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Difficulty Concentrating in Generalized Anxiety Disorder: An Evaluation of Incremental Utility and Relationship to Worry

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Abstract

Difficulty concentrating is one of the most common diagnostic criteria across *DSM-5* categories, especially within the emotional (mood- and anxiety-related) disorders. A substantial literature has characterized cognitive functioning in emotional disorders using objective (behavioral) computerized cognitive tasks. However, diagnoses are typically formed on the basis of subjective (self-reported; clinician-rated) assessments of symptoms, and little is known about difficulty concentrating as a symptom. These questions are particularly important for generalized anxiety disorder (GAD), which has long been the subject of nosological debates, and for which several theoretical models that suggest a central role for cognitive impairments (including difficulty concentrating) in the maintenance of psychopathology have been proposed. The present study evaluated the incremental utility of difficulty concentrating and its relationship to worry and other symptoms in 175 GAD-diagnosed adults. Clinician-assessed difficulty concentrating incrementally predicted clinician-rated GAD, anxiety, and depression severity even after other GAD symptoms were controlled. Consistent with theoretical models of GAD that propose a direct relationship between worry and cognitive impairment, difficulty concentrating mediated the relationship between trait worry and clinical severity. These findings suggest that difficulty concentrating has value as a diagnostic criterion and is a potential mechanism by which worry increases distress and impairment.

Keywords

worry; difficulty concentrating; generalized anxiety disorder; cognitive control; attention; nosology

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Difficulty concentrating is a frequent complaint among individuals with psychopathology and is the single most common diagnostic criterion within the emotional (i.e., anxiety, mood, obsessive-compulsive and related, and trauma- and stressor-related) disorders (American Psychiatric Association [APA], 2013). Despite the near-ubiquity of this complaint, surprisingly little research has investigated the validity of difficulty concentrating as a diagnostic criterion, nor the mechanisms by which it might relate to other facets of psychopathology. These questions are particularly important for generalized anxiety disorder (GAD), which has a long history of controversy surrounding the validity and reliability of the diagnosis (Brown, Barlow, & Liebowitz, 1994) and which has historically received less research attention relative to other anxiety disorders (Dugas, Anderson, Deschenes, & Donhegan, 2010).

One reason to investigate difficulty concentrating in the context of GAD is to inform longstanding nosological debates about the validity of the diagnosis. Recently, these debates have focused on the high rates of comorbidity between GAD and major depressive disorder (MDD; Brown, Campbell, Lehman, Grisham, & Mancill, 2001; Lamers et al., 2011), which have led some researchers to question whether GAD and MDD are truly distinct entities (Hettema, 2008; Beesdo, Pine, Lieb, & Wittchen, 2010; Rhebergen et al., 2014). One proposed explanation of the high rates of GAD-MDD comorbidity is that overlap between the GAD and MDD diagnostic criteria may artificially inflate the comorbidity between the disorders (Löwe et al., 2008; Zbozinek et al., 2012; although see Sunderland et al., 2010). Difficulty concentrating is one such shared symptom whose relevance to the GAD diagnosis has been called into question.[1] In the lead-up to *DSM-5*, these concerns led to a proposal to remove difficulty concentrating and other nonspecific symptoms from the GAD diagnosis (Andrews et al., 2010). These recommendations were not adopted for *DSM-5*; however, given the continued nosological and theoretical debates surrounding GAD, it remains theoretically and clinically important to identify the features that are integral to the GAD diagnosis.

We propose that difficulty concentrating may be an important feature of GAD even in the absence of diagnostic specificity. If difficulty concentrating strongly characterizes GAD (i.e., if it is present at clinically significant levels in the vast majority of GAD cases), or if it demonstrates incremental utility (i.e., if it predicts clinical severity beyond variance explained by other symptoms), it would suggest that its inclusion may enhance the validity of the GAD diagnosis. More generally, if difficulty concentrating acts as a mechanism of GAD pathology, it would warrant future study independent of its final status as a diagnostic criterion.

Preliminary studies of the validity of the difficulty concentrating criterion in GAD have yielded mixed results. In a mixed clinical sample of treatment-seeking youth, difficulty concentrating as assessed by the Anxiety Disorders Interview Schedule for Children and Parents for DSM-IV (ADIS-C/P; Silverman & Albano, 1997), was present in 83% of youth with GAD. Difficulty concentrating was significantly correlated with other GAD symptoms,

[1]Sleep disturbance and fatigue are the others. Some researchers also consider restlessness (expressed as psychomotor agitation in MDD) to be a shared feature (Zbozinek et al., 2012).

and this association remained significant after controlling for depression symptoms (Comer, Pincus, & Hofmann, 2012). In a sample of treatment-seeking adults with GAD, difficulty concentrating as assessed by the Anxiety Disorders Interview Schedule for DSM-IV-Lifetime version (ADIS-IV-L; Di Nardo, Brown, & Barlow, 1994) showed a small but significant association with GAD clinical severity (Gordon & Heimberg, 2011). In contrast to these findings, in a large undergraduate sample, self-reported difficulty concentrating as assessed by the Generalized Anxiety Disorder Questionnaire (GADQ; Roemer, Borkovec, Posa, & Borkovec, 1995) was uniquely associated with depression symptoms and did not correlate with other GAD symptoms after depression was statistically controlled (Joormann & Stöber, 1999). Taken together, the sparse and inconsistent current literature does not clearly establish whether difficulty concentrating is a valid and useful part of the GAD diagnosis.

Independent of nosological questions, difficulty concentrating may also play a critical role in the maintenance of GAD pathology. In particular, difficulty concentrating may share an important relationship with worry, a future-oriented, anxiety-laden form of perseverative thought (Borkovec, Robinson, Pruzinsky, & DePree, 1983) and the cardinal feature of GAD (APA, 2013). Experimental and prospective studies have linked worry to increased severity and recurrence of GAD symptoms (Calmes & Roberts, 2007; Ruscio, Seitchik, Gentes, Jones, & Hallion, 2011). Uncontrollability of worry in particular is uniquely associated with a range of clinically important outcomes, including increased GAD and anxiety severity, comorbidity, and treatment-seeking (Hallion & Ruscio, 2013). By contrast, results from a nationally representative sample suggest that individuals with and without *excessive* worry (who meet other GAD criteria) have similar syndromes (Ruscio, et al., 2005). This highlights the need to understand the mechanisms by which worry increases clinical severity, as they remain poorly understood.

We propose that difficulty concentrating may be one mechanism by which worry increases clinical severity. Anecdotally, patients with GAD often report that they have difficulty concentrating because they cannot stop worrying, and that their concentration difficulties cause significant distress and impaired role functioning. The assertion that worry might lead to difficulty concentrating is supported by several prominent theoretical models of anxiety (e.g., Eysenck, Derakshan, Santos, & Calvo, 2007; Hirsch & Mathews, 2012; Sarason, 1984). Consistent with these models, a growing body of literature has identified deficits in cognitive functioning related to worry (Hallion, Ruscio, & Jha, 2014; Hayes, Hirsch, & Mathews, 2008; Leigh & Hirsch, 2011; Stefanopoulou, Hirsch, Hayes, Adlam, & Coker, 2014) and GAD more broadly (Aikins & Craske, 2001; Hallion, Tolin, Assaf, Goethe, & Diefenbach, 2017; Price & Mohlman, 2007). However, these studies have measured cognitive functioning primarily through neuropsychological tests and computerized paradigms. In the majority of clinical and research settings, diagnoses are formed on the basis of subjective patient reports and clinician assessments. Correspondence between objective (behavioral) and subjective (self-report) assessments of cognitive functioning is often low (e.g., Hallion & Ruscio, 2010; Mowla et al., 2008). As a result, the applicability of these laboratory findings to our understanding of difficulty concentrating as it is operationalized in most research and clinical settings (i.e., the subjective difficulty concentrating *symptom*) is unclear.

The present study has two aims. The primary aim is to evaluate the prevalence, discriminant validity, specificity, and incremental utility of difficulty concentrating as a diagnostic criterion in a large community sample of individuals diagnosed with GAD. A second, more preliminary aim is to examine difficulty concentrating as a possible mechanism by which worry might increase clinical severity by exploring the statistical relationships between difficulty concentrating, worry, and clinical severity in a cross-sectional dataset.

Method

Participants

Participants were $N = 175$ adults with *DSM-5* GAD recruited from the Philadelphia community ($n = 165$) or a private northeastern university ($n = 10$; see Table 1). Participants were recruited via electronic (Craigslist) and paper advertisements (flyers) for a non-treatment research studies on anxiety and depression. Participants completed a brief telephone screen to assess major exclusion criteria and were subsequently invited to the lab for the diagnostic interview. Participants were excluded on the basis of a principal diagnosis other than GAD or MDD, acute psychosis or suicidality, or current substance use disorder. A small subset of participants ($n = 12$) were recruited as part of a neuroimaging study and were subject to additional MRI-related exclusion criteria. Participants were compensated $10/hour for their time.

Diagnostic interviews were conducted by trained post-baccalaureate and Master's-level diagnosticians. All diagnoses and severity ratings were discussed and finalized by consensus during a weekly meeting led by a licensed clinical psychologist. Diagnostic reliability data for an overlapping sample ($N = 126$ individuals with GAD) recruited and diagnosed using the same procedures are presented elsewhere (Hallion & Ruscio, 2013). Briefly, interrater reliability was excellent for the presence of GAD (K = 1.00) and acceptable for clinical severity (ICC = 0.73).

Participants completed the diagnostic interviews and self-report measures during a single session. Informed consent was obtained for all participants. Global anxiety and depression severity were not assessed for participants in the fMRI subsample ($n = 12$).

Measures

Diagnostic status and clinical severity—The presence and severity of GAD and comorbid emotional disorders was established using the Anxiety Disorders Interview Schedule for DSM-IV – Lifetime version (ADIS-IV-L; Brown, DiNardo, & Barlow, 1994). To comply with the removal of the "hierarchy rule" in *DSM-5*, 24 participants for whom a GAD diagnosis was not initially assigned because the GAD symptoms occurred exclusively during a depressive episode were considered to meet GAD criteria for these analyses. Clinical severity was rated from 0 (none) to 8 (very severely disturbing/disabling). Per the ADIS-IV-L administration guidelines, severity scores ≥ 4 reflect clinically significant symptoms.

Difficulty concentrating—Difficulty concentrating and other criterion C symptoms (i.e., fatigue; insomnia; muscle tension; irritability; restlessness) were assessed using the GAD

module of the ADIS-IV-L (Brown et al., 1994) and rated on a scale of 0 (none) to 8 (very severe). These items demonstrated good interrater reliability (r = 0.72 – 0.83) in a validation study that examined the item-level content of the ADIS-IV-L (Brown, Di Nardo, Lehman, & Campbell, 2001).

Trait worry—Trait worry was assessed using the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990), a widely-used and well-validated self-report measure of trait worry with strong psychometric properties (Fresco, Mennin, Heimburg, & Turk, 2003).

Global anxiety severity—Diagnosticians rated anxiety symptoms using the Hamilton Anxiety Rating Scale (HAM-A; Hamilton, 1959), a widely-used, 14-item clinician-administered measure of anxiety with strong psychometric properties (Shear et al., 2001).

Depression severity—Diagnosticians rated depression symptoms using the 17-item version of the Hamilton Depression Rating Scale (HAM-D; Hamilton, 1960), a widely-used and well-established 17-item clinician-administered measure of depression symptoms with generally strong psychometric properties (López-Pina, Sánchez-Meca, & Rosa-Alcázar, 2009).

Data Analytic Plan

Preliminary Analyses—Pearson correlations were used to examine the relationship between difficulty concentrating, worry, and clinical severity. Partial correlations were used to establish the robustness of these relationships after controlling for depression severity.

Incremental Validity Testing—Hierarchical multiple regression was used to examine incremental validity of difficulty concentrating as a diagnostic criterion.

Mediation analyses—Difficulty concentrating was examined as a potential mediator of the relationship between worry and clinical severity. Cross-sectional mediation analyses were conducted using OLS regression implemented by PROCESS (Hayes, 2012) for SPSS. Importantly, the aims of these analyses were not to derive conclusions about causal relationships, but instead to preliminarily evaluate potential models in a clinically relevant context. In mediation analyses, the total effect (c) of the independent variable X on the dependent variable Y is comprised of the direct effect of X on Y (c') and the indirect effects of X on Y (a x b) through the mediator (M). Following procedures described by Hayes (2013), significance testing of the indirect effects was performed using 95% confidence intervals generated via bias-corrected bootstrapping with 5000 samples. An indirect effect estimate with a confidence interval that does not include 0 is considered to be statistically significant at $p < .05$. Bootstrapping was selected in lieu of the Sobel test (Sobel, 1982) because it is generally considered to be more powerful and to rely on fewer assumptions about the shape of the sampling distribution.

Sensitivity analyses—We conducted several sets of sensitivity analyses to examine the robustness and specificity of the findings. We first examined the extent to which the findings remained stable when various comorbidities and other features of GAD were statistically

controlled. We also tested two alternative mediational models: trait worry (*M*) as a mediator of the relationship between difficulty concentrating (*X*) and clinical severity (*Y*; Alternative Model 1); and difficulty concentrating (*M*) as a mediator of the relationship between clinical severity (*X*) and trait worry (*Y*; Alternative Model 2).

Variance inflation factors (VIF) were below 4, suggesting that multicollinearity is not a concern in these analyses.

Results

Preliminary Analyses

Missing data accounted for less than 3% of values and was driven almost entirely by absent Hamilton Rating Scale scores for the 12 participants who were not administered the measures. When those values were excluded, missing data accounted for 0.2% of the data and was missing completely at random (Little's MCAR = 16.61, $p = .550$). Participants who were versus were not administered the Hamilton Rating Scales did not differ in GAD or difficulty concentrating severity (both $p \geq .65$). We therefore addressed missing data using pairwise deletion.

Clinical characteristics are presented in Table 1. Participants were 59% female and 65% White. As expected, comorbidity was common, with 87% of the sample meeting criteria for at least one diagnosis besides GAD. The mean number of comorbid diagnoses was 2.22 (*SD* = 1.55). The most common comorbid diagnosis was MDD (62%), followed by social anxiety disorder (53%) and specific phobia (27%).

Difficulty concentrating was present at a clinically significant level (severity ≥ 4) in the vast majority (89%) of cases. Zero-order correlations between measures of difficulty concentrating, trait worry, and clinical severity are presented in Table 2. Despite the restricted ranges, difficulty concentrating was significantly associated with trait worry and all indices of clinical severity. These associations ranged in strength from small but significant ($r = .18$, $p = .021$) to moderate ($r = .32$, $p < .001$).

Incremental Validity

In a model with the other five criterion C symptoms entered on the first step and difficulty concentrating entered on the second step, difficulty concentrating significantly incrementally predicted GAD severity, global anxiety severity, and depression severity, explaining an additional 2 – 4% of the variance in each outcome, respectively (see Table 3). Restlessness and sleep disturbance also showed incremental validity in predicting GAD severity, while muscle tension showed incremental validity in predicting global anxiety severity. As expected, the other two criterion C symptoms shared with MDD (fatigue and sleep disturbance) also explained additional variance in depression severity.

In sensitivity analyses with excessiveness and uncontrollability of worry also entered as predictors on Step 1, difficulty concentrating remained a significant predictor of global anxiety severity ($\beta = .20$, $p = .010$) and a marginally significant predictor of GAD severity ($\beta = .13$, $p = .067$) and depression severity ($\beta = .13$, $p = .056$).

Mediation Analyses

First, difficulty concentrating due to GAD symptoms was examined as a potential mediator of the relationship between trait worry and clinical severity (see Table 4). Consistent with full mediation, the indirect effect of trait worry on GAD severity via difficulty concentrating was significant, while the direct effect of trait worry on GAD severity after controlling for the effect of difficulty concentrating was nonsignificant. Full mediation of trait worry by difficulty concentrating was also observed for global anxiety severity and depression severity.

We also considered two alternative mediational models to probe the specificity of the observed mediational pathways (Table 4). In the first alternative model, trait worry was examined as a mediator (*M*) of the relationship between difficulty concentrating (*X*) and severity (*Y*). In the second alternative model, difficulty concentrating was examined as a mediator (*M*) of the relationship between severity (*X*) and trait worry (*Y*). Neither alternate model provided a good fit to the data; in both models, the indirect effect of *X* on *Y* via *M* was nonsignificant. Additionally, in Alternative Model 1, the direct effect of *X* on *Y* remained significant and was not significantly reduced after controlling for *M*. In Alternative Model 2, the effect of *X* on *Y* was nonsignificant irrespective of the inclusion of *M*.

Sensitivity Analyses

A final series of sensitivity analyses was conducted to examine the robustness of the correlation, regression, and mediation findings after controlling for the two most common forms of comorbidity: depression (HAM-D) and social anxiety disorder (ADIS-IV-L clinical severity rating). When depression severity was statistically controlled, the pattern of results was identical, except for one finding that was reduced to marginal significance (i.e., the correlation between trait worry and difficulty concentrating). The pattern of results was also identical when social anxiety disorder severity was controlled, again except for one finding that became marginally significant (i.e., the incremental utility of difficulty concentrating for predicting depression severity).

Discussion

The present study investigated the prevalence and incremental utility of difficulty concentrating and its relationship to worry in a sample of 175 adults with GAD. Difficulty concentrating was present at clinically significant levels in nearly 90% of the sample. Despite the restricted ranges in this relatively homogenous sample, difficulty concentrating was positively associated with trait worry and clinician-rated GAD, anxiety, and depression severity. Difficulty concentrating also mediated the relationship between worry and clinical severity in preliminary (cross-sectional) analyses. These findings inform nosological debates aimed at improving the validity of the GAD diagnosis and theoretical models of worry and GAD that propose a central role for cognitive impairments in the onset and maintenance of the disorder.

The finding that the vast majority of participants experienced clinically significant difficulty concentrating is in line with previous studies in pediatric GAD (Comer et al., 2012), and

underscores the ubiquity of concentration problems in GAD. However, difficulty concentrating is common across emotional disorders. Overlapping criteria between GAD and MDD, including difficulty concentrating, has been proposed to artificially inflate comorbidity (Zbozinek et al., 2012). One could argue that the pervasiveness of difficulty concentrating across diagnostic categories renders the symptom uninformative, much in the way that “headaches” contributes little that is diagnostically specific for many non-psychological disorders. Conversely, the high rates of difficulty concentrating across diagnoses might indicate that difficulty concentrating is a fundamental component of emotional disturbance that transcends diagnostic boundaries, and that removing it would weaken the validity of the GAD diagnosis and could discourage potentially valuable research.

Importantly, the relationships of difficulty concentrating with worry, GAD, and global anxiety severity generally remained significant after controlling for the two most common comorbidities (i.e., depression and social anxiety disorder), which is consistent with a specific relationship between difficulty concentrating and GAD-related phenomena. This is contrary to previous findings that difficulty concentrating did not relate to other GAD phenomena after depression symptoms were statistically controlled (Joormann & Stöber, 1999). These conflicting findings may be due to methodological differences between studies: Joormann and Stöber used an undergraduate student sample and self-report measures, whereas the present study used a diagnosed sample and clinician-administered measures. Additionally, we found that difficulty concentrating was one of only three criterion C symptoms to explain significant variance in GAD severity after the other symptoms were controlled. Difficulty concentrating was also the only criterion C symptom to predict additional variance in all three indices of clinical severity (i.e., GAD severity, global anxiety severity, and depression severity). Taken together, these findings suggest that difficulty concentrating may have an important relationship to emotional distress, broadly construed, as well as a more specific relationship to GAD.

In cross-sectional mediation analyses, difficulty concentrating also emerged as a mechanism by which worry, the core feature of GAD, might increase the severity of the disorder. Critically, causal conclusions cannot be drawn from our cross-sectional data (e.g., Maxwell, Cole, & Mitchell, 2011) and the present findings should be interpreted as preliminary. With that caveat, the statistical relationships identified here are broadly consistent with a model in which worry increases clinical severity through its adverse effects on (perceived or actual) concentration. Difficulty concentrating was associated with clinical severity, even after the direct effects of worry were statistically controlled. Our results did not support either of two alternative models (i.e., worry as a mediator between difficulty concentrating and clinical severity; difficulty concentrating as a mediator between clinical severity and trait worry).

These findings are generally consistent with prominent theoretical models of worry and anxiety that propose an antagonistic relationship between worry and impaired cognitive functioning (e.g., Eysenck, Derakshan, Santos, & Calvo, 2007; Hirsch & Mathews, 2012; Sarason, 1984). Experimental psychopathology studies in which cognitive functioning is assessed during or immediately following a worry induction have generally supported these models (Hallion, Ruscio, & Jha, 2014; Hayes, Hirsch, & Mathews, 2008; Leigh & Hirsch,

2011; Stefanopoulou, Hirsch, Hayes, Adlam, & Coker, 2014). However, because cognitive impairments identified in laboratory settings may not always correspond to the real-world experience of difficulty concentrating, and because only the latter of these is used in diagnostic settings, the clinical relevance of these models and findings has been unclear. The present findings provide preliminary convergent support for the validity and clinical relevance of these models by demonstrating that the proposed pathways are identifiable using clinician-administered as well as laboratory measures. The finding that the proposed pathway remained significant when depression severity was used as the outcome of interest also raises questions about the specificity of these models to GAD specifically versus their transdiagnostic applicability to emotional distress more broadly.

The present findings raise the question of *how* difficulty concentrating might increase clinical severity. We propose two non-mutually-exclusive pathways by which these effects could occur. First, difficulty concentrating could lead to impaired role functioning, such as problems performing at work. Second, the experience of difficulty concentrating might be perceived as distressing by individuals who are concerned about the possible negative consequences of difficulty concentrating (e.g., potential negative consequences of being unable to complete an important task). Thus, difficulty concentrating may increase both interference and distress, which are arguably the most important indices of clinical severity. Future research could test these hypotheses through real-time assessment of functioning (e.g., using ecological momentary assessment) or by incorporating a comprehensive measure of role functioning such as the Sheehan disability scale (Sheehan, 1986) into a serial mediation framework.

Taken together, these findings hint that interventions aimed at improving (perceived or actual) concentration ability could be beneficial for treating GAD. A growing body of research suggests that mindfulness meditation training may improve various facets of cognitive functioning (Chambers, Lo, & Allen, 2008; Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010). Recently there has been a surge of interest in evaluating mindfulness meditation as an intervention for anxiety, with some promising initial results (Lee et al., 2007). It will be theoretically and clinically important for these studies to establish whether the positive effects of mindfulness training on anxiety are attributable in whole or in part to improvements in actual and subjective cognitive functioning. These findings also raise the possibility that interventions designed to treat ADHD might help to reduce anxiety symptoms. For example, several studies have examined the therapeutic value of atomoxetine, a highly specific inhibitor of presynaptic norepinephrine transporter, for patients with comorbid diagnoses of ADHD and anxiety disorders. Relative to a placebo treatment, atomoxetine was successful in significantly reducing both ADHD and anxiety symptoms in adolescents (Geller et al., 2007) and adults (Adler et al., 2009). Future research should examine whether or not medications such as atomoxetine have therapeutic value for individuals with anxiety disorders outside the context of ADHD. Finally, it will be critical for future research to establish whether perceived concentration abilities, objective (laboratory-assessed) concentration abilities, or both are responsible for the relationship between worry and clinical severity. If subjective assessments of cognitive functioning drive the relationship between worry and anxiety severity, it may be that improving subjective

perceptions of one's concentration abilities (e.g., via cognitive restructuring) may reduce anxiety, even in the absence of actual cognitive enhancement.

The present study should be interpreted in light of several limitations. As noted above, these data are cross-sectional; as such, the mediation results must be interpreted with caution and should be considered a basis for subsequent research using experimental and prospective design, rather than a demonstration of causality in their own right. Nevertheless, these findings are broadly consistent with the theoretical and experimental research described above, which lends plausibility to the statistically observed pathways and highlights the potential clinical utility of the experimental studies described above. Another limitation is that our sample was entirely comprised of individuals with GAD, which restricted the questions we could ask about difficulty concentrating as a diagnostic criterion. Additional research including subthreshold cases or mixed clinical samples would be useful for further probing difficulty concentrating from a nosological perspective. Finally, the present sample demonstrated high rates of comorbidity, consistent with epidemiological data suggesting that comorbidity is the rule rather than the exception in GAD (Ruscio et al., 2017). Although the pattern of results remained stable when the two most common comorbidities (depression and social anxiety disorder) were controlled, the extent to which the present findings are unique to GAD *per se* remains uncertain. This question is particularly important because trait worry is elevated across a wide range of psychological disorders (e.g., Kertz, Bigda-Peyton, Rosmarin, & Björgvinsson, 2012), many of which are also characterized by difficulty concentrating. Additional research examining the specificity of the present findings to GAD as well as to worry (as opposed to other forms of perseverative thought, such as rumination) will be helpful in clarifying these relationships and their underlying mechanisms. Finally, it is important to acknowledge that several of the constructs examined in the present study necessarily overlap to some extent (e.g., GAD severity by definition depends in part on worry severity). Conceptual overlap is an inherent limitation of studies that attempt to disentangle these related but distinct constructs. Our confidence of the discriminability of these constructs derives in part from a substantial body of research that has identified and characterized individuals with elevated trait worry who nevertheless do not meet criteria for a diagnosis of GAD (e.g., Ruscio & Borkovec, 2004). Specific to the present study, GAD severity ratings were assigned on the basis of the severity and resulting interference and distress for all associated features of the disorder, many of which (e.g., insomnia; fatigue) have the potential to cause severe distress and impairment in their own right. The finding that several features made unique contributions to GAD severity further increases confidence in the discriminability of the constructs, as does the fact that findings were similar when global anxiety and depression severity, which were assessed using a different clinician-administered instrument, were examined as outcome measures.

Taken together, the present findings highlight the centrality of difficulty concentrating to GAD. Difficulty concentrating was present at clinically significant levels in nearly 90% of participants, incrementally predicted several indices of clinical severity above variance explained by other GAD criteria, and emerged as a potential mechanism by which worry may increase clinical severity. These findings suggest that removing the criterion may reduce the validity and utility of the GAD diagnosis. More generally, these findings underscore the importance of investigating difficulty concentrating from a transdiagnostic

perspective. These investigations are especially important because our preliminary mediation results suggest that difficulty concentrating could be a key mechanism, rather than a mere epiphenomenon, of psychopathology. Finally, the present findings underscore the importance of investigating cognitive functioning in psychopathology from a multimodal perspective. Laboratory studies are essential to a clear understanding of mechanisms of psychopathology; however, these studies do not provide the whole picture. Convergent sources of information, including subjective (self-report and clinician-assessed) and objective (laboratory-based) assessments of cognitive functioning will be essential to establishing a comprehensive understanding of the role of cognitive functioning in psychopathology and to developing the most effective interventions.

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Highlights

- Significant difficulty concentrating was present in almost 90% of the GAD sample
- Difficulty concentrating incrementally predicted clinical severity
- Difficulty concentrating mediated the relationship between worry and severity
- Findings are broadly consistent with cognitive models of worry and GAD

Table 1

Sample Characteristics

	M	*SD*	Range	%
Gender (female)	---	---	---	59%
Age (years)	33.03	12.34	18 – 78	
Race				
Asian	---	---	---	4.0%
American Indian or Alaska Native	---	---	---	0.6%
Black or African American	---	---	---	9.7%
Native Hawaiian or Other	---	---	---	13.1%
Pacific Islander				
White	---	---	---	65.1%
Other	---	---	---	7.4%
Education				
Some high school	---	---	---	2.3%
High school or equivalent	---	---	---	14.1%
Some college	---	---	---	28.6%
College	---	---	---	40.0%
Masters	---	---	---	12.9%
ADIS–IV–L GAD severity	5.25	1.92	4 – 7	---
Difficulty concentrating severity	5.41	1.92	0 – 8	---
PSWQ	61.13	10.99	25 – 80	---
Global anxiety severity (HAM-A)	16.15	5.91	0 – 31	---
Global depression severity (HAM-D)	15.65	5.53	1 – 28	---

Note. ADIS–IV–L = Anxiety Disorders Interview Schedule for DSM IV – Lifetime Version; GAD = Generalized Anxiety Disorder; PSWQ = Penn State Worry Questionnaire; HAM-A = Hamilton Anxiety Rating Scale; HAM-D = Hamilton Rating Scale for Depression.

Table 2

Associations Between Difficulty Concentrating, Trait Worry, and Clinical Severity

	PSWQ	GAD severity	HAM-A	HAM-D
Difficulty concentrating	.18*	.31**	.32**	.28**
PSWQ	---	.13†	.15†	.10
GAD severity	---	---	.43**	.38**
HAM-A	---	---	---	.68**

Note. PSWQ = Penn State Worry Questionnaire; GAD = generalized anxiety disorder; HAM-A = Hamilton Anxiety Rating Scale; HAM-D = Hamilton Depression Rating Scale.

† $p < .10$,

* $p < .05$,

** $p < .01$.

Table 3

Incremental Validity of Difficulty Concentrating for Predicting Anxiety-Related Outcomes

Model and predictor variables	*B*	*SE* (*B*)	β	R^2	Δ R^2
Predicting GAD clinical severity (*n* = 171)					
Model 1				.21	.21**
Restlessness	0.11*	0.04	0.23		
Fatigue	0.04	0.03	0.10		
Irritability	0.05	0.03	0.10		
Muscle tension	0.01	0.02	0.03		
Sleep disturbance	0.09*	.03	0.25		
Model 2				.24	.03*
Restlessness	0.10*	0.04	0.20		
Fatigue	0.02	0.03	0.06		
Irritability	0.04	0.03	0.10		
Muscle tension	0.01	0.02	0.10		
Sleep disturbance	0.08*	0.03	0.22		
Difficulty concentrating	**0.07***	**0.03**	**0.18**		
F(6, 165) = 8.74, *p*< .001					
Predicting global anxiety severity (HAM-A; *n* = 160)					
Model 1				.20	.20**
Restlessness	0.71*	0.31	0.18		
Fatigue	0.28	0.21	0.10		
Irritability	0.17	0.24	0.05		
Muscle tension	0.53*	0.19	0.22		
Sleep disturbance	0.50*	0.24	0.17		.
Model 2				.24	.04*
Restlessness	0.57†	0.31	0.14		
Fatigue	0.16	0.21	0.05		

Model and predictor variables	*B*	*SE* (*B*)	β	R^2	Δ R^2
Irritability	0.04	0.22	0.01		
Muscle tension	0.56*	0.19	0.23		
Sleep disturbance	0.39	0.23	0.13		
Difficulty concentrating	**0.67****	**0.23**	**0.22**		
F(6, 153) = 7.96, *p*< .001					
Predicting depression severity (HAM-D; *n* = 159)					
Model 1				.19	.19**
Restlessness	−0.03	0.29	−0.01		
Fatigue	0.77**	0.20	0.29		
Irritability	0.13	0.23	0.04		
Muscle tension	0.13	0.18	0.06		
Sleep disturbance	0.71**	0.22	0.25		
Model 2				.21	.02*
Restlessness	−0.14	0.29	−0.04		
Fatigue	0.68*	0.20	0.26		
Irritability	0.15	0.23	0.03		
Muscle tension	0.15	0.18	0.07		
Sleep disturbance	0.63*	0.22	0.22		
Difficulty concentrating	0.47	0.22	0.16		
F(6, 152) = 6.71, *p*< .001					

Note. GAD severity and difficulty concentrating were assessed using the Anxiety Disorders Interview Schedule for DSM IV – Lifetime Version. HAM-A = Hamilton Anxiety Rating Scale; HAM-D = Hamilton Depression Rating Scale.

† *p* < .10;

* *p* < .05;

** *p* < .01

Table 4

Mediational pathways between difficulty concentrating, trait worry, and clinical severity.

GAD severity		Anxiety severity		Depression severity	
Estimate	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**
Proposed model: Difficulty concentrating as a mediator (M) of the relationship between trait worry (X) and severity (Y)					
Total effect (c): Trait worry predicting severity					
0.01†	−0.001–0.02	0.09†	−0.002–0.17	0.05	−0.03–0.14
Direct effect (c'): Trait worry predicting clinical severity, controlling for difficulty concentrating					
0.01	−0.004–0.02	0.06	−0.03–0.14	0.03	−0.05–0.11
Mediational path (a): Trait worry predicting difficulty concentrating					
0.03*	0.01–0.06	0.03*	0.004–0.06	0.03*	0.003–0.06
Mediational path (b): Difficulty concentrating predicting severity, controlling for trait worry					
0.11*	0.06–0.17	0.88*	0.42–1.33	0.77*	0.33–1.20
*Indirect effect of trait worry on severity via difficulty concentrating (a*b)*					
0.003*	0.00–0.01	0.03*	0.003–0.07	0.03*	0.001–0.06
Alternative model 1: Trait worry as a mediator (M) of the relationship between difficulty concentrating (X) and severity (Y)					
Total effect (c): Difficulty concentrating predicting severity					
0.12*	0.06–0.17	0.93*	0.48–1.38	0.79*	0.04–1.22
Direct effect (c'): Difficulty concentrating predicting severity, controlling for trait worry					
0.11*	0.06–0.17	0.88*	0.42–1.33	0.77*	0.33–1.20
Mediational path (a): Difficulty concentrating predicting trait worry					
1.00*	0.15–1.85	0.95*	0.11–1.79	0.93*	0.09–1.78
Mediational path (b): Trait worry predicting severity, controlling for difficulty concentrating					
0.01	−0.004–0.02	0.06	−0.03–0.14	0.03	−0.05–0.11
*Indirect effect of difficulty concentrating on severity via trait worry (a*b)*					
0.01	−0.003–0.02	0.05	−0.12–0.20	0.03	−0.04–0.16
Alternative model 2: Difficulty concentrating as a mediator (M) of the relationship between severity (X) and trait worry (Y)					
Total effect (c): Severity predicting trait worry					
1.99	−0.29–4.28	0.28†	−0.01–0.56	0.20	−0.11–0.50

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GAD severity		Anxiety severity		Depression severity	
Estimate	**95% CI**	**Estimate**	**95% CI**	**Estimate**	**95% CI**
Direct effect (c'): Severity predicting trait worry, controlling for difficulty concentrating					
1.29	−1.10–3.67	0.20	−0.10–0.49	0.11	−0.20–0.43
Mediational path (a): Severity predicting difficulty concentrating					
0.83*	0.45–1.22	0.11*	0.05–0.16	0.10	0.05–0.16
Mediational path (b): Difficulty concentrating predicting trait worry, controlling for severity					
0.85†	−0.04–1.75	0.77	−0.12–1.65	0.84†	−0.04–1.72
*Indirect effect of severity on trait worry via difficulty concentrating (a*b)*					
0.71	−0.01–1.93	0.08	−0.01–0.21	0.09	−0.01–0.22

Note. GAD = generalized anxiety disorder.

† $p < .10$

* $p < .05$.