contribute to a diathesis to experience anxiety and related negative affective states. These particular experiences which make one more vulnerable to anxiety are examples of general psychological vulnerabilities. On the other hand, early learning experiences can focus anxiety on particular life circumstances. In this case, certain events or circumstances become imbued with a heightened sense of threat and danger. These early learning experiences comprise a specific psychological vulnerability (Barlow, 2000). It is hypothesized that the interplay of these three factors, general biological vulnerabilities,

general psychological vulnerabilities and specific psychological vulnerabilities, contribute to the development of specific anxiety disorders such as social phobia, obsessive compulsive disorder or generalized anxiety disorder (Barlow, 2000). It is less likely that any of these factors in isolation would cause serious pathology; therefore, it is important to identify risk factors at each level both for prevention purposes and to help us develop more efficient treatments that target key components of a psychological disorder. The target of this particular study will be to focus on a particular trait or general cognitive vulnerability.

Although a multitude of environmental risk factors have been identified and empirically studied, this process has proven more difficult with internal processes. These factors are often difficult to objectively observe and measure. An underlying trait that is common in those experiencing psychopathology can be referred to as “cognitive vulnerability”. A cognitive vulnerability can be understood as a dispositional factor that increases one’s susceptibility to pathology (Ingram, 2003). Although there is no formalized set of parameters that define a factor as a cognitive vulnerability, Koerner and Dugas (2008), propose three properties that may help to differentiate a variable as a cognitive vulnerability. First, when present, a cognitive vulnerability should heighten the risk that an emotional disorder will develop. Second, the proposed factor should contribute to the etiology of an emotional disorder directly or indirectly via subsidiary processes. Finally, the factor should be dispositional or trait-like in its stability, but malleable in that it can be altered with intervention.

Intolerance of Uncertainty definition and origins

One potential cognitive vulnerability that may be a higher order risk factor for more specific mood and anxiety disorders is termed “intolerance of uncertainty” (IU). IU is defined as a dispositional characteristic that reflects a set of negative beliefs about uncertainty and its implications (Korener & Dugas, 2006). A high level of intolerance of uncertainty affects the way that an individual perceives information in uncertain or ambiguous situations and also affects how they respond to ambiguous information. This can include cognitive, emotional and behavioral reactions (Ladouceur, Talbot, & Dugas, 1997). In other words, individuals with high levels of intolerance of uncertainty experience ambiguous situations in everyday life as stressful and fearful. This can result in dysfunctional emotional states, impaired problem-solving ability and delayed decision making (Freeston, Rheume, Letarte, Dugas, & Ladouceur, 1994). As ambiguity and uncertainty are a common part of everyday functioning, possessing a high level of intolerance of uncertainty can be emotionally taxing and even debilitating for some.

The question must then be asked, why do some individuals have higher levels of intolerance of uncertainty? As with many psychological constructs, the answer is not yet fully clarified. However there have been some postulations made as to the origins of intolerance of uncertainty. Some speculate that interactions between young children and their caregivers may play an important role in the development of high levels of IU. Preliminary data suggests that specific types of attachment style can set the stage for later development of anxiety disorders, specifically Generalized Anxiety Disorder (GAD). Caregivers promote the effective management of children’s emotions in many ways. For example, parents model effective coping strategies, protect children from traumatizing events and offer soothing, nurturant support to directly intervene in a child’s distress

(Thompson, 2001). However, if a parent responds to their child in an overprotective or overcontrolling way and permits the child to avoid confronting fear provoking events, the child may fail to learn mastery of anxiety (Vassey & Ollendick, 2000). Furthermore, parental criticism and a lack of warmth may also promote childhood anxiety (Gerlsma, Emmelkamp, & Arrindell, 1990). Therefore, childhood anxiety disorders may be associated with insecure parent-child attachment relationships. Bowlby (1973) has even argued that many common forms of anxiety disorders can be traced to insecurity over the availability of an attachment figure. Therefore, children that are either insecurely attached or have over-enmeshed relationships with their primary caregivers may develop higher levels of IU which in turn acts as a cognitive diathesis for the later development of an anxiety disorder. However at present, this pattern is only speculative with no data to either confirm or refute this connection.

Neural correlates of intolerance of uncertainty

In a related field of research, there has been a search for the neuro-cognitive correlates of anxiety (Krain, Hefton, Pine, Ernst, Castellanos, Klein & Milham, 2006). In order to examine such neuro-cognitive correlates of intolerance of uncertainty, researchers appear to have focus on the decision-making deficits that are often consequences of high levels of intolerance of uncertainty. Specifically, intolerance of uncertainty has been linked to the need for a greater number of certainty cues in order to make a decision and greater response latency when making a decision (Ladouceur, Talbot, & Dugas, 1997). Several brain areas have been linked with anxiety disorders in general and to a lesser extent to intolerance of uncertainty specifically. These areas include the orbitofrontal cortex (OFC) and the anterior cingulate cortex (ACC; Sachdev

& Malhi, 2005), as well as the dorsolateral prefrontal cortex (DLPFC; Ernst & Paulus, 2005). For example, Krain and colleagues (2006), asked adolescents and adults to complete an fMRI task, called the HiLo game, in which they are required to make a number of basic decisions. For each participant, an fMRI scan was completed and reaction time, response variability, and accuracy were calculated. They found that increasing the amount of uncertainty in the task increased the reaction time of the subjects as well as the perception of uncertainty. Furthermore, increasing the level of uncertainty also increased the level of activation in the ACC. They also found level of IU to be linked to amount of ACC activation in adolescents, but not adults. This may suggest that mature brains develop compensatory mechanisms for handling IU. Very few studies have focused specifically on the neural correlates of intolerance of uncertainty. However, this is an area which may have widespread implications in the future. If specific brain circuitry could be identified as connected with high levels of intolerance of uncertainty, behavioral and psychopharmacological interventions could be refined to target these specific areas.

Emotional and behavioral consequences of high levels of intolerance of uncertainty

Although little is known about the etiology of IU, more is known about the cognitive and emotional consequences associated with high levels of IU. First, it has been shown that people with high levels of IU tend to hold more positive beliefs about worry and believe worrying to be more useful than do people with more moderate levels (Ladouceur, Blais, Freeston & Dugas, 1998). Francis and Dugas (2003) identified five specific positive beliefs about worry that are more frequently endorsed by those that experience excessive or uncontrollable worry. The first belief is the thought that

worrying helps an individual find better solutions to a problem. This serves to make the individual more vigilant in their worry thus ramping up their anxiety level. The second belief is the idea that worrying motivates an individual to get things done. In other words, there is a fear that not worrying will lead to complacency and inaction. The third positive belief about worry intimates that worrying offers some form of “protection” from negative emotions. Thus by worrying, the person will not be as surprised, saddened etc. when an actual negative event occurs. The fourth positive belief about worry is the thought that worrying in and of itself is protective. This is a form of “magical thinking” where worry serves as a way to ward off negative events in much the same way superstitions or rituals do. The fifth positive belief about worry proposes that worrying is a positive personality trait. In this scenario, worrying is confused with caring or conscientiousness. High levels of intolerance of uncertainty may increase the likelihood that an individual endorses these positive beliefs about worry (Ladouceur, Blais, Freeston & Dugas, 1998). If someone endorses these beliefs, they are more likely to increase the frequency of their worrying thus avoiding actual problem resolution and reinforcing their intolerance of uncertainty. Thus, if an individual endorses one or more of these beliefs they are at a greater risk of the development or exacerbation of chronic anxiety levels.

Biased recall is another possible consequence of having high levels of IU. One research team attempted to highlight the connection between IU and biased recall (Dugas, Hedayti, Karavida, Buhr, Francis & Phillips, 2005). They asked participants to undertake an incidental learning task in order to assess whether IU was related to biased recall of words denoting uncertainty. They found a significant interaction between level of IU and recall of word type. Specifically, those with high IU recalled significantly more

“uncertain” words and fewer “neutral” words than those with low IU. Interestingly, the total number of words recalled did not differ between groups. This indicates that high levels of IU may lead to enhanced recall of stimuli associated with uncertainty. This is in line with studies that have found anxious individuals to selectively attend to threatening information (Ehlers, Margraf, Davies & Roth, 1988; Mathews, May, Mogg, & Eysenck, 1990) and have enhanced memory for threatening information (Friedman, Thayer, & Borkovec, 2000).

Link between intolerance of uncertainty and specific anxiety disorders

It is clear that intolerance of uncertainty plays a role in anxiety. However recently, researchers have begun to explore the role that IU may play in specific anxiety disorders. Given the clear relationship between IU and worry, it makes sense that many studies have focused on the link between IU and generalized anxiety disorder. As expected, researchers have found a clear link between IU and generalized anxiety disorder. For example, a preliminary study (Freeston, Rheaume, Letarte, Dugas, & Laddouceur, 1994) was done using 154 college students, which looked at the relationship between GAD symptoms measured by the *Questionnaire on Generalized Anxiety Disorder* and IU as measured by a newly developed experimental instrument, the *Intolerance of Uncertainty Scale*. The authors found that IU distinguished between groups of non-clinical subjects who met both cognitive and somatic criteria for generalized anxiety disorder, met only somatic criteria or met neither cognitive nor somatic criteria. Furthermore, they found that the link between IU and GAD symptoms was above and beyond what would be accounted for by general negative affectivity.

However, the correlational nature of the study precluded the authors from making any causal inferences (Freeston, Rheume, Letarte, Dugas, & Laddouceur, 1994). Using an English language version of the Intolerance of Uncertainty Scale (IUS), Buhr and Dugas (2002), examined the ability of the IUS to distinguish between participants. In this study, the three groups differed significantly on intolerance of uncertainty in the expected direction. Expanding upon these results, a study was done to examine the role of IU in a clinical population of GAD patients (Dugas, Gagnon, Ladouceur, & Freeston, 1998). They utilized a sample of twenty-four GAD patients diagnosed using the *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV) and twenty non clinical controls. The results of the study showed that IU was highly effective in discriminating GAD patients from non clinical controls. Recent studies have also demonstrated that specifically targeting IU in both individual and group therapy has had beneficial effects for patients with GAD (Ladouceur, Dugas, Freeston, Leger, Gagnon & Thibodeau, 2000; Dugas, Ladouceur, Leger, Freeston, Langlois, Provencher & Boisvert, 2003).

Although the majority of research with IU has focused on its specific role in worry and generalized anxiety disorder, recently IU has been linked with other anxiety disorders as well. There has been recent research linking GAD and obsessive compulsive disorder (OCD). Both disorders share similar cognitive processes. Specifically, both disorders are characterized by a form of pathological worry which suggests that these two disorders may be similar in terms of the functionality of worry (Comer, Kendall, Franklin, Hudson, & Pimentel, 2004). Given the established link between IU and worry and IU and GAD, it makes theoretical sense to postulate that IU also plays a role in OCD. One study to explore this link (Holaway, Heimberg, & Coles, 2006), utilized a sample of

560 undergraduates from a large metropolitan university. Participants were divided into the following groups based on their scores on measures of GAD and OCD: GAD, OCD, GAD + OCD, and non-anxious control. Analysis of variance was conducted to examine the differences in Intolerance of Uncertainty Scale (IUS) scores across groups. They found significant differences across groups with those meeting study criteria for both GAD and OCD scoring higher on the IUS than those in the OCD group and non-anxious control group. The GAD + OCD Group also scored higher than those in the GAD group, but only at the trend level. Furthermore, individuals in both the GAD and OCD groups scored significantly higher on the IUS than those in the non-anxious control group. Interestingly, the OCD and GAD group were not significantly different from each other. These data suggests that IU is not necessarily specific to one particular anxiety disorder, but is in fact relevant to both GAD and OCD (Holaway, Heimberg, & Coles, 2006).

Although numerous studies have shown a link between IU and specific anxiety disorders, most have utilized linear models. Newer etiological models of anxiety however are hypothesizing a hierarchical model of generalized and specific vulnerabilities in anxiety. One study to examine such a model (Sexton, Norton, Walker, & Norton, 2003), looked at the links between neuroticism, anxiety sensitivity, intolerance of uncertainty, panic, health anxiety, OCD symptoms, and worry/GAD. They used a non-clinical sample of 91 undergraduate students. In general, they found strong though not total support for their hypothesized model. In regards to Intolerance of Uncertainty, the IUS made significant direct contributions to prediction of worry/GAD, but was not significant in predicting panic, health anxiety or OCD (Sexton, Norton, Walker, & Norton, 2003). A replication of this study was done using a clinical sample with similar

results (Norton, Sexton, Walker, & Norton, 2005). In the second study, Intolerance of Uncertainty was found to partially mediate the relationship between neuroticism and GAD, however it was also found to partially mediate the relationship between neuroticism and depressive symptoms (Norton, Sexton, Walker, & Norton, 2005). Although both studies lend support to the validity of the hierarchical model of anxiety, both used regression-based path analyses which may have adversely impacted the results.

As a follow up study, Norton and Mehta (2007) expanded Sexton et al.'s model using latent variable modeling and also including the variables of positive affectivity and social anxiety using a non-clinical sample of undergraduates. With regards to intolerance of uncertainty, this model showed that IU is directly influenced by neuroticism. IU also mediated the relationship between neuroticism and OCD with IU independently accounting for about 6.3% of the variance. Also consistent with previous models, IU mediated the relationship between neuroticism and worry/GAD as well as affected worry/GAD directly, independently accounting for 5% of the variance. Surprisingly, IU had a significant independent effect on social anxiety accounting for 9.1% of the variance above and beyond neuroticism. In addition, 29% of the variability in social anxiety was explained by the mediated effect of neuroticism via IU. In this study, IU had up to 10% independent effect on various outcomes. This would suggest IU as an independently and theoretically relevant determinant of various specific anxiety disorders.

Link between intolerance of uncertainty and social anxiety disorder

Social Anxiety Disorder is characterized by intense fear in social situations causing considerable stress and impaired ability to function in at least some parts of daily life (American Psychiatric Association, 2004). Theoretically, uncertainty plays a large

part in social anxiety and social anxiety disorder. For example, Antony and Rowa (2008) found that in persons with social anxiety disorder, uncertainty is often associated with social anxiety before a social encounter, during the social encounter and/or after the social encounter.

One of the earliest studies to explore the relationship of intolerance of uncertainty and social anxiety was conducted by Boelen and Reijntjes (2009). This study looked at 126 community participants from the Netherlands. They examined the extent to which intolerance of uncertainty explained variance in social anxiety when controlling for neuroticism, fear of negative evaluation, anxiety sensitivity, self-esteem, perfectionism, and pathological worry. In this particular study, intolerance of uncertainty emerged as a unique correlate of social anxiety over and above neuroticism, accounting for an additional 5.4% of the variance. Furthermore, intolerance of uncertainty together with neuroticism and fear of negative evaluation accounted for 58.2% of the variance in social anxiety. The results of this study provided evidence of a specific link between social anxiety and IU. However, there were several limitations of this study, namely, the composition of the sample. The study included self-selected, predominantly highly educated subjects with internet access. In addition, most of the participants were female (91.3%). Thus conclusions about the generalizability of these results are limited.

In a similar study, Carleton, Collimore, and Asmundson (2010) expanded the concept of the Boelen study using a North American sample. This study looked at 286 Canadian participants from the community using web-based data collection. They aimed to replicate the findings of Boelen and Reijntjes (2009) linking intolerance of uncertainty and social anxiety as well as to explore various facets of IU, social anxiety (social

interaction, performance anxiety, social distress and avoidance), negative and positive affect and anxiety sensitivity. In addition, they wanted to compare levels of IU across participants reporting symptoms consistent with social anxiety disorder, relative to generalized anxiety disorder, as well as those reporting symptoms consistent with both social anxiety disorder and generalized anxiety disorder. Their results supported a robust relationship between IU and social anxiety independent of all other variables, IU accounting for 48% of the variance when entered first into the hierarchical regression and remaining significant even when variables were reverse ordered in the regression. Furthermore, when IU was broken down into two components, prospective anxiety and inhibitory anxiety, IU inhibitory anxiety accounted more than half (51%) of the variance in social interaction and performance anxiety and a third (30%) of the variance in social avoidance and distress. Comparisons across symptom groups suggest there were differences in IU levels between persons with a probable diagnosis of social anxiety disorder, generalized anxiety disorder, both disorders, or neither disorder. However, this study was also limited in several ways. Although informative, the study utilized a non-clinical sample and based their results upon diagnoses derived using cutoff scores on self-report measures as opposed to diagnostic clinical interview. Therefore, the extent to which the results will be applicable to clinical samples is unclear.

Present study

The primary aim of the current study is to further explore the relationship between intolerance of uncertainty and social anxiety. It is hypothesized that higher levels of negative affectivity will predict higher upward social anxiety both directly and indirectly via intolerance of uncertainty and that higher levels of intolerance of uncertainty will

uniquely directly predict higher levels of social anxiety independent of all other variables. These hypotheses are based upon previous research exploring both the relationship of intolerance of uncertainty and anxiety in general as well as the relationship of intolerance of uncertainty and social anxiety specifically. The present study will build upon the previous findings of (Boelen & Reijntjes, 2009; Carleton, Collimore & Asmundson, 2010). However, in contrast to previous studies, this study will explore the relationship of IU and social anxiety utilizing a clinical sample. Studying this relationship in a clinical population is an essential step in determining the importance of IU in treatments of social anxiety disorder as there may be important differences between people who meet full DSM-IV criteria for a diagnosis of social anxiety disorder and those who experience similar symptoms at a subthreshold level. This study will examine these relationships using structural equations modeling rather than path analysis. By using structural equations modeling as opposed to path analysis as used in the previous studies we have several advantages. First, by using SEM, we can examine the relationships free from measurement error, because the measurement error has been estimated and removed, leaving only common variance. Furthermore, we can simultaneously test all relationships in our model (Tabachnick & Fidell, 2001).

Method

Participants

Archival data was used for this study. Data was comprised of data from a larger study examining transdiagnostic cognitive-behavioral group therapy for anxiety disorders (Norton, 2008; Norton, in press; Norton & Barrera, in preparation). This project was

reviewed and approved by the University of Houston's Committee for the Protection of Human Subjects. Participants were chosen from a selection of individuals seeking services through a university run psychology clinic. They were initially screened via telephone using a brief semi-structured interview. Individuals indicating primary concerns with anxiety and an interest in group therapy were then referred to this study. Once enrolled in the study, participants provided a written informed consent and then completed a battery of questionnaires before their first appointment. They were then interviewed using a structured interview schedule based on DSM-IV criteria for diagnosis of anxiety disorders. There were 217 participants involved in this study ranging in age from 18 to 63 with the mean age being 31.34 ($SD = 10.02$). The racial break down of the sample is as follows: 51.6% Caucasian, 18% Hispanic/Latina, 9.2% Black/African American, 5.5% Asian, 0.5% Native American, 7.4% "Other/Mixed", and 7.8% with missing data. The sample was predominantly female (53.9%). The majority of participants were given a primary Axis I diagnosis (94.5%) with a break down as follows: 40.6% Social Anxiety Disorder, 19.8% Panic Disorder, 18.4% Generalized Anxiety Disorder, 5.1% Obsessive Compulsive Disorder, 3.7% Anxiety Disorder NOS, 3.7% Specific Phobia, 2.3% Post Traumatic Stress Disorder, and 1.4% Major Depressive Disorder (Table 1).

Measures

Anxiety Disorder Interview Schedule for DSM-IV (ADIS-IV, Brown, Di Nardo, & Barlow, 1994). The ADIS-IV is a semi-structured diagnostic interview schedule designed to assess the presence, nature, and severity of DSM-IV anxiety, mood, and

somatoform disorders, as well as previous mental health history. There is strong support for the reliability of diagnosis using the ADIS-IV (Brown, DiNardo, Lehman, & Campbell, 2001). Along with the diagnoses, Clinician Severity Ratings (CSR), subjective clinician ratings, are given to quantify the severity of each diagnosis. CSR range from 0 (not at all severe) to 8 (extremely severe/distressing). A CSR of 4 (moderate impairment) is generally considered the cut-off for a disorder of clinical significance (Heimberg, Dodge, Hope, Kennedy, Zollo, & Becker, 1990). Data from Norton (in press) reported 86% diagnostic agreement from a random subset of 25% of the diagnostic interviews that were observed and rated by a second independent interviewer who was blind to diagnosis.

Social Phobia Diagnostic Questionnaire (SPDQ, Newman, Kachim Zuellig, Constantino, & Cashman-McGrath, 2003). The SPDQ is designed to assess social phobia according to DSM-IV criteria. It contains three yes/no questions that assess excessive fearfulness in social, observational, and evaluative situations, as well as fear of embarrassing oneself, and/or being viewed critically by others, and whether an individual tries to avoid social situations. Next it includes a list of 16 social situations for which fear and avoidance are rated on a 5-point Likert scale from 0 (no fear or avoidance) to 4 (very severe fear or consistent avoidance). Following these ratings, there are three more yes/no questions assessing whether or not the fear is experienced each time they are in social situations, whether or not the fear is immediate upon encounter of the feared situations, and whether or not they consider the fear to be excessive or unreasonable. Finally, there are three additional questions addressing degree of interference, degree of

distress, and effect of fear on job or school performance. The SPDQ has demonstrated good internal consistency $\alpha = .92$ (Newman et al., 2003). It also has been shown to have good discriminant validity, results estimating an 89% probability that someone with social phobia will have a higher score on this measure. Furthermore, when compared with the ADIS-IV, Kappa agreement was 83%. The SPDQ also shows good concurrent validity when compared to other measure of social anxiety such as the SIAS (Newman et al., 2003).

Brief Fear of Negative Evaluation Scale (BFNE; Leary, 1983). The BFNE is a 12-item scale assessing fear of negative evaluation stemming from perceived loss of social approval. Eight of the items are straightforwardly worded and four of the items are reverse-worded. Items are rated on a 5-point Likert scale ranging from 0 (*not at all characteristic of me*) to 4 (*extremely characteristic of me*). The BFNE has demonstrated high internal consistency (α between .89 and .91) and good test-retest reliability ($r=.75$; Leary, 1983; Miller, 1995; Carleton, McCreary, Norton & Asmundson, 2006). Furthermore, when compared with four established measures of social anxiety including the SPS, SIAS, FQ-S, and LSAS, the BFNE was significantly correlated with each measure. The BFNE has also shown good discriminant validity, correlating more strongly with measures of social anxiety than measures of either depression or anxiety sensitivity (Weeks et al., 2005).

Intolerance of Uncertainty Scale, Short Form (IUS-12; Carleton, Norton & Asmundson, 2007). The IUS-12 is a 12-item short form of the original 27-item

Intolerance of Uncertainty Scale (Freeston, Rheaume, , Letarte, Dugas, & Ladouceur, 1994). The IUS-12 measure reactions to uncertainty, ambiguous situations, and the future. Items are scored on a 5-point Likert scale ranging from 1 (*not at all characteristic of me*) to 5 (*entirely characteristic of me*). The IUS-12 has strong correlation with the original scale, $r = .96$, and has been shown to have two factors including prospective anxiety (7 items, e.g., “*I can’t stand being taken by surprise*”) and inhibitory anxiety (5 items, e.g., “*When it’s time to act, uncertainty paralyzes me*”), both with identically high internal consistencies, $\alpha = .85$ (Carleton, Norton, & Asmundson, 2007).

Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1998). The PANAS is a 20-item measure assessing the frequency of experiencing positive affect (PA) and negative affect (NA). Items are rated on a 5-point Likert scale ranging from 1 (*Very slightly or not at all*) to 5 (*Extremely*). This study focuses on the construct negative affectivity and so only the PANAS-NA scale will be utilized. The PANAS-NA has demonstrated good internal consistency ($\alpha = .88$; Brown, Chorpita & Barlow, 1998).

Results

Descriptive Analyses

Table 2 provides descriptive analyses of each measure including means, standard deviations, minimum and maximum scores, and internal consistencies. The sample distribution was also examined for skewness and kurtosis and found to be within acceptable parameters. Table 3 provides the correlation matrix for the measures. All measures were significantly correlated with each other at the .01 level. However, this is

expected given that all of the instruments used were designed to measure various aspects of anxiety. None of the measures were so highly correlated as to cause concern of multicollinearity ($>.85$; Kline, 2005).

Model Fit

The model tested in this study was the hypothesized structural model (Figure 1). One model was investigated testing empirically and theoretically derived associations between the constructs of Negative Affectivity (NA), Social Anxiety (SA), and Intolerance of Uncertainty (IU). This model consisted of two explicit hypotheses: (1) higher levels of negative affectivity would predict higher upward social anxiety both directly and indirectly via intolerance of uncertainty and (2) higher levels of intolerance of uncertainty would uniquely directly predict higher levels of social anxiety independent of all other variables. The measurement model portion of the overall structural model consisted of the latent factors of Negative Affectivity measured by one observed indicator, Intolerance of Uncertainty measured by two observed indicators, and Social Anxiety measured by two observed indicators. Due to the fact that there is only a single indicator of Negative Affectivity, an *a priori* estimate of the measurement error was estimated based on previous studies as suggested in Kline (2005). The analyses were run using IBM SPSS AMOS v19 (Arbuckle, 2006). In the model, dependent latent variables were allowed to correlate. Model fit was evaluated by the root mean square error of approximation (RMSEA; ideally 0.02 to 0.07; Browne & Cudek, 1993), standardized root mean square residual (SRMR; ideally <0.05 ; Hu & Bentler 1995), and the Tucker Lewis Index (TLI; ideally >0.95 ; Hu & Bentler, 1995).

Various fit indices were used to interpret overall model results. The model showed acceptable fit to the data. The chi-square was not significant, ($\chi^2 = 5.298$, $p = .151$) suggesting acceptable fit. The SRMR value of 0.019 indicates that the model reproduced the sample covariances extremely well. Given the sample size, number of variables, and degrees of freedom, the RMSEA of 0.060 and TLI of .983 indicate also acceptable fit. Each of the indicators was highly associated with their respective latent variables suggesting good construct estimation (Table 4). For all constructs, the proportions of variance explained in the observed variables were all greater than 0.400 (0.467 – 0.991), indicating that the reliabilities of the various indicators ranged from moderate to high.

Direct and Indirect Effects

The parameter estimates did support the hypothesized relationships between variables. Overall, the model explained a fair amount of the variance for each of the latent variables ($R^2 = .331 - .469$). As predicted and congruent with previous models, NA was strongly associated with both IU and SA. Also as predicted, IU was strongly associated with SA even after controlling for NA.

Table 5 represents the results of the mediational analysis. Together, NA and IU explain a large percent of the variability (34%) in SA. The direct and unique effect of NA on SA (.32) explains about 10% of the variability in SA. The Indirect effect of NA mediated via IU (.26) explains an additional 7% of the variability in SA. On the other hand, the direct and unique effect of IU on SA (.45) explains about 20% of the variability in SA. All direct and indirect pathways in the model were significant at the .01 level. These results suggest first, that IU is functioning as a mediator of the effect of NA. Thus,

as expected IU partially mediates the effect of NA on SA. Also as hypothesized, IU was a significant independent predictor of SA above and beyond the effect of NA.

Discussion

Recently, research trends have suggested a need to expand our etiological models of anxiety to identify influencing factors such as cognitive vulnerabilities. One such potential cognitive vulnerability is “intolerance of uncertainty”, which is defined as defined as a dispositional characteristic that reflects a set of negative beliefs about uncertainty and its implications. Intolerance of uncertainty has been linked with various anxiety disorders including GAD (Freeston et al., 1994; Dugas et al., 1998; Ladouceur et al., 2000; Dugas et al., 2002; Leger et al., 2003) as well as OCD (Holaway et al., 2006). Only recently have researchers began to explore the link between intolerance of uncertainty and social anxiety (Boelen & Reijntjes, 2009; Carleton, Collimore, & Asmundson, 2010). This study sought to further examine the possible relationship between intolerance of uncertainty and the development of social anxiety.

There were two specific hypotheses that were the focus of attention in this particular study. First, it was hypothesized that Intolerance of Uncertainty and Negative Affectivity would be directly linked with Social Anxiety. Second, it was hypothesized that the relationship between Intolerance of Uncertainty and Social Anxiety would be explained via a direct effect even after the effect of negative affectivity was factored in.

Overall, the hypothesized model was supported by the data. First, results of the correlation analyses demonstrated significant interrelationships between all variables of interest in theoretically congruent directions. Specifically, measures of intolerance of uncertainty were significantly correlated with social anxiety. Using structural equations

modeling, the relationships could be further examined free from at least some of the measurement issues typically present in regression based path analysis. Various model fit indices suggested that the model provided generally good fit to the data. As found in previous research (Sexton et al., 2003; Norton et al., 2005; Norton & Mehta, 2007; Carleton et al., 2010), negative affectivity was confirmed as an important factor associated with social anxiety. In addition, as hypothesized and congruent with previous research (Boelen & Reijntjes, 2009; Carleton, Collimore, & Asmundson, 2010), intolerance of uncertainty was significantly linked with social anxiety. This confirmed the first hypothesis posed for this study. However, negative affectivity and intolerance of uncertainty accounted for only 47% of the variance in social anxiety. This indicates that there are probably multiple other factors that play a significant role in the development of social anxiety not accounted for in this study. This may include things like developmental factors, anxiety sensitivity, self-beliefs, evaluation sensitivity, and perfectionism.

In examining the direct and indirect paths in the model, the analyses indicate continued support of the hypotheses of this study. Specifically, all direct and indirect pathways were significant at the $<.01$ level. Interestingly, the direct path from intolerance of uncertainty to social anxiety (.45) was substantially stronger than the direct path from negative affectivity to social anxiety (.32). Furthermore, once the indirect pathway from negative affectivity to social anxiety was added, the influence of negative affectivity appears to decrease (.26). This suggests that intolerance of uncertainty partially mediates the relationship between negative affectivity and social anxiety. In addition, the data suggests the intolerance of uncertainty is uniquely related to social

anxiety above and beyond the influence of negative affectivity. This lends support for the second hypothesis of the study.

Limitations and Directions for Future Research

Despite the support for the model tested, this study has several limitations which are important to note. First, the model examined here is somewhat simplistic. Although theoretically consistent with previous studies, this particular project only examined two possible factors of social anxiety. There are certainly other factors such as positive affectivity, anxiety sensitivity, etc. that may make considerable improvements to amount of variance accounted for if added to the model. In addition, there is certainly a literature base suggesting that there is interplay between anxiety disorders which was not examined in this model. Future research could expand upon the current model examining multiple mediating constructs to determine the most optimal design. This would add more depth to our understanding of anxiety disorders and thus more generalizability to real-world practice.

In addition, this study used a cross-sectional design. Thus, assumptions of causality are based on postulation, not demonstration. Future studies could add more weight to the research base if they were to use a longitudinal design. This may be especially appropriate since as of yet, the etiology of intolerance of uncertainty and other such proposed cognitive vulnerabilities is only speculative.

Finally, although it is becoming clearer that intolerance of uncertainty plays a major in social anxiety specifically and in anxiety disorders in general, few studies have looked at the outcome of targeting intolerance of uncertainty in clinical practice.

Although the construct may be theoretically relevant, the ultimate goal of research is to

be able to inform clinical practice. Therefore, until we know how to best target intolerance of uncertainty in treatment, and the typical results of such interventions, the construct has limited utility to real-world practice.

Summary and Clinical Implications

Overall, the results of this study extend the work of previous research (Sexton, Norton, Walker, & Norton, 2003; Norton, Sexton, Walker, & Norton, 2005; Norton & Mehta, 2007; Carleton, Collimore, & Asmundson, 2010) and provides empirical support for intolerance of uncertainty as a cognitive vulnerability impacting social anxiety. In contrast however to previous research, the utilization of a clinical sample for this study increases the level of external validity in examining this specific construct. Furthermore, the utilization of structural equations modeling as opposed to a general path analysis lends complexity to the model and attempts to eliminate some of the measurement issues inherent in more simplistic models.

There are several key clinical implications of the current research. First, the growing support for intolerance of uncertainty as a possible predictor of social anxiety could have significant implications for the treatment of anxiety disorders. As previously mentioned, current research trends emphasize the identification of higher order risk factors that cut across disorders, in order to augment the dissemination and treatment accessibility to consumers (Norton & Philipp, 2008). If such factors are definitively identified, treatment protocols can focus on them in order to accommodate a greater number of individuals into treatment groups. As it stands now, many treatment protocols are designed to be implemented with a specific anxiety disorder. However, if the overarching common factors of anxiety disorders are identified, the various protocols

developed for specific disorders can be consolidated into one transdiagnostic procedure. This would ease the burden of dissemination by preparing clinicians to treat a multitude of disorders while allowing them to minimize the cost and time of training. Furthermore, the identification of risk factors may inform preventive measures. If specific vulnerabilities can be pinpointed, it may be possible to design preemptive interventions that curtail the proclivity of some to develop more serious anxiety disorders.

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Appendix A

IUS-12

You will find below a series of statements which describe how people may react to the uncertainties of life. Please use the scale to describe to what extent each item is characteristic of you. Please circle a number (1 to 5) that describes you best.

1	2	3	4	5
Not at all characteristic of me		Somewhat characteristic of me		Entirely characteristic of me

- ___1. Unforeseen events upset me greatly.
- ___2. It frustrates me not having all the information I need.
- ___3. One should always look ahead so as to avoid surprises
- ___4. A small unforeseen event can spoil everything, even with the best planning
- ___5. I always want to know what the future has in store for me
- ___6. I can't stand being taken by surprise
- ___7. I should be able to organize everything in advance
- ___8. Uncertainty keeps me from having a full life
- ___9. When it's time to act, uncertainty paralyzes me
- ___10. When I am uncertain, I can't function very well
- ___11. The smallest doubt can stop me from acting
- ___12. I must get away from all uncertain situations

The PANAS

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you generally feel this way, that is, how you feel on average. Use the following scale to record your answers.

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
___ Interested				___ Irritable
___ Distressed				___ Alert
___ Excited				___ Ashamed
___ Upset				___ Inspired
___ Strong				___ Nervous
___ Guilty				___ Determined
___ Scared				___ Attentive
___ Hostile				___ Jittery
___ Enthusiastic				___ Active
___ Proud				___ Afraid

BRIEF FNE

Please indicate how characteristic of you each of the following statements are, using the following rating scale:

1	2	3	4	5
Not at all characteristic of me	Slightly uncharacteristic of me	Moderately characteristic of me	Very characteristic of me	Extremely characteristic of me

- ____ 1. I worry about what people will think of me, even when it doesn't make any difference.
- ____ 2. I am unconcerned even if I know people are forming an unfavorable impression of me.
- ____ 3. I am frequently afraid of other people noticing my shortcomings.
- ____ 4. I rarely worry about what kind of impression I am making on someone.
- ____ 5. I am afraid that people will not approve of me.
- ____ 6. I am afraid that people will find fault with me.
- ____ 7. Other people's opinions of me do not bother me.
- ____ 8. When I am talking to someone, I worry about what they may be thinking about me.
- ____ 9. I am usually worried about what kind of impression I make.
- ____ 10. If I know someone is judging me, it has little effect on me.
- ____ 11. Sometimes I think I am too concerned with what other people think of me,
- ____ 12. I often worry that I will say or do the wrong things.

SPDQ

1. In social situations where it is possible that you will be noticed or evaluated by other people, do you feel excessively nervous, fearful or uncomfortable? Yes___ No___
2. Do you tend to be overly worried that you may act in a way that might embarrass or humiliate yourself in front of other people, or that others may not think well of you? Yes___ No___
3. Do you try to avoid social situations? Yes___ No___

Below is a list of some situations that are fear provoking for some people. Rate the severity of your anxiety and avoidance on the following scales:

0=No fear 0=Never avoid
 1=Mild fear 1=Rarely avoid
 2=Moderate fear 2=Sometimes avoid
 3=Severe fear 3=Often avoid
 4=Very severe fear 4=Always avoid

	(a) fear					(b) avoidance				
4. Parties	0	1	2	3	4	0	1	2	3	4
5. Meetings	0	1	2	3	4	0	1	2	3	4
6. Becoming the focus of attention	0	1	2	3	4	0	1	2	3	4
7. Dating circumstances	0	1	2	3	4	0	1	2	3	4
8. Meeting people in authority	0	1	2	3	4	0	1	2	3	4
9. Speaking with people in authority	0	1	2	3	4	0	1	2	3	4
10. Saying 'no' to unreasonable requests	0	1	2	3	4	0	1	2	3	4
11. A first date	0	1	2	3	4	0	1	2	3	4
12. Asking others to do something differently	0	1	2	3	4	0	1	2	3	4
13. Being introduced	0	1	2	3	4	0	1	2	3	4
14. Initiating a conversation	0	1	2	3	4	0	1	2	3	4
15. Keeping a conversation going	0	1	2	3	4	0	1	2	3	4
16. Giving a speech	0	1	2	3	4	0	1	2	3	4
17. Others judging you	0	1	2	3	4	0	1	2	3	4
18. Being under observation by others	0	1	2	3	4	0	1	2	3	4
19. Being teased	0	1	2	3	4	0	1	2	3	4

20. Do you tend to experience fear each time you are in feared social situations? Yes___ No___
21. Does the fear come on as soon as you encounter feared social situations? Yes___ No___
22. Would you say that your social fear is excessive or unreasonable? Yes___ No___
23. Circle the degree to which your social fear interferes with your life, work, social activities, family, etc.?
 0 1 2 3 4
 No Interference Mild Moderate Severe Very Severe/Disabling
24. How distressing do you find social fear? (Circle one)
 0 1 2 3 4
 Not Distressing Mild Moderately Severely Very Severely
25. Has what you have been able to achieve in your job or in school been negatively effected by your social fear? Yes___ No___

Table 1

Diagnostic Distribution of Sample

Primary Diagnosis	Frequency	Percent
Social Phobia	88	40.6
Panic Disorder	43	19.8
Generalized Anxiety Disorder	40	18.4
None	12	5.5
Obsessive Compulsive Disorder	11	5.1
Anxiety Disorder NOS	8	3.7
Specific Phobia	7	3.2
Post Traumatic Stress Disorder	5	2.3
Depression	3	1.4
Total	217	100

Table 2 *Descriptive statistics of the measures administered*

Measure	Mean	Standard Deviation	Minimum	Maximum	α
SPDQ	15.75	7.50	0	43.75	.952
BFNE	46.66	11.37	15	60	.771
PANAS-NA	29.88	7.76	12	51	.899
IUS-12	37.04	11.58	14	60	.907
IUS-PA	22.21	6.96	8	35	.856
IUS-IA	14.83	5.68	4	25	.875

Table 3

Correlations between measures

	SPDQ	BFNE	PANAS-NA	IUS-12	IUS-PA	IUS-IA
SPDQ	1					
BFNE	.693*	1				
PANAS-NA	.482*	.478*	1			
IUS-12	.428*	.485*	.529*	1		
IUS-PA	.291*	.376*	.419*	.932*	1	
IUS-IA	.516*	.529*	.566*	.897*	.676*	1

* Correlation is significant at the .01 level

Table 4

Factor loading estimate of observed indicators on latent factors for the model

Measure	NA	IU	SAD	R ²
PANAS-NA	1.000 (0.000)			.991
IUS-PA		1.000 (0.000)		.467
IUS-IA		1.183 (0.132)		.980
SPDQ			0.652 (0.061)	.685
BFNE			1.000 (0.000)	.702

Table 5
Direct, Indirect, and Total Effects

Outcome	Effect	Predictor	
		NA	IU
IU	Direct	.354/.575*	
SA	Total	.714/.579*	
	Direct	.395/.320*	.899/.499*
	Indirect via IU	.318/.258*	

Note: Numbers represent unstandardized/standardized regression coefficients

* $p < .01$

Figure 1
Model with Standardized Path Coefficients



