Is Pessimism a Mediator between Intolerance of Uncertainty and

Depression/General Anxiety?

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Abstract

Intolerance of uncertainty (IU) is considered a transdiagnostic factor for several disorders including depression and generalised anxiety disorder (GAD), although the mechanism through which it has its effect is unclear. This study sought to examine if pessimism mediates the relationship between IU and depression/GAD. A cross-sectional design was used to test the hypothesis that pessimism is a mediator for the effect of IU on depression/GAD symptoms while controlling for rumination and worry respectively. Participants ($N = 441$) were recruited from Utrecht University and filled out several batteries of questionnaires, which were coded and analysed. Mixed results were found. Pessimism partially mediated the relationship between IU and depression while controlling for rumination, 95% CI[0.11, 0.2]. In the GAD model no mediation was found when controlling for worry, 95% CI [-0.01, 0.01], however, a partial mediation was found when worry was not controlled for, 95% CI[0.03, 0.06]. IU continued to explain a significant amount of variance of both depression and GAD when controlling for rumination and worry respectively. These results raise the possibility that pessimism may trigger worry causing a double mediation, and/or there is construct overlap between pessimism/worry. The results also have implications for theoretical models of IU, depression, and GAD, as well as for the development and maintenance of pessimism. Results also show that IU has a relationship with depression and GAD that is unique of pessimism, worry, and rumination, which has yet to be explained. There were several limitations of this study which require replication both longitudinally and experimentally.

Is Pessimism a Mediator between Intolerance of Uncertainty and Depression/General Anxiety?

University years are a time full of uncertainty which is a primary cause of distress for students (Weurlander et al., 2019), and students with maladaptive responses to uncertainty are more likely to suffer both academically and personally (Martin et al., 2013). Intolerance of uncertainty (IU) refers to a set of future-oriented negative beliefs viewing uncertainty as undesirable, frustrating, and something to be avoided (Dugas et al., 2004). In recent years IU has become regarded as a transdiagnostic risk factor for symptoms of depression and a range of anxiety disorders including generalized anxiety disorder (GAD) (Hong & Cheung, 2015), with which it is positively associated (Gentes & Ruscio, 2011). IU has been shown to distinguish clinical from nonclinical GAD, and GAD from other anxiety disorders (Ladouceur et al., 1999). While most research to date has been done on the relationship between IU and GAD, a meta-analysis has shown IU to be equally associated with depression (Gentes & Ruscio, 2011). Longitudinal and randomised controlled trials targeting IU have found that changes in IU predicted changes in depression and GAD, suggesting precedence of IU in its association with these disorders (Miranda et al., 2008; van der Heiden et al., 2012). However, despite IU being a transdiagnostic factor in several disorders, it remains unclear exactly how it has such wide reaching effects (Hong & Cheung, 2015). While some suggestions of mechanisms have been made, they are incomplete in explaining the relationship (Yook et al., 2010). A better understanding of these mechanisms is crucial for the development of theoretical models of IU, as well as for treatment and prevention programs.

The most prominent theory for the relationship between IU and GAD is via worry, a style of future oriented and negatively affect-laden repetitive thinking, used to problem solve for uncertain future issues (Hong, 2007; Ladouceur et al., 2000). Worry is a core feature of GAD (Dugas et al., 1998). Experimental research has shown precedence of IU over worry by

manipulating IU and observing corresponding changes in worry, also suggesting a causal relationship (Ladouceur et al., 2000; Rosen & Knäuper, 2009). Studies found worry to partially, but not fully, mediate the relationship between IU and GAD (Dar et al., 2017; Yook et al., 2010). While IU is shown to contribute to worry (Buhr & Dugas, 2012), it has also been shown to be uniquely associated to GAD beyond that of worry (Yook et al., 2010). Given that this association beyond worry remains largely unexplained, it may be beneficial to examine another mediator.

The relationship between IU and depression is theorized to involve using rumination as a coping strategy to reduce uncertainty (Liao & Wei, 2011). Rumination, like worry, is a style of generally negative repetitive thinking, although it is past rather than future oriented (Hong, 2007). Rumination is also an important vulnerability factor for depression symptoms. While some studies have shown rumination to fully mediate the relationship between IU and depression (Liao & Wei, 2011; Yook et al., 2010), others show it to only partly mediate (V. Huang et al., 2019) and for IU to explain variance beyond that of rumination (Boelen et al., 2016). These mixed results indicate that there is a mechanism other than rumination mediating the relationship between IU and depression. Given that rumination typically relates to past events (Watkins, 2008) while IU relates to future events (Dugas et al., 2004), a future focused variable, such as pessimism, may explain more variance than rumination alone as a mediator between IU and depression (Andersen, 1990; Lyubomirsky & Nolen-Hoeksema, 1995).

Pessimism is defined as the belief that, in the future, negative events/outcomes will be experienced and positive events/outcomes will not (Miranda et al., 2008). It is associated with worry and rumination (Hong, 2007), and has been experimentally shown as a causal factor for both depression and GAD symptoms (Brouzos et al., 2021; Sergeant & Mongrain, 2014). Pessimism is believed to cause depression by inducing a sense of hopelessness about the

future, known as the hopelessness theory of depression (Abramson et al., 1989). It is thought

to cause GAD by increasing the belief that negative future events are inevitable, which causes

anxiety about the future (Miranda et al., 2008). Pessimism is considered a transdiagnostic

factor in the comorbidity between anxiety and depressive disorders (O'Driscoll et al., 2021)

and may be the link between IU and depression/GAD.

Studies have shown that negative outcomes following uncertain situations are

responded to more aversively and result in lower mood, when compared to negative

outcomes that were certain (Bar-Anan et al., 2009; Grupe & Nitschke, 2011; Sarinopoulos et

al., 2010). If people experience negative life events more distressingly when they are

preceded by uncertainty than when they are certain to occur, then it is reasonable to assume

that some people would adopt a coping strategy of certainty. This would reduce the additional

distress of uncertainty, and those high in IU may be particularly vulnerable. However, people

may be predisposed to take a specifically pessimistic stance when faced with uncertainty.

Herwig et al. (2007) conducted an fMRI study in which healthy participants were presented

with a cue that would certainly be followed by a positive or negative stimulus, or an uncertain

cue that could be followed by either stimulus. Neural activity following the uncertain cue

correlated only with that of the certain negative cue. These results were replicated in

depressed populations (Herwig et al., 2010) and with other physiological and self-report

measurements (Grupe & Nitschke, 2011; Schumacher et al., 2015). As none of these studies

found an association between the uncertain and certain positive conditions, it seems that the

coping strategy of certainty that people adopt is one of certain pessimism, rather than

optimism. Supporting this, pessimism was shown to be positively correlated with IU, and

optimism negatively correlated (Hong & Cheung, 2015; Pepperdine et al., 2018). From an

evolutionary perspective it also makes sense that preparing for the worst would be beneficial

for survival (Leahy, 2002). Thus, it seems that some people adopt a coping strategy of

pessimism to avoid the distress experienced with uncertainty and this is likely particularly

true for those high in IU.

A method to further reduce uncertainty may be to increase certainty in one's

pessimistic outlook. It seems logical that people high in IU, given their excessive distress at

uncertainty, might be particularly likely to adopt this strategy of increased pessimistic

certainty. While reducing uncertainty decreases short-term distress (Ladouceur et al., 2000),

the long-term risk of pessimism, and particularly higher pessimistic certainty, to the

development and maintenance of depression/GAD symptoms is substantial (Andersen, 1990;

Miranda & Mennin, 2007). This puts those high in IU at a particularly high risk of developing

depression/GAD symptoms. As frequently activated schemas become more accessible for

general future use, the pessimistic schemas of people high in IU may become more accessible

in all situations due to their frequent activation when faced with uncertainty (Srull & Wyer,

1979). This may cause increased pessimism outside of situations characterised by

uncertainty.

Summarizing, many people tend to take a pessimistic stance when faced with

uncertainty and those with IU may become more certain in this pessimistic outlook (Herwig

et al., 2007). Pessimism is part of the aetiology and maintenance of depression (Abramson et

al., 1989) and GAD (MacLeod, 1994), and the higher pessimistic certainty of those high in

IU further increases their risk (Andersen, 1990; Miranda et al., 2008). Frequent activation of

a pessimistic schema during uncertainty causes that schema to be more accessible in other

more general, less uncertain situations (Srull & Wyer, 1979). Taken together this leads to the

hypotheses of the current study, that pessimism partially mediates the relationship between

IU and depression symptoms , and between IU and GAD symptoms. Because rumination and

worry have both been shown to partially mediate the IU-depression/GAD relationship, they

were controlled for in the primary analysis of this study in an effort to isolate the effect of

pessimism (Yook et al., 2010). If pessimism does mediate the relationship between IU and depression/GAD, it provides support to the theory that people with high IU adopt a coping strategy of certain pessimism and that it is, at least partially, through this mechanism that IU affects symptoms of depression and GAD.

Method

Participants and Procedure

This study used a cross-sectional design, taking data of 458 participants from an ongoing longitudinal internet-based study. Sixteen participants were excluded from all analyses for incomplete data and one for suspicious answering patterns on reverse scored items, leaving 441. GAD data was missing for three participants, resulting in a total of 441 participants for the depression analysis and 438 for GAD. There were no other exclusion criteria. Remaining participants were between the age of 18-58 ($M = 22.0$, $SD = 3.3$), including 347 females (79%), 93 males (21%) and one "other" (0.2%). All participants were university students and were recruited from Utrecht University via posters and university website advertisements. Participants were awarded course credits for their participation. This was the only compensation given. Informed consent was provided by all participants. All questionnaires were in Dutch and were completed via computer.

Materials

Intolerance of Uncertainty Scale (IUS-12)

The IUS-12 is a 12-item self-report inventory used to measure IU (Carleton et al., 2007; de Bruin et al., 2006). Items are rated on a 5-point Likert scale, ranging from 1 (*not at all*) to 5 (*entirely characteristic of me*). Scores are summed giving totals ranging from 12 (*low IU*) to 60 (*high IU*). An example item is "Unforeseen events upset me greatly". The

inventory has excellent internal reliability in the current sample (*Cronbach's α* = .92) and good convergent validity (Carleton et al., 2007).

Life Orientation Test (LOT)

The LOT is an 8-item self-report inventory used to measure optimism and pessimism (Scheier & Carver, 1985; Vinck et al., 1998). Four items measure pessimism and the other four, which are reverse scored, measure optimism. Items are rated on a 5-point Likert scale, ranging from 0 (*not at all*) to 4 (*extremely*). Scores are summed giving totals ranging from 0 (*optimistic*) to 32 (*pessimistic*). An example reversed item is "I'm always optimistic about my future". The inventory has good internal reliability in the current sample (*Cronbach's α* = .85), and good convergent and discriminant validity (Scheier & Carver, 1985).

Beck Depression Inventory (BDI)

The BDI is a 21-item self-report inventory used to measure depression in adults and adolescents (Beck et al., 1996; Van der Does, 2002). Items are rated on a 4-point Likert scale, ranging from 0 (*low depression*) to 3 (*high depression*). Items scores are summed giving totals ranging from 0 to 63. Each item measures a different aspect of depression experienced within the last two weeks, for example "Sadness", and example low and high answers are "I do not feel sad" and "I am so sad and unhappy that I can't stand it", respectively. The recommended cut-off score is 16 with scores above indicating presence of depression and below indicating an absence of depression (Warmenhoven et al., 2012; Zich et al., 1990). The inventory has excellent internal reliability in the current sample (*Cronbach's α* = .92) and good concurrent validity (Storch et al., 2004).

Ruminative Response Scale (RRS)

The RRS is a 10-item self-report inventory used to measure rumination (Schoofs et al., 2010; Treynor et al., 2003). It is an adaption of the original 22-item questionnaire (Nolen-

Hoeksema & Morrow, 1991) with 12 items, that were deemed similar to BDI items, removed to differentiate rumination from depression (Treynor et al., 2003). Participants rate items on a 4-point Likert scale, ranging from 1 (*almost never*) to 4 (*almost always*), in relation to what they generally do when feeling sad, down, or depressed. Scores are summed giving totals ranging from 10 (*low rumination*) to 40 (*high rumination*). An example item is "do you think "why can't I handle things better?"". The inventory has good internal reliability in the current sample (*Cronbach's α* = .81) and good construct validity (Treynor et al., 2003).

Generalized Anxiety Disorder Questionnaire (GAD-Q)

The GAD-Q is an 9-item self-report inventory used to measure generalized anxiety disorder (Boelen & Reijntjes, 2009; Newman et al., 2002). Five items are answered "yes/no" with a "yes" scored as 1 and "no" 0. An example yes/no item is "do you worry about minor things?". Two items ask for a list of most frequent worries and physical anxiety symptoms, with 1 point given for each listed item up to 6. These points are then summed and divided by 3 to get a total score for these items. Two items are scored on a 9-point Likert scale from 0 (*none*) to 8 (*very severely*). An example item is "how much are you bothered by worry and physical symptoms". These points are then summed and divided by 4 to get a total score for these items. All item scores are then summed with totals ranging from 0 (*low GAD*) to 13 (*high GAD*). The recommended cut-off score is 5.7 with scores above indicating presence of GAD and below indicating an absence of GAD (Newman et al., 2002). The inventory has good internal reliability in the current sample (*Cronbach's α* = .81), and good clinical validity (Newman et al., 2002).

Penn State Worry Questionnaire (PWSQ)

The PWSQ is an 8-item self-report inventory used to measure worry (Hopko et al., 2003; van Rijsoort et al., 1999). It is an adaption of the original 16-item questionnaire (Meyer

et al., 1990), modified to increase generalizability to older adults (Hopko et al., 2003). Items are rated on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*always*). Scores are summed giving totals ranging from 8 (*low worry*) to 40 (*high worry*). An example item is "my worries overwhelm me". The inventory has excellent internal reliability in the current sample (*Cronbach's α* = .93), and good convergent and divergent validity (Hopko et al., 2003).

Data Analysis

To investigate if pessimism partially mediates the relationship between IU and depression/GAD, controlling for rumination and worry respectively, two mediation analysis were performed using PROCESS (Hayes, 2017). Due to the correlation between pessimism and both rumination and worry (Hong, 2007), if an non-significant mediation was found, a model was run without the control variable. For each model, the independent variable (IV) was IU, and the mediator was pessimism. One model was run using depression as the dependent variable (DV) and one using GAD. PROCESS tests the significance of the indirect mediation pathway using bootstrapped confidence intervals (Hayes, 2017). A model including the IV, controlling variable, and mediating variable was used to test for a full or partial mediation. If the IV no longer significantly predicted the DV after adding the mediating variable to the model, it can be said to be a full mediation. Outliers, determined to have absolute studentized residual values greater than 3, were removed prior to the analysis (Field, 2018). Five outliers were removed from the depression model and two from the GAD model, leaving 436 and 435 participants respectively. All following assumptions were checked using SPSS and, unless otherwise specified, were met for each analysis. Uncorrelatedness of residuals and multicollinearity were checked using the Durbin-Watson-statistic and variance inflation factors respectively. Homoscedasticity and linearity were checked using scatterplots. Normality was checked using a histogram.

Results

Mean scores and standard deviations for each questionnaire are reported in Table 1 along with inter-questionnaire correlations. Correlations between all questionnaires were positive and significant. Of the 436 participants, 384 had BDI scores below the cut-off of 16, while 52 (11.9%) scored above (Warmenhoven et al., 2012; Zich et al., 1990). GAD scores above the 5.7 cut-off were recorded by 136 participants (31.3%), leaving 299 below the cut-off (Newman et al., 2002).

Table 1

Mean (standard deviation) of each questionnaire and inter-questionnaire Pearson correlations. N between 433 and 441.

|	*M (SD)*	Pearson Correlations					
		IUS-12	LOT	BDI	GAD-Q	RRS	PWSQ
IUS-12	28.15 (9.78)		.62	.60	.64	.57	.68
LOT	11.44 (5.35)			.62	.53	.44	.59
BDI	9.58 (8.3)				.65	.49	.58
GAD-Q	4.94 (3.07)					.50	.81
RRS	20.87 (5.4)						.52
PWSQ	22.73 (8.43)						

Note. All correlations have a *p*-value < .001

A mediation analysis, controlling for rumination, was performed to test the hypothesis that pessimism partially mediates the relationship between IU and depression ($N = 436$). Robust standard errors (Cribari-Neto) were used to account for heteroscedasticity (Field, 2018). In line with expectations, there was a significant indirect mediating effect of pessimism on the relationship between IU and depression (Figure 1). Higher IU still significantly predicted higher depression symptoms after pessimism was added to the model, showing a partial mediation, $b = .195$, $t(432) = 4.92$, $p < .001$.

A mediation analysis, controlling for worry, was performed to test the hypothesis that pessimism partially mediates the relationship between IU and GAD ($N = 435$). Contrary to expectations, there was no significant indirect mediating effect of pessimism on the relationship between IU and GAD (Figure 2). Also, pessimism did not predict GAD symptoms in this model. However, higher IU did significantly predict higher GAD symptoms, $b = .053$, $t(431) = 4.11$, $p < .001$. Interestingly, a post-hoc mediation analysis revealed that when worry was excluded from the model, pessimism both predicted GAD and mediated the relationship between IU and GAD (see Figure 3). Higher IU still significantly predicted higher GAD symptoms when pessimism, but not worry, was included in the model, showing a partial mediation, $b = .159$, $t(432) = 11.02$, $p < .001$.
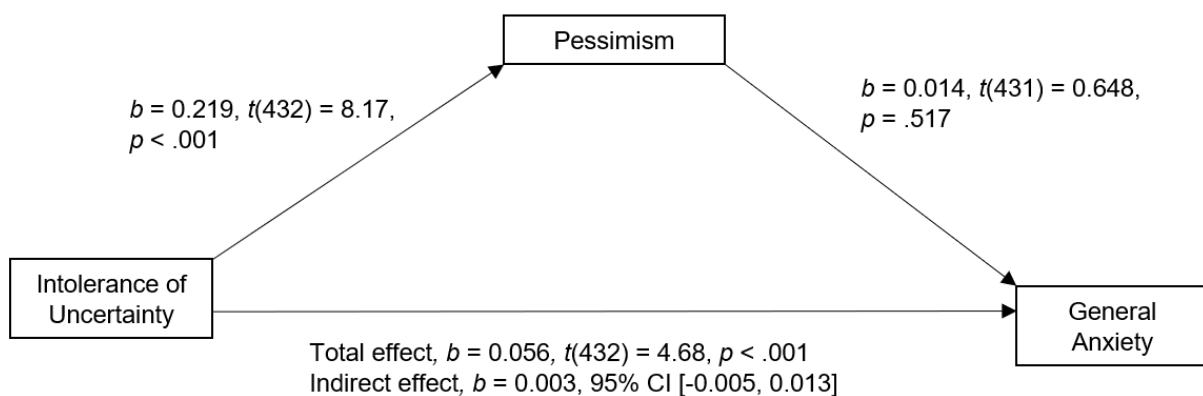
Figure 1

Mediation Model of Intolerance of Uncertainty and Depression Mediated Through

Pessimism, Controlling for Rumination
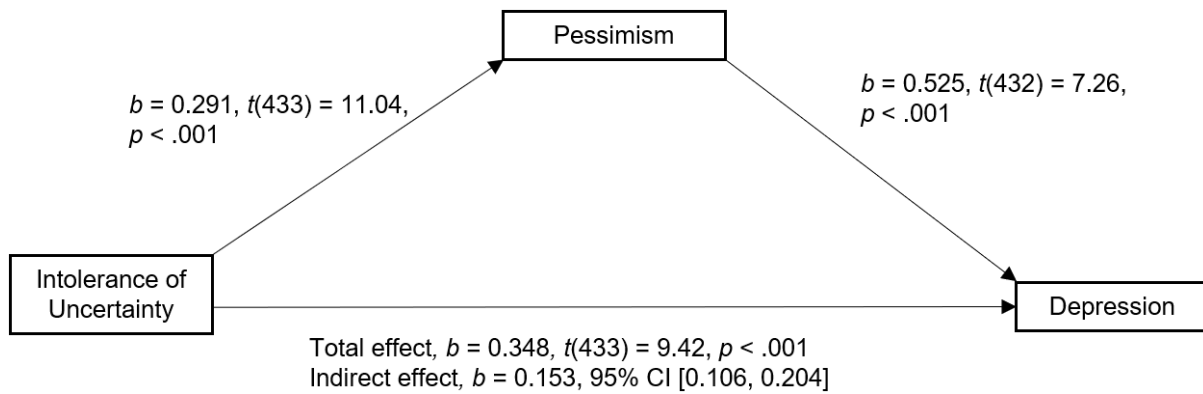
Note. CI = confidence interval. Total effect is the effect of IU on depression symptoms

controlling only for rumination. Indirect effect is the effect of IU on depression symptoms
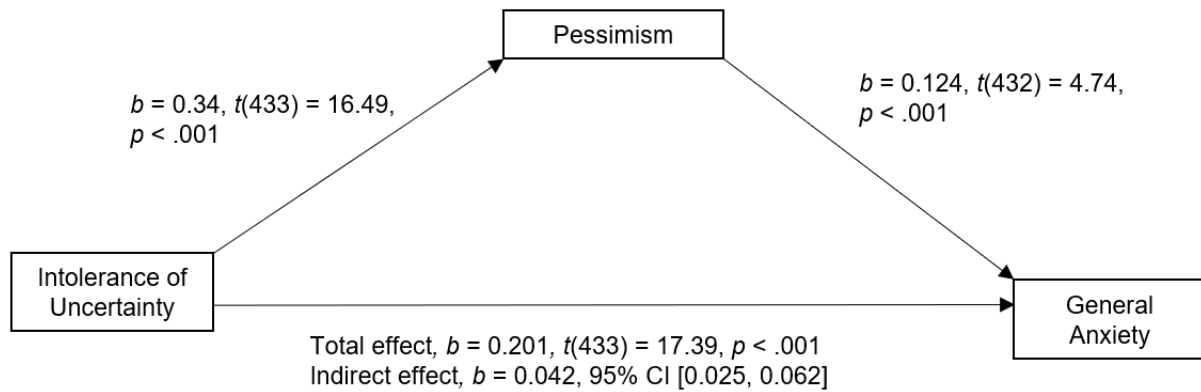
that is mediated through pessimism.

Figure 2

Mediation Model of Intolerance of Uncertainty and General Anxiety Mediated Through

Pessimism, Controlling for Worry

Note. CI = confidence interval. Total effect is the effect of IU on GAD symptoms controlling

only for worry. Indirect effect is the effect of IU on GAD symptoms that is mediated through

pessimism.

Figure 3

Post-hoc Analysis. Mediation Model of Intolerance of Uncertainty and General Anxiety

Mediated Through Pessimism, not Controlling for Worry.

Note. CI = confidence interval. Total effect is the effect of IU on GAD symptoms without any control variables. Indirect effect is the effect of IU on GAD symptoms that is mediated through pessimism.

Discussion

This study investigated if pessimism is a partial mediator for the relationship between IU and depression/GAD symptoms. It was theorised that higher IU would result in increased pessimism and that this was the mechanism through which IU affected depression/GAD symptoms. As rumination and worry have been shown to partially mediate the relationship between IU and depression/GAD respectively, they were first controlled for to isolate the effect of pessimism. The current study found mixed results for these hypotheses. Firstly, concurrent with expectations, pessimism was shown to partially mediate the relationship between IU and depression while controlling for rumination. Secondly, contrary to expectations, pessimism did not mediate the relationship between IU and GAD when controlling for worry. Nor did pessimism significantly predict GAD when worry was included in the model. Thirdly, a post-hoc analysis not controlling for worry, found

pessimism to both predict GAD, and partially mediate the IU-GAD relationship. Overall, these results suggest that pessimism may be used as a coping mechanism for those high in IU, and that it is partly via this increased pessimism that depression and, potentially, GAD symptoms increase.

Previous research suggested that, when faced with uncertainty, people tend to adopt a strategy of certain pessimism to reduce the distress felt with uncertainty (Grupe & Nitschke, 2011). Building on this, the current theory suggested that people high in IU would be particularly vulnerable to this due to the higher levels of distress felt with uncertainty. The results of this study support this by showing that IU and pessimism are significantly positively correlated (see Table 1). While certain pessimism can reduce the short-term distress of uncertainty (Ladouceur et al., 2000), high levels of pessimism have been shown to be a risk factor for both depression (Andersen, 1990) and GAD (Miranda et al., 2008) in the long-term. Therefore, pessimism was suggested to be the mechanism through which IU increased depression/GAD symptoms. This was also supported by the results of this study which showed the mediating role that pessimism plays between IU and depressive/GAD symptoms. Although these results come from cross-sectional data, and hence need to be interpreted cautiously, they offer preliminary support for the theory that IU increases depression, and possibly GAD, symptoms by increasing pessimism. They also suggest that pessimism may develop and be maintained by a motivation to avoid uncertainty. If supported by longitudinal and experimental studies, these results have implications for models of IU, depression, and GAD and for the treatments based on them.

As a central symptom and transdiagnostic factor in several models of anxiety and depressive disorders (Mullarkey et al., 2019; O'Driscoll et al., 2021), pessimism is considered a good target for treatment (Fried et al., 2017). However, when considering that IU may not only increase pessimism, but may also explain significant variance of depression

and GAD beyond that explained by pessimism, rumination, or worry, IU may be considered a more effective target than pessimism for treatment of depression and GAD. The partial mediation found in this study while controlling for rumination also contradict previous research which found rumination to fully mediate the IU-depression relationship (Liao & Wei, 2011; Yook et al., 2010). However, before future directions can be discussed, the mixed results of this study need to be acknowledged.

Two unexpected findings were that both the mediating effect of pessimism, and pessimism's prediction of GAD, were evident only when worry was excluded from the model, but not when controlling for it. While this result may be due to the possibility that pessimism doesn't mediate any more than worry alone, there are two possible alternative explanations – a possible double mediation and construct overlap.

First, is the possibility that pessimism serves as the first part of a double mediation followed by worry as the second mediator. A leading theory explaining the relationship between IU and GAD includes worry as a partial mediator (Ladouceur et al., 2000). It has also been suggested that the method through which pessimism increases GAD is by increasing certainty that negative future events will occur (Miranda et al., 2008). It is possible that when people hold the belief that negative future events will occur, they would attempt to control or prepare themselves for these events. As worry is often used as a coping mechanism to give people a sense of control and to prepare for future events, this may be a common response to an increase in pessimism (MacLeod, 1994; MacLeod et al., 1991). This use of worry to cope with pessimism has already been established as part of a theory of "defensive pessimism" (Lim, 2009). Summarizing, increased pessimism may trigger worry, creating the sequence of IU – pessimism – worry – GAD. This would explain the lack of both a mediating effect and pessimism's prediction of GAD when controlling for worry. While this doesn't explain much more of the IU-GAD variance than worry alone, it does provide an important

piece of information informing theories on the development of GAD. Future research using longitudinal data is needed to test this explanation and the temporal order of these constructs.

A second explanation is that of potential construct overlap which could occur in two ways. The first is overlap between pessimism and worry, and that controlling for one, hides the effect of the other. While worry and pessimism are believed to be separate constructs, it has been suggested that there is some overlap, particularly in the exaggerated perceived probabilities of negative future events occurring, which features in both (MacLeod et al., 1991). The definition of pessimism – the belief that, future negative events/outcomes will be experienced (Miranda et al., 2008) – and worry – a style of future oriented and negatively affect-laden repetitive thinking (Ladouceur et al., 2000) – are remarkably similar in that they are both specifically future oriented, negative thought processes. Rumination on the other hand is specifically past oriented, suggesting less potential overlap (Hong, 2007). The stronger correlation between pessimism and worry than with rumination supports this (see Table 1), as does the doubling of the test statistic for the IU-pessimism pathway when worry was excluded (see Figure 2 and Figure 3), indicating a stronger relationship when not controlling. This would again explain why pessimism was not shown to mediate or to predict GAD when controlling for worry. The second is the possibility of construct overlap between worry and GAD. Worry is a defining feature of GAD, as shown in Dugas et al.'s (1998) conceptual model of GAD, and by their high correlation (see Table 1). It is therefore possible that after controlling for worry, there was little GAD variance left to explain. However, as IU continued to predict GAD even when controlling for worry, it seems that there is some unique variance not explained by pessimism or worry, that is explained by IU, making this explanation less likely. These explanations may independently or cumulatively explain the lack of a significant effect when including worry to the GAD model, but not when including rumination to the depression model. The implications that these potential explanations may

have for the theoretical understanding of IU and it's working mechanisms warrants further investigation.

Future research to strengthen the current theory and findings can focus on experimentally demonstrating causality between IU and pessimism. However, research to disentangle the GAD model needs to consider the possibility of bidirectionality. Longitudinal and experimental studies have found evidence for a bidirectional relationship between IU and symptoms associated with IU, including worry (Britton et al., 2019; Britton & Davey, 2014; Dugas et al., 2012; Meeten et al., 2012). Importantly, no studies that the author is aware of have tested for directionality and found IU to be solely a dependent variable. This means that the directionality assumed in this study is likely not incorrect, but that a bidirectional relationship is likely. This bidirectionality complicates future research seeking to disentangle the GAD model as interventions targeting a single variable in the model may result in several variables being affected. Research should therefore seek to establish which variables have a bidirectional relationship and the strength of the relationship in each direction. Clinically this means that, while many variables may be affected by any intervention, the most appropriate intervention would target the independent variable with the strongest and most connections to other variables.

An important limitation of this study is the cross-sectional design. Due to this, the study relies on an assumption of primacy of IU over pessimism. Although, prior longitudinal and experimental research shows primacy of IU over depression/GAD (Ladouceur et al., 2000; Meeten et al., 2012; Miranda et al., 2008; van der Heiden et al., 2012), other studies have suggested the possibility of a bidirectional relationship between IU and variables associated with it (Dugas et al., 2012). To test directionality, future studies manipulating IU and pessimism separately, while measuring changes in both constructs are needed. It should also be noted that, while both general pessimism (belief that negative events will be

experienced) and pessimistic certainty (degree of certainty that negative events will be experienced) would be expected to be positively correlated with IU according to the theory, pessimistic certainty was not measured in this study. This limits the extent to which these results confirm the underlying theory relating to people with high IU having higher pessimistic certainty. This is something that future studies can address by measuring both pessimism and pessimistic certainty. Another limitation is that this study used a convenience sample of university students. For these results to be useful in a clinical setting, they should be replicated with a clinical sample. Furthermore, this data was collected during the COVID-19 pandemic which saw a sharp increase in depression and GAD worldwide, as was evident in this study (Lakhan et al., 2020). In the current study, depression and GAD scores above the cut-off distinguishing disordered from non-disordered were 11.9% and 31.3% respectively (Dolle et al., 2012; Newman et al., 2002). While this is in line with prevalence rates in other European countries during the pandemic (Y. Huang & Zhao, 2020; Lakhan et al., 2020), it contrasts with pre-pandemic prevalence of depression and GAD in the Dutch general population of 5.8% and 1.2% respectively (Bijl et al., 1998). A Dutch study found that, during the pandemic, depression and anxiety symptoms increased most in previously healthy individuals, which would further explain the inflated proportion of participants above the cut-off (Pan et al., 2021). As the current data was collected during an extraordinary situation in which normally healthy people exhibited symptoms of disorders not usually characteristic of them, results should be generalised with caution. A further limitation is that the current sample was predominantly young, female (79%), university students which, again, limits the generalisability of the results to the general population. Women are approximately twice as likely to experience depression and GAD, however the results of this study are not intended to be gender specific, hence a more balanced sample should be sought by future studies (Bijl et al., 1998).

This study found preliminary evidence that IU increases pessimism and this in turn increases depression while controlling for rumination. However, this effect on GAD was not found while controlling for worry and requires further research. This finding, combined with previous research, suggests that both pessimism and worry may both be sequential mediators in the relationship between IU and GAD symptoms (Lim, 2009). Pessimism cannot be said to fully explain the relationship between IU and depression/GAD symptoms however, as only a partial mediation was found. These novel findings add to existing knowledge on how IU affects symptoms of depression/GAD and may affect the treatment of these disorders. However, these findings carry several limitations, particularly the assumption of precedence of IU over pessimism, which require further research.

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