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An exploration of Intolerance of Uncertainty and memory bias

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ABSTRACT

Background and objectives: Research suggests that individuals high in Intolerance of Uncertainty (IU) have information processing biases, which may explain the close relationship between IU and worry. Specifically, high IU individuals show an attentional bias for uncertainty, and negatively interpret uncertain information. However, evidence of a memory bias for uncertainty among high IU individuals is limited. This study therefore explored the relationship between IU and memory for uncertainty.
Methods: In two separate studies, explicit and implicit memory for uncertain compared to other types of words was assessed. Cognitive avoidance and other factors that could influence information processing were also examined.
Results: IUS Factor 1 was a significant positive predictor of explicit memory for positive words, and IUS Factor 2 a significant negative predictor of implicit memory for positive words. Stimulus relevance and vocabulary were significant predictors of implicit memory for uncertain words. Cognitive avoidance was a significant predictor of both explicit and implicit memory for threat words. Female gender was a significant predictor of implicit memory for uncertain and neutral words.
Limitations: Word stimuli such as those used in these studies may not be the optimal way of assessing information processing biases related to IU. In addition, the predominantly female, largely student sample may limit the generalizability of the findings.
Conclusions: Future research focusing on IU factors, stimulus relevance, and both explicit and implicit memory, was recommended. The potential role of cognitive avoidance on memory, information processing, and worry was explored.

1. Introduction

Intolerance of Uncertainty (IU) has been defined as a dispositional characteristic resulting from a set of negative beliefs about uncertainty and its implications (Dugas & Robichaud, 2007). Individuals who are intolerant of uncertainty believe that uncertainty is stressful, unfair, interferes with their ability to function, and should be avoided (Sexton & Dugas, 2009). Difficulty coping with uncertainty can be seen as a type of dispositional bias which gives rise to excessive worry. IU is the key process in the theoretical model of worry and Generalized Anxiety Disorder (GAD; proposed by Dugas, Gagnon, Ladouceur, & Freeston, 1998); while this model includes other components, IU appears to be the central mechanism that underlies the other processes (Buhr & Dugas, 2002, 2006; Ladouceur et al., 1999). Several studies have found links between IU and other anxiety symptoms, most prominently those of Social Anxiety and Obsessive-Compulsive Disorder (i.e., Boelen & Reijntjes, 2009; McEvoy & Mahoney, 2011). This has led some researchers to propose that IU is a transdiagnostic factor across anxiety disorders, which is consistent with recent evidence (i.e., Carleton, 2012; Einstein, 2014; McEvoy & Mahoney, 2012). At the same time, however, an accumulated body of research shows that IU remains a robust predictor of worry (i.e., Buhr & Dugas, 2006; Dugas, Marchand, & Ladouceur, 2005; van der Heiden et al., 2010), and a stronger mediator of worry compared to other anxious and depressive symptoms (McEvoy & Mahoney, 2012). While research on IU may have broader implications, therefore, investigations of the strong relationship between IU and worry

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remain relevant.

Although research has repeatedly linked IU to worry, we have yet to fully understand *how* IU may contribute to worry. From an information-processing perspective, the question is: how might IU influence how a person attends to, interprets, and remembers information, in such a way that they worry more? Contemporary research does suggest that IU influences information processing. For example, using a probe classification paradigm, Heinecke and colleagues found that individuals high in IU showed an attentional bias toward threatening and uncertain information (Heinecke, Koerner, Dugas, & Mogg, 2006). Dugas, Hedayati, et al. (2005) found an interpretation bias among individuals high in IU, who reported significantly more concern about ambiguous scenarios compared to those low in IU. Koerner and colleagues found that IU was the strongest predictor of concern about ambiguous scenarios when demographics, mood, and anxiety symptoms were controlled (Koerner & Dugas, 2008). Similar findings have emerged from studies using pictorial stimuli. For example, Koerner, Hedayati, and Dugas (2004) found that individuals high in IU rated negative and ambiguous pictures as significantly less pleasant compared to those low in IU.

Some research also suggests that there is a memory bias for uncertain information among high IU individuals. Dugas, Hedayati, et al. (2005) used an incidental learning task and found that all participants recalled more uncertain words; however, high IU participants recalled a significantly higher proportion of uncertain compared to neutral words.

Taken together, these studies suggest that individuals high in IU have an attentional bias toward uncertain and threat words; a tendency to appraise uncertain scenarios as more threatening; and may also have an enhanced memory for uncertain words. This could explain how IU leads to excessive worry: a high IU individual, with enhanced attention for uncertainty, who interprets uncertainty in a negative way, might experience more cues to worry, and consequently worry more. They would likely also experience enhanced memory for uncertainty. However, research on memory bias in IU remains limited. As research on memory bias in GAD has primarily concerned memory for *threat* rather than uncertainty, it does not address this question (see Coles & Heimberg, 2002, for a review).

The goal of the current research was therefore to determine whether IU is associated with a memory bias for uncertainty. Two studies were conducted to explore the relationship between IU and memory for uncertain compared to other types of words. Study 1 tested explicit memory (recall and recognition) for uncertain words, and Study 2 tested implicit memory (priming). In both studies, cognitive avoidance and other factors likely to impact information processing (i.e., mood state, personal relevance of the stimuli) were also assessed. It was expected that IU would be a significant predictor of both explicit and implicit memory for uncertain words.

2. Study 1 method

We report our sample size, all data exclusions, manipulations, and measures used in both Study 1 and Study 2. Participants were recruited through the University's Psychology Department Participant Pool, and advertisements in the community. Students received course credit for participation, and community participants received a small financial compensation.

2.1. Participants

Of the 87 fluently English speaking participants, 84 were retained for this study (see *Data Screening and Outlier Analyses*, below). The sample included 71 women and 13 men aged 18 to 49, with a mean age of 24.16 ($SD = 6.37$). Ethnicity/race was primarily White (69%), followed by Middle Eastern (9.5%), Black (4.8%), Asian (4.8%), Multi-racial (3.6%), First Nations (3.6%), Other (3.6%), and Latino/a (1.2%). Students made up 90% of the sample.

2.2. Materials

Four types of word stimuli (neutral, uncertain, threat, and positive) were pilot-tested for this research (nb: the uncertain words represented the *concept* of uncertainty, and were not intended to invoke a state of uncertainty). Two-hundred and forty-six candidate words were rated by 50 participants on five dimensions: concreteness, familiarity, imageability, uncertainty, and valence (positive or negative). Based on these ratings, words were selected as follows: neutral words that were most neutral in valence; positive and threat words that were highest and lowest in valence, respectively; and uncertain words that were highest in uncertainty. Of these, the neutral, threat, and positive words lowest on uncertainty were selected. The resulting subset was then matched as closely as possible to the uncertain words on length, familiarity, concreteness, and imageability. This resulted in 64 final stimulus words, comprised of 16 neutral words, 16 uncertain words, 16 threat words, and 16 positive words (see Appendix for stimuli). An additional pool of matched neutral words were pilot tested for use on practice trials.

2.3. Stimulus words

For this study, 32 of the stimulus words were presented: 8 positive, 8 neutral, 8 threat, and 8 uncertain. The remaining 32 words (8 of each type) were used as recognition test distractors.

2.4. Procedure

Participants were informed that the study concerned the relationship between word processing and responses to self-report questionnaires. In order to promote naturalistic learning, they were not told in advance that their memory would be tested. Participants sat in groups in a classroom and looked at a projector screen on which 32 stimulus words (4 categories of 8 words each) were presented for 8 s each. The words appeared in the same randomized order for all participants. Participants were asked to rate the familiarity of each word on a sheet containing 3-point Likert scales ranging from *1 = not at all familiar* to *3 = very familiar*. After a written 3 min distractor task (subtracting by threes) to minimize recency effects, participants were given 5 min to use free recall to write down as many of the 32 words as they could remember. After the recall task, participants were given a recognition test that included the original 32 words plus an additional set of 32 matched distractor words. Finally, participants completed a package of questionnaires, the first being a subjective rating of mood states.

2.5. Measures

The State-Trait Anxiety Inventory–Trait version, Form Y (STAI-T: Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1977) is a 20-item measure of trait anxiety. Items are rated on a 4-point Likert scale ranging from 1 = *almost never* to 4 = *almost always*. The STAI-T has shown good internal consistency in clinical ($\alpha = .89$; Bieling, Antony, & Swinson, 1998) and student samples ($\alpha = .81$; Bernstein & Eveland, 1982). In a student sample, the STAI-T has shown good test-retest reliability, ranging from $r = .71$ to .75 over 30 days, and $r = .65$ to .68 over 60 days (Spielberger et al., 1977). The STAI-T also demonstrates convergent validity with other measures of anxiety (Bieling et al., 1998; Creamer, Foran, & Bell, 1995).