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Examination of the Intolerance of Uncertainty Construct in Youth with Generalized Anxiety Disorder

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Abstract

Objective: Intolerance of uncertainty (IU) is a dispositional characteristic reflecting negative cognitive, behavioral, and emotional reactivity in response to events or situations that are uncertain. Although closely associated with a generalized anxiety disorder (GAD) diagnosis in adulthood, IU has received little attention in youth. The goal of this study was to examine the construct in children with GAD and non-anxious children, including its incremental validity in predicting GAD severity and worry beyond anxiety.

Method: Ninety-eight children ages 6 to 11 years (51% male; 57% Caucasian) were assessed. The sample included 24 with a GAD diagnosis only (i.e., pure GAD), 36 with GAD plus at least one other disorder (i.e., comorbid GAD), and 38 healthy control children. Clinician, parent, and child reports of IU, anxiety, worry and GAD severity were collected.

Results: Significant differences in levels of IU were found across all three groups; the highest levels in children with comorbid GAD, followed by children with pure GAD, and healthy controls. IU significantly contributed to worry but not GAD severity beyond the effects of anxiety. A significantly larger proportion of self-reported IU data was missing for younger (e.g., 6–8 years) as compared to older children, raising question about the validity of the construct in younger children.

Conclusions: Overall findings suggest thatIU is not specific to a GAD diagnosis in childhood. IU may instead serve as a broad cognitive risk factor for more severe (e.g., comorbid) forms of affective psychopathology. Future directions for research, including developmental considerations, are discussed.

Keywords

intolerance of uncertainty; generalized anxiety disorder; children; worry;anxiety severity

Intolerance of uncertainty (IU) is a dispositional characteristic reflecting negative cognitive, behavioral, and emotional reactivity in response to events or situations which are ambiguous or uncertain (Dugas, Buhr, & Ladouceur, 2004). As a cognitive vulnerability factor, IU is implicated in the development and maintenance of anxiety (Carleton, 2012; Holaway,

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Heimberg, & Coles, 2006) and pathological worry (Dugas, Gagnon, Ladouceur, & Freeston, 1998). Individuals high in IU evaluate uncertainty as threatening even when adverse outcomes are improbable (Koerner & Dugas, 2008) and tend to engage in cognitions (e.g., worry) and behaviors (e.g., avoidance) that minimize negative emotional arousal, a pattern characteristic of individuals with anxiety disorders broadly, and generalized anxiety disorder (GAD) in particular (Dugas, Buhr, & Ladouceur, 2004; Krohne, 1993).

Researchers initially interested in the IU construct focused on its role in the etiology and maintenance of GAD (Dugas, Freeston, & Ladouceur, 1997; Dugas et al., 1998) based on evidence of a strong association with worry (Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994; Ladouceur et al., 1995). A number of studies have indeed shown IU uniquely contributes to trait worry(Dugas, Freeston, & Ladouceur, 1997) and is significantly associated with high levels of worry in both non-clinical and clinical samples of adults with GAD (Freeston et al., 1994; Ladouceur, Blais, Freeston, & Dugas, 1998). Further, experimental manipulation of IU in non-anxious individuals produces increases in worry (Ladouceur, Gosselin, & Dugas, 2000)just as reductions in IU have been associated with improvements in GAD following treatment (Dugas & Ladouceur, 2000). These collective data are theorized to implicate IU as a potential etiological factor of GAD and suggest that treatments directly targeting IU could be highly beneficial for GAD patients (Dugas et al., 2003).

In contrast, other research has focused on the contribution of IU to affective psychopathology more broadly. Elevated levels of IU have been found in those with obsessive-compulsive disorder (OCD; Holaway, Heimberg, & Coles, 2006; Steketee, Frost, & Cohen, 1998; Tolin, Abramowitz, Brigidi, & Foa, 2003), social anxiety (Whiting et al., 2014), and panic (Carleton et al., 2014), as well as other affective disorders (Gentes & Ruscio, 2011). Similar to findings in GAD patients, significant reductions in IU have been found to correspond with post-treatment reductions in anxiety and depressive symptoms in other clinical samples(Boswell, Thompson-Hollands, Farchione, & Barlow, 2013; Mahoney & McEvoy, 2012a). Thus, rather than a specific etiologic factor for any one disorder, IU may represent a transdiagnostic feature common to all anxiety and depressive disorders (Carleton, 2012; Mahoney & McEvoy, 2012b; McEvoy & Mahoney, 2012). Still, the relationship between IU and worry, both in non-clinical and clinical samples is most robust (Buhr & Dugas, 2002; Dugas, Marchand, & Ladouceur, 2005).

Postulation of IU as a unique factor in the development of GAD presumes its presence in early forms of the disorder as well. Although the IU construct has received limited attention in child samples, particularly those with a primary GAD diagnosis, a focus on IU in early-onset GAD could serve to inform questions of its origins. In non-clinical child samples, IU differentiates moderate from severe worriers(Laugesen, Dugas, & Bukowski, 2003) and is a stronger predictor of worry than depression or cognitive factors such as perceived control and perfectionism(Buhr & Dugas, 2006; Fialko, Bolton, & Perrin, 2012).Among clinically-anxious youth, scores on a child version of the Intolerance of Uncertainty Scale(IUS; Freeston et al., 1994)differentiatedyouth(ages 7 to 17 years) with heterogeneous anxiety disorders from controls and corresponded with more severe overall anxiety(Comer et al., 2009). In the only study to examine IU in youth with primary or co-primary GAD, mixed

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evidence was found for the construct's specificity (Read, Comer, & Kendall, 2013). That is, IU scores significantly predicted clinician (but not parent or child) severity ratings of GAD,but were also associated with more severe child-reported anxiety across all diagnoses (Read, Comer, & Kendall, 2013). As the authors point out (pg. 727), examination of specificity was limited by the fact that only 34 (out of 86) anxious children in this sample met criteria for primary (not co-primary) GAD.Rates of secondary diagnoses were also high. Thus, a better understanding of these possible unique relationships is needed.

Developmental issues also warrant consideration. Alterations and individual variation in meta-cognitive skills across early development raise question as to whether younger children (e.g., under age 7)are able to adequately understand the IU construct, which is both abstract and internally-focused.Meta-cognitive skills, or the ability to think about thinking(Prins, 2001)does not develop until around the age of 7(Kuhn, 1999), and it is not until the age of 8 (on average) that children experience a worry process similar to that found among adults(Szabó & Lovibond, 2004; Vasey, 1993). In fact, Comer and colleagues(2009)found a child version of the IUSto possess weaker psychometric properties in distinguishing anxiousfrom control children at the extremes of the age range examined (i.e., ages 7–8 and 16–17). Possibly, the adult form of the IUS may be more appropriate for use with older adolescents whereas younger children might lack the prerequisite skills to comprehend and provide reliable reports of the cognitive construct.

In light of these gaps in available research, the current study had three primary aims. First, we were interested in examining associations between IU, anxiety, worry, and GAD severity across three groups of children, 7 to 11 years: youth with pure GAD (i.e., a GAD diagnosis only), youth with comorbid GAD (i.e., primary GAD with secondary diagnoses) and non-anxious controls. We first compared child-reported IU among the groups as a means of examining the question of specificity. If IU is unique to childhood GAD, then its measurement should yield similar estimates irrespective of comorbidity. Based on available research to date showing IU to be associated with anxiety severity rather than GAD specifically, we expected to find statistically significant differences in IU scores across all three groups. We also explored relationships among IU, anxiety, worry, and GAD including whether these relationships differed significantly by group. Informed by previous findings, we hypothesized positive relationships among IU, anxiety, and worry in all children, and with GAD severity in clinically-anxious youth. We predicted similar, moderate relationships across all three groups.

Next, we examined the incremental validity of IU in predicting worry and GAD severity in clinical children. Specifically, beyond the contribution of overall anxiety, we examined the proportion of variance accounted for by IU scores.As IU and worry are considered related but distinct constructs (Freeston et al., 1994), we expected IU to incrementally predict unique variance in worry beyond the effects of anxiety. Consistent with findings by Read and colleagues (2013), we also expected IU to contribute unique variance to clinician GAD severity ratings. Lastly, we compared IUS-C scores and the measure's psychometric properties in younger (6–8 years) versus older children (9–12 years). Based on findings reported by Comer and colleagues (2009), we expected to find lower scores and estimates of reliability and convergent validity in 6–8 year olds.

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Method

Participants

One hundred twelve children between 6 and 12 years of age were recruited via community flyers, print advertisements, and mailings to local schools in Washington, DC and Houston, TX. The current study included 98 children (M = 9.08 ± 1.40 years; 51% male) with complete assessment data (see Missing Data section below). Children were recruited for one of two studies— a prospective study examining sleep in anxious and non-anxious children (n = 77), or an intervention study for childhood GAD (n = 21). All participants lived with a primary caretaker and were enrolled in regular classroom settings. Exclusion criteria for both studies included: 1) current/lifetime history of a psychotic, pervasive developmental, bipolar, or eating disorder; 2) use of medications known to impact sleep or anxiety; 3) IQ < 80; and 4) current treatment services for an emotional, behavioral, or sleep problems. Anxious children were required to have a primary diagnosis of GAD and eligible healthy controls had no diagnoses or significant symptomatology.

The overall sample consisted of participants with pure GAD (n = 24), comorbid GAD (n = 36), or no psychiatric diagnosis (n = 38) based on the Anxiety Disorders Interview Schedule for DSM-IV for Children/Parents (ADIS-C/P; Silverman & Albano, 1996). In the comorbid group, 19 children met criteria for two diagnoses, 14 met for three diagnoses, and 3 met for four diagnoses. Comorbid diagnoses included social phobia (36%), separation anxiety disorder (20%), specific phobia (13%), attention deficit hyperactivity disorder (15%), oppositional defiant disorder (7%), and dysthymia/major depressive disorder (5%). The sample was 57% Caucasian, 14% Hispanic, 8% African American, 2% Asian, and 17% other or mixed race.

Measures

Anxiety Disorders Interview Schedule- Child and Parent Versions(ADIS-C/P; Silverman & Albano, 1996).—The ADIS-C/P is a reliable semi-structured interview for youth ages 7–17 that screens for additional disorders including developmental, psychotic, and mood disorders (Silverman & Albano, 1996). Children and parents were interviewed separately by a licensed clinical psychologist or a trained doctoral-level graduate student. Training in the administration of the ADIS-C/P required that assessors achieve interrater reliability at a level of.85 (kappa) or higher on three videotaped interviews prior to conducting independent diagnostic evaluations.Final diagnoses were based on information from both child and parent interviews. The ADIS-C/P also generates reliable clinician severity ratings (CSR) used to identify primary versus secondary disorders. All assessments and diagnoses were reviewed with a licensed clinical psychologist prior to being finalized. Psychometric properties of the ADIS-C/P include excellent inter-rater reliability, test–retest reliability, and concurrent validity (Lyneham, Abbott, & Rapee, 2007; Silverman, Saavedra, & Pina, 2001).Separate raters reviewed videorecordings of interviews to determine agreement regarding presence/absence of diagnoses. Reliability for a GAD dignosis was excellent (kappa =1.00).

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Intolerance of Uncertainty Scale for Children (IUS-C).—For the current study we revised the original adult version of theIUS developed by Freeston and colleagues (1994),a 27-item self-report measure of negative emotional, cognitive, and behavioral reactions to uncertain or ambiguous situations. Items weresimilarly rated on a 5-point Likert scale from 1 (not at all like me) to 5 (exactly like me) with higher scores reflectinggreater intolerance of uncertainty. Similar to the child version developed later by Comer and colleagues (2009), language was simplified to be developmentally appropriate while retaining the same concepts as the adult version. For example, “the ambiguities of life,” was changed to, “things that are unclear.” Also similar to Comer and colleagues, high estimates of internal consistency (Cronbach’s α = .94) and convergent validity (see Table 4) were found in the full sample. See Table 1 for IUS-C items.

Screen for Child Anxiety-Related Emotional Disorders (SCARED; Birmaher et al., 1997).—The SCARED is a 41-item measure of total and different types of anxiety rated on a 3-point scale (0 = almost never, 1 = sometimes 2 = often). The SCARED has demonstrated good internal consistency, test-retest reliability, and discriminative validity (within anxiety disorders and between anxiety and other disorders; Birmaher et al., 1997). The current study included the child-report (SCARED-C) and parent-report (SCARED-P) versions. Reliability in the current sample was excellent, with Cronbach’s α = .93 for child report and α = .95 for parent report.

The Penn State Worry Questionnaire for Children (PSWQ-C; Chorpita, Tracey, Brown, Collica, & Barlow, 1997).—The PSWQ-C is 14-item self-report questionnaire designed to assess worry, including excessiveness and uncontrollability of worry. Responses are scored on a 4-point Likert scale from 0 (never) to 3 (always). Favorable psychometric properties, including high internal consistency, and high convergent and discriminative validity, have been reported (Pestle, Chorpita, & Schiffman, 2008). Reliability in the current sample was excellent, with Cronbach’s α = .91.

Study Procedures

All study procedures were conducted under the approvalofappropriate Institutional Review Boards. Following recruitment and a brief phone screen to determine eligibility, parents and children were scheduled for an in-person evaluation during which informed consent and assent were obtained from parents and children, respectively. The evaluation included parent and child semi-structured interviews and completion of parent and child-report questionnaires. Child forms were completed with the assistance of a research assistant to ensure children understood all questions. Families recruited for the non-treatment study were compensated for their efforts and provided appropriate clinical referrals, and families recruited for the treatment study received clinical services free of charge.

Results

Missing/Invalid Data

All 112 children in the original sample attempted to complete the full battery of measures; however, in some cases measures were deemed invalid based on: 1) the child indicating that

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s/he did not understand the instructions or questions; and/or 2) determination by the research assistant (e.g., seemingly random response patterns). Because these forms were 'missing not at random' (MNAR), imputation methods were neither appropriate nor possible. Specifically,2 children (1.8% of the sample) were missing SCARED or PSWQ-C measures and 14 children (14.3% of the sample) were missing the IUS-C. Given the large proportion of children missing IU data, chi-square and *t*-tests were conducted to explore the characteristics of children who did (n=98) versus did not complete the IUS-C (n=14). The two groups differed significantly in terms of age, $t = -4.04$, $p < .001$; those with invalid IUS-C forms ($M = 7.38$, $SD = 1.56$) were younger than those with valid IUS-C forms ($M = 9.08$, $SD = 1.40$). Also, mothers of children missing IUS-C data had fewer college or advanced degrees (53.9% vs. 80.4%), $\chi^2(4) = 18.53$, $p = .001$. A similar pattern was found for paternal education, $\chi^2(4) = 10.88$, $p = .02$. No differences in parent or child-reported anxiety or worry were found, but anxious youth with valid IUS-C data had significantly higher GAD CSR ratings (n=59; $M = 6.27$, $SD = 1.10$) than those without (n=6; $M = 4.83$, $SD = 0.75$), $t = -3.13$, $p = .003$.

Preliminary Analyses

Chi-square tests and *t*-tests were first conducted to compare the three groups (pure GAD, comorbid GAD, and controls) on key demographic variables. Diagnostic groups differed marginally by sex. Consistent with previous research (Alfano, 2012), children in the pure GAD group were less likely to be female than children with comorbid GAD. Sex was therefore entered as a covariate in all group comparisons. No other demographic variables (i.e., child age, race/ethnicity, marital status, parental education, household income) significantly differed across groups. See Table 2.

Given the relatively small sample size, a power analysis was conducted to determine whether the study was adequately powered. Using G*Power version 3.0.10, power for omnibus F-tests for ANCOVA and regression models was calculated based on total sample size and the number of groups (3) or number of predictors (2). Results indicated that the current study had 80% power for the ANOVA and 94% power for regression analyses to detect a medium effect size at p<.05.

Group Differences in IU, Anxiety, Worry, and GAD Severity

ANCOVAs were used to examine group differences in IU, anxiety and worry across the three groups. An overall significant group difference was found for IUS-C scores, $F(2, 94) = 29.67$, $p = .00$. Post-hoc pairwise comparisons showed children with comorbid GAD reported significantly higher levels of IU than children with pure GAD and healthy controls. Children with pure GAD also differed from the control group. For anxiety, all three groups significantly differed from one another on both parent and child-reports, $F(2, 93) = 105.75$, $p = .00$, $F(2, 94) = 26.66$, $p = .00$, respectively. The highest levels were observed in the comorbid GAD group and the lowest levels in controls. A significant group difference also emerged for worry, $F(2, 94) = 25.70$, $p = .00$, with post-hoc pairwise comparisons revealing significantly higher levels of worry among children with pure and comorbid GAD compared to controls. Finally, the two GAD groups differed significantly in terms of GAD severity,

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$F(1, 56) = 7.39$, $p = .01$, again with higher levels in the comorbid GAD group relative to the pure GAD group. All results are presented in Table 3.

Relationships among IU, Anxiety, Worry and GAD Severity in the Full Sample and by Group

Pearson's bivariate correlations were conducted in order to determine whether IUS-C scores were related to parent- and child-reported anxiety severity (SCARED), and child-reported worry (PSWQ-C) in the full sample. As expected, IU was significantly moderately correlated with child-reported anxiety, parent-reported anxiety, and child-reported worry. In the GAD groups, IU was also associated with GAD CSR. See Table 4.

In order to determine whether these relationships differed by group, a moderated multiple regression analysis was conducted using the PROCESS macro in SPSS (Hayes, 2012). To reduce complexity associated with a three-category variable as a moderator, the three groups (pure GAD, comorbid GAD, and controls) were recoded into two variables using indicator coding. One variable represented children with pure GAD, the other variable represented children with comorbid GAD, and controls represented the reference group. Model 2 was selected in order to calculate the effect of two moderators (the two recoded groups) on the relationship between each variable and IU (Hayes, 2015). Because PROCESS only allows one predictor in each model, the symptom variables (parent-reported anxiety and child-reported anxiety and worry) were entered as independent variables in three separate models. In each model, IU was entered as the dependent variable, and the two group variables were entered as moderators. Group did not significantly moderate the relationship between any of the three predictors and IU. Further, findings remained non-significant when sex was entered as a covariate in each model.

IU as a Predictor of Worry and GAD Severity

A hierarchical regression model including all children with GAD ($n = 60$) was conducted to determine the unique contribution of IU to worry and GAD severity. Anxiety was entered into both models prior to IU. In the first model, parent SCARED score was entered in step 1, IUS-C score was entered in step 2, and PSWQ-C score was entered as the criterion variable. Anxiety significantly predicted worry, yielding overall model significance, $F(1, 95) = 37.57$, $p = .00$. When IU was added to the model in step 2, anxiety continued to significantly predict worry, and IU also significantly predicted worry, F change $(1, 94) = 31.74$, $p = .00$. These results are presented in Table 5.

In the second model, the same variables were entered in steps 1 and 2, and GAD CSR was entered as the criterion variable. Anxiety significantly predicted GAD severity, yielding overall model significance, $F(1, 56) = 17.66$, $p = .00$. When IU was added to the model in step 2, anxiety continued to significantly predict GAD CSR, whereas IU did not, F change $(1, 55) = 2.90$, $p = .09$. These results are presented in Table 6.

Developmental Differences in IUS-C

A one-way ANOVA was conducted to examine whether mean IUS-C scores were significantly different between younger (ages 6–8 years) and older (ages 9–12 years) children. Based in part on missing data patterns, fewer younger children ($n = 32$) had valid

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IUS-C data compared to older children (n = 66), however group variances were not significantly different (Levene statistic = 0.20, p = .66). Younger children (M = 57.97, SD = 23.67) had higher mean IUS-C scores on average than older children (M = 53.73, SD = 20.98), but this difference was not significantly different.

Reliability and convergent validity were also examined to evaluate the psychometric properties of our IU measure in these two age groups. Internal consistency was nearly identical for the 6–8 year olds (Cronbach's α = 0.94) and 9–12 year olds (Cronbach's α = 0.95). To examine convergent validity, Pearson's bivariate correlations were conducted examining relationships between IUS-C scores, parent- and child SCARED, PSWQ-C, and GAD severity separately by group. IU was moderately and positively correlated with anxiety and worry in both age groups, whereas IU was positively but not significantly correlated with GAD severity in either group[1]. Correlations are presented in Table 7.

Discussion

Despite a robust link between IU and worry in adult samples, evidence regarding the specificity of IU to a GAD diagnosis is mixed. Even less is known about the role of IU in childhood GAD. The current study extends limited work in this area by comparing children with both pure and comorbid GAD as well as a non-anxious control group. Assuming specificity to GAD, similar levels of IU would be expected in the two clinical groups and both groups would evidence higher IU scores than controls. Instead, we found all three groups differed significantly from one another, with the comorbid GAD group reporting the highest IU scores. The same pattern was found for child and parent-reported anxiety severity across the groups. In contrast, levels of worry (a hallmark feature of GAD) did not differ between the two GAD groups. This overall pattern of results suggests that, rather than a specific association with GAD, IU may correspond with more severe forms of anxious pathology in youth.

Other findings support this conclusion as well. IU was significantly associated with anxiety, worry, and GAD severity in all children, and relationships did not significantly differ by group. Moreover, IUS-C scores contributed to worry but did not contribute to GAD severity ratings when accounting for the role of anxiety. Collectively, these findings contradict the notion that IU is important to childhood GAD specifically and instead point to a broader, linear association with severity. This conclusion also aligns with results from a study in adults in which IU scores were similar among patients with pure GAD or pure major depressive disorder, but significantly higher in those with both disorders (Yook, Kim, Suh, & Lee, 2010). Intuitively, children with a greater number of disorders are apt to experience anxiety/distress across a broader range of settings and situations, which may in turn decrease their overall tolerance of uncertainty. Another possibility, derived from meta-analytic findings in adults (Gentes & Ruscio, 2011), is that IU may be most closely associated with disorders characterized by recurrent negative thoughts (e.g., worry), such as GAD, depression, and obsessive compulsive disorder. Repetitive thought processes more so than

[1]Results for all IUS-C developmental analyses remained unchanged when 9-year-olds were included in the younger age group.

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anxiety broadly, may provide a mechanistic explanation of relationships between IU and certain disorders. However, the latter thesis remains to be examined, especially in youth

Developmental findings present a more mixed picture. On the one hand, IUS-C scores and estimates of reliability and convergent validity were similar between younger (6–8 years) and older (9–12 years) children, supporting the validity of our IU measure across the age range examined. However, a significantly larger proportion of young children were missing IUS-C forms, excluding these data from all analyses. Importantly, a research assistant provided children assistance in the completion of measures but several young children expressed difficulty understanding (and therefore completing) the IUS-C. In other cases, children's response patterns on the IUS-C were clearly invalid (e.g., inconsistent response patterns). Together, these results likely reflect patterns of individual variability in the development of meta-cognitive skills during early childhood and highlight the importance of ensuring valid responses in children younger than 8 years of age.

In addition to the abstract nature of the construct, IU lacks clear differentiation from other related constructs. For example, intolerance of ambiguity (IA) has been described as a tendency to interpret ambiguity as threatening/disconcerting and to react to ambiguoussituations with rigidity, anxiety, and avoidance (Grenier, Barrette, & Ladouceur, 2005). Both IU and IA are characterized by discomfort in the absence of certainty. However, IU refers to uncertainty about future events, whereas IA focuses on ambiguity in the present (Grenier, Barrette, & Ladouceur, 2005). We are unaware of any studies examining IA in clinical child populations, but this construct may be more easily understood at earlier stages of meta-cognitive development than IU. Similarly, the extent to which IU may follow patterns consistent with behavioral inhibition (BI), an early trait that is predictive of later anxiety disorders (Hirshfeld-Becker et al., 2008; Prior, Smart, Sanson, & Oberklaid, 2000), is worthy of future investigation. BI has primarily been examined in young children and is defined as a tendency to react with fear, hypervigilance, and withdrawal in response to novel events or situations (Kagan, 1997).

Several limitations to this study are notable and warrant consideration. First, while our sample including both pure and comorbid GAD groups is unique, our study did not include an anxious group of children without GAD. Thus, conclusions regarding IU as a transdiagnostic factor in youth remains tentative and should be explored in future studies. Further, the child-reported measure of IU used in the current study was adapted from the IUS for adults, and younger children were significantly less likely to complete the measure. Together with results from a previous study, the validity and reliability of this adapted scale for use with younger children (i.e., ages 7 to 8; Comer et al., 2009) have not been established. We also note that revision of the IUS measure and data collection for this study began prior to the studies published by Comer and colleagues (2009) and our IUS-C measure therefore includes differently worded items. Although items and psychometric properties of these measures are highly similar, they are not entirely parallel and caution is warranted in making direct comparisons across studies. Since IU was assessed via child report only, future studies should also include parent report. Additionally, although IU is described as a trait-like tendency among adults, the temporal stability of IU in childhood is less clear. Intra-individual changes in IU over time may be a better predictor of GAD

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severity rather than point estimates. Further, we did not examine other core aspects of the IU model of GAD including positive beliefs about worry, a negative problem orientation, and cognitive avoidance. It is possible that IU contributes indirectly to GAD severity by increasing risk for these other process variables.

Overall, there is insufficient evidence presently to support IU as a specific feature of or risk factor for childhood GAD. However, findings supporting a relationship between IU and anxiety broadly correspond with previous research (Gentes & Ruscio, 2011) and suggest IU to be a correlate of affective disorders in general. Higher levels of IU have been shown to negatively bias information processing (Dugas et al., 2005) and interfere with problem-solving (Luhmann, Ishida, & Hajcak, 2011), likely undermining the effects of cognitive-behavioral therapy in clinically anxious children. Additionally, considering evidence that experimental manipulations of IU significantly alter levels of worry in non-anxious adults (Ladouceur, Gosselin, & Dugas, 2000), IU may represent a viable treatment target to enhance therapeutic outcomes. Future studies are needed to examine IU (and related constructs such as IA) in the context of other forms of childhood affective psychopathology toward better elucidating its role in developmental psychopathology of affective disorders including GAD.

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References

Alfano CA (2012). Are children with “pure” generalized anxiety disorder impaired? A comparison with comorbid and healthy children. Journal of Clinical Child & Adolescent Psychology, 41, 739–745. doi: 10.1080/15374416.2012.715367 [PubMed: 22963176]

Birmaher B, Khetarpal S, Brent D, Cully M, Balach L, Kaufman J, & Neer SM (1997). The screen for child anxiety related emotional disorders (SCARED): Scale construction and psychometric characteristics. Journal of the American Academy of Child and Adolescent Psychiatry, 36, 545–553. [PubMed: 9100430]

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, 630–645. doi: 10.1002/jclp.21965 [PubMed: 23381685]

Buhr K, & Dugas MJ (2002). The Intolerance of Uncertainty Scale: Psychometric properties of the English version. Behaviour Research and Therapy, 40, 931–945. doi: 10.1016/S0005-7967(01)00092-4 [PubMed: 12186356]

Buhr K, & Dugas MJ (2006). Investigating the construct validity of intolerance of uncertainty and its unique relationship with worry. Journal of Anxiety Disorders, 20, 222–236. doi: 10.1016/j.janxdis.2004.12.004 [PubMed: 16464706]

Carleton RN (2012). The intolerance of uncertainty construct in the context of anxiety disorders: Theoretical and practical perspectives. Expert Review of Neurotherapeutics, 12, 937–947. doi: 10.1586/ern.12.82 [PubMed: 23002938]

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, 463–470. doi: 10.1016/j.janxdis.2014.04.006 [PubMed: 24873884]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Chorpita BF, Tracey SA, Brown TA, Collica TJ, & Barlow DH (1997). Assessment of worry in children and adolescents: An adaptation of the Penn State Worry Questionnaire. Behaviour Research and Therapy, 35, 569–581. [PubMed: 9159982]

Comer JS, Roy AK, Furr JM, Gotimer K, Beidas RS, Dugas MJ, & Kendall PC (2009). The intolerance of uncertainty scale for children: A psychometric evaluation. Psychological Assessment, 21, 402–411. doi: 10.1037/a0016719 [PubMed: 19719351]

Dugas MJ, Buhr K, & Ladouceur R (2004). The Role of Intolerance of Uncertainty in Etiology and Maintenance. New York, NY: Guilford Press.

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

Dugas MJ, Gagnon F, Ladouceur R, & Freeston MH (1998). Generalized anxiety disorder: A preliminary test of a conceptual model. Behaviour Research and Therapy, 36, 215–226. [PubMed: 9613027]

Dugas MJ, Hedayati M, Karavidas A, Buhr K, Francis K, & Phillips NA (2005). Intolerance of uncertainty and information processing: Evidence of biased recall and interpretations. Cognitive Therapy and Research, 29(1), 57–70. doi: 10.1007/s10608-005-1648-9

Dugas MJ, & Ladouceur R (2000). Treatment of GAD: Targeting intolerance of uncertainty in two types of worry. Behaviour Modification, 24, 635–657. doi:10.1177/0145445500245002

Dugas MJ, Ladouceur R, Leger E, Freeston MH, Langlois F, Provencher MD, & Boisvert JM (2003). Group cognitive-behavioral therapy for generalized anxiety disorder: Treatment outcome and long-term follow-up. Journal of Consulting and Clinical Psychology, 71, 821–825. [PubMed: 12924687]

Dugas MJ, Marchand A, & Ladouceur R (2005). Further validation of a cognitive-behavioral model of generalized anxiety disorder: Diagnostic and symptom specificity. Journal of Anxiety Disorders, 19, 329–343. doi: 10.1016/j.janxdis.2004.02.002 [PubMed: 15686860]

Fialko L, Bolton D, & Perrin S (2012). Applicability of a cognitive model of worry to children and adolescents. Behaviour Research and Therapy, 50, 341–349. doi: 10.1016/j.brat.2012.02.003 [PubMed: 22459733]

Freeston MH, Rhéaume J, Letarte H, Dugas MJ, & Ladouceur R (1994). Why do people worry? Personality and Individual Differences, 17, 791–802. doi: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. doi: 10.1016/j.cpr.2011.05.001 [PubMed: 21664339]

Grenier S, Barrette A-M, & Ladouceur R (2005). Intolerance of uncertainty and intolerance of ambiguity: Similarities and differences. Personality and Individual Differences, 39, 593–600. doi:10.1016/j.paid.2005.02.014

Hayes A (2015). Hacking PROCESS to estimate a simple moderation model with a three category moderator [White paper]. Department of Psychology, The Ohio State University, Columbus, OH.

Hayes AF (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from http://www.personal.psu.edu/jxb14/M554/articles/process2012.pdf.

Hirshfeld-Becker DR, Micco J, Henin A, Bloomfield A, Biederman J, & Rosenbaum J (2008). Behavioral inhibition. Depression and Anxiety, 25, 357–367. doi: 10.1002/da.20490 [PubMed: 18412062]

Holaway RM, Heimberg RG, & Coles ME (2006). A comparison of intolerance of uncertainty in analogue obsessive-compulsive disorder and generalized anxiety disorder. Journal of Anxiety Disorders, 20, 158–174. doi: 10.1016/j.janxdis.2005.01.002 [PubMed: 16464702]

Kagan J (1997). Temperament and the reactions to unfamiliarity. Child Development, 68, 139–143. doi: 10.1111/j.1467-8624.1997.tb01931.x [PubMed: 9084130]

Koerner N, & Dugas MJ (2008). An investigation of appraisals in individuals vulnerable to excessive worry: The role of intolerance of uncertainty. Cognitive Therapy and Research, 32, 619–638. doi: 10.1007/s10608-007-9125-2

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Krohne HW (1993). Vigilance and cognitive avoidance as concepts in coping research In Krohne HW (Ed.), Attention and avoidance: Strategies in coping with aversiveness (pp. 19–50). Seattle, WA: Hogrefe & Huber.

Kuhn D (1999). Metacognitive development In Balter L & TamisLeMonda C (Eds.), Child psychology: A handbook of contemporary issues (pp. 259–286). New York: Psychology Press.

Ladouceur R, Blais F, Freeston MH, & Dugas MJ (1998). Problem solving and problem orientation in generalized anxiety disorder. Journal of Anxiety Disorders, 12, 139–152. doi: 10.1016/S0887-6185(98)00002-4 [PubMed: 9560176]

Ladouceur R, Freeston M, Dugas M, Rhéaume J, Gagnon F, Thibodeau N, . . . Blais F (1995). Specific association between generalized anxiety disorder and intolerance of uncertainty among anxiety disorder patients. Paper presented at the Annual meeting of the Association for Advancement of Behavior Therapy, Washington, DC.

Ladouceur R, Gosselin P, & Dugas MJ (2000). Experimental manipulation of intolerance of uncertainty: a study of a theoretical model of worry. Behaviour Research and Therapy, 38, 933–941. doi: 10.1016/S0005-7967(99)00133-3 [PubMed: 10957827]

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

Luhmann CC, Ishida K, & Hajcak G (2011). Intolerance of uncertainty and decisions about delayed, probabilistic rewards. Behavior Therapy, 42, 378–386. doi: 10.1016/j.beth.2010.09.002 [PubMed: 21658521]

Lyneham HJ, Abbott MJ, & Rapee RM (2007). Interrater reliability of the Anxiety Disorders Interview Schedule for DSM-IV: child and parent version. Journal of the American Academy of Child and Adolescent Psychiatry, 46, 731–736. doi: 10.1097/chi.0b013e3180465a09 [PubMed: 17513985]

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

Mahoney AE, & McEvoy PM (2012b). A transdiagnostic examination of intolerance of uncertainty across anxiety and depressive disorders. Cognitive Behaviour Therapy, 41, 212–222. doi: 10.1080/16506073.2011.622130 [PubMed: 22032195]

McEvoy PM, & Mahoney AE (2012). To be sure, to be sure: intolerance of uncertainty mediates symptoms of various anxiety disorders and depression. Behavior Therapy, 43, 533–545. doi: 10.1016/j.beth.2011.02.007 [PubMed: 22697442]

Pestle SL, Chorpita BF, & Schiffman J (2008). Psychometric properties of the Penn State Worry Questionnaire for children in a large clinical sample. Journal of Clinical Child & Adolescent Psychology, 37(2), 465–471. doi: 10.1080/15374410801955896 [PubMed: 18470782]

Prins PM (2001). Affective and cognitive processes and the development and maintenance of anxiety and its disorders. Cambridge, England: Cambridge University Press.

Prior M, Smart D, Sanson A, & Oberklaid F (2000). Does shy-inhibited temperament in childhood lead to anxiety problems in adolescence? Journal of the American Academy of Child and Adolescent Psychiatry, 39, 461–468. doi: 10.1097/00004583-200004000-00015 [PubMed: 10761348]

Read KL, Comer JS, & Kendall PC (2013). The Intolerance of Uncertainty Scale for Children (IUSC): Discriminating principal anxiety diagnoses and severity. Psychological Assessment, 25(3), 722. doi: 10.1037/a0032392 [PubMed: 23647032]

Silverman WK, & Albano AM (1996). The Anxiety Disorders Interview Schedule for Children DSM–IV: (Child and Parent Versions). San Antonio, TX: Psychological Corporation.

Silverman WK, Saavedra LM, & Pina AA (2001). Test-retest reliability of anxiety symptoms and diagnoses with the Anxiety Disorders Interview Schedule for DSM-IV: child and parent versions. Journal of the American Academy of Child and Adolescent Psychiatry, 40, 937–944. doi: 10.1097/00004583-200108000-00016 [PubMed: 11501694]

Steketee G, Frost RO, & Cohen I (1998). Beliefs in obsessive-compulsive disorder. Journal of Anxiety Disorders, 12, 525–537. doi: 10.1016/S0887-6185(98)00030-9 [PubMed: 9879033]

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Szabó M, & Lovibond PF (2004). The cognitive content of thought-listed worry episodes in clinic-referred anxious and nonreferred children. Journal of Clinical Child and Adolescent Psychology, 33, 613–622. doi: 10.1207/s15374424jccp3303_18 [PubMed: 15271618]

Tolin DF, Abramowitz JS, Brigidi BD, & Foa EB (2003). Intolerance of uncertainty in obsessive-compulsive disorder. Journal of Anxiety Disorders, 17, 233–242. doi: 10.1016/S0887-6185(02)00182-2 [PubMed: 12614665]

Vasey MW (1993). Development and cognition in childhood anxiety: The example of worry. Advances in Clinical Child Psychology, 15, 1–39.

Whiting SE, Jenkins WS, May AC, Rudy BM, Davis TE, & Reuther ET (2014). The role of intolerance of uncertainty in social anxiety subtypes. Journal of Clinical Psychology, 70, 260–272. doi: 10.1002/jclp.22024 [PubMed: 23843207]

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, 623–628. doi: 10.1016/j.janxdis.2010.04.003 [PubMed: 20439149]

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Table 1

Items on the Intolerance of Uncertainty Scale for Children (IUS-C)

1. Uncertainty stops me from making up my mind
2. If I am uncertain about something it means I am unorganized
3. Uncertainty makes life really difficult
4. Not knowing what will happen is unfair
5. It is hard to relax if I don't know what will happen tomorrow
6. Uncertainty makes me feel upset, nervous or stressed
7. I get upset if something unexpected happens
8. It bothers me if I do not have all the information I need about something
9. Uncertainty keeps me from doing what I want to do
10. I always think about the future so that I will not be surprised
11. A small unexpected event can ruin everything
12. Uncertainty makes it impossible to get things done
13. Being uncertain means that I am not at my best
14. When I am uncertain, I can't get things done
15. When I am uncertain, I can't function very well
16. Unlike me, other kids always seem to know what they are going to do with their lives
17. Uncertainty makes me scared, unhappy, or sad
18. I always want to know what will happen in the future
19. I hate surprises
20. The smallest doubt can stop me from doing something
21. I should be able to organize everything ahead of time
22. Being uncertain means that I am not confident
23. It's not fair that other kids seem sure about their future
24. Uncertainty stops me from sleeping well
25. I try to avoid all uncertain things
26. Things that aren't clear stress me out
27. I hate not knowing what to do about my future

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Table 2

Demographic Group Comparisons

Variable	Pure GAD (*n*=24)	Comorbid GAD (*n*=36)	Controls (*n*=38)	χ^2/F
Sex: Female (*n*/%)	7 (29.2%)	22 (61.1%)	19 (50.0%)	5.91 *
Race: White (*n*/%)	14 (%)	19 (%)	23 (%)	5.19
Marital Status (*n*/%)				7.36
Married	19 (79.2%)	29 (80.6%)	32 (84.2%)	
Single/Divorced/Separated	4 (16.7%)	7 (19.4%)	5 (13.2%)	
Income (*n*/%)				8.86
<$60,000	2 (8.3%)	8 (22.9%)	9 (24.3%)	
$60,000-$100,000	6 (25.0%)	8 (22.9%)	11 (54.1%)	
>$100,000	16 (66.7%)	19 (54.3%)	17 (45.9%)	
Maternal Education (*n*/%)				6.66
Some college or less	3 (13.0%)	8 (22.2%)	8 (21.1%)	
College degree	11 (47.8%)	12 (33.3%)	18 (47.4%)	
Advanced degree	9 (39.1%)	16 (44.4%)	12 (31.6%)	
Paternal Education (*n*/%)				13.44
Some college or less	6 (25.0%)	14 (41.2%)	14 (38.9%)	
College degree	9 (37.5%)	5 (14.7%)	13 (36.1%)	
Advanced degree	9 (37.5%)	15 (44.1%)	9 (25.0%)	
Age (M/SD)	8.67 (1.52)	9.28 (1.58)	9.16 (1.10)	1.47

Note.

*p=.05

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Table 3.

ANCOVAs Examining Group Differences

	Pure GAD		Comorbid GAD		Controls		η_p^2
Variable	***M***	***SD***	***M***	***SD***	***M***	***SD***	
IUS-C	53.58[a]	19.26	71.69[b]	21.34	40.37[c]	9.98	0.39
Parent SCARED	24.65[a]	10.75	34.28[b]	11.33	4.47[c]	4.01	0.70
Child SCARED	23.33[a]	9.74	34.58[b]	13.91	14.68[c]	9.90	0.36
PSWQ-C	17.58[a]	7.85	23.00[a]	8.82	10.11[b]	6.26	0.35
GAD CSR	5.83[a]	1.01	6.57[b]	1.07			0.18

Note. GAD = Generalized Anxiety Disorder; SCARED = Screen for Child Anxiety Related Emotional Disorders; PSWQ-C = Penn State Worry Questionnaire for Children; IUS-C = Intolerance of Uncertainty – Child version; CSR = Clinician Severity Rating. Sex and research study group entered as covariate in group comparisons. For each variable, superscripts that differ from one another represent significant group differences. Bonferroni correction was applied to planned post-hoc comparisons.

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Table 4

Pearson's Bivariate Correlations among IU and Anxiety/Worry Variables in the Full Sample

Variables	1	2	3	4
1.IUS-C	–			
2. SCARED-P	0.51***	–		
3. SCARED-C	0.68***	0.47***	–	
4. PSWQ-C	0.65***	0.53***	0.74***	–
5. GAD CSR	0.28*	0.34**	0.34**	0.46***

Note. GAD = Generalized Anxiety Disorder; SCARED-P = Parent-reported Screen for Child Anxiety Related Emotional Disorders; SCARED-C = Child-reported Screen for Child Anxiety Related Emotional Disorders; PSWQ-C = Penn State Worry Questionnaire for Children; IUS-C = Intolerance of Uncertainty – Child version; CSR = Clinician Severity Rating.

*$p < .05$,

**$p < .01$,

***$p < .001$.

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Table 5

Hierarchical Regression Model Predicting Worry

	Step 1			Step 2		
Variable	***B***	***SE B***	***β***	***B***	***SE B***	***β***
Anxiety	0.32	0.05	0.53***	0.17	0.05	0.28***
IU				0.21	0.04	0.49**
R^2		.28			.45	
F		37.57***			40.74***	

Note.

**$p < .01$,

***$p < .001$.

Age and sex did not significantly contribute to the model and did not significantly moderate the relationship between IU and worry. Therefore, these variables were excluded from the model.

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Table 6

Hierarchical Regression Model Predicting Clinician GAD Severity Rating

	Step 1			Step 2		
Variable	***B***	***SE B***	***β***	***B***	***SE B***	***β***
Anxiety	0.32	0.05	0.53***	0.17	0.05	0.28**
IU				0.01	0.01	0.20
R^2		.28			.46	
F		37.57***			40.74***	

Note.

**$p < .01$,

***$p < .001$.

Age and sex did not significantly contribute to the model and did not significantly moderate the relationship between IU and GAD severity. Therefore, these variables were excluded from the model.

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Table 7.

Correlations Between IU and Symptom Variables in Younger and Older Children

Variable	SCARED-P	SCARED-C	PSWQ-C	GAD CSR
IUS-C (6–8 year olds)	0.55**	0.64**	0.65**	0.42
IUS-C (9–12 year olds)	0.48**	0.70**	0.64**	0.18

Note. GAD = Generalized Anxiety Disorder; SCARED-P = Parent-reported Screen for Child Anxiety Related Emotional Disorders; SCARED-C = Child-reported Screen for Child Anxiety Related Emotional Disorders; PSWQ-C = Penn State Worry Questionnaire for Children; IUS-C = Intolerance of Uncertainty – Child version; CSR = Clinician Severity Rating.

**$p < .01$.