Intolerance of uncertainty on distress and impairment: The mediating role of repetitive negative thinking

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Abstract

Repetitive negative thinking and intolerance of uncertainty are risk and maintenance factors for emotional disorders. Although emerging evidence suggests that intolerance of uncertainty predicts increases in distress through repetitive negative thinking, these relationships have yet to be investigated among veterans. The present study examines if repetitive negative thinking mediates the relationships of intolerance of uncertainty with stress, disordered symptoms and impairment among a mixed clinical sample of veterans. Two hundred and forty-four treatment-seeking veterans with diagnoses of major depressive disorder, panic disorder, or posttraumatic stress disorder completed measures of intolerance of uncertainty, repetitive negative thinking, stress, impairment, depression, panic, and posttraumatic stress prior to receiving treatment. Mediation models revealed indirect effects of intolerance of uncertainty through repetitive negative thinking on stress and impairment in the full sample, and on disordered symptoms in subsamples with major depressive disorder and posttraumatic stress disorder. Conversely, intolerance of uncertainty did not have direct or indirect effects on disordered symptoms in a panic disorder subsample. Findings suggest that repetitive negative thinking and intolerance of uncertainty uniquely contribute to stress, impairment, and disordered symptoms, but repetitive negative thinking, may, in part, drive intolerance of uncertainty's contribution to emotional disorders. Interventions for repetitive negative thinking might improve the efficacy of existing transdiagnostic treatment protocols. Cross-sectional data is a limitation of the present study. Prospective designs in civilian samples can better establish the temporality of these relationships and if they are generalizable to the larger population.

Keywords

repetitive negative thinking; uncertainty; emotional disorders; distress; impairment

Clinical research has increasingly focused on identifying psychological processes that contribute to a range of mental health problems or transdiagnostic factors (Eaton et al.,

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2015; Lynch et al., 2021). Repetitive negative thinking (RNT) and intolerance of uncertainty (IU) are highly related cognitive factors that increase risk for and maintain emotional disorders (de Jong-Meyer et al., 2009; Mahoney & McEvoy, 2012b; Topper et al., 2010). Yet, the nature of their relationship and their respective roles in psychopathology remain unclear, particularly among veterans. The present study examines if repetitive negative thinking mediates the relationships of intolerance of uncertainty with stress, impairment, and disordered symptoms in a sample of veterans with emotional disorders.

Repetitive negative thinking (RNT) describes recurrent, intrusive, and difficult-to-control negative cognitions. One form of RNT, worry, concerns future outcomes, and is associated with increased depressive, anxiety, and posttraumatic stress symptoms (Tull et al., 2011; Vîslă et al., 2022). Worry was first studied in the context of generalized anxiety disorder (GAD); however, individuals with depressive, anxiety, and trauma- and stressor-related disorders report greater worry than healthy controls and individuals with other mental health problems (Arditte-Hall et al., 2019; Bakhshian et al., 2013; Olatunji et al., 2010). While worry is more frequent and severe in individuals with GAD, it is increasingly viewed as a cognitive process that may perpetuate other emotional disorders (Vîslă et al., 2022).

Rumination, another well-studied form of RNT, focuses more on the past (Papageorgiou & Wells, 1999). Rumination describes repeatedly and passively thinking about the causes and consequences of distressing symptoms (Nolen-Hoeksema, 1991). Rumination was initially studied in reference to major depressive disorder (MDD) and predicts the onset and worsening of depression symptoms (Nolen-Hoeksema, 2000). Rumination is more frequent and severe in individuals with MDD relative to healthy controls and individuals with other disorders (Olatunji et al., 2013). Yet, rumination is not exclusive to MDD. Rumination also predicts increases in anxiety and posttraumatic stress symptoms (McLaughlin & Nolen-Hoeksema, 2011), and individuals with emotional disorders report higher levels of rumination relative to healthy controls (Olatunji et al., 2013). Rumination may be especially relevant to posttraumatic stress disorder (PTSD), given its emphasis on a past traumatic event, and evidence shows that individuals with PTSD report higher levels of rumination compared to non-trauma- and trauma-exposed individuals without PTSD (Moulds et al., 2020). Rumination might be particularly detrimental to veterans. Relative to civilians, rumination is more predictive of posttraumatic stress symptoms and suicidality in veterans (Hetelekides et al., 2022).

While most findings specifically focus on worry and rumination, researchers increasingly recognize their considerable overlap and question how much they are meaningfully different (McEvoy et al., 2010; Topper et al., 2010). Consequently, RNT was recently introduced as a broad transdiagnostic cognitive process to subsume worry, rumination, and other maladaptive thinking patterns. Measures of RNT (e.g., Ehring et al., 2011; McEvoy et al., 2010) do not explicitly refer to "worry" or "rumination," nor do they specify whether negative thoughts concern future or past issues or situations. Rather, items capture the tendency to experience negative thoughts as intrusive ("Thoughts intrude into my mind"), recurring ("I keep thinking about the same issue all the time;" Ehring et al., 2011) and uncontrollable ("Once I start thinking about the situation, I can't stop;" McEvoy et al., 2010). RNT measures exhibit strong relationships with established measures of worry and

rumination and are just as predictive of emotional disorder symptom severity (Ehring et al., 2011; McEvoy et al., 2010). Further, evidence demonstrates that RNT can be effectively targeted to treat emotional disorders (Akbari et al., 2015). However, to effectively target RNT, it is critical to understand what prompts individuals to engage in it in the first place.

Individuals may engage in RNT about an issue or situation that is uncertain. That is, they may be high in IU, or the tendency to perceive ambiguity as harmful and experience discomfort when encountering uncertain stimuli (Dugas et al., 1997). IU was introduced to contextualize GAD's hallmark symptom, excessive and uncontrollable worry. The Intolerance of Uncertainty Model (IUM) theorizes that individuals with GAD find uncertain situations particularly threatening and cope with the associated distress they feel by considering a range of future adverse outcomes (Dugas et al., 1995). That is, they worry to increase their sense of certainty and control when facing ambiguity (Freeston et al., 1994).

In line with IUM, findings support that IU predicts GAD onset, GAD symptom severity, and worry (Dugas et al., 1997; Gentes & Ruscio, 2011; Ladouceur et al., 1997). However, IU is not unique to GAD and worry. Evidence demonstrates that IU is a risk and maintenance factor for other disorders characterized by RNT (Mahoney & McEvoy, 2012b), including MDD, anxiety disorders, and PTSD (Carleton et al., 2012; Hunt et al., 2022; McEvoy et al., 2019; White & Gumley, 2009). Accumulating findings show that IU predicts rumination (e.g., de Jong-Meyer et al., 2009; Liao & Wei, 2011; Yook et al., 2010) and other forms of RNT such as catastrophizing and post-event processing (Rondung et al., 2019; Shikatani et al., 2016).

Although a growing body of literature supports IU's relationship with RNT, the directionality and nature of their relationship are less studied. IU is expected to precede engagement in RNT (Dugas et al., 2004; Bredemeier & Berenbaum, 2008), and multiple studies support this theory. Measurement models show that IU connects more distal, higher-order factors like neuroticism to worry and rumination (e.g., Clarke & Kiropoulos, 2021; McEvoy & Mahoney, 2012, 2013), and IU mediates the relationship between retrospective reports of anxious parenting and worry (Zlomke & Young, 2009). These findings suggest IU drives the development of RNT. Still, another study found that IU and worry exhibit a reciprocal relationship over time in adolescents (Dugas et al., 2012).

Specific forms of RNT have been evaluated as mediators between IU and symptoms in non-clinical and clinical samples. Cross-sectionally and longitudinally, Huang et al. (2019) found that worry mediated the relationships of IU with anxiety and depression, and Yao et al. (2022) found that rumination mediated the relationship between IU and depression among community participants. Yook and colleagues (2010) found that worry partially mediated the relationship between IU and anxiety and fully mediated the relationship between IU and depression in a small sample of individuals with MDD and/or GAD. RNT may explain why IU predicts symptoms of depression and anxiety.

While multiple findings suggest IU may influence emotional disorders through worry and rumination, no studies have evaluated the indirect effect of IU through RNT on symptoms in a clinical sample of veterans. As veterans exhibit higher rates of emotional disorders (Black

et al., 2004; Kessler et al., 2005) and are more likely to experience resulting problems (i.e., homelessness, suicidality; Olenick et al., 2015) relative to civilians, they could benefit from treatments informed by an improved understanding of transdiagnostic factors that contribute to anxiety, depressive and related disorders.

The present investigation addresses gaps in the literature by exploring RNT as a mediator between IU and psychopathological outcomes in a mixed clinical sample of treatment-seeking veterans with emotional disorders. The indirect effects of IU through RNT on 1) stress and 2) impairment will be tested in a full sample of participants with primary emotional disorder diagnoses, while the indirect effects of IU through RNT will be tested on 3) depressive symptoms in a subsample of participants with MDD; 4) panic symptoms in a subsample of participants with panic disorder; and 5) posttraumatic stress symptoms in a subsample of participants with PTSD. RNT is expected to partially mediate the relationships of IU with stress and impairment in the full sample and partially mediate the relationships of IU with specific symptoms in the MDD, panic disorder, and PTSD subsamples.

Methods

Participants

The current study includes participants (175 males and 69 females) enrolled in larger ongoing randomized controlled trials. Participants presented to a Southeastern Veteran Affairs Healthcare System (VAHCS) for treatment and agreed to enroll in a study of evidence-based psychotherapy for emotional disorders. To be eligible, participants needed to 1) demonstrate competence to complete study consent and procedures, 2) meet diagnostic criteria for a primary emotional disorder of MDD, PTSD, or panic disorder in the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (*DSM-5*; American Psychiatric Association, 2013), and 3) be 18 to 80 years old. Participants were not eligible to participate if they had 1) recently (2 months) been hospitalized or made a suicide attempt; 2) an acute, severe illness or medical condition that would impede study procedures; or 3) a psychotic, personality, bipolar, or substance use disorder diagnosis. Two-hundred fifty-seven participants were eligible and included in the study.

Participants ranged in age from 20 to 80 years old ($M = 45.91$; $SD = 13.97$), and their racial and ethnic makeup was consistent with that of the Southeastern United States (55.3% White, 36.1% Black, 7% Hispanic/Latino, 0.8% Native American, 0.4% Asian American, and 0.4% Other). Approximately half of participants were employed (52.3%). Participants varied in educational attainment (0.4% did not graduate high school, 13.7% completed high school, 46.1% finished some college or earned a 2-year degree, 39.8% earned a college degree or more) and income (37.8% $0–40K, 40.4% $40–80K, 21.71% >$80K). Primary diagnoses included MDD ($n = 108$), panic disorder ($n = 51$), and PTSD ($n = 85$), and 75% of participants met criteria for at least one comorbid diagnosis. Given symptom-specific outcomes of interest, participants with comorbid MDD, panic disorder, and PTSD were included in disorder subsamples. The present study included a full sample ($N = 244$) and three subsamples (MDD = 190; panic disorder = 65; PTSD = 140).

Procedures

The local VAHCS Research and Development Committee and the affiliated university's institutional review board approved all study procedures. At baseline, participants completed informed consent documents and self-report measures, and underwent a diagnostic interview conducted by trained clinician interviewers.

Measures

Anxiety Disorders Interview Schedule-5—The Anxiety Disorders Interview Schedule-5 (ADIS-5; Brown, 2014) is a semi-structured interview designed to diagnose anxiety, mood, obsessive-compulsive, trauma, and related disorders using *DSM-5* diagnostic criteria. A diagnosis of PTSD requires endorsement of exposure to and symptoms in response to a criterion A traumatic event, defined in *DSM-5* as experiencing or witnessing events associated with death, serious injury or sexual violence. ADIS-5 is a valid diagnostic interview for emotional disorders and exhibits excellent interrater reliability (Brown, 2014). As data collection is ongoing, interrater reliability has yet to be available for this dataset. In past studies from the same research group (Gros & Allan, 2019), independent raters scored 20% of interviews, and findings demonstrated excellent interrater agreement.

Intolerance of Uncertainty Scale-12—The Intolerance of Uncertainty Scale-12 (IUS-12; Carleton et al., 2007). The IUS-12 is a 12-item self-report measure of the tendency to perceive the potential of negative outcomes as threatening. Respondents rate how characteristic items are of them in general on a 5-point Likert scale from 1 (not at all characteristic of me) to 5 (entirely characteristic of me). Item ratings are summed for a total score, with higher scores indicating greater intolerance of uncertainty (score range: 12–60). The IUS-12 exhibits strong relationships with a range of anxiety disorder symptoms (Carleton et al., 2007), and its longer predecessor, the intolerance of uncertainty scale (IUS), demonstrates good test-retest reliability after five weeks ($r = .74$) and accounts for additional variance in anxiety symptoms beyond neuroticism (Freeston et al., 1994). The IUS-12 demonstrated excellent internal consistency in the current investigation ($a = 0.92$).

Perseverative Thinking Questionnaire—The Perseverative Thinking Questionnaire (PTQ; Ehring et al., 2011) is a 15-item self-report measure of repetitive negative thinking. PTQ items are rated on a 5-point Likert scale from 0 (never) to 4 (almost always) based on how typical they are of a person's reactions to stressors. Item responses are summed to produce a PTQ total score, with higher scores suggesting higher levels of repetitive negative thinking (score range: 0–75). The PTQ correlates strongly with worry and rumination measures, demonstrating satisfactory test-retest reliability after four weeks ($r = .69$; Ehring et al., 2011). In this study, the PTQ exhibited excellent internal consistency ($a = 0.96$).

Patient Health Questionnaire-9—The Patient Health Questionnaire-9 (PHQ-9; Kroenke, 2001) is a 9-item self-report measure of depressive symptoms. Items are rated on a 4-point Likert scale from 0 (not at all) to 3 (nearly every day) based on how bothersome symptoms have been in the preceding two weeks. Item responses are added to produce a total score, with higher scores reflecting greater symptom severity (score range: 0–27). The PHQ-9 predicts functional impairment and exhibits strong test-retest reliability after two

days (r = .84; Kroenke, 2001). In the present study, the PHQ-9 demonstrated good internal consistency (a = 0.86).

Albany Panic and Phobia Questionnaire-Interoceptive Subscale—The Albany Panic and Phobia Questionnaire-Interoceptive Subscale (APPQ-I; Rapee et al., 1994) is a self-report measure of fear of specific activities, and the 8-item interoceptive subscale assesses fear of activities that induce physiological sensations characteristic of panic. APPQ items are rated on a 9-point Likert scale from 0 (no fear) to 8 (extreme fear) based on how much fear a person would expect to experience in the upcoming week if they engaged in an activity. Item ratings are summed to produce an APPQ-I subscale score, with higher scores suggesting greater fear of interoceptive symptom-inducing activities (score range: 0–64; Rapee et al., 1994). The APPQ-I is strongly associated with the anxiety sensitivity index, particularly the physical concerns relative to the social concerns subscales (Brown et al., 2005). The APPQ-I demonstrated good internal consistency in the current study (a = 0.86). As interoceptive fear is considered a core feature of panic disorder (Taylor et al., 2007), the APPQ-I was used as a proxy measure of panic symptoms.

PTSD Checklist-5 for DSM-5—The PTSD Checklist-5 for *DSM-5* (PCL-5; Weathers et al., 2013) is a 20-item self-report measure of PTSD symptoms. Items are rated on a 5-point Likert scale from 0 (not at all) to 4 (extremely) based on how bothersome a symptom has been in the past month. Items are summed to produce a total PCL-5 score, with higher scores indicating higher symptom severity (range 0–80). The PCL-5 exhibits strong relationships with other measures of PTSD, weak relationships with measures of antisocial personality disorder and mania, and good test-retest reliability over one week (r = .82; Blevins et al., 2015). The PCL-5 exhibited excellent internal consistency in this study (a = 0.93).

Depression Anxiety Stress Scales-21-Stress Scale—The 7-item stress scale (DASS-21-S) in the Depression Anxiety Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995) is designed to assess tension and agitation. The DASS-21-S was employed in the present study as it assesses common, rather than unique, characteristics of depression and anxiety (Antony et al., 1998). Items are rated on a 4-point Likert scale from 0 (Did not apply to me at all) to 3 (Applied to me very much or most of the time) based on the degree to which a person experienced symptoms over the preceding week. Item responses are summed to create a total score, with higher scores indicating greater stress (range 0–21). The DASS-21-S is moderately associated with measures of anxiety and depression (Lovibond & Lovibond, 1995). In the present investigation, the DASS-21-S demonstrated good internal consistency (a = 0.88).

Illness Intrusiveness Ratings Scale—The Illness Intrusiveness Ratings Scale (IIRS; Devins, 2010) measures the extent to which illness or treatment interferes with different domains of functioning. Respondents rate 13 items on a 7-point Likert scale from 1 (not very much) to 7 (very much) about how much their illness and treatment currently interfere with their functioning in different domains. Item ratings are summed to produce a total score, with higher scores suggesting greater functional impairment (range: 7–91). The IIRS is

associated with different levels of care and symptom severity among patients with different illnesses and demonstrates good to excellent test-retest reliability over 3–18 months ($r =$ .79-.85). The IIRS exhibited excellent internal consistency in this investigation ($\alpha = 0.91$).

Statistical analysis

All data were inspected for item-level missing values. Thirteen participants in the sample, thirteen participants in the MDD subsample, three in the panic disorder subsample, and twelve in the PTSD subsample had significant item-level missing data (>10%) on outcome measures and were excluded from analyses. The remaining full sample and subsamples contained <1% item-level missing data. Item-level missing values were replaced using within-scale mean substitution for remaining participants with minimal missing data.

IBM SPSS Statistics (Version 19) was used to conduct initial correlations between 4 variables in the full sample (IU, RNT, stress, and functional impairment) and the three variables in each subsample (IU and RNT with depressive, panic, and PTSD symptoms), generating 15 correlations total. A p-value less than .05 was deemed statistically significant; however, due to multiple comparisons, a Bonferroni correction was used (.05/15 = .003).

To determine if RNT mediated the relationship between IU and outcomes, bootstrap mediation analyses through the SPSS Process macro were conducted. Since bootstrap mediation is nonparametric and does not assume normality on the sampling distribution of the indirect effect, it is considered more robust for mediation analyses than Sobel's test (Preacher & Hayes, 2004, 2008). The present analyses used 5000 bootstrap samples to estimate indirect effects, which were considered statistically significant if the 95% bias-corrected confidence intervals did not include zero (Preacher & Hayes, 2004, 2008). Per Wen and Fan's (2015) recommendation, indirect and direct effects ratios were reported as effect sizes for consistent mediation paths in addition to the ratio of indirect and total effects. For inconsistent mediation, as the ratio of indirect and direct effects is not considered an appropriate effect size (Wen & Fan, 2015), the standardized, which is considered directly interpretable, was reported (Preacher & Kelly, 2011).

Results

Correlations

Pearson correlations, mean scores, and standard deviations for each of the four variables in the full sample and each of the three variables in the three subsamples are presented in Table 1, respectively. IU, RNT, stress, and functional impairment exhibited medium to large relationships with one another in the full sample (rs = .42-.61). MDD and PTSD subsample relationships among IU, RNT, depressive, and PTSD symptoms ranged from medium to large (rs = .42-.64). Although PTQ moderately correlated with panic symptoms in the panic disorder subsample, the relationship between IU and panic symptoms was not significant. Further, after Bonferroni correction for multiple comparisons ($p < 0.05/15 =$ 0.003), relationships among variables remained significant in the full sample and MDD and PTSD subsamples, but PTQ no longer correlated with symptoms in the panic disorder subsample.

Mediation effects of RNT on the relationships of IU with stress and functional impairment in full sample

Results are presented in Table 2. Separate mediation analyses were conducted with stress and impairment as outcomes. The total effect of IU on stress was significant. When RNT was included the analysis, the strength of the of IU's relationship with stress was reduced. IU demonstrated an indirect effect on stress through RNT.

Likewise, the total effect of IU on impairment was significant. After accounting for the contribution of RNT, the direct effect of IU on impairment exceeded the corrected significance threshold, suggesting an indirect effect of IU on impairment through RNT.

Mediation effects of RNT on the relationships between IU and symptoms in subsamples

Results of three subsample analyses are presented in Table 3. IU exhibited a total effect on depressive symptoms in the MDD subsample. Using the Bonferroni corrected threshold ($p = .003$), the direct effect of IU on depressive symptoms was not significant after RNT was included in the analysis IU, indicating an indirect effect of IU on depressive symptoms through RNT.

The total effect of IU on panic symptoms in the panic disorder subsample was not significant. With the Bonferroni corrected threshold ($p > .003$), RNT did not predict panic symptoms. When RNT was included in the analysis, IU did not exhibit a direct effect on panic symptoms. IU did not demonstrate an indirect effect on panic symptoms through RNT.

IU demonstrated a total effect on posttraumatic stress symptoms in the PTSD subsample. Once RNT was included in the analysis, the direct effect of IU on posttraumatic stress symptoms was significant. IU exhibited an indirect effect on posttraumatic stress symptoms through RNT.

Discussion

The present study aimed to address gaps in the literature by evaluating RNT as a mediator of IU's relationships with broad and specific symptoms among veterans with a range of emotional disorders. IU exhibited indirect effects on stress and impairment through RNT in the full mixed clinical sample. Similarly, IU exhibited indirect effects on depression and posttraumatic stress through RNT in the MDD and PTSD subsamples. This is consistent with previous studies that suggest IU's influence over psychopathology is exerted through forms of RNT, like worry and rumination (Huang et al., 2019; Yao et al., 2022; Yook et al., 2010). The present findings are in line with previous studies that indicate IU (Carleton et al., 2012; McEvoy et al., 2019; White & Gumley, 2009) and RNT (Arditte-Hall et al., 2019; Bakhshian et al., 2013; Olatunji et al., 2010) contribute to symptom severity in individuals with MDD and PTSD. Given that these findings extended to stress and impairment in the full mixed clinical sample and specific symptoms in two of the three clinical subsamples, this further supports IU and RNT as transdiagnostic factors.

If IU and RNT uniquely contribute to a range of symptoms, and RNT can partially explain IU's deleterious effects, this has implications for specific models of emotional disorders.

In particular, although IUM was initially conceptualized in reference to GAD (Dugas et al., 1995), it may be extended to MDD and PTSD. Likewise, existing models of MDD and PTSD symptoms may benefit from contextualizing pathological thinking and behavioral patterns with IU to improve our understanding of these disorders. The cognitive model of MDD emphasize negative thoughts about the self, world, and future (Beck, 1967), and the behavioral activation model of MDD emphasize behavioral restriction (Lewinsohn, 1974). IU may enhance or connect cognitive and behavioral models of MDD. Individuals report greater depressive symptoms when they are uncertain about their ability to cope with negative affect and experience positive affect (Thibodeau et al., 2015). This might explain why IU predicts behavioral restriction in individuals with MDD (Mahoney & McEvoy, 2012a). Perhaps individuals with MDD engage in fewer activities because they do not know if activities will make them feel worse and/or not feel better. Likewise, IU may improve conceptualizations of thoughts and behaviors characteristic of PTSD (Brewin & Holmes, 2003). Individuals report increased posttraumatic stress symptoms when they are unclear about the affective consequences of talking or thinking about traumatic events (Mahoney & McEvoy, 2012a). Individuals with PTSD might avoid trauma reminders because they do not know how facing reminders will make them feel (Fetzner et al., 2013).

Findings also have transdiagnostic implications for treatments of emotional disorders. Although existing treatments that explicitly target IU and RNT, including IU therapy, metacognitive therapy, and mindfulness-based therapies, were designed to address GAD and MDD, they may be adapted to other emotional disorders. IU therapy and metacognitive therapy entail interventions to challenge beliefs about the threat of uncertainty and the utility of RNT. Mindfulness-based therapies entail techniques to disengage from the perceived threat of uncertain stimuli and RNT. Multiple randomized clinical trials demonstrate that IU therapy, metacognitive therapy, and mindfulness-based therapies result in significant decreases in IU and RNT (Alimehdi et al., 2016; Hui & Zhihui, 2016; van der Heiden et al., 2012; Zemestani et al., 2021). Alternatively, specific interventions within these treatments (i.e., behavioral experiments, metacognitive restructuring, and mindfulness) may be incorporated into treatments for other emotional disorders.

Even when transdiagnostic interventions do not explicitly target IU and RNT, they appear to produce comparable reductions in IU and RNT, including applied relaxation, cognitive restructuring, exposure, behavioral activation, and problem-solving (Mahoney & McEvoy, 2012c; Monteregee et al., 2020). Findings show transdiagnostic treatments lead to significant decreases in IU and RNT in individuals with anxiety and depressive disorders, and changes in IU and RNT correspond to changes in symptoms (Boswell et al., 2013; Laposa et al., 2017; Talkovsky & Norton, 2016). This may be especially important for veterans who struggle with IU and RNT. IU predicts symptom severity among veterans with emotional disorders (Hunt et al., 2022) and they report smaller reductions in RNT following treatment relative to civilians (Barrera et al., 2015; Hundt et al., 2014). Since veterans are more likely to have comorbid mental health problems (Black et al., 2004; Kessler et al., 2005), they may benefit from transdiagnostic treatments that reduce IU and RNT.

Neither IU nor RNT predicted symptoms in the panic disorder subsample. This could suggest that IU and RNT may not contribute to panic, which conflicts with previous results

(Carleton et al., 2014; Mahoney et al., 2012). Other studies have found that IU and RNT may not contribute or contribute less to panic symptoms relative to symptoms of other emotional disorders (Dugas et al., 2001; McEvoy et al., 2012). Null results might also stem from methodological issues. Evidence suggests that the panic outcome measure in this study (APPQ-INT) may be a suboptimal measure of panic symptoms. The feared activities and situations described in the APPQ-INT may be more relevant to agoraphobia, or physical exertion symptoms of panic more so than other panic symptoms (Brown et al., 2005). Additionally, the present panic analyses may have been underpowered. Due to multiple comparisons, the present study employed a Bonferroni correction, reducing the typical p-value from .05 to .003. Without this correction, RNT exhibited a significant direct effect ($p = .01$) on panic symptoms in the panic disorder subsample. Further, the panic disorder subsample ($n = 65$) was substantially smaller than the MDD ($n = 189$) and PTSD ($n = 140$) subsamples. Given the generally small to medium effects of IU and RNT on panic in the literature (e.g., Carleton et al., 2014; McEvoy et al., 2012) and the small subsample size, the present secondary data analysis was likely underpowered to detect direct and indirect effects.

Limitations

Implications of present findings are tempered by limitations. First, the relationships were analyzed cross-sectionally, which prevents the establishment of directionality of relationships among IU, RNT, and symptoms. It may be particularly important to establish temporal precedence between IU and RNT, given that previous findings suggest that IU may mediate the relationship of RNT with symptoms (Zlomke & Young, 2009). Second, as previously mentioned, the mediation analysis within the panic subsample may have employed suboptimal measures and was underpowered to detect direct and indirect effects due to the small subsample size. Third, the full mixed clinical sample included individuals with primary MDD, panic disorder, and PTSD diagnoses, which represent a portion of individuals with emotional disorders. Emotional disorders also include other depressive, anxiety, and categories of disorders. Fourth, results from a veteran sample may not apply to civilians with MDD, panic disorder, and PTSD.

To address these limitations, these relationships must be examined prospectively to determine directionality. RNT should also be investigated as a mediator of IU, and symptoms should also be examined in a larger sample of individuals with panic disorder with a broader measure of panic symptoms (e.g., Panic Disorder Severity Scale; Shear et al., 1997). RNT should also be examined as a mediator of IU's relationships with symptoms in other mental health problems with strong relationships to these constructs, including obsessive-compulsive and related disorders and eating disorders (Brown et al., 2017; Gentes et al., 2011). These relationships should be examined in non-veteran samples to ensure generalizability to the greater clinical population.

Future Directions

Future research could investigate RNT as an explanatory mechanism between different subtypes of IU and symptoms. While situational IU concerns IU regarding scenarios that may be threatening to individuals with different disorders, prospective IU and inhibitory IU represent subdimensions of trait IU. Prospective IU concerns uncertainty around future

outcomes, while inhibitory IU concerns difficulty coping with uncertainty (Hong et al., 2015). Analyzing the indirect effects of specific forms of IU on symptoms through RNT may yield a more granular understanding and targeting of IU for specific symptom presentations. For example, if a veteran is higher in prospective IU, they may benefit more from interventions designed to challenge beliefs about uncertainty related to future events and the utility of worry. As RNT partially mediates the relationships between IU and symptoms, other mediators, particularly maladaptive forms of coping, should be studied. Evidence indicates that IU contributes to behavioral avoidance (Flores et al., 2018), another driver of psychopathology in emotional disorders. Researchers may fully explain why IU results in symptoms by identifying other mediators.

Conclusions

The present study is the first exploration of IU's indirect effects on distress and impairment through RNT in a mixed clinical sample of veterans. RNT may help explain why IU leads to 1) stress and impairment in emotional disorders, 2) depressive symptoms in MDD, and 3) posttraumatic stress symptoms in PTSD. IU and RNT are established transdiagnostic risk and maintenance factors for emotional disorders that are strongly related to one another. The present findings demonstrate how the dynamic between IU and RNT contributes to psychopathology. By improving our understanding of how their relationship contributes to symptoms, IU and RNT can be effectively targeted to reduce distress and impairment for veterans with emotional disorders.

Acknowledgments

References

Akbari M, Roshan R, Shabani A, Fata L, Shairi MR, & Zarghami F (2015). Transdiagnostic treatment of co-occurrence of anxiety and depressive disorders based on repetitive negative thinking: A case series. Iranian Journal of Psychiatry, 10(3), 200–211. Retrieved from /pmc/articles/PMC4749690/ [PubMed: 26877754]

Akbari M, Seydavi M, Hosseini ZS, Krafft J, & Levin ME (2022). Experiential avoidance in depression, anxiety, obsessive-compulsive related, and posttraumatic stress disorders: A comprehensive systematic review and meta-analysis. Journal of Contextual Behavioral Science, 24, 65–78. 10.1016/j.jcbs.2022.03.007

Alimehdi M, Ehteshamzadeh P, Naderi F, Eftekharsaadi Z, & Pasha R (2016). The effectiveness of mindfulness-based stress reduction on intolerance of uncertainty and anxiety sensitivity among individuals with generalized anxiety disorder. Asian Social Science, 12(4), 179–187. 10.5539/ass.v12n4p179

Antony MM, Bieling PJ, Cox BJ, Enns MW, & Swinson RP (1998). Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. Psychological Assessment, 10(2), 176–181. 10.1037/1040-3590.10.2.176

American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Mental Disorders. In Diagnostic and Statistical Manual of Mental Disorders. 10.1176/appi.books.9780890425596

Arditte Hall KA, Quinn ME, Vanderlind WM, & Joormann J (2019). Comparing cognitive styles in social anxiety and major depressive disorders: An examination of rumination, worry, and

reappraisal. British Journal of Clinical Psychology, 58(2), 231–244. 10.1111/bjc.12210 [PubMed: 30484868]

Badawi A, Steel Z, Harb M, Mahoney C, & Berle D (2022). Changes in intolerance of uncertainty over the course of treatment predict posttraumatic stress disorder symptoms in an inpatient sample. Clinical Psychology and Psychotherapy, 29(1), 230–239. 10.1002/cpp.2625 [PubMed: 34110076]

Bakhshian F, Abolghasemi A, & Narimani M (2013). Thought Control Strategies in the Patients with Acute Stress Disorder and PTSD. Procedia - Social and Behavioral Sciences, 84, 929–933. 10.1016/j.sbspro.2013.06.676

Bardeen JR, Fergus TA, & Wu KD (2013). The interactive effect of worry and intolerance of uncertainty on posttraumatic stress symptoms. Cognitive Therapy and Research, 37(4), 742–751. 10.1007/s10608-012-9512-1

Barrera TL, Cully JA, Amspoker AB, Wilson NL, Kraus-Schuman C, Wagener PD, … & Stanley MA. (2015). Cognitive–behavioral therapy for late-life anxiety: Similarities and differences between Veteran and community participants. Journal of anxiety disorders, 33, 72–80. [PubMed: 26005839]

Beck AT (1967). Depression: Clinical, experimental, and theoretical aspects. New York: Harper & Row.

Black DW, Carney CP, Peloso PM, Woolson RF, Schwartz DA, Voelker MD, … & Doebbeling BN. (2004). Gulf War veterans with anxiety: prevalence, comorbidity, and risk factors. Epidemiology, 135–142. 10.1097/01.EDE.0000103188.18059.21 [PubMed: 15127904]

Blevins CA, Weathers FW, Davis MT, Witte TK, & Domino JL (2015). The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Development and Initial Psychometric Evaluation. Journal of Traumatic Stress, 28(6), 489–498. 10.1002/jts.22059 [PubMed: 26606250]

Boswell JF, Thompson-Hollands J, Farchione TJ, & Barlow DH (2013). Intolerance of Uncertainty: A Common Factor in the Treatment of Emotional Disorders. Journal of Clinical Psychology, 69(6), 630–645. 10.1002/jclp.21965 [PubMed: 23381685]

Bredemeier K, & Berenbaum H (2008). Intolerance of uncertainty and perceived threat. Behaviour Research and Therapy, 46(1), 28–38. 10.1016/j.brat.2007.09.006 [PubMed: 17983612]

Brewin CR, & Holmes EA (2003). Psychological theories of posttraumatic stress disorder. Clinical Psychology Review, 23(3), 339–376. 10.1016/S0272-7358(03)00033-3 [PubMed: 12729677]

Brown M, Robinson L, Campione GC, Wuensch K, Hildebrandt T, & Micali N (2017). Intolerance of Uncertainty in Eating Disorders: A Systematic Review and Meta-Analysis. European Eating Disorders Review, 25, 329–343. 10.1002/erv.2523 [PubMed: 28544668]

Brown TA, & Barlow DH (2014). Anxiety and related disorders interview schedule for DSM-5 (ADIS-5)-adult and lifetime version: Clinician manual. Oxford University Press.

Brown TA, White KS, & Barlow DH (2005). A psychometric reanalysis of the Albany Panic and Phobia Questionnaire. Behaviour Research and Therapy, 43(3), 337–355. 10.1016/j.brat.2004.03.004 [PubMed: 15680930]

Carleton NR, Mulvogue MK, Thibodeau MA, McCabe RE, Antony MM, & Asmundson GJG (2012). Increasingly certain about uncertainty: Intolerance of uncertainty across anxiety and depression. Journal of Anxiety Disorders, 26(3), 468–479. 10.1016/j.janxdis.2012.01.011 [PubMed: 22366534]

Carleton RN, Duranceau S, Freeston MH, Boelen PA, McCabe RE, & Antony MM (2014). "But it might be a heart attack": Intolerance of uncertainty and panic disorder symptoms. Journal of Anxiety Disorders, 28(5), 463–470. 10.1016/j.janxdis.2014.04.006 [PubMed: 24873884]

Carleton RN, Fetzner MG, Hackl JL, & McEvoy P (2013). Intolerance of Uncertainty as a Contributor to Fear and Avoidance Symptoms of Panic Attacks. Cognitive Behaviour Therapy, 42(4), 328–341. 10.1080/16506073.2013.792100 [PubMed: 23758117]

Carleton RN, Norton MAPJ, & Asmundson GJG (2007). Fearing the unknown: A short version of the Intolerance of Uncertainty Scale. Journal of Anxiety Disorders, 21(1), 105–117. 10.1016/j.janxdis.2006.03.014 [PubMed: 16647833]

Clarke E, & Kiropoulos LA (2021). Mediating the relationship between neuroticism and depressive, anxiety and eating disorder symptoms: The role of intolerance of uncertainty and cognitive flexibility. Journal of Affective Disorders Reports, 4, 1–8. 10.1016/j.jadr.2021.100101

Devins GM (2010). Using the Illness Intrusiveness Ratings Scale to understand health-related quality of life in chronic disease. Journal of Psychosomatic Research, 68(6), 591–602. 10.1016/j.jpsychores.2009.05.006 [PubMed: 20488277]

Dugas MJ, Buhr K, & Ladouceur R (2004). The Role of Intolerance of Uncertainty in Etiology and Maintenance. In Generalized anxiety disorder: Advances in research and practice. (pp. 143–163). Retrieved from https://psycnet.apa.org/record/2004-16375-006

Dugas MJ, Freeston MH, & Ladouceur R (1997). Intolerance of uncertainty and problem orientation in worry. Cognitive Therapy and Research, 21, 593–606. 10.1023/A:1021890322153

Dugas MJ, Gosselin P, & Ladouceur R (2001). Intolerance of uncertainty and worry: Investigating specificity in a nonclinical sample. Cognitive Therapy and Research, 25(5), 551–558. 10.1023/A:1005553414688

Dugas MJ, Laugesen N, & Bukowski WM (2012). Intolerance of uncertainty, fear of anxiety, and adolescent worry. Journal of Abnormal Child Psychology, 40(6), 863–870. 10.1007/s10802-012-9611-1 [PubMed: 22302481]

Dugas MJ, Letarte H, Rhéaume J, Freeston MH, & Ladouceur R (1995). Worry and problem solving: Evidence of a specific relationship. Cognitive Therapy and Research, 19, 109–120. 10.1007/BF02229679

Eaton NR, Rodriguez-Seijas C, Carragher N, & Krueger RF (2015). Transdiagnostic factors of psychopathology and substance use disorders: a review. Social Psychiatry and Psychiatric Epidemiology, 50, 171–182. 10.1007/s00127-014-1001-2 [PubMed: 25563838]

Ehring T, Zetsche U, Weidacker K, Wahl K, Schönfeld S, & Ehlers A (2011). The Perseverative Thinking Questionnaire (PTQ): Validation of a content-independent measure of repetitive negative thinking. Journal of Behavior Therapy and Experimental Psychiatry, 42(2), 225–232. 10.1016/j.jbtep.2010.12.003 [PubMed: 21315886]

Fetzner MG, Horswill SC, Boelen PA, & Carleton RN (2013). Intolerance of uncertainty and PTSD symptoms: Exploring the construct relationship in a community sample with a heterogeneous trauma history. Cognitive Therapy and Research, 37(4), 725–734. 10.1007/s10608-013-9531-6

Flores A, López FJ, Vervliet B, & Cobos PL (2018). Intolerance of uncertainty as a vulnerability factor for excessive and inflexible avoidance behavior. Behaviour Research and Therapy, 104, 34–43. 10.1016/j.brat.2018.02.008 [PubMed: 29524740]

Freeston MH, Rhéaume J, Letarte H, Dugas MJ, & Ladouceur R (1994). Why do people worry? Personality and Individual Differences, 17(6), 791–802. 10.1016/0191-8869(94)90048-5

Gentes EL, & Ruscio AM (2011). A meta-analysis of the relation of intolerance of uncertainty to symptoms of generalized anxiety disorder, major depressive disorder, and obsessive-compulsive disorder. Clinical Psychology Review, 31, 923–933. 10.1016/j.cpr.2011.05.001 [PubMed: 21664339]

Gros DF, & Allan NP (2019). A randomized controlled trial comparing Transdiagnostic Behavior Therapy (TBT) and behavioral activation in veterans with affective disorders. Psychiatry Research, 281, 112541. 10.1016/j.psychres.2019.112541 [PubMed: 31514043]

Hetelekides E, Bravo AJ, Burgin E et al. PTSD, rumination, and psychological health: examination of multi-group models among military veterans and college students. Curr Psychol (2022). 10.1007/s12144-021-02609-3

Hong RY, & Lee SSM (2015). Further clarifying prospective and inhibitory intolerance of uncertainty: Factorial and construct validity of test scores from the intolerance of uncertainty scale. Psychological Assessment, 27(2), 605–620. 10.1037/pas0000074 [PubMed: 25602690]

Huang V, Yu M, Nicholas Carleton R, & Beshai S (2019). Intolerance of uncertainty fuels depressive symptoms through rumination: Cross-sectional and longitudinal studies. PLoS ONE, 14(11), e0224865. 10.1371/journal.pone.0224865 [PubMed: 31743357]

Hundt NE, Amspoker AB, Kraus-Schuman C, Cully JA, Rhoades H, Kunik ME, & Stanley MA (2014). Predictors of CBT outcome in older adults with GAD. Journal of anxiety disorders, 28(8), 845–850. 10.1016/j.janxdis.2014.09.012 [PubMed: 25445074]

Hunt C, Exline JJ, Fletcher TL, & Teng EJ (2022). Intolerance of uncertainty prospectively predicts the transdiagnostic severity of emotional psychopathology: Evidence from a Veteran sample. Journal of Anxiety Disorders, 86, 1–10. 10.1016/J.JANXDIS.2022.102530

de Jong-Meyer R, Beck B, & Riede K (2009). Relationships between rumination, worry, intolerance of uncertainty and metacognitive beliefs. Personality and Individual Differences, 46(4), 547–551. 10.1016/j.paid.2008.12.010

Katherine Shear M, Brown TA, Barlow DH, Money R, Sholomskas DE, Woods SW, … Papp LA (1997). Multicenter collaborative panic disorder severity scale. American Journal of Psychiatry, 154(11), 1571–1575. 10.1176/ajp.154.11.1571 [PubMed: 9356566]

Kessler RC, Chiu WT, Demler O, & Walters EE (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Archives of General Psychiatry, 62(6), 617–627. 10.1001/archpsyc.62.6.617 [PubMed: 15939839]

Kroenke K, Spitzer RL, & Williams JBW (2001). The PHQ-9: Validity of a brief depression severity measure. Journal of General Internal Medicine, 16(9), 606–613. 10.1046/j.1525-1497.2001.016009606.x [PubMed: 11556941]

Ladouceur R, Talbot F, & Dugas MJ (1997). Behavioral expressions of intolerance of uncertainty in worry: Experimental findings. Behavior Modification, 21, 355–371. 10.1177/01454455970213006 [PubMed: 9243960]

Laposa JM, Mancuso E, Abraham G, & Loli-Dano L (2017). Unified Protocol Transdiagnostic Treatment in Group Format: A Preliminary Investigation with Anxious Individuals. Behavior Modification, 41(2), 253–268. 10.1177/0145445516667664 [PubMed: 27591430]

Laugesen N, Dugas MJ, & Bukowski WM (2003). Understanding adolescent worry: The application of a cognitive model. Journal of Abnormal Child Psychology, 31(1), 55–64. 10.1023/A:1021721332181 [PubMed: 12597699]

Liao KYH, & Wei M (2011). Intolerance of uncertainty, depression, and anxiety: The moderating and mediating roles of rumination. Journal of Clinical Psychology, 67(12), 1220–1239. 10.1002/jclp.20846 [PubMed: 22052621]

Lovibond PF, & Lovibond SH (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behaviour Research and Therapy, 33(3), 335–343. 10.1016/0005-7967(94)00075-U [PubMed: 7726811]

Lynch SJ, Sunderland M, Newton NC, & Chapman C (2021). A systematic review of transdiagnostic risk and protective factors for general and specific psychopathology in young people. Clinical Psychology Review, 87, 2–20. 10.1016/j.cpr.2021.102036

Mahoney AEJ, & McEvoy PM (2012a). Trait versus situation-specific intolerance of uncertainty in a clinical sample with anxiety and depressive disorders. Cognitive Behaviour Therapy, 41(1), 26–39. 10.1080/16506073.2011.622131 [PubMed: 22032804]

Mahoney AEJ, & McEvoy PM (2012b). A Transdiagnostic Examination of Intolerance of Uncertainty Across Anxiety and Depressive Disorders. Cognitive Behaviour Therapy, 41(3), 212–222. 10.1080/16506073.2011.622130 [PubMed: 22032195]

Mahoney AE, & McEvoy PM (2012c). Changes in intolerance of uncertainty during cognitive behavior group therapy for social phobia. Journal of Behavior Therapy and Experimental Psychiatry, 43(2), 849–854. 10.1016/j.jbtep.2011.12.004 [PubMed: 22204898]

McEvoy PM, & Erceg-Hurn DM (2015). The search for universal transdiagnostic and transtherapy change processes: Evidence for intolerance of uncertainty. Journal of Anxiety Disorders, 41, 96–107. 10.1016/j.janxdis.2016.02.002

McEvoy PM, Hyett MP, Shihata S, Price JE, & Strachan L (2019). The impact of methodological and measurement factors on transdiagnostic associations with intolerance of uncertainty: A meta-analysis. Clinical Psychology Review, 73, 101778. 10.1016/j.cpr.2019.101778 [PubMed: 31678816]

McEvoy PM, & Mahoney AEJ (2012). To Be Sure, To Be Sure: Intolerance of Uncertainty Mediates Symptoms of Various Anxiety Disorders and Depression. Behavior Therapy, 43(3), 533–545. 10.1016/j.beth.2011.02.007 [PubMed: 22697442]

McEvoy PM, & Mahoney AEJ (2013). Intolerance of uncertainty and negative metacognitive beliefs as transdiagnostic mediators of repetitive negative thinking in a clinical sample with anxiety disorders. Journal of Anxiety Disorders, 27(2), 216–224. 10.1016/j.janxdis.2013.01.006 [PubMed: 23474912]

McEvoy PM, Mahoney AEJ, & Moulds ML (2010). Are worry, rumination, and post-event processing one and the same?. Development of the repetitive thinking questionnaire. Journal of Anxiety Disorders, 24(5), 509–519. 10.1016/j.janxdis.2010.03.008 [PubMed: 20409676]

McLaughlin KA, & Nolen-Hoeksema S (2011). Rumination as a transdiagnostic factor in depression and anxiety. Behaviour Research and Therapy, 49(3), 186–193. 10.1016/j.brat.2010.12.006 [PubMed: 21238951]

Monteregge S, Tsagkalidou A, Cuijpers P, & Spinhoven P (2020). The effects of different types of treatment for anxiety on repetitive negative thinking: A meta-analysis. Clinical Psychology: Science and Practice, 27(2), 1–20. 10.1111/cpsp.12316

Moulds ML, Bisby MA, Wild J, & Bryant RA (2020). Rumination in posttraumatic stress disorder: A systematic review. Clinical Psychology Review, 82, 1–16. 10.1016/J.CPR.2020.101910

Nolen-Hoeksema S (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. Journal of Abnormal Psychology, 109(3), 504–511. 10.1037/0021-843X.109.3.504 [PubMed: 11016119]

Nolen-Hoeksema S (1991). Responses to Depression and Their Effects on the Duration of Depressive Episodes. Journal of Abnormal Psychology, 100(4), 569–582. 10.1037/0021-843X.100.4.569 [PubMed: 1757671]

Olatunji BO, Naragon-Gainey K, & Wolitzky-Taylor KB (2013). Specificity of rumination in anxiety and depression: A multimodal meta-analysis. Clinical Psychology: Science and Practice, 20(3), 225–257. 10.1037/h0101719

Olatunji BO, Wolitzky-Taylor KB, Sawchuk CN, & Ciesielski BG (2010). Worry and the anxiety disorders: A meta-analytic synthesis of specificity to GAD. Applied and Preventive Psychology, 14(1–4), 1–24. 10.1016/j.appsy.2011.03.001

Olenick M, Flowers M, & Diaz VJ (2015). US veterans and their unique issues: enhancing health care professional awareness. Advances in medical education and practice, 635–639. 10.2147/AMEP.S89479 [PubMed: 26664252]

Lewinsohn PM (1974). Clinical and theoretical aspects of depression. Innovative Treatment Methods in Psychopathology, 63–120.

Papageorgiou C, & Wells A (1999). Process and Meta-Cognitive Dimensions of Depressive and Anxious Thoughts and Relationships with Emotional Intensity. Clinical Psychology and Psychotherapy, 6(2), 156–162. 10.1002/(SICI)1099-0879(199905)6:2<156::AID-CPP196>3.0.CO;2-A

Preacher KJ, & Hayes AF (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behavior Research Methods, 40(3), 879–891. 10.3758/BRM.40.3.879 [PubMed: 18697684]

Preacher KJ, & Hayes AF (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. Behavior Research Methods, Instruments, and Computers, 36(4), 717–731. 10.3758/BF03206553

Preacher KJ, & Kelley K (2011). Effect size measures for mediation models: Quantitative strategies for communicating indirect effects. Psychological Methods, 16(2), 93–115. 10.1037/a0022658 [PubMed: 21500915]

Robichaud M, Dugas MJ, & Conway M (2003). Gender differences in worry and associated cognitive-behavioral variables. Journal of Anxiety Disorders, 17(5), 501–516. 10.1016/S0887-6185(02)00237-2 [PubMed: 12941362]

Rondung E, Ekdahl J, & Sundin Ö (2019). Potential mechanisms in fear of birth: The role of pain catastrophizing and intolerance of uncertainty. Birth, 46(1), 61–68. 10.1111/birt.12368 [PubMed: 29954044]

Shikatani B, Antony MM, Cassin SE, & Kuo JR (2016). Examining the Role of Perfectionism and Intolerance of Uncertainty in Postevent Processing in Social Anxiety Disorder. Journal of Psychopathology and Behavioral Assessment, 38(2), 297–306. 10.1007/s10862-015-9516-8

Stevens K, Rogers T, Campbell M, Björgvinsson T, & Kertz S (2018). A transdiagnostic examination of decreased intolerance of uncertainty and treatment outcome. Cognitive Behaviour Therapy, 47(1), 19–33. 10.1080/16506073.2017.1338311 [PubMed: 28650777]

Taylor S, Asmundson GJ, & Wald J (2007). Psychopathology of panic disorder. Psychiatry, 6(5), 188–192. 10.1016/j.mppsy.2007.02.004

Talkovsky AM, & Norton PJ (2016). Intolerance of uncertainty and transdiagnostic group cognitive behavioral therapy for anxiety. Journal of Anxiety Disorders, 41, 108–114. 10.1016/j.janxdis.2016.05.002 [PubMed: 27212226]

Thibodeau MA, Carleton RN, McEvoy PM, Zvolensky MJ, Brandt CP, Boelen PA, … Asmundson GJG (2015). Developing scales measuring disorder-specific intolerance of uncertainty (DSIU): A new perspective on transdiagnostic. Journal of Anxiety Disorders, 31, 49–57. 10.1016/j.janxdis.2015.01.006 [PubMed: 25728016]

Topper M, Emmelkamp PMG, & Ehring T (2010). Improving prevention of depression and anxiety disorders: Repetitive negative thinking as a promising target. Applied and Preventive Psychology, 14(1–4), 57–71. 10.1016/j.appsy.2012.03.001

Tull MT, Hahn KS, Evans SD, Salters-Pedneault K, & Gratz KL (2011). Examining the role of emotional avoidance in the relationship between posttraumatic stress disorder symptom severity and worry. Cognitive Behaviour Therapy, 40(1), 5–14. 10.1080/16506073.2010.515187 [PubMed: 21337211]

van der Heiden C, Muris P, & van der Molen HT (2012). Randomized controlled trial on the effectiveness of metacognitive therapy and intolerance-of-uncertainty therapy for generalized anxiety disorder. Behaviour Research and Therapy, 50(2), 100–109. 10.1016/j.brat.2011.12.005 [PubMed: 22222208]

Vîsl A, Stadelmann C, Watkins E, Zinbarg RE, & Flückiger C (2022). The Relation Between Worry and Mental Health in Nonclinical Population and Individuals with Anxiety and Depressive Disorders: A Meta-Analysis. Cognitive Therapy and Research, 46(3), 480–501. 10.1007/s10608-021-10288-4

Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, & Schnurr PP (2013). The PTSD Checklist for DSM-5 (PCL-5). Scale available from the National Center for PTSD at www.ptsd.va.gov.

Wen Z, & Fan X (2015). Monotonicity of effect sizes: Questioning kappa-squared as mediation effect size measure. Psychological Methods, 20(2), 193–203. 10.1037/met0000029 [PubMed: 25664380]

White RG, & Gumley AI (2009). Postpsychotic posttraumatic stress disorder: Associations with fear of recurrence and intolerance of uncertainty. Journal of Nervous and Mental Disease, 197(11), 841–849. 10.1097/NMD.0b013e3181bea625 [PubMed: 19996723]

Yao N, Yang Y, Jiang Y, & Rodriguez M (2022). Intolerance of Uncertainty Relates to Anxiety and Depression Through Negative Coping and Worry: Evidence from a Repeated-Measures Study. International Journal of Cognitive Therapy, 15(1), 42–56. 10.1007/s41811-021-00130-w

Yook K, Kim KH, Suh SY, & Lee KS (2010). Intolerance of uncertainty, worry, and rumination in major depressive disorder and generalized anxiety disorder. Journal of Anxiety Disorders, 24(6), 623–628. 10.1016/j.janxdis.2010.04.003 [PubMed: 20439149]

Zlomke KR, & Young JN (2009). A retrospective examination of the role of parental anxious rearing behaviors in contributing to intolerance of uncertainty. Journal of Child and Family Studies, 18(6), 670–679. 10.1007/s10826-009-9269-7

Table 1

Means, standard deviations (*SD*s) and correlations of measures in full sample and subsamples

Full sample (*N* = 244)

Measure	*M*	*SD*	1	2	3	4
1 IUS-12	39.15	11.00	1	0.61**	0.60**	0.43**
2 PTQ	37.12	13.59		1	0.55**	0.54**
3 DASS-21-S	12.06	5.34			1	0.60**
4 IIRS	62.49	17.10				1

MDD subsample (*n* = 190)

Measure	*M*	*SD*	1	2	3
1 IUS-12	39.52	10.84	1	0.63**	0.42**
2 PTQ	38.19	13.28		1	0.48**
3 PHQ-9	18.06	5.23			1

Panic disorder subsample (*n* = 65)

Measure	*M*	*SD*	1	2	3
1 IUS-12	41.18	12.12	1	0.66**	0.13
2 PTQ	38.98	14.16		1	0.32*
3 APPQ-I	16.12	12.07			1

PTSD subsample (*n* = 140)

Measure	*M*	*SD*	1	2	3
1 IUS-12	39.97	10.44	1	0.63**	0.56**
2 PTQ	38.25	13.50		1	0.64**
3 PCL-5	50.52	14.61			1

IUS-12 = Intolerance of Uncertainty Scale; PTQ = Perseverative Thinking Questionnaire; DASS-21-S = Depression Anxiety and Stress Scales Stress Scale; IIRS = Illness Intrusiveness Rating Scale; PHQ-9 = Patient Health Questionnaire; APPQ-I = Albany Panic and Phobia Questionnaire Interoceptive Subscale; PCL-5 = PTSD Checklist for DSM-5.

Notes:

*
$p < .05$;

**
$p < 0.001$

Correlations at *$p < .05$ did not survive the Bonferroni correction for multiple comparisons

Table 2

Mediating effects of PTQ of IUS-12 with DASS-21-S and IIRS in full sample

Full sample (*N* = 244)		*B*	*P*	95% CI	
				LL	*UL*
Between IUS-12 and DASS-21-S					
Total effect (c)		0.29	< .001	0.24	0.34
Direct effect (c')		0.21	< .001	0.15	0.27
Indirect effect (ab)		0.09		0.05	0.13
Ratio of indirect to direct effect:	0.43				
Ration of indirect to total effect:	0.31				
Between IUS-12 and IIRS					
Total effect (c)		0.66	< .001	0.49	0.84
Direct effect (c')		0.24	0.02	0.03	0.45
Indirect effect (ab)		0.43		0.29	0.58
Ratio of indirect to direct effect:	1.79				
Ratio of indirect to total effect:	0.65				

CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit; IUS-12 = Intolerance of Uncertainty Scale; PTQ = Perseverative Thinking Questionnaire; DASS-21-S = Depression Anxiety and Stress Scales Stress Scale; IIRS = Illness Intrusiveness Rating Scale.

Table 3

Mediating effects of PTQ of IUS-12 with disorder specific symptom measures in subsamples

MDD subsample (*n* = 190)		*B*	*P*	95% CI	
				LL	*UL*
Between IUS-12 and PHQ-9					
Total effect (c)		0.20	< .001	0.14	0.27
Direct effect (c')		0.10	0.02	0.02	0.17
Indirect effect (ab)		0.11		0.04	0.18
Ratio of indirect to direct effect:	1.10				
Ratio of indirect to total effect:	0.55				

Panic disorder subsample (*n* = 65)		*B*	*P*	95% CI	
				LL	*UL*
Between IUS-12 and APPQ-I					
Total effect (c)		0.13	0.29	−0.12	0.38
Direct effect (c')		−0.13	0.41	−0.45	0.18
Indirect effect (ab)		0.27		0.08	0.44
		□			
Standardized indirect effect (ab)		0.27		0.08	0.44

PTSD subsample (*n* = 140)		*B*	*P*	95% CI	
				LL	*UL*
Between IUS-12 and PCL-5					
Total effect (c)		0.78	<.001	0.59	0.98
Direct effect (c')		0.36	.002	0.13	0.59
Indirect effect (ab)		0.42		0.27	0.62
Ratio of indirect to direct effect:	1.17				
Ratio of indirect to total effect:	0.54				

CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit; IUS-12 = Intolerance of Uncertainty Scale; PTQ = Perseverative Thinking Questionnaire; PHQ-9 = Patient Health Questionnaire; APPQ-I = Albany Panic and Phobia Questionnaire Interoceptive Subscale; PCL-5 = PTSD Checklist for DSM-5.