

# The relative deprivation trap: How feeling deprived relates to the experience of generalized anxiety disorder

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## Abstract

**Introduction:** How income inequality associates with poorer mental health remains unclear. Personal relative deprivation (PRD) involves appraising oneself as unfairly disadvantaged relative to similar others and has been associated with poorer mental health and negative cognitive appraisals. As generalized anxiety disorder (GAD) is associated with negative cognitive appraisals, PRD may relate to the experience of GAD and its cognitive predictors, intolerance of uncertainty (IU), positive beliefs about worry (PBW), negative beliefs about worry (NBW), and experiential avoidance (EA). **Method:** In two observational studies (Study 1, N = 588; Study 2, N = 301) participants completed measures of PRD, cognitive predictors and symptoms of GAD, subjective socioeconomic status (SES), self-efficacy, and self-esteem. **Results:** A relationship between PRD and GAD was found across studies, which was simultaneously mediated by IU and NBW. These results remained when controlling for subjective SES but were weakened when controlling for self-concept factors. **Discussion:** This research supports the possibility that the experience of relative deprivation may “trap” people in thinking patterns that contribute to anxious symptomology.

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## Introduction

Poor mental health outcomes are a global reality but are particularly striking in countries characterized by high economic inequality (Buttrick & Oishi, 2017; Wilkinson & Pickett, 2006). For example, the size of the gap between the rich and poor is associated with societal rates of anxiety and depression (Filho et al., 2013; Pickett & Wilkinson, 2010; Weich et al., 2001). There is also a strong positive association between inequality and anxiety disorders as a group (Pickett & Wilkinson, 2010; WHO International Consortium in Psychiatric Epidemiology, 2000), and this relationship is not fully explained by people's objective socioeconomic status (SES; Kondo et al., 2009; Pickett et al., 2006).

Emerging research suggests that people's psychological reactions to inequality – such as lower levels of social trust and greater tendency to feel inferior to others – may in part explain inequality's effect on overall mental health (Delhey & Dragolov, 2014). In addition, inequality may be partially linked to increased symptomology and diagnosis of psychological disorders through lower perceived SES (one's subjective appraisal of where they fall in the social hierarchy), less trust in others, and less social cohesion (Ehsan & De Silva, 2015; Scott et al., 2014).

Another psychological process that may partly explain the link between high inequality and psychological disorders is personal relative deprivation (PRD). PRD occurs when people compare themselves to similar others, appraise themselves to be at an unfair disadvantage, and react with dissatisfaction, anger and resentment (Smith & Huo, 2014). People tend to prefer less inequality in society than currently exists (Norton & Ariely, 2011), and may view conditions that allow high inequality as unfair (Starmans et al., 2017). As the rich become relatively richer in unequal societies, this can have cascading effects on those below them. For example, as people try to keep up with those above them, the gap between each rung of the societal ladder may perceptually widen, leading many individuals to feel worse off (Frank, 1999; Schneider, 2019). Preliminary research also indicates that living in areas of greater economic inequality (e.g., at the state or neighbourhood level) is related to greater experience of PRD (Hastings, 2019; Osborne et al., 2015). While much of the potential effects of PRD on psychological disorders can exist independent of societal inequality, the above reasoning and evidence suggests that inequality may exacerbate PRD and thus also mental health issues. Although we do not directly test the effects of inequality in the present research, the role PRD may have in the perceived inequality-mental health relationship (Pettigrew, 2016; Walker & Smith, 2002) suggests a need for additional research in this area.

Because anxiety disorders have been associated with inequality, we consider whether PRD may have a role in this outcome. Among anxiety disorders, generalized anxiety disorder (GAD) is the most common (Kroenke et al., 2007), and so represents a promising target of investigation in the context of PRD. However, to our knowledge, no empirical research has examined if the tendency to experience PRD can, in part, explain the degree to which people experience symptoms of anxiety disorders, including those of generalized anxiety. In the following, we review (a) evidence linking PRD and mental health generally, (b) cognitive correlates of GAD specifically, and (c) how cognitive processes may link PRD to GAD. We then present two empirical studies to examine associations between PRD and generalized anxiety, as well as cognitive mediators that may link the two.

### **Personal Relative Deprivation (PRD) and Mental Health**

PRD theory attempts to explain how people react both psychologically and behaviourally to deprivation, or the feeling associated with the belief that they are not receiving a deserved outcome (Crosby, 1976; Walker & Pettigrew, 1984). People often make comparisons to those around them (e.g., based on income or employment) and in reaction, some people may believe that they are at a disadvantage. Critically, PRD involves the subjective experience of being at an unfair disadvantage compared to similar others and the immediate emotions (e.g., resentment, dissatisfaction) resulting from this process (Crosby, 1976; Smith & Pettigrew, 2015). As a consequence, PRD can be experienced throughout the social hierarchy (although it tends to be modestly stronger among those lower in SES; Callan et al., 2015a). Also, because the process involves subjective evaluations of relative standing and fairness, there is individual variation. For example, someone who experiences high objective deprivation (e.g., possessing low SES in a society of high economic disparity), but does not perceive it as unfair, should not experience PRD (Walker & Pettigrew, 1984).

The experience of PRD is associated with broad measures of mental health and well-being. Higher levels of PRD have been linked with greater negative affect and perceived stress, as well as lower subjective well-being beyond the contributions of subjective SES, education, and income (Callan et al., 2015b; Mishra & Carleton, 2015; Smith et al., 2012; Walker & Mann, 1987). Furthermore, in a longitudinal study of university students, higher PRD predicted poorer mental health two years later, while poor mental health did not predict changes in PRD over the same time period (Smith et al., 2020). In the domain of psychopathology, PRD has been positively associated with depressive symptomology, as well as broad cognitive and affective indicators of mood and anxiety (Beshai et al. 2017; Callan et al., 2015b; Mishra & Carleton, 2015). PRD has also been associated with several emotional and cognitive processes that relate to the onset and maintenance of depression, including negative automatic thoughts about the self, dysfunctional attitudes, and a tendency to suppress emotions (Beshai et al., 2017). In particular, the relationship between PRD and depressive symptomology appears to be primarily mediated by negative automatic thoughts about the self (Beshai et al., 2017).

Taken together, this research highlights that PRD is associated with a number of poor mental health outcomes; however, it is unknown if PRD is associated with anxiety specifically, and if so, which cognitive mechanisms may link the two.

### **Cognitive Correlates of Generalized Anxiety Disorder**

Generalized anxiety disorder (GAD) is typified by chronic, excessive, and uncontrollable worry that pervades a person's life, in addition to the experience of several other symptoms (e.g., fatigue, muscle tension, sleep disturbances). The worry experienced in GAD takes the form of repetitive thinking (e.g., recursive "what-if" questions) about potential threats and risks (Watkins, 2008). A major context that tends to evoke worry is perceived environmental uncertainty or ambiguity (Buhr & Dugas, 2006). Indeed, experiencing greater *intolerance of uncertainty (IU)* involves finding situations with ambiguous outcomes relatively distressing due to perceived potential negative outcomes, consequently increasing the likelihood of experiencing symptoms of GAD (Dugas et al., 2004).

Among people with GAD, worrying can often be used as a cognitive coping response that is perceived to help in problem-solving (Gentes & Ruscio, 2011; Ruscio & Borkovec, 2004; Watkins, 2008). As people rely on these *positive beliefs about the utility of worry (PBW)* they may view worrying as an effective means of coping with difficulties, potentially increasing their vulnerability to GAD (Ruscio & Borkovec, 2004). People can also simultaneously hold negative appraisals of their worries – that their worrying is uncontrollable, dangerous, or that they are unable to cope with it (Watkins, 2004; Wells, 2005). These *negative beliefs about worry (NBW)* can exacerbate GAD symptoms (Moffitt et al., 2007). Additionally, worrying may be employed as a means of avoiding or modulating intense emotional experiences that arise in subjectively threatening situations (Mennin et al., 2002). The evasion of emotional experiences is known as *experiential avoidance (EA)*, and is also commonly seen in GAD (Chawla & Ostafin, 2007).

Although our focus is on cognitive processes, other psychological factors may partly account for people's experience of GAD, such as one's self-concept, or one's beliefs about themselves (Chen et al., 2001; Sinclair et al., 2010). For example, lower self-efficacy (less confidence in one's abilities to succeed) and poorer self-esteem (lower feelings of self-worth), have been associated with higher levels of GAD symptomology (Blanco et al., 2014; Muris, 2002; Sowislo & Orth, 2013; Stanley et al., 2002).

### **Links Between PRD and Cognitive Correlates of GAD**

Several aspects of the experience of PRD may exacerbate cognitive processes related to GAD. Although previously untested, we propose that there may be links between PRD and these processes. Consistent with recent longitudinal evidence (Smith et al., 2020), PRD may be associated with people's tendency to engage in thinking styles that contribute to anxiety. Experimental research has found that participants experience greater IU when the potential negative consequences of a situation are highlighted to them, or the uncertainty of a situation is made more salient (Ladouceur et al., 2000; Mosca et al., 2016). Accordingly, greater experience of PRD may increase IU, as the feelings of deprivation highlight the negative consequence of being at an unfair disadvantage in society, and may bring focus to uncertainty, such as surrounding the exact reasons why others are seemingly better off, or how to change one's relative standing. Moreover, negative experiences such as feeling deprived and resentful can contribute to people worrying (Beshai et al., 2017; Lewis et al., 2018). Although previously untested, we suggest that PRD may relate to meta-beliefs about this worry. Specifically, we hypothesize that people may increase their positive beliefs about this worry, utilizing it to help them resolve this negative situation. Similarly, people may increase their negative beliefs about this worry, perceiving it as uncontrollable or dangerous. Finally, negative affect in the form of resentment, anger, and dissatisfaction may also relate to EA. That is, people may feel motivated to avoid such unpleasant emotional experiences, and thus increasingly engage in EA, which further exacerbates symptoms of psychopathology. Taken together, we believe that PRD will relate to greater experience of these cognitive processes, which will in turn relate to greater anxious symptomology.

### **Present Research**

We propose that the tendency to feel relatively deprived compared to similar others may relate to people's tendency to engage in maladaptive forms of thinking, and to worsened GAD symptoms. In Study 1, we explored (a) associations of PRD and GAD in a previously collected

multi-national sample; and (b) if three of the four proposed underlying processes (IU, PBW, NBW) mediate any relationship between PRD and GAD. In Study 2, we replicated analyses from Study 1 in a pre-registered U.S. sample, with the addition of EA as a fourth potential mediator of associations between PRD and GAD. Consistent with the literature reviewed and our reasoning above, we predicted that all four cognitive mechanisms (IU, PBW, NBW, and EA) would mediate associations of PRD and GAD.

We also explored if expected associations between PRD and GAD would hold controlling for a variety of background, socio-economic, and self-concept related factors. We included background variables of sex, age, education, and household income, as these have been associated with GAD (Grant et al., 2009; Moffitt et al., 2007; Ruscio et al., 2017). We also included elements of self-concept, including self-efficacy (Study 1) and self-esteem (Study 2) because they are important predictors of psychopathology symptoms, including GAD. A measure of perceived SES (Study 2) will also be included as lower perceived SES has been related to lower life satisfaction, and poorer mental health outcomes (Schneider, 2019). By testing these relationships across two studies we hope to provide initial evidence of whether the experience of personal deprivation consistently relates to the experience of GAD symptoms and how this may occur.

## Study 1

### Methods

#### Participants

Study 1 participants ( $n = 748$ ) were based on an existing dataset (see Beshai et al., 2017) previously recruited through CrowdFlower, an online crowdsourcing platform (Goodman et al., 2013). Participants primarily resided in the U.S., as well as in Canada, New Zealand, Australia, and the U.K. We excluded participants under 18 years of age ( $n = 2$ ) or for failing an attention check ( $n = 158$ ); yielding a final sample of 588 (57.6% women,  $M_{\text{age}} = 39.3$  years; 52.4% completed university, college or higher education; median household income = US\$40,000 - \$50,000). Previous research has shown the suitability of the CrowdFlower platform for mental health research (Beshai et al., 2017; Mishra & Carleton, 2015).

#### Procedure and materials

Participants provided consent for an online study on “Personality and Mental Health,” and completed the following measures in random order, with questions within each measure also randomized. All measures were completed with higher numbers indicating greater experience of the construct. See the Supplemental File for full study materials.

***Personal relative deprivation (PRD)***. Participants’ subjective experience of deprivation was assessed using a 5-item measure ( $\alpha = 0.83$ ; PRDS-R; Callan et al., 2011). This measure evaluates feelings of deprivation, resentment, and dissatisfaction associated with comparing oneself to similar others (e.g., “I feel dissatisfied with what I have compared to what other people like me have”). It shows strong reliability and validity when used in similar populations and on similar platforms (see Mishra & Meadows, 2018).

**Intolerance of uncertainty (IU).** The 12-item IUS-12 ( $\alpha = 0.91$ ) assesses acceptance and reaction to the possibility of being exposed to ambiguous events (Carleton et al., 2007; Laugesen et al., 2003). Participants indicated how much they agreed that each statement is characteristic of their experience (e.g., “It frustrates me not having all the information I need”). The IUS-12 has shown strong validity and internal consistency when used with non-clinical, community samples (Carleton et al., 2012).

**Positive beliefs about worry (PBW).** A 6-item subscale ( $\alpha = 0.91$ ) of the Metacognitions Questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004) was used to evaluate one’s belief in the benefit of worry for solving one’s problems (e.g., “Worrying helps me to avoid problems in the future”). The MCQ-30, and its subscales, have shown good reliability and validity when used in American community samples (Fergus & Bardeen, 2017; Spada et al., 2008).

**Negative beliefs about worry (NBW).** Another 6-item subscale ( $\alpha = 0.90$ ) of the MCQ-30 was used to assess unfavorable beliefs about worrying thoughts, like the uncontrollability or dangerousness of worries (e.g., “My worrying is dangerous for me”; Wells & Cartwright-Hatton, 2004).

**Generalized anxiety disorder symptoms (GAD).** The 7-item GAD-7 ( $\alpha = 0.92$ ) assesses presence and severity of GAD symptoms in accordance with the Diagnostic and Statistical Manual (American Psychological Association, 2013; Spitzer et al., 2006), and has been validated for use in non-clinical populations (Löwe et al., 2017). Participants ranked the frequency with which they experienced symptoms (e.g., “Feeling nervous, anxious or on edge”).

**Self-efficacy (SEF).** Participants’ perception of their ability to achieve outcomes despite difficulties was measured using the 8-item ( $\alpha = .94$ ) New General Self-efficacy Scale (e.g., “Even when things are tough, I can perform quite well; NGSES; Chen et al., 2001). The NGSES has shown strong reliability and validity in a variety of samples (Chen et al., 2001; Scherbaum et al., 2006).

**Demographics.** Participants also answered questions about their sex, age, highest level of education, and household income, in addition to questions used for other research.

## Results and Discussion

We first examined zero-order correlations among the main study variables (see Table 1). The tendency to experience PRD was positively correlated with more severe GAD symptoms ( $r = .466, p < .001$ ). Furthermore, PRD was positively correlated with all three mediating variables (IU, PBW, NBW; all  $r_s > .21, p_s < .001$ ), and these mediating variables were positively related with each other and GAD symptoms (all  $r_s > .36, p_s < .001$ ). Multicollinearity analyses confirmed that our predictor, mediators, and outcome variable could be treated as independent constructs (see Supplemental Materials for these analyses for Studies 1 and 2).

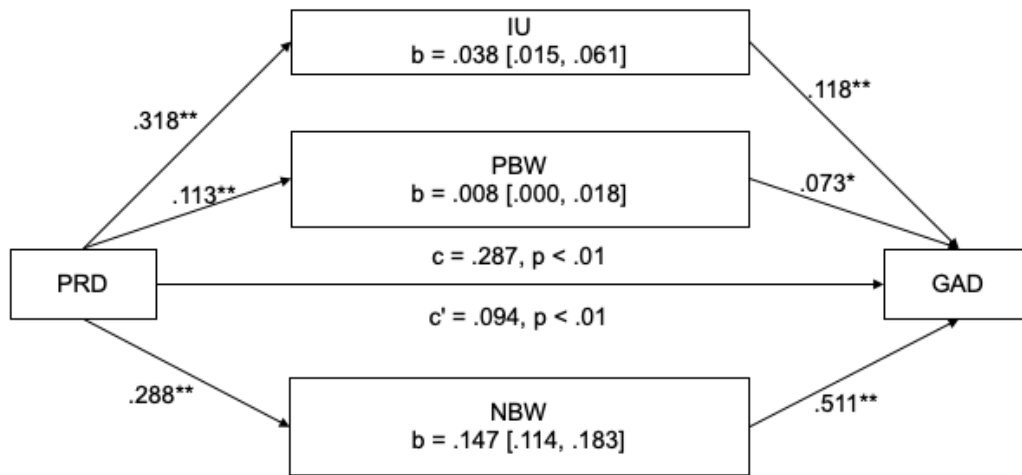
**Table 1:** Means, standard deviations, and correlations among main variables, Study 1

	<i>M (SD)</i>	PRD	IU	PBW	NBW	GAD
PRD	3.58 (1.20)	-				
IU	2.84 (0.80)	.476***	-			
PBW	1.74 (0.67)	.201***	.401***	-		

NBW	2.07 (0.81)	.424***	.681***	.381***	-	
GAD	1.84 (0.74)	.466***	.611***	.364***	.741***	-
SEF	5.04 (1.06)	-.550***	-.420***	-.114***	-.445***	-.464***

Notes: \*\*\* $p < .001$ , PRD=personal relative deprivation, IU=intolerance of uncertainty, PBW=positive beliefs about worry, NBW=negative beliefs about worry, GAD=generalized anxiety disorder symptoms, SEF=self-efficacy

To explain the association of PRD and GAD, we conducted a mediation analysis using PRD as the predictor variable, IU, PBW, and NBW as mediators, and GAD as the outcome variable. We followed a multiple-mediation bootstrapping procedure with 5,000 resamples and a 95% bias-corrected confidence interval to simultaneously examine if these cognitive processes account for significant indirect variance in the relation between PRD and GAD symptoms (Hayes, 2018; Preacher & Hayes, 2008, PROCESS v3.3). This analysis revealed that specific indirect effects of IU, PBW, and NBW, all significantly mediated the effect of PRD on experience of GAD symptoms (see Fig. 1; see Supplemental File for select models with all effects included). The total and direct effects of PRD on GAD were also significant. Post-hoc contrasts showed the specific indirect effect of NBW was significantly greater than IU,  $b = .110$ , CI [.065, .159], which was in turn significantly greater than PBW,  $b = .029$ , CI [.003, .056].



**Figure 1.** Mediation model of indirect effects of intolerance of uncertainty (IU), positive beliefs about worry (PBW), and negative beliefs about worry (NBW) on the relationship between personal relative deprivation (PRD) and symptoms of generalized anxiety disorder (GAD), Study 1. Values depict unstandardized regression coefficients, [95% confidence intervals]. \*  $p < .05$ ; \*\*  $p < .01$

In secondary analyses we examined the robustness of the above mediating model by first including sex, age, education, and household income as covariates. With these factors included,

all pathways through the mediators remained significant, as did the direct pathway of PRD on experience of GAD symptoms (see Supplemental File for full analysis). Next, we included self-efficacy as the main control variable in the mediation model. This analysis again revealed significant indirect effects of all mediators: IU,  $b = .025$  [.008, .045]; PBW,  $b = .010$ , CI [.001, .020]; NBW,  $b = .085$ , CI [.055, .119]; with IU and NBW showing smaller indirect effects with the inclusion of self-efficacy relative to the initial mediation model. The total,  $b = .260$ ,  $p < .001$ , and direct,  $b = .096$ ,  $p < .001$ , effects of PRD on GAD remained significant.

Thus, the positive association between PRD and GAD was partially explained by IU, PBW, and NBW, such that PRD related to higher IU, PBW, and NBW, which in turn related to higher GAD symptoms. These results held when controlling for several background variables. When controlling for self-efficacy, mediating variables showed less explanatory power, suggesting that an individual's perception of their ability to succeed despite adversity may account for some variance in the experience of GAD symptoms otherwise explained by other model variables.

## Study 2

Study 2 sought to examine whether the pattern of findings observed in Study 1 would replicate in a separate, preregistered sample, and if a fourth proposed psychological mediator, experiential avoidance (EA), would explain the relation between the experience of PRD and GAD symptoms beyond the three mediators in Study 1.

To further test the robustness of our expected findings we added two control measures: perceived SES, which has been associated with well-being, and self-esteem, which has been related to lesser symptoms of mental illness.

## Methods

### Participants

Following our preregistration plan, we targeted a sample of  $n = 300$  to achieve roughly 80% power, based on the assumption that indirect pathways in our mediation model would produce small to medium effects (Fritz & MacKinnon, 2010). We recruited an online sample of 305 American residents through Prolific Academic's crowdsourcing platform. Prolific has been recognized as providing quality research samples comparable to other crowdsourcing services (Peer et al., 2017). Participants consented to take part in a survey about "Societal Beliefs and Mental Health," and were compensated with approximately \$1.00 U.S. We excluded participants according to the following pre-registered criteria: failing to complete 50% of all questions ( $n = 4$ ), taking less than 3 minutes to complete all study measures (e.g., to remove participants who "clicked-through"), or being under 18 years of age. The final sample included 301 participants ( $M_{\text{age}} = 34.8$  years), of which 51.0% identified as women, 50.5% completed an undergraduate degree or greater, and with reported median income between US\$45,000-\$60,000.

### Procedure and materials

Participants completed the same measures as in Study 1. PRD and perceived SES appeared in a randomized order, followed by the mediators in this order: PBW, IU, EA, NBW, or its reverse. After, participants completed measures of GAD symptomology and self-esteem,



measures unrelated to the present study, and finally, demographic questions. All measures were completed with higher numbers indicating greater experience of the construct.

Measures showed good reliability with the current sample: Personal Relative Deprivation (PRD; 5-items;  $\alpha = .84$ ); Generalized Anxiety Disorder (GAD; 7-items;  $\alpha = .93$ ); Intolerance of Uncertainty (IU; 12-items;  $\alpha = .89$ ); Positive Beliefs about Worry (PBW; 6-items;  $\alpha = .90$ ); and Negative Beliefs About Worry (NBW; 6-items;  $\alpha = .95$ ). While all instructions and item phrasing remained identical for all measures, some scales for these measures differed slightly from Study 1 to Study 2. The scale for measures of PBW and NBW changed from a 4-point to a 7-point scale, and the scale and anchors changed for the measure of IU (see the Supplemental File for all study materials). Additional measures were as follows:

**Experiential avoidance (EA):** The Brief Experiential Avoidance Questionnaire (BEAQ) was used to assess the tendency to avoid one's internal experiences (i.e., thoughts, feelings) (Gámez et al., 2014). The 15-item questionnaire ( $\alpha = 0.86$ ) assesses beliefs about behavioural avoidance, distress aversion, procrastination, distraction, and distress endurance (e.g., "I work hard to keep out upsetting feelings"), using a 7-point scale. It has been validated in use in both clinical and non-clinical populations (Gámez et al., 2014).

**Perceived SES:** This widely used measure assesses participants' subjective view of their place in the social hierarchy, represented by a picture of a ladder (Adler et al., 2000; Operario et al., 2004). Participants placed themselves from 1 (lowest in the hierarchy) to 10 (highest in the hierarchy) on the ladder.

**Self-esteem (SE):** The 10-item Rosenberg measure ( $\alpha = 0.94$ ) assesses one's general feelings and attitudes about themselves (e.g., "On the whole, I am satisfied with myself"). It is one of the most widely used measures of self-esteem (Sinclair et al., 2010).

**Demographics:** Similar to Study 1, participants provided gender (rather than sex), age, education, and household income. Participants also indicated their ethnicity and provided additional background information for use in other research.

## Results and Discussion

First, we examined the zero-order correlations among the key study variables (Table 2). As in Study 1, PRD was related to greater severity of GAD symptoms,  $r = .366, p < .001$ . Additionally, PRD was positively related to all four mediating variables (all  $r_s > .13, p_s < .05$ ). All mediating variables were positively related to each other and GAD symptoms (all  $r_s > .24, p_s < .001$ ).

**Table 2:** Means, standard deviations, and correlations among main variables, Study 2

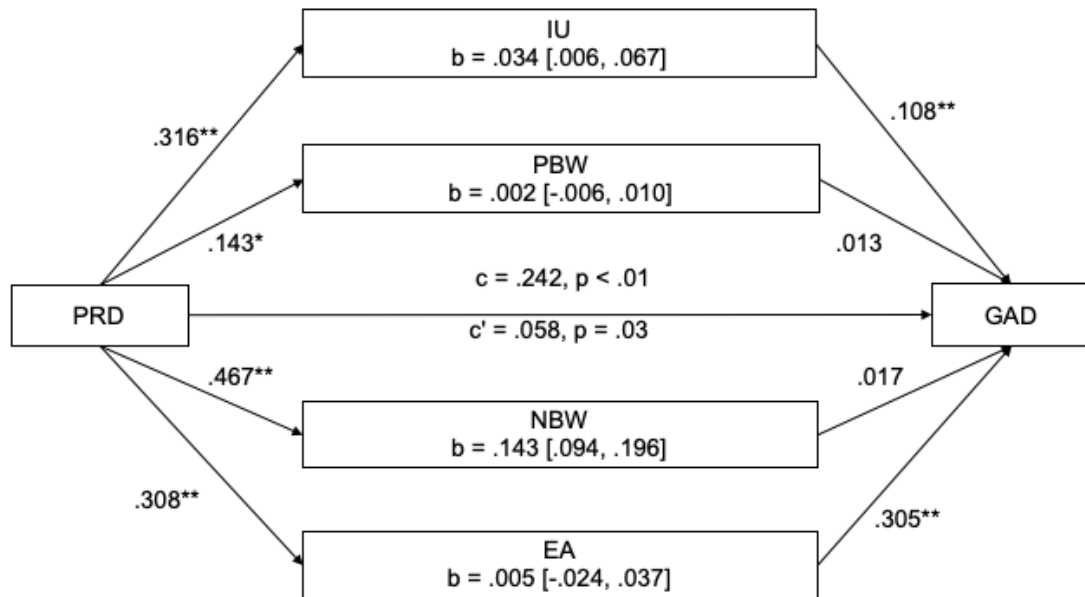
	<i>M (SD)</i>	PRD	IU	PBW	NBW	EA	GAD	SE
PRD	3.49 (1.25)	-						
IU	4.30 (1.08)	.366***	-					
PBW	3.26 (1.35)	.132*	.295***	-				
NBW	3.91 (1.70)	.344***	.619***	.295***	-			
EA	3.74 (0.93)	.415***	.683***	.240***	.615***	-		
GAD	1.01 (0.83)	.366***	.579***	.263***	.761***	.542***	-	

SE	4.79 (1.43)	-.473***	-.502***	.167***	-.667***	-.578***	-.664***	-
PSES	5.32 (1.71)	-.396***	-.226***	.063	-.132*	-.133***	-.193***	.315***

Notes: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ; PRD = personal relative deprivation, IU = intolerance of uncertainty, PBW = positive beliefs about worry, NBW = negative beliefs about worry, IU = intolerance of uncertainty, EA = experiential avoidance, GAD = generalized anxiety disorder symptoms, SE = self-esteem, PSES = perceived socioeconomic status

To directly replicate analyses from Study 1, we constructed a mediation model with three mediators (IU, PBW, NBW) linking PRD and GAD symptomology. Using identical procedures, this analysis partly replicated findings of Study 1. The specific indirect effects of IU,  $b = .036$ , CI [.001, .066], and NBW,  $b = .144$ , CI [.093, .197], significantly mediated the relationship between PRD and experience of GAD symptoms. However, the specific indirect effect of PBW did not,  $b = .002$ , CI [-.006, .011]. As in Study 1, the total effect of PRD on GAD,  $b = .242$ ,  $p < .001$ , was significant, as was the direct effect of PRD on GAD,  $b = .060$ ,  $p = .023$ . Also consistent with Study 1, the indirect effect of NBW was significantly greater than that of IU,  $b = .108$ , CI [.050, .170], and the indirect effect of IU was greater than PBW,  $b = -.034$ , CI [-.067, -.007]. Moreover, indirect effects of IU and NBW remained significant when the same covariates as in Study 1 (age, gender, household income, and education) were added as controls to the mediation model (see Supplemental File). Together, these results mostly replicate findings of Study 1.

Next, we tested whether the relation between PRD and GAD symptoms was mediated by all four proposed cognitive processes (i.e., by adding EA to the mediation model). A mediation analysis revealed that the specific indirect effects of IU and NBW significantly mediated the association between PRD and GAD symptoms; however the specific indirect effects of PBW and EA did not. The total and direct effects of PRD on GAD symptoms were significant (see Fig. 2). We also examined the same four-mediator model when controlling for the background variables used in Study 1, along with participant ethnicity. Including these control variables did not significantly alter the results (see Supplemental File).



**Figure 2.** Mediation model showing indirect effect of IU, PBW, NBW, and experiential avoidance (EA) on the relationship between PRD and symptoms GAD, Study 2. Values depict unstandardized regression coefficients, [95% confidence intervals]. \*  $p < .05$ ; \*\*  $p < .01$

Finally, to further test the robustness of the results, we ran the four-mediator model twice, separately adding perceived SES and self-esteem as covariates. When perceived SES was added to the model, the specific indirect effects of IU,  $b = .028, CI [.003, .057]$ , and NBW,  $b = .144, CI [.088, .198]$ , mediated the PRD-GAD relationship, while the specific indirect effects of other mediators were non-significant. The total effect of PRD on GAD was significant,  $b = .227, p < .001$ , but the direct effect of PRD on GAD was not,  $b = .044, p = .126$ . When self-esteem was added to the four-mediator model, the indirect effect of IU remained significant,  $b = .016, CI [.002, .035]$ , but the indirect effect of NBW did not,  $b = .013, CI [-.022, .050]$ . PBW,  $b = .002, CI [-.003, .008]$ , and EA,  $b = -.004, CI [-.019, .011]$ , remained non-significant. While the total effect,  $b = .046, p = .161$ , and direct effect,  $b = .020, p = .460$ , of PRD on GAD were not significant, the significant indirect effect through IU indicates that mediation still occurred (MacKinnon et al., 2002; Zhao et al., 2010).

Consistent with Study 1, in Study 2 we demonstrated a relationship between the experiences of PRD and GAD. Whereas in Study 1 higher levels of three processes (IU, PBW, and NBW) helped explain this association, in Study 2 only two of these (IU and NBW) were significant. When the fourth proposed mediator, EA, was added to the mediation model in Study 2, IU and NBW continued to mediate the relationship between PRD and GAD, while EA and PBW did not. These results were also robust to the inclusion of several demographic variables as well as perceived SES, a known predictor of health and well-being outcomes that involves elements of social comparison. Taken together, these findings suggest that PRD relates to GAD

beyond indicators of one's objective and subjective place in the social hierarchy. The inclusion of self-esteem as a covariate relatively weakened the explanatory power of the mediators. Although IU remained significant, the indirect role of NBW became indistinguishable from zero. This latter finding, though exploratory, suggests that consideration of global evaluations of self (i.e., through self-efficacy or self-esteem), may be useful when examining GAD-related predictors and underlying processes, a point we return to in the next section.

## General Discussion

People commonly interact with, notice, and think about similar others. Almost inevitably, some social comparison will occur, during which many may feel that they are relatively deprived and deserve to have more (Kim et al., 2018). Societal conditions, such as inequality, can intensify this dissatisfying experience, and over time, the tendency to feel deprived may be problematic for people's well-being (Callan, et al., 2015b; Smith et al., 2012, Smith et al., 2020). The present research examined the possibility that feeling deprived compared to similar others may relate to symptoms of generalized anxiety disorder, and how this may occur. Across two studies, we demonstrated novel and consistent evidence of an association between personal relative deprivation (PRD) and symptoms of generalized anxiety disorder (GAD). Although our results are correlational, they suggest the possibility that the tendency to experience personal relative deprivation may "trap" people in thinking patterns that may exacerbate the experiences of anxiety.

Intolerance of uncertainty (IU) and negative beliefs about worry (NBW) consistently explained part of the relationship between PRD and GAD. The indirect effects of IU and NBW held independent of key demographic predictors of mental health, including objective and subjective indicators of socioeconomic status (Adler et al., 2000; Singh-Manoux et al., 2003). Critically, the relationships of PRD to IU and NBW suggest that PRD may act as an instigative factor for the onset or maintenance of generalized anxiety (Penney et al., 2013; Ruscio & Borkovec, 2004). The results of our research are also consistent with other demonstrated links between PRD and negative mental health outcomes, and between PRD and cognitive processes that contribute to psychopathology (Beshai et al., 2017; Callan et al., 2015b).

The association between PRD and GAD was not explained through participants' positive beliefs about their worry (PBW), or through avoidance of unwanted emotional experiences (EA). The failure of PBW to mediate the relationship between PRD and GAD ran counter to our hypotheses. In examining the direct effects, this result may be partly explained by the relatively weaker associations between engaging in PBW and experiencing GAD symptoms, rather than associations between PRD and PBW (see Supplemental File for select models with all effects included). This shows some consistency with the finding that PBW is more specifically associated with trait worry rather than with more specific symptoms of GAD (e.g., irritability, tension; Penney et al., 2013).

Similarly, EA had a relatively weaker relationship to GAD, but was significantly related to PRD. We initially hypothesized that resentment and anger typically inherent in PRD may contribute to experiential avoidance, and in turn GAD symptoms. The weak association observed may be rooted in the inconsistent relationship between avoidance of anger and GAD (Buhr & Dugas, 2012; Roemer et al., 2005). Further research into the consistency of the contribution of EA to GAD symptoms may help shed light on our findings.

The inclusion of variables that reflect self-concept evaluations reduced the strength of the relationship between PRD and GAD through the proposed mediators. When self-efficacy was controlled for in Study 1, the strength of all the mediators was reduced but remained significant. When self-esteem was controlled for in Study 2, only IU helped explain the PRD-GAD relationship. These results suggest that while IU and NBW partly explained the relationship between PRD and GAD in both studies, evidence for the unique role of NBW in this relationship is weak. Consistent with prior research, we treated self-esteem as a stable trait predictor of psychological disorders, but some evidence suggests that PRD may negatively affect self-esteem momentarily as well as over time (Osborne et al., 2015; Walker, 1999). Plausibly, lower self-esteem may also influence engaging in PRD, which combined, suggests a potentially more complex relationship between these factors. Although the present research focused on cognitive processes relevant to PRD and GAD, it may be useful to clarify the potential roles of self-concept factors in the design of future research on PRD and mental health related outcomes.

### **Limitations and Implications**

Our studies have limitations that provide questions for further research. First, the correlational nature of our research limits our ability to draw causal inferences. We hypothesized that PRD contributes to greater anxiety, but the reverse – that people experiencing anxiety are more likely to experience PRD – could also be true. However, PRD as a risk factor for poorer mental health in general is consistent with PRD theory as well as recent longitudinal research (Beshai et al., 2017; Smith et al., 2020). Future research could employ longitudinal or experimental study designs to further test whether PRD increases GAD symptoms (and explore processes involved therein). Second, our study used self-report measures of symptoms of generalized anxiety disorders and associated cognitive processes. Although these measures are frequently used and have strong psychometric properties, they lack sensitivity and specificity of a structured clinical interview. Thus, future research with varied measurement techniques could increase confidence in the PRD and GAD association and the indirect processes. Third, while our research benefited from the consistency of having two reasonably sized Western samples which facilitated comparison across studies, it would be illuminating to examine if the present findings generalize to more representative and diverse samples. For example, it may be interesting to examine if factors such as societal inequality and cultural values—that likely influence PRD—moderate the results (Smith et al., 2018).

This study adds to a growing body of evidence suggesting that PRD is a powerful predictor of mental health, and thus has several possible implications for research, individual experiences, and societal experiences. As an example, PRD may provide unique insight into the experience of social anxiety given that, similar to GAD, it appears to be partly grounded in intolerance of uncertainty (Boelen & Reijntjes, 2009). At the individual level, our research may provide insight into researching treatments for GAD. The tendency to feel relatively deprived when comparing to others may exacerbate dysfunctional cognitions associated with mental illness. Accordingly, mental health practitioners may find it fruitful to evaluate whether deprivation is a potential risk factor during treatment. Finally, our research has potential implications at the systemic/societal levels. Feeling relatively deprived may in part be the result of unequal or competitive systems (e.g., societal systems of high inequality, or unequal pay; Osborne et al., 2012). Consequently, it may be possible to reduce the experience of deprivation (and downstream mental health consequences) through policy changes that reduce unfair

inequalities and competition. It is clear that further research is required to examine these possibilities.

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