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Intolerance to Uncertainty, Worry and Attention

being a Thesis submitted for the Degree of Doctor of Clinical Psychology

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by

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Overview

This portfolio Thesis consists of three parts: a Systematic Literature Review, an Empirical Research Report and Appendices.

Part One is a Systematic Literature Review, concerning the prediction of worry in adults. Though various definitions of worry implicate different psychological constructs, Intolerance to Uncertainty (IU) has been considered to have a unique relationship with worry. Hence, the review evaluated whether IU is a superior predictor of worry. Sixteen studies were identified by applying eligibility criteria in searches across two electronic databases. Methodological quality of studies was incorporated into the interpretation of findings. Generally, it was found that IU is indeed predictive of worry. However, IU did not always explain the highest proportion of worry, when compared with constructs tied to alternative theories of worry. Reasons for this are discussed, as well as clinical implications, future research directions and limitations of literature included and the review itself.

Part Two is an Empirical Research Report, exploring IU and attention. A clearer understanding of how IU influences cognitive processes can help to improve current treatments for Generalised Anxiety Disorder. The report extended a previous study by investigating whether IU biases attentional processes towards information considered as threatening in GAD and Obsessive Compulsive Disorder. Fifty-seven participants completed questionnaires on Depression, Anxiety and IU. Participants also provided personal relevance ratings of words used in a computerised task, in which reaction times to Threat words were considered a measure of attentional bias. No significant relationships between levels of Depression, Anxiety, IU and attentional threat bias were found. Discussion of findings focuses on the experimental task's sensitivity to detecting the hypothesised effects. Theoretical implications are tentatively drawn and recommendations for improving the future use of the experimental task are made.

Part Three contains Appendices to Parts One and Two and a Reflective Statement on the research process.

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This paper is written in the format ready for submission to the *Journal of Affective Disorders*

Please see Appendix A for author guidelines

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The prediction of adult worry by Intolerance to Uncertainty as compared to other psychological constructs: a systematic literature review

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The prediction of adult worry by Intolerance to Uncertainty as compared to other psychological constructs: a systematic literature review

Abstract

Background

Conceptualisations of worry emphasise different psychological constructs in its aetiology and maintenance. Though Intolerance to Uncertainty (IU) is regarded by some as the construct most predictive of worry, this has not been systematically evaluated. The present review sought to determine unique and shared contributions in predicting worry, by IU and alternative constructs.

Method

For inclusion, studies must have been published in English, used adult samples, measured IU and worry with established measures and used IU with at least another variable to predict worry. Search terms related to IU and worry. A total of sixteen studies were reviewed, identified through searches of the EBSCO platform, Web of Knowledge, hand searching two journals and reference inspection of studies. Methodological quality was assessed using a bespoke scale.

Results

IU was not consistently the strongest predictor of worry, either in terms of variance explained or size of standardised coefficients. IU was a superior predictor compared with assorted Anxiety/Depression variables, but not when compared with trait-like constructs (e.g. Neuroticism) or Meta-Worry and Emotional Dysregulation.

Limitations

The review itself only included cross-sectional, correlational research, prohibiting inferences about causality. Limitations of research reviewed concerned the conduct/reporting of statistical analyses and issues associated with operationalising/measuring worry, including ecological validity.

Conclusions

Despite not always explaining the highest proportion of worry, IU nevertheless adds useful information in predicting worry. Clinically, a thorough assessment of all worry-related variables is indicated. Further refinements to models of worry should be afforded by research exploring how worry-relevant variables interact to produce this state.

Key words: Intolerance to Uncertainty, Worry, Generalised Anxiety Disorder

Introduction

Definitions of worry often rest on theoretical explanations of its cause and/or function. Borkovec, Robinson, Pruzinsky & DePree (1983) considered worry as an effort to problem-solve in uncertain situations, where ultimate outcomes may be negative. In line with this, Mathews (1990) conceptualised worry as 'thwarted' attempts to problem-solve, during which danger is repeatedly rehearsed, but no solution found. MacLeod, Williams & Bekerian (1991) defined worry as being orientated towards future events with uncertain outcomes, where negative thinking dominates and leads to anxiety. Subsequently, a prominent account of worry has stressed its verbal-linguistic nature, which serves to avoid internal exposure to images of feared events, thus suppressing autonomic nervous arousal and allowing the avoidance of painful feelings (Borkovec, Ray & Stober, 1998). Aikins & Craske (2001) too have suggested worry might be used to cope with threatening images, whilst Brown, O'Leary & Barlow (2001) see worry as a state of preparedness, intended to allow individuals to deal with expected negative events. Thus, whilst there are differences in how worry is conceptualised, commonalities can be discerned. These include worry as a form of repetitive thinking, a focus on future events and a pre-occupation with negative outcomes in the face of uncertainty.

It is estimated that 38% of the general population experience daily worry and that there are no qualitative differences in the worry process between clinical and non-clinical populations (Tallis, Davey & Capuzzo, 1994; Dugas & Ladouceur, 1998). Whilst some argue that worry can barely be distinguished from Neuroticism (Watson, Gamez & Simms, 2005), there is evidence that worry is related to but independent from more general constructs like Neuroticism and trait anxiety (Gana, Martin & Canouet, 2001). Hence, it can be stated that worry is ubiquitous in everyday life and linked to, but not the same as, trait-like variables.

Chronic and uncontrollable worry, a hallmark feature of Generalised Anxiety Disorder (GAD), can be extremely debilitating. GAD is a highly prevalent diagnosis and has considerable cost implications for service-providers (Wittchen & Hover, 2001; Lieb, Becker

& Altamura, 2005). Additionally, worry appears to be a concomitant characteristic of 40-60% of other anxiety disorders (Barlow, 1988). Improving our understanding of what leads to maladaptive worry is crucial to improving the assessment and treatment of such disorders. Research targeting causal and maintenance factors of worry is especially pressing as, compared to other anxiety disorders, less research is annually published on GAD and Cognitive Therapy is less efficacious for this disorder (Dugas, Anderson, Deschenes & Donegan, 2010; Brown, Barlow & Liebowitz, 1994). In recognition of gaps in knowledge concerning the psychological processes of GAD, including worry, models of the disorder have been proposed (Behar, DiMarco, Hekler, Mohlman & Staples, 2009).

One cognitive model, the Intolerance of Uncertainty Model (IUM) (Dugas, Gagnon, Ladouceur & Freeston, 1998; Dugas & Robichaud, 2007) places Intolerance of Uncertainty (IU) at its core. IU is regarded as a dispositional characteristic pertaining to stable negative beliefs about uncertainty and its implications. According to this model, IU triggers worry as a result of experiencing uncertainty and, in support, a number of empirical studies have shown that IU appears to share a unique relationship with worry (e.g. Dugas et al, 1998; Buhr & Dugas, 2002; 2006; Laugesen, Dugas & Bukowski, 2003). Indeed, Zlomke & Young (2009, pp.671) state that IU has "…consistently emerged as the best predictor of worry across both clinical and non-clinical populations…". However, as is acknowledged by authors of the IUM, other variables may be equally important (Buhr & Dugas, 2012) and alternative conceptual accounts implicate different variables in the development of excessive /uncontrollable worry. For example, Wells' meta-cognitive model (Wells, 1995; 2005) stresses that negative appraisals about worry (Type 2, or 'meta-worry') may be more important than an initial worry about a triggering event (Type 1 worry). Supporting this assertion is research showing that meta-worry predicts pathological worry even in the presence of trait anxiety and Type 1 worry (Wells & Carter, 1999; Nuevo, Montorio & Borkovec, 2004). Emotional dysregulation is another construct put forward as the core feature of GAD, with fear of emotions/experiential avoidance having been linked to worry (Mennin, 2004; Roemer, Salters, Raffa, & Orsillo, 2005). Other variables shown to be

predictive of worry include a perceived responsibility to continue thinking and dissatisfaction with problem-solving (Sugiura, 2005). Finally, as stated, certain personality dimensions, such as Neuroticism and trait anxiety are closely associated with worry (Kotov, Watson, Robles & Schmidt, 2007; Davey, 1993).

Although a number of researchers have proposed differing constructs to account for pathological worry, no review has systematically evaluated their prediction of worry compared to IU, which is often considered the most predictive of worry. Therefore, the present review compared the prediction of worry by IU with constructs from competing theories of worry, to evaluate the claim that IU is the strongest predictor. Conceptually, establishing which variables most strongly predict worry provides an indirect test of GAD models, which contain theories on how worry develops. Further, constructs purported to be predictive of worry differ in the kind of deficit/process they put forward as causing worry. Thus, comparing how well these constructs predict worry can add to the debate on what the core deficits/processes of GAD are. Clinically, knowing the strongest predictors of worry can assist in the formulation process, especially if clients score highly on measures of multiple relevant construct.

The approach taken in this review was to evaluate studies that included IU and at least one other predictor of worry, so that the unique effects of IU on worry, in relation to other potential predictors, could be determined. As such, to consider the relative predictive power of IU compared to other variables, studies were selected in which participants provided data on a range of relevant measures.

In sum, although the view exists that IU is the strongest predictor of worry, no review has empirically tested this. Systematically evaluating this claim is important for stated conceptual as well as clinical reasons. The main research question is whether IU is the strongest predictor of worry, compared to other psychological constructs.

Method

Search strategy & study selection

Searches were conducted during October 2012 via the EBSCO host platform, across the PsycINFO, MEDLINE and PsycARTICLES databases and using the Web of Knowledge gateway, via Web of Science. Search terms were chosen to reflect the main independent and dependent variables of interest, and therefore included: "intoler* to uncertain*", "intoler* of uncertain*", "IU", "IUM" combined with "Worr*" (in 'any field' on EBSCO and in the 'topic' field on Web of Knowledge). For the search on EBSCO, the 'Scholarly (Peer Reviewed) Journals' option was chosen in order to refine results from the outset. No time periods were specified for the searches. Studies were included if they met all eligibility criteria and were accessible to the author.

Eligibility criteria were that studies had to have:

1. Been published in a peer-reviewed journal in English (or with accessible translation)
2. Used an adult sample (minimum age 18)
3. Measured Intolerance of Uncertainty using an established psychometric measure
4. Measured Worry using an established psychometric measure
5. Used Intolerance of Uncertainty and at least one other psychological construct to predict levels of worry

Figure 1 shows the process by which studies were selected for final inclusion. Following the initial searches, abstracts were inspected to determine whether studies met all eligibility criteria. Although initial abstract inspection identified 20 potential studies, this reduced to 14 once papers had been inspected in full (six studies not being concerned with the prediction of worry). In addition, Behaviour Research and Therapy and the Journal of Anxiety Disorders were electronically searched due to a larger proportion of relevant studies having been published in these journals. Both journals were individually

accessed and searched using ScienceDirect, using the same terms as the main search. One extra study was identified and included through this. Lastly, a final study was included after reference inspection of studies already obtained.

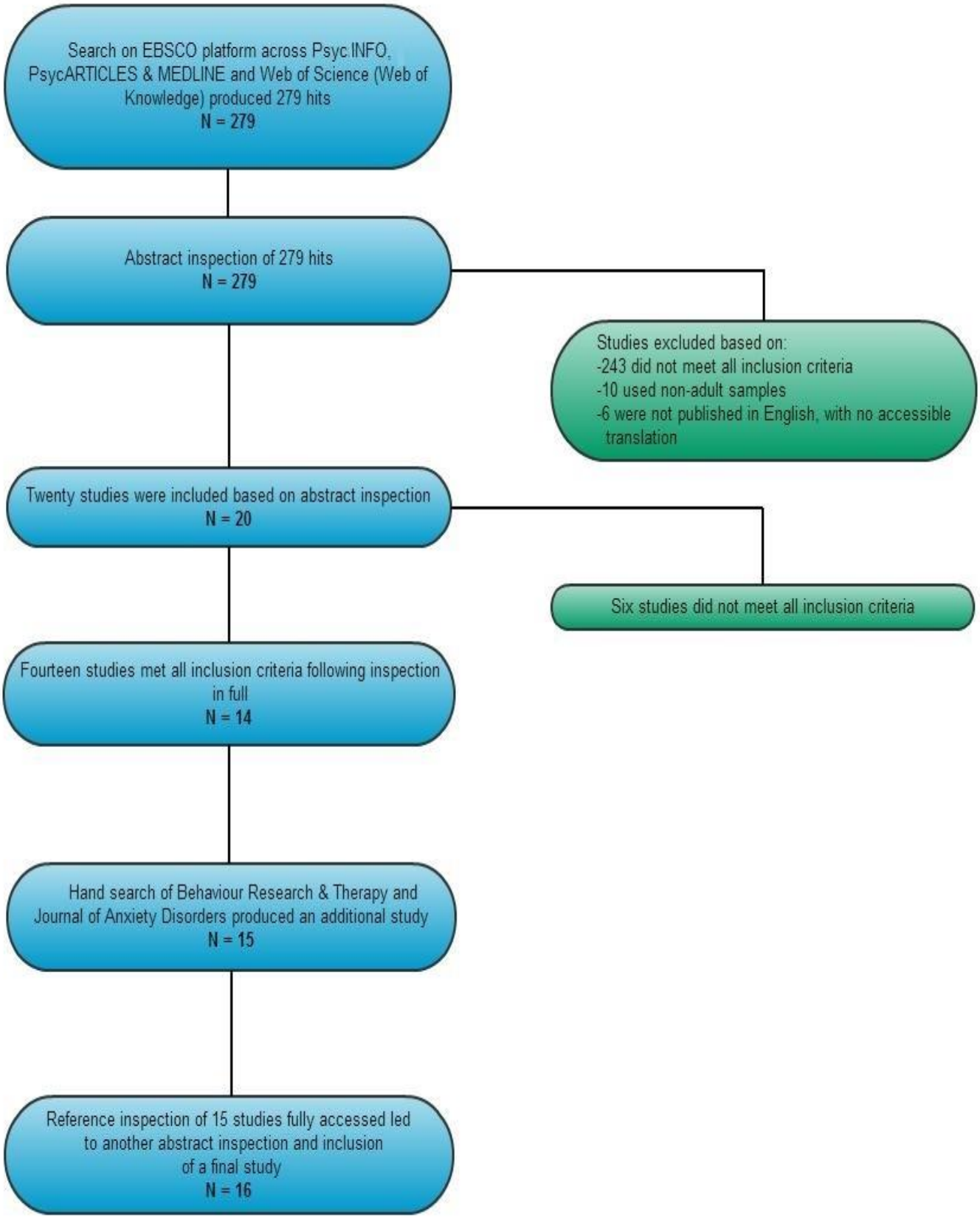

Figure 1. Flowchart showing stages of study selection.

Data Extraction

Data extraction initially covered information on: main aims/hypotheses, descriptive statistics of samples, independent and dependent variables, data analytic method/s and the main findings (Appendix B & E). Of this information, data most important to interpreting the findings was the number of predictors included, sample type, variance explained (in total and by individual constructs) and standardised coefficients. The latter data were therefore condensed into Table 1, embedded in the main text, to allow for an easier overview of the most pertinent findings.

Quality Assessment

A bespoke scale was devised to specifically assess the methodological quality of included studies, in which the comparative strength of relationships was a key focus (Appendix C). Items were taken from three existing checklists designed to assess quality in healthcare research and correlational designs. Items 1, 2, 4-10 were adapted from Downs and Blacks (1998); a checklist for the assessment of methodological quality of health care interventions. Item 3 was adapted from the quality appraisal checklist for quantitative studies reporting correlations/associations developed by the UK National Institute for Health and Clinical Excellence (NICE, 2012) and items 11-17 from Thompson, Diamond, McWilliam, Snyder & Snyder (2005). The final scale contained 17 items, of which 11 received one point if endorsed and two were reverse scored. Additionally, 4 items concerning the rationale for predictor variables, power calculation, potential confounding variables and reporting of effect sizes could receive more points as they were weighted. The maximum obtainable score was 26. Five studies, randomly selected, were rated by an independent assessor. Discrepancies in ratings were resolved by using the primary researcher's rating and Cohen's Kappa could not be computed as the sample size was too small for this calculation.

Analysis of findings

Narrative synthesis was used to describe and analyse the data, due to the need to integrate findings with conceptual, methodological and statistical issues in the sample and broader literature. Findings for individual studies were grouped based on how predictor variables were conceptualised.

Results

Study characteristics

Overview

In total, 16 studies were included for review and obtained a mean quality assessment rating of 19.13 (S.D. = 3.01) (inter-rater percentage agreement across five studies was 82.4%) (Appendix D). Four studies included a clinical sample, whilst the rest used non-clinical participants. Studies were cross-sectional, correlational designs and analysed data mostly using hierarchical regression, with variations like regression-based path analysis and mediation analysis. Studies varied in whether they reported effect sizes for examined relationships and other statistics, like standardised beta-values for individual predictors. The number of variables used to predict worry ranged from 2 to 7.

Measurement of IU

All studies measured IU using the Intolerance to Uncertainty Scale (IUS) (Freeston, Rhéaume, Letarte, Dugas & Ladouceur, 1994), which has shown good internal reliability and convergent validity (Buhr & Dugas, 2002; Sexton & Dugas, 2009). All studies, bar McEvoy & Mahoney (2012), employed the IUS as a unifactorial scale.

Measurement of Worry

In all studies, worry was treated as one of the dependent variables and measured by the Penn State Worry Questionnaire (PSWQ) (Meyer, Miller, Metzger & Borkovec, 1990). The PSWQ was designed in particular to measure clinical levels of worry, with items

covering how generalised worry is, its intensity and perceived uncontrollability (Molina & Borkovec, 1994) and has good internal reliability, convergent, divergent and construct validity (van Rijsoort, Emmelkamp & Vervaeke, 1999). Worry scores consisted of a (unidimensional) total of the PSWQ.

Table 1. Key data from studies, including predictors, proportions of variance explained and size of coefficients. All values relate to the prediction of worry, as measured by the Penn State Worry Questionnaire.

Study authors, location & main aims	Number of predictors	Sample type	Total variance explained by predictors	Variance explained by individual predictors	Variance explained by IU	Standardised coefficients for other predictors	Standardised coefficient for IU
Sexton et al (2003)- Canada. Examination of hypothesised hierarchical model, in which Neuroticism is the higher-order construct that influences Anxiety Sensitivity and IU. Together, these three constructs predict various symptoms	3	Non-clinical (N= 91)	Model 1: Neuroticism & IU 50.5% Model 2: Neuroticism, Anxiety Sensitivity & IU 52.3%	Model 1: Neuroticism 26.9% Model 2: Neuroticism 18.9%	Model 1: 11.4% Model 2: 8.4%	Model 1: Neuroticism .52 Model 2: Neuroticism .44	Model 1: .34 Model 2: .29
Norton et al (2005)- Canada. Examination of relationships between Negative & Positive Affect, specific vulnerabilities IU and Anxiety Sensitivity and their combined effect on symptoms	4	Clinical (N= 125)	Negative Affect & IU 14.2%	Not reported	Not reported	Negative Affect .4	0.26
Van der Heiden et al (2010)- Holland. Exploration of relationships between Neuroticism and Extraversion, specific vulnerabilities IU/ Metacognitive Beliefs and Worry	4	Clinical (N= 137)	Neuroticism, Extraversion, Meta-Cognitions & IU 39.8%	Not reported	Not reported	Negative Meta-Cognitions (indirect effect) .2	(Indirect effect) .1

Study authors, location & main aims	Number of predictors	Sample type	Total variance explained by predictors	Variance explained by individual predictors	Variance explained by IU	Standardised coefficients for other predictors	Standardised coefficient for IU
de Bruin, Rassin & Muris (2007)- Holland. Examination of mediation of Neuroticism's effect on worry by Meta-Worry and IU	3	Non-clinical (N= 105)	Not reported	Not reported	Not reported	Neuroticism .62 (uncorrected) Neuroticism .49 (when mediators were controlled) Meta-Worry .3	0.27
Zlomke & Young (2009)- United States of America. Examination of whether IU mediates the relationship between Anxious Parenting variables and symptoms of anxiety	3	Non-clinical (N= 174)	Anxious Rearing & IU 32%	Anxious Rearing 11%	31%	Anxious Rearing (uncorrected) .19 Anxious Rearing (IU controlled) .1	0.49
McEvoy & Mahoney (2012)- Australia. Test of whether dimensions of IU mediate the relationships between Neuroticism and symptoms of various disorders	3	Clinical (N= 328)	Not reported	Not reported	Not reported	Neuroticism (uncorrected) .56 Neuroticism (IU controlled) .38	IU Prospective Anxiety .36

Study authors, location & main aims	Number of predictors	Sample type	Total variance explained by predictors	Variance explained by individual predictors	Variance explained by IU	Standardised coefficients for other predictors	Standardised coefficient for IU
Dugas, Freeston & Ladouceur (1997)- Canada. Exploration of the relationship between IU and Problem Orientation in Worry	7	Non-clinical (N= 285)	Age, Sex, Anxiety, Depression, Problem-solving Skills, Problem Orientation & IU 62.9%	Age 2.3%, Sex 5.8%, Anxiety 25.2%, Depression 8%, Problem-Solving Skills 0.6%, Problem Orientation 15.4% & 4.8% (depending on order of entry)	16.3% & 5.6% depending on order of entry	Age -.07, Sex -.13, Anxiety .17, Depression .05, Problem-Solving Skills (not reported), Problem Orientation -.34	0.36
Dugas, Schwartz & Francis (2004)- Canada. Examination of specificity of the relationship between IU and Worry, compared to Depression-related variables	4	Non-clinical (N= 240)	Age, Sex, Depressive Cognitions & IU 39.5%	Age & Sex 7.7%, Depressive Cognitions 17.4 & 2.7% (depending on order of entry)	14.4 & 28.5% (depending on order of entry)	Age -.01, Sex -.2, Depressive Cognitions .19	0.45
Buhr & Dugas (2006)- Canada. Examination of the relationship between IU, Intolerance to Ambiguity, Perfectionism , Control and Worry	6	Non-clinical (N= 197)	Age, Sex, Intolerance of Ambiguity, Perfectionism, Control & IU 47%	Age & Sex 12%, Intolerance of Ambiguity, Perfectionism & Control 22%	14%	Sex -.2, Age -.1, Intolerance of Ambiguity -.03, Perfectionism .26, Control -.12	0.5

Study authors, location & main aims	Number of predictors	Sample type	Total variance explained by predictors	Variance explained by individual predictors	Variance explained by IU	Standardised coefficients for other predictors	Standardised coefficient for IU
de Bruin et al (2006)- Holland. Establishment of psychometric properties of the Dutch Intolerance of Uncertainty Scale	5	Non-clinical (N= 232)	Sex, Age, Depression, Anxiety & IU 49%	Sex & Age 5%, Anxiety and Depression 41%	4%	Sex .09, Age -.2, Anxiety .61, Depression .06	0.23
Khawaja & Chapman (2007)- Australia. Exploration of the prediction of worry by IU and mood/ anxiety related variables	6	Non-clinical (N= 96)	Trait anxiety, Problem-Solving Confidence, Positive Beliefs about Worry, Negative Cognitive Style and IU 68%	Trait Anxiety 55%, Problem-Solving Confidence, Positive Beliefs about Worry, Negative Cognitive Style & IU 13%	Not reported	Trait Anxiety .74, Problem-Solving Confidence -.07, Positive Beliefs about Worry .09, Negative Cognitive Style .39	0.32
Sigiura (2007)- Japan. Assessment of how well Responsibility to Continue Thinking predicts Worry beyond other relevant variables	5	Non-clinical (N= 150)	Neuroticism, Beliefs about Worry, IU, Responsibility to continue Thinking, Lack of Satisfaction with Problem-solving 70% & 65% (depending on	Neuroticism 52%, Meta-cognitions & IU12%/Consequences of worry & IU 6%, Responsibility to continue Thinking & Lack of satisfaction with	Not reported	With Meta-Cognitions as Worry Belief measure: Neuroticism .46, Meta-Cognitions Questionnaire Positive Beliefs - .03,	.05 & .00

Study authors, location & main aims	Number of predictors	Sample type	Total variance explained by predictors	Variance explained by individual predictors	Variance explained by IU	Standardised coefficients for other predictors	Standardised coefficient for IU
Sigiura (2007) (continued.)			measure of worry beliefs)	Problem-solving 6 or 7% (depending on measure of worry beliefs)		Meta-cognitions Questionnaire Negative Beliefs .36, Responsibility to Continue Thinking .32, Lack of Satisfaction with Problem-solving -0.11 With Consequences of Worry Scale as Worry Belief Measure: Neuroticism .61, Positive Consequences of Worry -.03, Negative Consequences of Worry .17, Responsibility to Continue Thinking .34, Lack of Satisfaction with Problem solving -.08	
Khawaja & McMahon (2011)- Australia. Test of relationships between IU, Meta-Worry and various disorder-specific symptoms	2	Non-clinical (N= 253)	IU and Meta-Worry 59%	Meta-Worry 13.76%	6.10%	Meta-worry .5	0.33

Study authors, location & main aims	Number of predictors	Sample type	Total variance explained by predictors	Variance explained by individual predictors	Variance explained by IU	Standardised coefficients for other predictors	Standardised coefficient for IU
Ruggiero et al (2012)- Italy. Exploration of interactive effects between IU, Negative Beliefs about Worry and Anxiety Control on the prediction of Worry	3	Non-clinical (N= 173)	Not reported	Not reported	Not reported	Negative Beliefs about Worry .34, Anxiety Control -.26	.31
Stapinski, Abbott & Rapee (2010)- Australia. Assessment of unique contributions of Emotional Dysregulation constructs in predicting GAD symptoms, whilst controlling for other GAD-relevant variables	6	Clinical (N= 123) and non-clinical group (N= 76)	Depression, Perceived Likelihood/Consequences of Threat, Meta-Cognitions, IU, Fear of Losing Control of Emotions, Perceived Control over Emotions 41% (clinical) 53% (non-clinical)	Depression 8% (12%), Perceived Likelihood/Consequences of Threat, Meta-Cognitions & IU 26% (35%), Fear of Losing Control of Emotions & Perceived Control over Emotions 7% (6%)	Not reported	Depression .10 (.02), Perceived Likelihood/Consequences of Threat .36 (0.32), Meta-Cognitions .25 (.38), Fear of Losing Control of Emotions -.19 (0.04), Perceived Control over Emotions -.30 (-.31)	.13 (-.09)

Study authors, location & main aims	Number of predictors	Sample type	Total variance explained by predictors	Variance explained by individual predictors	Variance explained by IU	Standardised coefficients for other predictors	Standardised coefficient for IU
Buhr & Dugas (2012)- Canada. Contrast of relationships between Worry and Fear of Emotions, Experiential Avoidance and IU	5	Non-clinical (N= 251)	Age, Sex, IU, Fear of Emotions & Experiential Avoidance 52%	Age & Sex 5%, IU, Fear of Emotions & Experiential Avoidance 47%	Not reported	Age -.04, Sex -.16, Fear of Anxiety .33, Fear of Depression .05, Fear of Anger -.12, Fear of Positive Affect -.04, Experiential Avoidance .18	0.33

*For Stapinski et al (2010), values in brackets denote findings in the non-clinical group

Organisation of findings

The included studies fell into three main categories, based on whether IU was considered a second-order vulnerability factor, a mediator or a predictor. In the first category, studies included variables considered to be general, 'higher-order' and specific, or 'second-order', vulnerability factors. They are labelled Hierarchical models. The second category concerns studies that tested whether IU mediated the effects of another predictor variable on worry. Lastly, in the third category, IU was directly compared with other constructs in the prediction of worry, rather than its indirect effects.

Hierarchical models

Studies here took the view that certain factors are common to all anxiety disorders. Constructs deemed to constitute such higher order factors were Neuroticism, Negative Affect, Positive Affect and Extraversion. These in turn were held to influence the expression of second-order vulnerabilities, like IU, Anxiety Sensitivity and Meta-Worry as well as disorder-specific symptoms.

Using student participants, Sexton, Norton, Walker & Norton (2003) investigated the effects of Neuroticism, IU and Anxiety Sensitivity (fear of anxiety and its perceived dangerous consequences; McNally, 1999) on a range of symptom measures, of which worry was one. Their hypothesised model (Model 1 in Table 1) found Neuroticism to predict 28.6% of variability in IUS scores and 26.9% variability in worry scores (β = .52). IU significantly predicted 11.4% of variability in worry scores (β = .34). Neuroticism and IU jointly predicted 50.5% of variance in worry scores, a larger proportion than a sum of their independent contributions. In the full model (Model 2 in Table 1), which permitted IU and Anxiety Sensitivity to influence all symptom measures, Neuroticism predicted 28.5% of variability in IU and 18.9% variability in worry (β = .44). IU predicted 8.4% of variance in worry (β = .29). The full model predicted a slightly higher proportion of variance across all symptom measures.

Norton, Sexton, Walker & Norton (2005) used a similar methodological approach with a mixed clinical sample. In their study, Positive and Negative Affect were the higher-order factors while IU and Anxiety Sensitivity remained second-order factors. Analysis using regression-based path analysis showed that Negative Affect was not significantly predictive of IU (β = .17). Negative Affect and IU both significantly predicted worry, jointly accounting for 14.2% of variance in worry scores (Negative Affect β = .4, IU β = .26). Positive Affect did not significantly improve the prediction of worry beyond IU and Negative Affect.

Van der Heiden, Melchior, Muris, Bouwmeester, Bos & van der Molen (2010) recruited participants with a primary diagnosis of GAD to investigate whether IU and Meta-Cognitions mediate relationships from Neuroticism and Extraversion to worry. They conducted a multiple mediation analysis, with bootstrapping, and found that the four constructs together explained 39.8% of variation in worry scores. There were no direct effects of Neuroticism or Extraversion on worry, but there was a significant indirect effect of Neuroticism, fully mediated by Negative Meta-Cognitions (b = .2) and IU (b = .1).

In summary, across these three hierarchical models, the overall variance in worry explained differed markedly: 50%, 14.2% and 39.8% (Sexton et al, 2003; Norton et al, 2005; van der Heiden et al, 2010 respectively). In Sexton et al (2003) and Norton et al (2005), Neuroticism and Negative Affect directly predicted worry, which contrasts van der Heiden et al's (2010) finding that Neuroticism only had an indirect effect on worry, mediated by negative Meta-Cognitions and IU. Standardised coefficients were smaller for IU than high-order factors Neuroticism and Negative Affect (Sexton et al, 2003; Norton et al, 2005). Hence, these higher-order vulnerabilities are a stronger predictor of worry than IU, though as shown by van der Heiden et al (2010), IU may mediate the relationship between these variables and worry.

Quality assessment ratings for these three studies (16, 17, 18; van der Heiden et al, 2010; Norton et al, 2005; Sexton et al, 2003) were slightly lower than the sample mean, mostly due to a lack of reporting of reliability/validity of measures and effect sizes. Van

der Heiden et al (2010) for instance only reported the combined variance explained by all predictors, meaning only a rather general interpretation of their findings was possible.

IU as Mediator

Four studies explored whether IU mediates the relationship between a particular predictor and worry, using Baron and Kenny's (1986) criteria, according to which a variable is a mediator if:

1. Variation in levels of the independent variable accounts for significant variability in the dependent variable
2. Variation in levels of the independent variable significantly account for variability in the supposed mediator/s
3. Variation in levels of the mediating variable/s significantly explains variance in the dependent variable
4. The relation between the independent and dependent variable significantly decreases when the effect of the mediator is controlled for

In a non-clinical sample of students, de Bruin, Rassin & Muris (2007) explored whether IU and Meta-Worry mediated the relationship between Neuroticism and worry. Both IU and Meta-Worry satisfied all four conditions of being a mediator when the PSWQ was used to measure worry. Neuroticism had a comparable relationship with Meta-Worry and IU (r = .41 & .44) and Meta-Worry and IU contributed similarly to variance in PSWQ scores even when controlling for Neuroticism (r =.30 & .27). When the effects of Meta-Worry and IU were controlled, the effect of Neuroticism on worry reduced from β = .62 to .49.

From a developmental angle, Zlomke & Young (2009) investigated whether IU acts as a mediator in two relationships, in a sample of older adolescents. Of these, IU only mediated the relationship between perceived Anxious Parenting and worry. Notably, IU significantly predicted 31% of the variance in worry scores (β = .49), compared to 11%

directly predicted by Anxious Parenting. The relationship between perceived Anxious Parenting and worry became non-significant when controlling for IU (reduction in β from .19 to .1).

McEvoy & Mahoney (2012) argued that there are two dimensions to IU: Prospective Anxiety (IU-PA) and Inhibitory Anxiety (IU-IA). IU-PA concerns anxiety aroused by future uncertainty and IU-IA gauges inability to act in the face of uncertainty (McEvoy & Mahoney, 2012). In a large clinical sample, the role of IU-PA and IU-IA in mediating the relationships between Neuroticism and various anxiety symptom manifestations was explored. With regards to worry, IU-PA fulfilled the criteria for mediation, significantly predicting variance in worry scores (β = .36) and reducing the effect of Neuroticism on worry (from β = .56 to .38) when it was controlled for.

In brief, all three studies found IU to mediate the relationship between a predictor and worry. De Bruin, Rassin & Muris (2007) found that Neuroticism predicted worry more strongly than either IU or Meta-Worry, but the latter two variables mediated the relationship between Neuroticism and worry to a similar degree. McEvoy & Mahoney (2012) also found Neuroticism to more strongly predict worry than IU, but the Prospective Anxiety dimension of IU mediated the relationship between Neuroticism and worry. In Zlomke & Young's (2009) study, IU mediated the relationship between perceived Anxious Parenting and worry and here IU also accounted for more variance in worry than Anxious Parenting.

These three studies obtained quality assessment scores of 19, 19 and 22 (de Bruin, Rassin & Muris, 2007; McEvoy & Mahoney, 2012; Zlomke & Young, 2009), which are equivalent or higher than the sample mean. In de Bruin, Rassin & Muris (2007) and McEvoy & Mahoney (2012), insufficient reporting of reliability/validity of measures used and effect sizes of all relationships examined explains their lower score compared to Zlomke & Young (2009).

IU as a Predictor

The remaining ten studies included IU as one of a number of predictors of worry. For ease of interpretation, studies are split into three groups: 1. Studies employing constructs typically related to Anxiety/Depression, 2. Studies which included Meta-Worry/Beliefs about Worry and 3. Research incorporating Emotional Dysregulation constructs.

Mood and Anxiety-related variables

In a non-clinical student sample, Dugas, Freeston & Ladouceur (1997) sought to clarify the contributions made by IU and Problem Orientation in predicting worry. In two regression analyses, Age, Sex, Depression and Anxiety were firstly entered, followed by IU then Problem Orientation or vice versa. When IU was the penultimate variable entered, it accounted for 16.3% and Problem Orientation for 4.6% of variability in worry, beyond variance already explained by the other variables. In the second order (where IU was entered last) Problem Orientation predicted 15.3% and IU 5.6% of variance in worry, beyond demographic and mood variables (IU β = .36 & Problem Orientation β = -.34). IU and Problem Orientation accounted for very similar proportions of variance in worry, irrespective of order of entry, due to their standardised coefficients being very similar in size.

Employing a similar analytic approach, Dugas, Schwartz & Francis (2004) examined the specificity of the relationship between IU and worry, whilst controlling for Depressive cognitions. In the first order of their regression, Age/Sex were entered, followed by Depressive cognitions and IU, which respectively accounted for 17.4% and 14.4% of the variance beyond age and sex. In the second order, IU was entered second last and Depressive cognitions last, respectively explaining 28.5% and 2.7% of variance in worry beyond age and sex (IU β = .45 & Depressive cognitions β = .19) IU explained more variance in worry than Depressive cognitions given the same order of entry, as the size of its standardised coefficient was more than double the value for Depressive cognitions.

Buhr & Dugas (2006), with another normative student sample, explored if IU predicts unique variance in worry not predicted by Intolerance to Ambiguity, Perfectionism and Control. In the first step of the regression analyses, Age and Sex were entered, followed by Intolerance of Ambiguity/ Perfectionism/Control, jointly entered at the second step, and IU entered last. Here, IU accounted for 14% of unique variance in worry, not explained by the preceding variables. IU carried the highest beta-coefficient (β = .5), compared to the other significant predictors Sex (β = .2) and self-oriented Perfectionism (β = .16).

de Bruin, Rassin, van der Heiden & Muris (2006), in assessing the construct validity of the Dutch IUS in a student sample, used IU in a hierarchical regression analysis to predict worry. Age and Sex were entered first, followed by Depression and Anxiety, and lastly IU. Together, these variables explained 49% of the variance in worry scores (5% age and sex, 41% Anxiety and Depression, 4% IU). IU (β = .23) significantly predicted a unique 4% of variance in worry, not explained by the other significant predictors age (β = -.2) and trait Anxiety (β = .61).

Across this group of studies with non-clinical samples, IU emerged as similarly predictive of worry as negative Problem Orientation. IU was more predictive than Depressive cognitions, Depression, Intolerance of Ambiguity, Perfectionism and Control. In this group, Trait Anxiety was the only construct that predicted more variance in worry than IU. Dugas et al (1997), Dugas et al (2004) and Buhr & Dugas (2006) obtained quality assessment ratings of 21-23, these scores lying above the sample mean. Possibly because it was concerned with validating a questionnaire, De Bruin et al's (2006) study received a lower rating of 16, partly due to a weaker theoretical basis for inclusion of the predictors.

Meta-Worry/Beliefs about Worry

Khawaja & Chapman (2007) compared how well trait Anxiety, Problem-Solving Confidence, Positive Beliefs about Worry, Negative Cognitive Style and IU predicted worry in a student sample. When all variables were included, trait Anxiety predicted 55% (β =

.74) of variance in worry, with the remaining four predictors collectively accounting for an additional 13%. Only Negative Thinking (catastrophising, selective abstraction & intrusive thoughts) (β = .39) and IU (β = .32) significantly explained variability in worry when Trait anxiety was controlled.

Sigiura (2007) employed a student sample to explore whether perceived Responsibility to Continue Thinking predicts worry beyond other relevant variables. In two regression analyses, Neuroticism was entered first and explained 52% (β = .46) of variability in worry. IU and Beliefs about Worry (depending on the scale used to measure the latter), explained a further 6-12% of variance in worry, whilst perceived Responsibility to Continue Thinking (β = .32-.34) and Dissatisfaction with the Problem-solving Process (β = -.08- -.11) explained an additional 6% of variability in worry. IU did not significantly predict worry in this study (β= .05 and .00 in the two analyses.). Whilst IU had a non-significant relationship with worry, there is the possibility that IU mediated the relationship between Neuroticism and worry, although this was not tested for in Sigiura (2007).

Khawaja & McMahon (2011) used a student sample to investigate how well IU and Meta-Worry predicted severity in several anxiety disorder symptomatologies. In predicting worry, they found that Meta-Worry uniquely accounted for 13.76% (β = .5) of the variance compared to 6.1% (β = .33) in variance accounted for by IU.

Ruggiero et al (2012) explored potential interactions between IU, Negative Worry Beliefs and Anxiety Control on the prediction of worry. Using a clinical (primary diagnosis GAD) and non-clinical group of mixed Australian/Italian participants, it was found that IU, Negative Worry Beliefs and Anxiety Control all significantly predicted variability in worry (respective β = .31, .34 & -.26). A moderation effect was found in that IU was most predictive of worry when levels of Anxiety Control were low and levels of Meta-Worry high.

Thus, in these four studies, IU was a stronger predictor of worry than Problem-Solving Confidence, Positive Beliefs about Worry and Anxiety Control. IU explained less

variance in worry than trait Anxiety, Negative Cognitive Style, Neuroticism, Responsibility to Continue Thinking, Dissatisfaction with Problem-Solving and negative Meta-Worry/Beliefs. Khawaja & Chapman (2007), Sigiura (2007) and Khawaja & McMahon (2011) obtained quality assessment ratings of 17-19, around the sample mean. Ruggiero et al (2012)'s study scored 13 because of inadequately reporting several aspects of their research. Ruggiero et al (2012) also note that interactions are difficult to replicate, perhaps especially true for findings based on a sample of mixed Nationalities.

Emotional dysregulation

In a clinical (primary diagnosis GAD) and non-clinical group, Stapinski, Abbott & Rapee (2010) assessed whether Emotional Dysregulation constructs uniquely predicted worry after controlling for established GAD-related variables. In the GAD group, once Depression, perceived Likelihood and Consequences of Threat, Meta-Cognitions and IU were controlled, Fear and Perceived Uncontrollability of Emotions significantly explained a further 7% variability in worry. Only Meta-Cognitions, perceived Likelihood/Consequences of Threat and perceived Control over Emotions significantly predicted worry (respective β = .25, .26 & .30) compared to β = .13 (non-significant) for IU. The full model accounted for 41% of variance in worry scores. In the control group, results were identical and beta coefficients very similar (IU β = -.09, not significant). Here the full model accounted for 53% of variance in worry.

Buhr & Dugas (2012) examined the predictive power of IU relative to Fear of Emotions and Experiential Avoidance. In a student sample, it was found that Sex and Age accounted for 5% of variance in worry and Fear of Emotions, Experiential Avoidance and IU jointly accounted for a further 47%. IU (β = .33), Fear of Anxiety (β = .33), Experiential Avoidance (β = .18) and Sex (β = .16) all significantly predicted worry.

These two studies suggest that Fear of Emotions, their perceived Controllability and Avoidance of them are equally or more predictive of worry than IU. Of any sub-group of studies, these two received the highest quality assessment ratings: 22 (Buhr & Dugas,

2012) and 24 (Stapinski, Abbott & Rapee, 2010). Thus, implications drawn from comparing IU to Emotional Dysregulation constructs rest on high-quality studies, even though there were only two such publications.

Trends in methodological issues

In all studies, self-report questionnaires were administered and a subset of measured variables used to predict scores on other variables. IU was always one of the predictors/mediators and worry was always one of the dependent variables. However, the uniformity in overall design was offset by variation particularly in statistical approaches and how these were reported (please see Appendix D for breakdown of methodological quality ratings, where a higher variability for items 9 and 15 is apparent). Further, only Stapinski et al (2010) reported that their sample size was sufficiently large for planned statistical procedures. Although it cannot be assumed that studies not reporting power calculations lacked power, it remains questionable whether other studies had adequate power to detect all effects.

Generally, there was little consistency in justifications provided for types of data analysis and screening, which usually consisted of tests of normality, homogeneity of variance and excluding outliers. For instance Sexton et al (2003) defined univariate outliers, whereas other authors simply reported that outliers were removed.

Overall, trends in the findings are apparent, though individual decision-making by each research group as regards data screening and analysis is likely to have influenced at least aspects of their results. With predictive ability of constructs often tied to proportions of unique variance explained, these statistical issues have direct implications for how theories of worry are evaluated.

Discussion

Overall summary

Worry has been defined in different ways by various researchers and theories of its aetiology/maintenance implicate a range of constructs. The present review was undertaken to evaluate claims that IU is the best predictor of worry, compared to these constructs from alternative theoretical backgrounds.

In studies reviewed, IU predicted worry to varying extents, depending on factors such as other independent variables included, sample type and statistical procedures employed. IU significantly predicted worry in 14 out of 16 studies, meaning it adds useful information in the prediction of worry. However, claims that IU is the best predictor of worry were not substantiated. Across studies, IU did not consistently explain the highest proportion of variance in worry or obtain the largest standardised coefficients. Aforementioned issues in the procedures and reporting of statistical analyses have probably affected findings in ways that differ on a study-by-study basis, rather than systematically. These issues notwithstanding, there are several overall trends.

Firstly, IU may be a cognitive manifestation of higher-order vulnerability factors. Trait-like constructs like Neuroticism and Negative Affect predict more variance in worry than IU, but IU appears to mediate relationships between these constructs and worry. Secondly, IU appears to predict worry more strongly than Anxiety and Depression-related variables. Thirdly, compared to constructs integral to alternative models of GAD (Meta-Beliefs/Meta-Worry and Emotional Dysregulation), IU predicts equal or less variance in worry.

IU as second-order vulnerability variable

Hierarchical models, typically comprising three 'layers' of higher-order vulnerabilities, second-order vulnerabilities and specific symptoms, generally show IU to be significantly predicted by general vulnerability factors, like Neuroticism/Negative Affect. Both the higher-order factors and IU significantly predict worry (Sexton et al, 2003;

Norton et al, 2005; van der Heiden et al, 2010). In studies testing IU's role as a mediator, IU mediates the relationship between trait-like variables like Neuroticism and worry (de Bruin, Rassin & Muris, 2007; McEvoy & Mahoney, 2012). Taken together, these studies suggest IU might be one particular expression of more general vulnerability factors, like Neuroticism/Negative Affect/Trait Anxiety (van der Heiden et al, 2010). Whilst general vulnerability factors predicted more variance in worry than IU, the presence and/or severity of second-order factors like IU can clarify which particular symptoms might be experienced (Norton et al, 2005). As both IU and worrying are predominantly cognitive constructs (Dugas & Robichaud, 2007; Borkovec et al, 1998), it could be that beliefs about uncertainty and the verbal-linguistic process of worrying are the cognitive dimension of general vulnerabilities like Neuroticism/Negative Affect. How beliefs about uncertainty arise in the first place was not the focus of the present review. However, with Anxious Parenting significantly predicting variance in IU and IU mediating the relationship between Anxious Parenting and worry (Zlomke & Young, 2009), experiences of Anxious Parenting may be related to the development of IU, a potentially useful avenue for further research.

IU as direct predictor of worry

Of ten studies employing both clinical and non-clinical samples, eight found IU to significantly predict worry to varying extents. The capacity of IU to explain variance in worry when included alongside other relevant variables indicates its robust predictive ability per se. However, due to reporting issues it was not always clear how much unique variance IU predicted.

Interpreting the predictive ability of IU

IU emerged as a better predictor of worry than Depression/Depressive cognitions (in 2 of 3 studies), Intolerance of Ambiguity, Perfectionism, Control, Anxiety Control and Experiential Avoidance.

Whilst Dugas et al (2004) and de Bruin et al (2006) found IU to have more predictive power than Depression/Depressive Cognitions, Stapinski et al (2010) found that IU did not significantly predict worry. For the latter, IU's non-significant relationship with worry will be discussed, because there may be several reasons for this, other than Depression being a better predictor. In the other two studies, instruments gauging Depression usually cover functioning and mood, whereas worry is thought to occur in anticipation of negative events. With individuals high on IU being pre-occupied with the predictability of events, this may explain IU's closer relationship with worry over Depression in Dugas et al (2004) and de Bruin et al (2006).

Comparing Intolerance to Ambiguity with IU, Buhr & Dugas (2006) argued that distinct aspects of IU might explain IU's superior prediction of worry. Also relevant may be the theoretical distinction between the two; ambiguity relates to situations in the present whereas IU relates to situations in the future (Grenier, Barrette & Ladouceur, 2005). Hence, both the unique aspects of IU and its temporal orientation might explain its superiority in predicting worry. The same study found IU to better predict worry than self-oriented Perfectionism, with the authors theorising this may be because Perfectionism has both positive and negative components, whereas IU is always maladaptive (Buhr & Dugas, 2006). Lastly, Buhr & Dugas (2006) found IU to better predict worry than Control, which suggests that irrespective of someone's perceived levels of Control, negative appraisal of uncertainty increases the likelihood of worry.

With regards to Experiential Avoidance, Buhr & Dugas' (2012) finding that IU was a superior predictor needs to be considered in conjunction with their finding that Fear of Emotions (Anxiety) predicted worry equally well. Fear of Emotions was measured by the Fear of Anxiety subscale of the Affective Control Scale (Williams, Chambless & Ahrens, 1997), which may capture emotional dysregulation better than the Acceptance and Action Questionnaire (Hayes et al, 2002), of which only two items actually tap Experiential Avoidance. The Fear of Anxiety subscale was perhaps a better measure of broad

Emotional Dysregulation deficits and that when this construct is accurately measured, it predicts worry similarly to IU.

Khawaja & Chapman (2007) found IU to be a better predictor than Problem-solving Confidence and Positive Beliefs about worry, both of which are components of the IUM. IU may have predicted worry more accurately than Positive Beliefs about Worry because there are at least five types of positive beliefs (Laugesen et al, 2003). A generic measure of positive worry beliefs may capture less of the intensity with which certain beliefs are held. On the other hand Problem Solving Confidence, although an element of Problem Orientation, is only one dimension of it. It might be that, without the associated dimensions of Problem Orientation included in a measure, it has a weaker relationship with worry. This would be in line with Dugas et al's (1997) finding that Problem Orientation (Emotional Subscale) does predict worry to a similar degree as IU.

Interpreting equal or superior prediction by alternative constructs

Constructs that appear to have a similar or superior ability to predict worry included Problem Orientation (Dugas et al, 1997), trait anxiety (de Bruin et al, 2006; Khawaja & Chapman, 2007; Sigiura, 2007), Negative Thinking Style (Khawaja & Chapman, 2007), Meta-Worry (Khawaja & McMahon, 2011; Ruggerio et al 2012; Stapinski et al 2010) and Fear of Anxiety (Buhr & Dugas, 2012).

The emotional subscale of Problem Orientation was found to be similarly predictive of worry in Dugas et al's (1997) study. Problem Orientation is a component of the IUM and independent of actual problem solving ability (Dugas et al, 1997). Although in Khawaja and Chapman (2007), Problem Solving Confidence did not significantly predict worry, this might be due to emotional facets of the variable not being measured, which may be what causes problems to trigger worry (Dugas et al, 1997). Ensuing worry in response to emotional arousal fits with conceptualisations of worry as an arousal-suppressing mechanism (Borkovec et al, 1998). On the basis of these two studies, it can be said that only negative emotional Problem Orientation, rather than confidence or

cognitive/behavioural aspects predict worry similarly to IU, although further research is required to verify this.

Khawaja & Chapman (2007) found that Negative Thinking Style obtained a higher standardised coefficient than IU. The former was measured by the Anxious Thoughts and Tendencies Scale (ATT) (Uhlenhuth, McCarthy, Paine & Warner, 1999) which contains items that tap catastrophising, selective abstraction and intrusive thoughts. Importantly, Khawaja & Chapman (2007) found Negative Thinking and trait Anxiety had the highest correlation with each other (r = .85) and noted that Negative Thinking is a broad concept. Perhaps the close association with trait Anxiety and its breadth makes it appropriate to consider Negative Thinking a trait-like variable, which would raise the question of whether IU might mediate the relationship between Negative Thinking and worry.

Empirical support for theories of worry

Meta-Cognitive Model (Wells, 1995; 2005)

Every study that included Beliefs about Worry or Meta-Worry as a predictor (Khawaja & McMahon, 2011; Ruggerio et al 2012; Stapinski et al 2010; Sigiura, 2007) or mediator (van der Heiden et al, 2010; de Bruin et al, 2007) found this construct to have a closer relationship with worry compared with IU, evidenced by either higher standardised coefficients or a larger proportion of worry explained. Negative, rather than Positive Beliefs about Worry drove this relationship. These findings are in line with a central tenet of the Meta-Cognitive model (Wells, 2005), namely that beliefs about worry may determine its occurrence.

In Wells' Meta-Cognitive model, negative Beliefs about Worry are thought to characterise individuals with GAD, two main beliefs being that worry is dangerous and uncontrollable (Wells, 2005). In included studies, worry was always measured using the PSWQ, which itself assesses perceptions of worry intensity and controllability (Molina & Borkovec, 1994). Accordingly, some of the extra variability in worry that Meta-Worry explained may be attributable to this potential measurement bias. Another reason Meta-

Worry may have a closer relationship with worry is that negative worry beliefs tap into extremely threatening appraisals about worry, which can lead to intense worry episodes. IU on the other hand taps into a desire for predictability and paralysis when uncertain, with more focus on what triggers worry. It therefore appears that appraisals of worry are more predictive of worry than triggers, like experiencing uncertainty.

Although there was a unanimous trend, the size of the difference in predictive ability between Meta-Worry and IU depends on the study. For example Khawaja & McMahon (2011) found Meta-Worry to predict double the unique variance in worry whereas in Ruggiero et al (2012), it can only be gleaned that Meta-Worry had a slightly higher standardised coefficient than IU (β = .34 VS .31). As with other variations in reported statistical values, this makes it difficult to comment on the degree to which Meta-Worry/Beliefs about Worry are more predictive than IU. By extension, the degree to which the Meta-Cognitive Model might provide a better theory of worry than the IUM is difficult to judge using the available data.

Emotional Dysregulation Model (Mennin, 2004)

Emotional Dysregulation constructs predicted worry similarly or were superior than IU, in two high-quality studies. Buhr & Dugas (2012) did not report the variance independently explained by IU and Fear of Anxiety, but both variables attained standardised coefficients of β = .33. In Stapinski et al (2010), Fear of Losing Control over Emotions and Perceived Control over Emotions predicted unique variance once Depression, Perceived Likelihood/Consequences of Threat, Meta-Worry and IU were controlled for (IU did not significantly predict worry). A strength of the latter study was their identical pattern of results in both a non-clinical and clinical group, whereas Buhr & Dugas (2012) used a sample of undergraduate students. The prediction of worry by Emotional Dysregulation variables conforms to theories of worry as strategy to reduce negative emotional experiences (Mennin, 2004).

The Emotional Dysregulation model (Mennin, 2004) states that individuals with GAD have a deficit in regulating their emotions, so that negative affect in particular is difficult to understand and manage. Unhelpful coping strategies are consequently employed, of which worry is a prominent one, to reduce negative emotional experiences and their feared catastrophic consequences (Mennin, Heimberg, Turk & Fresco, 2002). In explaining their findings, Buhr & Dugas (2012) espoused this theory. They hypothesised that worry may be used to avoid distressing emotions, which prevents emotional processing and thereby fuels further avoidance, resulting in the chronic worry of GAD (Buhr & Dugas, 2012).

Experientially, a sense of inner danger provides a powerful impetus to reduce this state. If worry indeed allows fast relief from this felt danger, then being a readily available internal strategy, it provides immediate negative reinforcement. Its perceived effectiveness in enabling avoidance of negative emotions might explain why Emotional Dysregulation constructs were more predictive of worry than IU in these two studies. However, as with the Meta-Cognitive Model, conclusions concerning the validity of the Emotional Dysregulation model compared to the IUM must await further research.

Interpreting non-significant prediction of worry by IU

Stapinski et al (2010) and Sigiura (2007) were the two studies that did not find IU to significantly predict worry. In Sigiura's (2007) two analyses, Neuroticism, Beliefs about Worry and IU, Responsibility to Continue Thinking and Dissatisfaction with Problem Solving predicted between 65-70% of variance in worry. Nevertheless, given that other research found IU to mediate relationships between higher-order constructs and worry, IU could have at least partially mediated the influence of Neuroticism on worry. In Stapinski et al's (2010) study, where no trait variable was included, worry was predicted by Depression, Perceptions of Threat, Meta-Cognitions, IU, Perceived Control of Emotions and Fear of Losing Control of Emotions. Stapinski et al (2010) was the only study to assess the contribution of constructs related to Meta-Worry, Emotional Dysregulation and IU.

More research incorporating all three types of predictors is needed, to establish whether IU retains its predictive power when included alongside Meta-Worry and Emotional Dysregulation. Presently, conclusions can not be drawn based on one study.

Limitations of literature reviewed

In addition to previously stated limitations in study quality, a further qualification of presented findings is that only half of the studies reported the overall variance explained by all predictors and proportion of variance explained by individual predictors. Some only reported standardised coefficients, which did enable interpretation of variables' relative predictive strength within each study. However, when effect size estimates for individual predictors were lacking, it was difficult to comment on how well they predicted worry per se, rather than merely compared to others in the same study.

Another general limitation is that each study measured worry using the PSWQ. Some of the diversity in definitions of worry (Introduction) is perhaps lost through the exclusive use of a single measure. Additionally, in the PSWQ each item contains the word 'worry' but does not enquire about engagement in specific behaviours, without which there is an assumption that researchers and participants are referring to the same phenomenon, which may not be the case (C.Clarke, personal communication, April, 2013).

Lastly, only four studies recruited clinical participants. The predominance of mostly non-clinical samples limits generalisibility of findings to clinical populations.

Clinical implications

Higher-order vulnerabilities like Neuroticism and Negative Affect were the most predictive of worry. However, these constructs in themselves are less informative than when combined with specific vulnerabilities (Claridge & Davis, 2001), like IU, that are also predictive of worry.

The absence of a single second-order construct that is reliably the best predictor of worry highlights the clinical need for a thorough assessment of all worry-related

constructs in GAD and other psychological difficulties where worry is a feature. Psychological formulation is likely to benefit from the exploration of factors like IU, Meta-Worry and capacity for Emotional Regulation, no matter which conceptual model ultimately guides the intervention. Similarly, it matters that across the studies reporting it, the mean total variance in worry explained was 49.7%. This means that roughly half of the variance in worry is not explained by the predictors included. Alternative sources of worry, not covered by the outlined constructs, may thus be just as prevalent.

Although common elements in definitions of worry can be extracted, alternative conceptualisations of its aetiology and maintenance may be clinically relevant. Worry may serve any number of functions for a particular individual, e.g. attempts at problem-solving, suppressing nervous arousal or preparing oneself for undesired outcomes. Relationships between second-order vulnerabilities and worry may differ depending on the function of worry. For instance, if worry's predominant function is to avoid affect, targeting Meta-Beliefs may have little impact. Conversely, if an individual's only way of problem-solving is to worry, then providing emotional regulation strategies may not reduce its occurrence.

Further research

In enhancing future research on the predictors of worry using correlational designs, improvements at the design, implementation and reporting stages can be made. In designing studies, specifying the kind of worry being investigated would be helpful. For example, the worry used to avoid internal sensations might be experienced quite differently to the worry for rehearsing future events. Verkuil, Borscchot & Thayer (2007) discuss the duration of a worry episode being an indicator of pathological worry. Likewise, the frequency, intensity and content of worry may all have differential relationships with second-order vulnerabilities. Measuring these aspects of worry in future predictive models would enable an exploration of such relationships, which could lead to further refinement of models of worry.

Further, designs that enable exploration of possible interactions between IU and other GAD-related constructs would be clinically useful. Ruggiero et al's (2012) approach of exploring the moderating effects of variables in the prediction of worry may be the most informative. Further research of this nature would encourage the synthesis of elements from the main GAD models, which has been recently advocated (Hanrahan, Field, Jones & Davey, 2013). Designs would also be improved by using more ecologically valid criterion variables to measure worry, as self-report questionnaires predict less than 25% of variance in real-life worry episodes (Verkuil et al, 2007). To this end, worry logs could be employed (Verkuil et al, 2007), or experience-sampling (Larson & Csikszentmihalyi, 1983), which enables systematic collection of self-report data throughout a specified time period.

In the conducting and reporting of research, methodological issues arising in the reviewed literature should be addressed. These have included a virtual absence in reporting sample size/power calculations, inconsistent rationales and reporting of data screening, inconsistent reporting of the reliability and validity of measured variables and variability in what aspects of significant relationships are reported (i.e. raw/standardised coefficients, effect sizes).The guidelines of Thompson et al (2005), which informed a number of items on the quality assessment scale, are instructive in adhering to good practice in correlational research and avoiding the above pitfalls.

Limitations of present review

The exclusively cross-sectional, correlational design of studies permitted a meaningful comparison of findings. At the same time, causality cannot be inferred and experimental research is needed in order to determine whether constructs regarded as predictors in correlational designs, cause increases in worry when experimentally manipulated. Experimental research incorporating IU has so far not compared IU with other constructs, to determine which variables causes the largest changes in worry when

manipulated (Buhr & Dugas, 2009; Ladouceur, Gosselin & Dugas, 2000; de Bruin, Rassin & Muris, 2006; Rosen & Knauper, 2009).

In assessing study quality, a bespoke scale was used. Although the percentage of inter-rater agreement was high (82.4%), Cohen's Kappa could not be computed due to the small sample size, meaning that percentage agreement expected by chance was not accounted for.

Conclusion

Overall, the view that IU is the strongest predictor of worry was not upheld. However, IU's value in contributing to the prediction of worry was supported, even when included alongside a host of variables with different theoretical underpinnings. Meta-Worry and Emotional Dysregulation may be superior predictors of worry, but more research is needed on how these constructs might interact with IU to predict worry. Such research should consider how worry is operationalised and measured, as well as addressing limitations in the conduct and reporting of statistical analyses raised. High-quality research of this sort can help to elucidate how aspects of worry are predicted by which constructs.

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Part Two: Empirical Paper

Intolerance to Uncertainty and attention in an Emotional Go/No Go task

This paper is written in the format ready for submission to the *Journal of Affective Disorders*

Please see Appendix A for author guidelines

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Intolerance to Uncertainty and attention in an Emotional Go/No Go task

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Intolerance to Uncertainty and attention in an Emotional Go/No Go task

Abstract

Background

Intolerance to Uncertainty (IU), central to a model of Generalised Anxiety Disorder (GAD), affects the processing of threatening information. Better understanding into how IU affects cognition is required and little research has focused on attention, one study reporting an association between IU and facilitated attention towards uncertainty-related words. Clinically, it is also important to determine if IU influences attentional processes to other threatening stimuli. This formed the study's main aim and the potential relationship between IU and attentional threat bias was investigated using the Emotional Go/No Go Task (EGNGT). Estimating the task's internal reliability formed a secondary aim.

Method

Fifty-seven participants completed questionnaires gauging self-reported Depression, Anxiety, IU and the EGNGT. In the EGNGT, participants responded to single-word presentations of either Neutral or Threat words, whilst ignoring words from the non-target category. Eight blocks of 15 trials were counterbalanced across participants and reaction times to Threat words was the main variable of interest.

Results

Internal reliability of the EGNGT was poor and no significant relationships were observed between self-report measures and RTs to Threat words (present operationalisation of attentional bias).

Limitations

Methodological factors may have impaired the study's potential to detect relationships between Depression, Anxiety, IU and attentional threat bias. Discussion of such possible methodological issues is provided, of which the task's low internal reliability seems most relevant.

Conclusions

The present null result was potentially an artifact of experimental design. Future research with the EGNGT can be improved through carefully selecting stimulus materials and cross-comparison with other paradigms.

Key words: Intolerance to Uncertainty, attention, bias, threat

Introduction

Generalised Anxiety Disorder (GAD) is characterised by widespread anxiety and chronically excessive worry, which often causes demoralisation and exhaustion (American Psychiatric Association, 2000). GAD is often associated with marked reductions in social and occupational functioning, on par with chronic health conditions like arthritis (Wittchen, 2002). Whilst cognitive-behavioural therapies (CBT) for various conditions have become increasingly refined, CBT for GAD remains the least efficacious compared to other anxiety disorders (Gould, Safran, O'Neill & Otto, 2004). When CBT is specifically adapted for GAD, however, recovery rates tend to be better (Fisher, 2006). These adaptations have been made by identifying important psychological constructs and researching their role in GAD. A better understanding of the psychological processes such constructs give rise to may further improve treatments for GAD.

The Intolerance to Uncertainty Model (IUM) (Dugas, Gagnon, Ladouceur & Freeston 1998; Dugas & Robichaud, 2007) proposes a specific construct, Intolerance to Uncertainty (IU), as being crucial in the development and maintenance of GAD. IU consists of negative beliefs about uncertainty and its implications and is regarded as a dispositional characteristic that predisposes individuals to develop generalised anxiety (Dugas & Robichaud, 2007). Negative appraisals of uncertainty lead to worrying as an attempt to manage and reduce uncertainty. Other components of this model include positive beliefs about worry, cognitive avoidance and negative problem orientation, all of which are held to contribute to the anxiety and worry characteristising GAD. The IUM as a whole and the cognitive therapy derived from it have both received considerable empirical support (Behar, DiMarco, Hekler, Mohlman & Staples, 2009). However, as Bredemeier & Berenbaum (2008) point out, more research is needed on exactly how components of the model interact and the mechanisms through which IU leads to unhelpful cognitive operations. Beyond the IUM, IU is now regarded as a 'transdiagnostic' construct (Gentes & Ruscio, 2011; McEvoy & Mahoney, 2012) and, as such, researching how IU affects cognition may have more far-reaching implications.

Proposals regarding how IU leads to excessive worry/anxiety include IU increasing positive beliefs about worry, negative problem orientation and cognitive avoidance (Dugas, Buhr & Laudouceur, 2004), interfering with decision-making (Dugas & Robichaud, 2007; Luhmann, Ishida & Hajcak, 2011) and affecting the perception/interpretation of threat (Dugas, Hedayati, Karavidas, Buhr, Francis & Philips, 2005; Koerner & Dugas, 2008; Bredemeier & Berenbaum, 2008). The latter proposal is tied to the notion of IU being a cognitive disposition that affects how information is processed (Koerner & Dugas, 2008) and there is some evidence to support this. For instance, high IU is related to threatening interpretations of ambiguous information (Dugas et al, 2005; Koerner & Dugas, 2008) and higher estimations of the likelihood and consequences of negative outcomes (Bredemeier & Berenbaum, 2008). Further investigations into how IU affects threat-related information processing might help to explain how such tendencies arise.

Little research has so far been devoted to how IU might impact attention. It is known that attentional biases to threat are ubiquitous in anxiety (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenberg & van Ijzendoorm, 2007; Cisler & Koster, 2010), yet only one study has investigated this bias with regards to IU. Using a Visual Search Task, Fergus, Bardeen & Wu (in press) found that IU was significantly associated with attentional bias towards uncertainty-related words, whilst controlling for anxiety, depression and general distress. Whilst this suggests IU can impact on attentional processes, Fergus et al's (in press) study was confined to uncertainty-related material rather than generally threatening stimuli. However, it is known that people with GAD diagnoses experience worry and anxiety in relation to wide-ranging triggers. Therefore, it is important to determine whether IU's relationship with attentional bias applies to other categories of threat. Using an alternative paradigm and different threat stimuli, the present study sought to replicate the association between IU and attentional bias reported by Fergus et al (in press). However, GAD and Obsessive Compulsive Disorder (OCD) were used as domains of threat-stimuli, due to the strong association these disorders tend to have with IU (Gentes & Ruscio, 2011). If there is a significant relationship

between IU and attentional bias towards GAD/OCD-related threat, it may mean that IU biases attention more broadly, i.e. not only towards uncertain stimuli.

Within the framework of the IUM, IU may cause hypervigilance to threat, as part of an individual's attempt to reduce uncertainty. A state of hypervigilance may be preferable to experiencing uncertainty for individuals with high IU, as it may afford a sense of control over expected aversive events (Miranda & Mennin, 2007). Such hypervigilance may lead to rapid detection of any threats, corresponding to a bias in 'facilitated attention' (Cisler & Koster, 2010), as found by Fergus et al (in press). As perceptions of threat generally trigger anxiety responses (Borkovec, Alcaine & Behar, 2004), the identification of threat may activate other components of the IUM, like cognitive avoidance and/or negative problem orientation.

In the present study, the Emotional Go/No Go Task (EGNGT; Murphy et al, 1999) was used to investigate the potential relationship between IU and attentional threat bias. This task has been used to demonstrate attentional biases across various stimuli in both non-clinical and clinical populations (e.g. Gole, Kochel, Schafer & Schienle, 2012; Mobbs, Van Der Linden, d'Acremont, Perroud, 2008; Waters & Valvoi, 2009). Well-known tasks, like the Emotional-Stroop and Dot-Probe tasks have been shown to lack adequate internal reliability (Kindt, Bierman & Broschott 1996; Schmuckle, 2006). Other behavioural paradigms (e.g. Visual Search, Spatial Cuing Tasks) have also been used to explore attentional bias, but their psychometric properties have barely been investigated (Cisler, Bacon & Williams, 2009). It has become apparent that there is a need to provide data on the internal reliability of behavioural paradigms used to detect attentional bias in relation to affective states. This was therefore a subsidiary goal of the present study.

Thus, a prerequisite for detecting any relationship between IU and attentional bias was the reliability of the EGNGT. In interpreting such a potential relationship, levels of anxiety and depression were considered as co-variates, as these are known to correlate highly with IU (Khawaja & Chapman, 2007; Gentes & Ruscio, 2011). Further, personal relevance ratings of stimulus-materials were obtained, in order to explore whether any

significant relationships were moderated by these (Otto, McNally, Pollack, Chen & Rosenbaum, 1994). Based on Fergus et al's (in press) findings and outlined theoretical considerations, it was hypothesised that IU would be significantly associated with facilitated attention towards both GAD and OCD-related threat words.

Method

Sample size calculation

It was anticipated that each participant would provide an approximate total of 30-40 RT measurements (i.e. respond appropriately) on Go trials for Neutral and Threat words. This would allow an estimation of the intraclass correlation coefficient, taken here to indicate the task's internal reliability (see below). A sample size calculation was based on the assumption that the EGNGT would be reliable enough to use participants' mean values for RTs in each word category. Due to the well-established relationship between anxiety and attentional threat bias and a study regressing dimensions of anxiety onto RTs for Threat words (Bar-Haim et al, 2007; Calvo, Avero, Castillo & Miguel-Tobal, 2003), the relationship between HADS-A scores and RTs to Threat words was assumed to be around $R^2 = .25$. To detect an increase in R^2 attributable to IU of around .1 with 80% power (at alpha = 0.05), 53 participants were required (computed using GPower, Version 3.0.10, Bucher, Endfelder, Faul & Long). This increase was a conservative estimate of IU's potential contribution to an attentional bias, in the absence of research that has investigated the relationship using the same paradigm.

Design

Participants

Ethical approval was obtained from the faculty of Health and Social Care at the University of Hull (Appendix F). Participants were recruited through notices at the University and in the community, e.g. e-mails and posters. Interested participants

contacted the primary researcher for more information or to arrange a time to participate.

Participants were 57 self-selected adults (minimum 18 years old) of the general public, most of whom were students and none were paid for their participation. Forty two were female (74%) and the mean age was 26.11 with a standard deviation of 7.13 and a range of 35.

Materials

Self-report questionnaires

Hospital Anxiety and Depression Scale- Anxiety (HADS) (Zigmond & Snaith, 1983)

The HADS, a commonly used mood/anxiety questionnaire, was used to measure state mood and anxiety levels at time of participation. The HADS possesses good internal consistency, test-retest reliability and construct validity (Snaith, 2003; Bjelland, Dahl & Neckelmann, 2002).

Intolerance of Uncertainty Scale (IUS) (Freeston, Rhéaume, Letarte, Dugas & Ladouceur, 1994)

The IUS was used to measure levels of IU. It has demonstrated good internal consistency, test-retest reliability as well as discriminant, convergent and external validity (Freeston et al, 1994; Buhr & Dugas, 2002; Birrell, Meares, Wilkinson & Freeston, 2011). The scale contains 27 items and is scored by summing scores on each item to provide a total.

Personal relevance ratings

Participants rated the three word categories according to relevance to 'current worries or concerns' in their lives (see Appendix K). Participants placed a mark along a visual analogue scale (horizontal line, 13.4cm), anchored on the left by 'Barely relevant at all' and on the right by 'Extremely relevant'.

Apparatus

Stimuli were presented on a 34.5 by 19.4cm HD LED monitor, at a distance of about 40cm from participants. The EGNGT was programmed using OpenSesame, an open-source software for experiments in the Social Sciences (Mathot, Schreij & Theeuwes, 2012).

Emotional Go/No Go Task

Word selection

Thirty Neutral and Threat words were selected, of which the latter category contained 15 OCD and 15 GAD words. Neutral and Threat words were matched on frequency and length, whereas Threat words were selected to be more arousing than Neutral words.

Words were taken from the Affective Norms for English Words (ANEW) database (Bradley & Lang, 1999). Neutral words were significantly less arousing than threatening words ($F(1,58) = 281.416$, $p < .000$) and there was no significant difference in arousal between OCD and GAD-related words ($F(1,28) = .098$, $p = .757$). Frequencies of words were taken from an assorted list of the British National Corpus (http://www.kilgarriff.co.uk/bnc-readme.html), which contains written and spoken English from wide-ranging sources. There were no significant differences in frequency and length between the three categories (one -way ANOVAs: $F(8,51) = .661$, $p = .72$ & $F(2,57) = .417$, $p = .66$). Typical worry domains, e.g. health (Tallis, Eysenck & Mathews, 1992) and typical OCD domains, e.g. responsibility/consciousness (Moritz, Jacobsen, Kloss, Fricke, Rufer & Hand, 2004) were considered when selecting GAD and OCD words. Threat words were chosen if they related to at least one of these domains and were further screened by a Clinical Psychologist for suitability. A sample of OCD and GAD words was independently rated by an experienced CBT therapist (Cohen's Kappa = 0.47), after which the final word pool was chosen (Appendix L).

EGNGT design

The EGNGT requires participants to respond as fast as possible to 'Go' trials and ignore 'No Go' trials. The present experiment began with a general instruction screen. Before each upcoming block of words, an instruction screen informed participants which word category (Neutral or Threat) would form 'Go' trials, to be responded to by pressing the spacebar. Instructions (Appendix M) were explicit in referring to Neutral and Threat categories to encourage threat processing. Each trial began with a fixation mark for 1000ms, followed by a 300ms blank screen, thus the between-trial interval was 1300ms. Words were centred, presented one at a time for 850ms and participants were informed when each block was finished.

Each participant completed 8 blocks of 15 words. In each block, 11 words were 'Go' and 4 were 'No Go' trials. This Go-NoGo ratio of roughly 70% is thought to increase task demands, with more cognitive control required to inhibit responses to relatively rare No Go trials (Casey et al, 1997; Casey, Durston & Fossella, 2001). Thirty neutral words, 15 OCD-related and 15 GAD-related words were used. Each word was presented twice. When Threat words constituted Go trials, neutral words formed the No Go category and vice versa. There were four 'shifts' (e.g. Mobbs et al, 2008) in each presentation order; when the 'No Go' category of the previous block becomes the 'Go' category for the upcoming block (and vice versa). The order of blocks (including when a shift occurred) was counterbalanced across participants and within each block, trials were randomly presented.

The task gives three dependent variables: reaction times (RTs), number of omission errors (not responding on a Go trial) and commission errors (erroneous response on a No Go trial). RTs are usually taken as an index of appropriate attentional engagement, omission errors as a combination of attentional engagement and set-shifting and commission errors as index of inhibitory control. RTs in particular can also be used to measure attentional threat engagement (Gole et al, 2012).

Procedure

The experimental procedure was conducted in a research room in the Department of Clinical Psychology, at the University of Hull. To start, participants read an information sheet, signed a consent form and had opportunity to ask questions (Appendices G & H). The HADS and IUS were then administered, followed by the EGNGT and ratings of personal relevance. Lastly, participants had further opportunity to ask questions and were fully debriefed.

Data Analysis

The planned data analytic approach was mixed modeling, due to the need to test for within and between-subject effects, as will be elaborated in the Results.

Results

Data analytic strategy

Mixed modeling with a random participant effect was employed as data analytic strategy, as it could simultaneously address the main and subsidiary research objectives. Most importantly, it permitted testing for significant associations between HADS-A, HADS-D and IUS scores and RTs for threat words.

A random effect of participants was included and for each word category, pairs of RTs were assumed to be equally correlated. Based on this, intraclass correlations for RTs to each word category could be computed. The intraclass correlation was considered a measure of internal reliability as it is the proportion of between subject variance divided by between subject variance plus residual (within-subject) variance. Here, a higher value was taken to indicate higher reliability.

The above conceptualisation of internal reliability was favoured over the reporting of Cronbach's alpha, for numerous reasons. Alpha was primarily intended for questionnaire research, where data is not usually continuous, unlike RTs in the EGNGT. Usually, items in a questionnaire are different and alpha is taken to gauge how well they

tap the same construct, though even this has been questioned (Sijtsma, 2009). Using alpha for the EGNGT would mean each trial is treated as an 'item', which was problematic due to the possibility of participants legitimately missing 'items' (omission errors). Further, participants were essentially asked to respond to only two 'items': threatening and neutral words, with 30 instances of each (presented twice). Consequently, a key computation of alpha, the average relatedness of items, would not have the same meaning for the EGNGT as it might for a standardised self-report measure.

Further, within the model, the moderation of potential relationships between independent variables and RTs by personal relevance ratings of words could be computed. In addition, mixed models deal quite well with missing data (Tabachnik & Fidell, 2007), which are inherent to the EGNGT through omission errors.

To summarise, in the present model, IUS, HADS-A and HADS-D scores were treated as fixed effects upon the dependent variable of RTs for each word category. Fixed interaction effects between HADS & IUS scores and RTs were also included to test whether any relationships between self-report scores and RTs were moderated by the personal relevance ratings of word categories.

Demographic and self-report measures

Age was not significantly correlated with any of the independent or dependent measures and sex was only significantly correlated (r = 0.27) with HADS-A scores, female participants tending to score higher. The mean HADS-D and HADS-A scores were 2.89 (S.D. 2.37) and 7.9 (S.D. 3.85) respectively. On the IUS, the mean score for the sample was 62.45 (S.D. 17.53), comparable to other research with non-clinical samples (Buhr & Dugas, 2006; Norton, 2005). Self-report measures were significantly correlated with each other, as shown in Table 1.

Table 1. Correlation matrix between HADS-D, HADS-A and IUS scores.

	HADS-D	HADS-A	IUS
HADS-D	1	.68	.66
HADS-A	.68	1	.65
IUS	.66	.65	1

All correlations statistically significant ($p < 0.05$)

Transformed into percentages, mean personal relevance ratings for OCD words were 27.3% (S.D. 25), 34.17% (S.D. 27.63) for GAD words and 12.27% (S.D. 23.16) for Neutral words, indicating that Threat words were more relevant to worries/concerns than Neutral words. With relatively high variability in these ratings, it appears that words were quite personally relevant to present worries/concerns for some but not all participants.

EGNGT

Omission and Commission Errors

The mean number of omission errors for Neutral and Threat (OCD+GAD) words was 5.3 and 3.04 respectively (mean percentage error rates of 12.05% and 6.9% respectively). For commission errors, the mean was 0.81 for Neutral words and 2.54 for Threat words (mean percentage error rates of 5.06% and 15.88% respectively). The Friedman test was performed to test for significant differences in errors between word categories. There were significant differences in omission errors, $\chi 2$ (2, N = 57) = 12.95, p = .002, with more errors committed in the Neutral than OCD/GAD categories and more errors for GAD than OCD words. Likewise, there were significant differences in commission errors, $\chi 2$ (2, N = 57) = 13.45, p = .001, with more errors committed for OCD/GAD than Neutral words.

Given the lower rates of omission and higher rates of commission errors for Threat words, it is possible that categorising words as threatening was easier and simultaneously inhibiting responses to these words more difficult.

RT data

RT data consisted of all legitimate responses to Go trials; pressing the spacebar within 850ms (Gole et al, 2012). RTs of less than 200ms were excluded, as RTs faster than this make accurate perception and responses to words highly unlikely (Abdullaev & Posner, 1998). Only two data points were excluded through this.

The means and standard deviations for RTs in each word category are presented in Table 2, below.

Table 2. RT means and standard deviations for Go trials, by word category (Threat Combined = OCD + GAD words), given in milliseconds.

	Neutral	OCD	GAD	Threat Combined
Mean	603.21	596.44	606.78	600.24
S.D.	98.29	100.60	103.88	102.59

As mixed modeling assumes that residuals are normally distributed (Tabachnik & Fidell, 2007), tests of normality for residuals in each word category were computed. For residuals of RTs to Neutral, OCD and GAD words, the Kolmogorov-Smirnov test was significant, at 0.053 (d.f. 2188), $p < .000$; 0.060 (d.f. 1075), $p < .000$; 0.073 (d.f. 1043) $p < .000$ respectively. However, histograms of residuals were symmetrically distributed, not skewed (Appendix O). The large number of observations means that even small deviations from normality will be statistically significant but this was not considered to invalidate the present use of mixed modeling.

Mixed modeling

Neutral Words

No relationship was expected between IUS, HADS-D and HADS-A scores and RTs to Neutral words. Nevertheless, mixed modeling was conducted for this category to rule out the possibility that scores on self-report measures have a general effect on RT speed. For Neutral words, the estimated inter-subject variance was 2486.47 (S.E. 566.30), compared

to the residual variance of 7706.09 (S.E. 236.18). The intra-class correlation coefficient was 0.24.

There were no significant interactions between personal relevance ratings of the words and main effects of either HADS-D, HADS-A or IUS scores: F (1, 45.12) = 0.466, p = 0.508; F (1, 45.68) = 0.533, p = 0.469; F (1, 44.96) = 0.029, p = 0.866 respectively. Main effects of HADS-D, HADS-A and IUS scores themselves were not significant either: F (1, 45.75) = 1.626, p = 0.209; F (1, 45.98) = 0.787, p = 0.380; F (1, 44.828) = 0.257, p = 0.615 respectively.

OCD Words

For OCD words, the estimated inter-subject variance was 2808.26 (S.E. 673.51), compared to the residual variance of 7864.90 (S.E. 348.72), yielding an intra-class correlation coefficient of 0.26.

There were no significant interactions between personal relevance ratings of OCD words and main effects of either HADS-D, HADS-A or IUS scores: F (1, 46.68) = 0.035, p = 0.853; F (1, 46.87) = 0.058, p = 0.811; F (1, 45.94) = 1.343, p = 0.253 respectively. Main effects of HADS-D, HADS-A and IUS scores on RTs to OCD words were also non-significant: F (1, 47.97) = 0.000, p = 0.992; F (1, 47.79) = 0.036, p = 0.850; F (1, 45.72) = 0.957, p = 0.333 respectively.

GAD Words

The estimated inter-subject variance in RTs to GAD words was 3731.49 (S.E. 886.46), compared to the residual variance of 7877.55 (S.E. 355.26), giving an intra-class correlation coefficient of 0.32.

There were no significant interactions between personal relevance ratings of GAD words and main effects of either HADS-D, HADS-A or IUS scores: F (1, 44.11) = 0.736, p = 0.396; F (1, 44.79) = 0.412, p = 0.524; F (1, 44.39) = 0.034, p = 0.855 respectively. Main effects of HADS-D, HADS-A and IUS scores on RTs to GAD words were non-significant: F (1,

44.67) = 0.836, p = 0.365; F (1, 45.68) = 0.590, p = 0.446; F (1, 44.97) = 0.014, p = 0.908 respectively.

Sex

As sex was significantly correlated with HADS-A scores, analyses were repeated with sex also entered as a co-variate. There were no interactions or main effects of sex, in any word category.

Threat Combined

A separate analysis was conducted with combined RTs for OCD + GAD words as the dependent variable and combined personal relevance ratings for OCD + GAD words as moderating variable. In this analysis, an intraclass correlation coefficient of 0.27 was obtained and the same pattern of non-significant interactions/main effects, with F and p values comparable to preceding analyses.

Mixed modeling with exclusions applied

Comparison of inter- to within-subject variability showed that, for each word category, there was at least double the variance within each participant's measurements as there was between them. This is reflected in the low intra-class correlation coefficients of 0.24, 0.26 and 0.32.

Post-hoc exploration was undertaken to determine if a minority of participants were particularly variable in responses. An assumption was made that those with a high incidence of errors may have been responding less consistently. Datasets with omission errors on more than a third of Go trials and commission errors on more than half of No Go trials were excluded and above analyses repeated. With seven participants excluded, the pattern of findings did not change.

Lastly, participants' standard deviations for RTs in each word category were compared to the group mean and excluded if they lay more than two standard deviations above it. Exclusion of four such outliers had a minimal effect on the findings.

Discussion

One way IU potentially leads to pathological worry and anxiety is through effects on threat-related information processing (Koerner & Dugas, 2008). Focusing on attention, the present study sought to build on Fergus et al's (in press) findings of a relationship between IU and attentional bias towards uncertainty, but using stimuli related to GAD and OCD. Results showed that there were no significant relationships between Depression, Anxiety, IU and RTs to Threat words, even after excluding participants with the highest error rates. In interpreting this null result, it can be argued that a Type 2 error (incorrect acceptance of the null hypothesis), based on methodological issues, cannot be excluded. Due to this, suggestions for improving the use of the EGNGT are given more prominence than potential theoretical/clinical implications of the findings.

Methodological considerations

The non-significant relationship between HADS-A scores and RTs to Threat words can be interpreted as a Type 2 error. Whilst only one study has so far demonstrated a relationship between IU and attentional bias (Fergus et al, in press), the relationship between anxiety and attentional threat biases is a widely replicated finding (Cisler & Koster, 2010). The non-significant association between HADS-A scores and RTs to Threat words can be taken as evidence that design factors affected the study's potential to detect such relationships.

Various design factors could have potentially influenced responses on the EGNGT. Several measures were taken to minimise these potential sources of systematic error: selection of words based on arousal, frequency & length, counterbalancing of blocks, ratio of Go/No Go trials of roughly 70%, counterbalancing of 'shift' blocks and randomisation of

trial order. Despite this, intraclass correlation coefficients for Neutral, OCD & GAD words were low. In each word category, reliability of responses seemed poor, in that RTs from trial to trial were quite variable. The detection of relationships between scores on self-report measures and RTs was contingent on an adequate internal reliability of the EGNGT. As such, it is possible that the large intra-individual variability in RTs obscured any relationships that could have been present between HADS-D, HADS-A, IUS scores and RTs to Threat words.

Another explanation for the apparent lack of effects might relate to how attentional threat bias was operationalised. In the present study, it was defined as RTs towards Threat words. In other tasks, however, such as the Dot-Probe and also the Visual Search Task used by Fergus et al (in press), attentional bias is defined as the difference in RTs between neutral and, usually, threat stimuli, typically yielding a composite score (MacLeod, Mathews & Tata, 1986). It might be argued that composite scores are more indicative of attentional bias. However, other studies that have successfully demonstrated attentional biases with the EGNGT also used only raw RTs to particular stimulus categories (Gole et al, 2012; Mobbs et al, 2008). Additionally, in other RT-based behavioural paradigms, like the Emotional Stroop task, composite scores are apparently less reliable than RTs for individual stimulus categories (Eide, Kemp, Silberstein & Nathan, 2002). Using composite scores may have therefore led to even poorer internal reliability in the present design. Taking these issues into account, it is unlikely that the present operationalisation of attentional bias played a key part in the null results.

In a similar vein, responses to stimuli considered as threatening can be affected by their personal meaning. Mean personal relevance ratings of Threat words were low; 27.3% for OCD and 34.17% for GAD. Whilst Threat words were more arousing than Neutral words, this might have been insufficient to cross a hypothesised threshold required to process a stimulus as personally threatening. Whilst this is conceivable, personal relevance of stimuli has not often been measured in research that has detected attentional biases and generic threat words elicit attentional biases just as strongly as

naturalistic stimuli (Bar-Haim et al, 2007). On balance, attentional biases are not confined to highly personally relevant stimuli. The words used are therefore not regarded as atypical of stimuli associated with detecting attentional biases.

As with personal relevance, the precise cognitive operations required to process words could have affected responses. In Fergus et al (in press), significant relationships were observed for the facilitated attention condition. Participants were instructed to press one of two keys, depending on whether or not they saw an English word, in arrays of four letter-strings (lexical decision). Words were nouns, so that recognition of a noun was the main cognitive demand. In the present study, instead of lexical decisions, participants had to rapidly categorise words as Neutral or Threatening and respond/not respond based on these categorisations. A recent study found emotional processing of words to occur slightly after lexical access, both processes being slightly more rapid for nouns and adjectives than verbs (Palazova, Mantwill, Sommer & Schacht, 2011). Unlike Fergus et al (in press), word class was not controlled for, potentially explaining one source of RT variability in the present data. At the same time, it is unclear whether controlling for word class would have substantially improved consistency of responses. For example, in the Neutral category, where 26/30 words were nouns, the intra-class correlation coefficient was the lowest (.24).

Lastly, the sample used merits discussion. In line with a dimensional view of cognitive processes, attentional biases are detectable in both non-clinical and clinical populations (Bar-Haim et al, 2007) and Fergus et al (in press) used a sample of undergraduate students, not pre-selected for high Anxiety/IU. The present sample's mean HADS-A score was in the borderline range (Snaith, 2003) and IUS scores had a mean and S.D. consistent with other non-clinical samples, where significant effects of IU have been found (e.g. Buhr & Dugas, 2006). Despite these qualifications, the use of a non-clinical sample is a limitation. Reasonably, self-reported anxiety, mood and maladaptive beliefs about uncertainty would be expected to be higher in clinical populations and perhaps more closely related to attentional biases.

Potential clinical implications

Research has demonstrated IU's association with threat-related information processing. It was presently hypothesised that IU would be significantly associated with facilitated attention towards OCD/GAD-related Threat. Methodological factors may have obstructed the detection of some relationships, like between Anxiety and RTs to Threat words, though it is also possible that IU's relationship with Threat words would have been non-significant, even in a more sensitive experimental paradigm. IU might indeed have no relationship with facilitated attention towards threatening stimuli taken from GAD/OCD domains, but relate to facilitated attention to uncertainty-related stimuli (Fergus et al, in press). Theoretically, this would support the central role of IU in GAD (Dugas & Robichaud, 2007) and suggest a narrow pre-occupation with uncertainty, rather than general threats. Clinically, it would imply that attentional modification techniques are best targeted at uncertainty, rather than generic threat domains.

Suggested improvements for future research

Use of the EGNGT, in research where RTs are the main variable of interest, can be improved by addressing methodological limitations outlined above. If using words as stimuli, one way of attempting to decrease a potential source of variability in RTs is controlling for word category, in addition to arousal, frequency and length. Ensuring that stimulus materials have a minimum level of personal relevance across the sample might further reduce individual variability and improve the validity of stimuli. This could be achieved by asking participants to rate or rank potential stimuli for personal relevance and including only those in the upper half of an overall pool. More broadly, as Cisler et al (2009) note, attentional biases detected using one paradigm do not necessarily correlate with other paradigms. Studies exploring attentional biases would therefore benefit from using multiple experimental tasks within the same study, preferably utilising various stimuli modalities (e.g. verbal vs. visual). Discrepancies between experimental paradigms

might then be more confidently attributed to methodological factors, if the same sample provides data on all of them.

Conclusion

The present study found no significant relationships between self-reported Anxiety, Depression, IU and RTs to Threat words using the EGNGT. Low internal reliability of the task, explicable through methodological factors, made it difficult to confidently reject the experimental hypothesis and elaborate on theoretical and clinical implications. However, adjustments to methodology based on the outlined recommendations may improve future research into how IU exerts its effects.

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Part Three: Appendices

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eg, We thank Mr A, who kindly provided the data necessary for our analysis, and Miss B, who assisted with the preparation and proof-reading of the manuscript.

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eg, Author X designed the study and wrote the protocol. Author Y managed the literature searches and analyses. Authors X and Z undertook the statistical analysis, and author W wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

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Willner, P., 1995. Dopaminergie mechanisms in depression and mania. In: Bloom, F.E. and Kupfer, D.J. (Eds.), Psychopharmacology: The Fourth Generation of Progress. Raven Press, NY, pp. 921-931.

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Appendix B - Data Extraction Form

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings

Appendix C – Quality Assessment Scale

1. Are the aims/objectives clearly described?

   YES NO

2. Are hypotheses formulated and explicitly stated prior to conducting analyses (i.e. a priori)?

   YES NO

3. Did the selection of independent variables have a theoretical basis?*

   0 = None of the independent variables had any theoretical basis
   1 = One independent variable had some theoretical basis
   2 = All independent variables had some theoretical basis
   3 = All independent variables were included based on credible theoretical grounds

4. Are the main outcome measures clearly described?

   YES NO

5. Are the sample characteristics clearly described?

   YES NO

6. Was the sample representative of the entire population from which it was taken?

YES NO

7. Did the study*

i) report a power calculation?

YES (2 points) NO (0 points)

ii) if yes, was the final sample large enough to detect a clinically important effect, where the probability value for a difference being due to chance is less than 5%?

YES (1 point) NO (0 points)

8. Are the main findings of the study clearly described?

YES NO

9. i) Have variables that could affect the relationship between independent variables and dependent variables been described?*

YES (2 points) NO (0 points)

ii) If yes, was there an attempt to adjust for any such effects?

YES (2 points) NO (0 points)

10. Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes, except where the probability value is less than 0.001?

YES NO

11. Is score reliability reported for all measured independent variables based on induction from a prior study or analysis of data within current study?

YES NO

12. Is score reliability reported for all measured dependent variables based on induction from a prior study or analysis of data within current study?

YES NO

13. Is score validity reported for all measured independent variables based on induction from a prior study or analysis of data within current study?

YES NO

14. Is score validity reported for all measured dependent variables based on induction from a prior study or analysis of data within current study?

YES NO

15. Effect sizes are reported for each independent variable- dependent variable relationship, even when the outcome was not statistically significant. Examples of effect categories include: (a) standardized differences (e.g., Cohen's d, Glass's Δ); (b) "uncorrected" variance-accounted-for (e.g., η2, R2); and (c) "corrected" variance-accounted-for (e.g., adjusted R2, ω2)*

0 = No effect sizes are reported for any relationships between independent and dependent variables

1 = The effect size is reported for a relationship between one of the independent and dependent variables

2 = Effect sizes are reported for more than one relationship between an independent and dependent variable

3 = Effect sizes are reported for each examined relationship between an independent and dependent variable

16. Are interval data (e.g. IQ scores) converted to nominal scale (e.g. 'low' & 'high') without thoughtful consideration and justification?

YES (0 points) NO (1 point)

17. Are univariate methods inappropriately used in the presence of multiple outcome variables?

YES (0 points) NO (1 point)

*= weighted items

Appendix D – Quality Assessment Ratings Summaries

Table summarising total methodological quality scores for each study

Study	Total score
Ruggiero et al (2012)	13
Van der Heiden et al (2010)	16
De Bruin et al (2006)	16
Norton et al (2005)	17
Sigiura (2007)	17
Sexton et al (2003)	18
Khawaja & Chapman (2007)	18
Khawaja & McMahon (2011)	19
De Bruin, Rassin & Muris (2007)	19
McEvoy & Mahoney (2012)	19
Buhr & Dugas (2006)	21
Zlomke & Young (2009)	22
Dugas, Freeston & Ladouceur (1997)	22
Buhr & Dugas (2012)	22
Dugas, Schwartz & Francis (2004)	23
Stapinski, Abbott & Rapee (2010)	24

Table summarising individual item ratings and total item ratings across studies

	Item																		
Study	**1**	**2**	**3**	**4**	**5**	**6**	**7i**	**7ii**	**8**	**9i**	**9ii**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Ruggiero et al (2012)	1	1	2	1	1	0	0	0	1	0	0	1	0	0	0	0	3	1	1
Van der Heiden et al (2010)	1	0	3	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1
De Bruin et al (2006)	1	0	1	1	1	0	0	0	1	2	2	1	1	1	0	0	2	1	1
Norton et al (2005)	1	0	3	1	1	1	0	0	1	2	0	1	1	0	1	0	2	1	1
Sigiura (2007)	1	0	2	1	1	0	0	0	1	2	2	1	0	1	0	1	2	1	1
Sexton et al (2003)	1	1	3	1	1	0	0	0	1	2	2	1	1	0	0	0	2	1	1
Khawaja & Chapman (2007)	1	1	3	1	1	1	0	0	1	0	0	1	1	1	1	1	2	1	1
Khawaja & McMahon (2011)	1	1	3	1	1	1	0	0	1	0	0	1	1	1	1	1	3	1	1
De Bruin, Rassin & Muris (2007)	1	1	3	1	1	1	0	0	1	2	2	1	1	1	0	0	1	1	1
McEvoy & Mahoney (2012)	1	1	3	1	1	1	0	0	1	2	0	1	1	1	1	1	1	1	1
Buhr & Dugas (2006)	1	1	3	1	1	0	0	0	1	2	2	1	1	1	1	1	2	1	1
Zlomke & Young (2009)	1	1	3	1	1	1	0	0	1	2	2	1	1	1	1	0	3	1	1
Dugas, Freeston & Ladouceur (1997)	1	1	3	1	1	1	0	0	1	2	2	1	1	1	0	1	3	1	1
Buhr & Dugas (2012)	1	1	3	1	1	1	0	0	1	2	2	1	1	1	1	1	2	1	1
Dugas, Schwartz & Francis (2004)	1	1	3	1	1	1	0	0	1	2	2	1	1	1	1	1	3	1	1
Stapinski, Abbott & Rapee (2010)	1	1	3	1	1	0	2	1	1	2	2	1	1	1	1	1	2	1	1
Item totals	16	12	44	16	16	10	2	1	16	24	20	16	14	13	10	10	34	16	16

Appendix E – Systematic Literature Review Comprehensive Results Table

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Sexton, Norton, Walker, Norton (2003), Canada	Main aim: Examination of hypothesised hierarchical model Hypothesis: Neuroticism is the highest-order factor, which influences Anxiety Sensitivity and IU. These three vulnerability factors predict specific anxious processes and symptoms; worry, obsessive thinking, panic symptoms and hypochondriacal fears	91 undergraduate students, 64.8% female, mean age 20 (SD= 4.56)	-Neuroticism subscale of NEO Five Factor Index (NEO-N) -Anxiety Sensitivity Index-Revised (ASI-R) -Intolerance to Uncertainty Scale (IUS)	-Penn State Worry Questionnaire (PSWQ) -Washington State University Revision of the Padua Inventory (PI-WSUR) -Illness Attitudes Scale (IAS) -Beck Anxiety Inventory (BAI)	Regression-based path analysis, testing a hypothesised and full model	Hypothesised path model: Direct effect of NEO-N significantly accounted for 28.6% of variability in IUS scores. NEO-N significantly accounted for 26.9% of variability in PSWQ scores (path coefficient .52*), whilst IUS accounted for 11.4% of variability in PSWQ scores (path coefficient .34*). Together, NEO-N & IUS accounted for 50.5% of variability in PSWQ scores Full hierarchical model: NEO-N significantly accounted for 28.5% of variability in IUS scores. NEO-N significantly accounted for 18.9% of variability in PSWQ scores (path coefficient .44*). The IUS significantly accounted for 8.4% of variability in PSWQ scores (path coefficient .29*). The full model accounted for 52.3% of variability in PSWQ scores

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Norton, Sexton, Walker & Norton (2005), Canada	Main aim: To examine the relationship between Negative and Positive Affect, specific vulnerability factors (IU and Anxiety Sensitivity) and their effect on various disorder-specific anxiety symptoms and depression	125 individuals seeking outpatient treatment for mood/anxiety disorder/s, 66.4% female, mean age 40.46 (SD = 11.82)	-Positive and Negative Affect Scale (PANAS) -Anxiety Sensitivity Index (ASI) -Intolerance to Uncertainty Scale (IUS)	-Beck Anxiety Inventory (BAI) -Illness Attitude Scale (IAS) -Penn State Worry Questionnaire (PSWQ) -Washington State University Revision of the Padua Inventory (PI-WSUR) -Beck Depression Inventory (BDI)	Regression based path analyses	-Negative Affect did not significantly predict variance in IUS scores -Negative Affect and IUS both had direct, significant, unique effects on PSWQ scores (the path from Negative Affect to PSWQ was .40*, the path from Negative Affect to IU was non-significant at .17 and the path from IU to PSWQ was significant at .26*), together accounting for 14.2% of variance in PSWQ scores -Positive Affect did not significantly improve prediction of PSWQ scores
Van der Heiden, Melchior, Muris, Bouwmeester, Bos & van der Molen (2010), Holland	Main aim: To explore relationships between Neuroticism and Extraversion (higher-order factors),	137 individuals with a primary diagnosis of GAD (57.8% had a DSM-IV co-morbid Axis 1 diagnosis),	-NEO-Five Factor Inventory Neuroticism and Extraversion scales (NEO-FFI)	-Penn State Worry Questionnaire (PSWQ)	Multiple mediation analysis, with boot strapping	-Higher order and specific vulnerability factors together explained 39.8% of variation in PSWQ scores

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Van der Heiden et al (2010) (continued.)	specific vulnerability factors IU and Metacognitive Beliefs with worry Hypothesis: Not specified	101 female, mean age 35 (range= 19-66).	-Intolerance of Uncertainty Scale (IUS) -Meta-Cognitions Questionnaire: Positive and Negative Beliefs about worry subscales (MCQ)	-Beck Depression Inventory-II (BDI-II)		-The total indirect effect of Neuroticism on PSWQ scores was significant, with MCQ-negative beliefs (.2*) and IUS (.1*) making significant contributions
de Bruin, Rassin & Muris (2007), Holland	Main aim: To examine the relationship between Neuroticism, IU, Meta-worry and worry Hypothesis: The prediction of worry by Neuroticism would be mediated by both levels of Meta-Worry and IU	105 undergraduate students, 81 female, mean age 20.55 (SD= 2.11)	-Intolerance of Uncertainty Scale (IUS) -Anxious Thought Questionnaire: Meta worry subscale (AnTI-MW) -Eysenck Personality Questionnaire-Neuroticism (EPQ-N)	-Penn State Worry Questionnaire (PSWQ) -Worry about the Test Questionnaire (bespoke measure developed for study, gauging worry specifically concerning an upcoming exam)	Mediational analysis (using regression)	-When the PSWQ was used to measure worry, all four conditions of the mediational model were met for both IUS and AnTI-MW -For the bespoke measure of worry, IU and AnTI-MW did not significantly predict worry when controlling for Neuroticism, meaning they could not be considered mediators. Hierarchical regression showed that no variable significantly predicted variance in worry scores at Time 1 and Neuroticism significantly predicted just 6% of the variance in worry at Time 2

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Zlomke & Young (2009), United States of America	Main aim: To examine whether IU mediates the relationship between anxious rearing variables and anxiety Hypothesis: IU would mediate the relationship between anxious rearing and symptoms of anxiety, worry and depression	174 older adolescent undergraduate students, 79.9% female, mean age 20.6 (SD 1.33)	-Intolerance of Uncertainty Scale (IUS) -The Egna Minnen Betriiffende Uppfostran Questionnaire (English Version) (EMBU-C)	-Depression Anxiety and Stress Scale (DASS) -Penn State Worry Questionnaire (PSWQ)	Mediation analysis (based on regression)	-IU showed no significant correlation with perceived Parental Control and so was not tested as a mediator of this variable -IU met all four criteria as a mediator between perceived Anxious Parenting and PSWQ scores: Anxious Parenting was significantly predictive of worry (.19*), IUS scores were significantly predicted by anxious rearing (.19*), IUS significantly predicted variance in PSWQ scores (.49*) & Anxious Parenting no longer significantly predicted PSWQ scores when IUS was controlled (.1) -Percentage variance in PSWQ scores explained by predictors: Anxious Parenting 11%, IUS 31%

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
McEvoy & Mahoney (2012), Australia	Main aim: To test whether IU mediates the relationship between Neuroticism and symptoms of various mental disorders Hypotheses: -IU (Prospective Anxiety) would mediate the relationship between Neuroticism and GAD/OCD -IU (Inhibitory Anxiety) would mediate the relationship between Neuroticism and Social Anxiety, Panic Disorder/Agoraphobia and Depression	328 individuals referred to a specialist anxiety disorders treatment service (76% had two or more diagnoses), 54% female, mean age 34.1 (SD = 11.76)	-Eysenck Personality Questionnaire-Neuroticism Subscale (EPQ-N) -Intolerance to Uncertainty Scale 12-item version, used as two separate sub-scales: Inhibitory and Prospective Anxiety (IU-IA & IU-PA)	-Penn State Worry Questionnaire (PSWQ) -Body Sensations Questionnaire (BSQ) -Agoraphobic Cognitions Questionnaire (ACQ) -Beck Depression Inventory-II (BDI-II) -Social Phobia Scale (SPS) -Social Interaction Anxiety Scale (SIAS) -Padua Inventory-Washington State University Revision (PI-WSUR)	Series of linear regression analyses	-The four conditions of IU-PA being a mediator between EPQ-N and PSWQ were met; EPQ-N significantly predicted variance in PSWQ (β before controlling for IU-PA =.56*), EPQ-N significantly predicted variance in IU-PA scores (β = .49*), IU-PA significantly explained variance in PSWQ scores (β = .36*) and the relationship between EPQ-N and PSWQ scores reduced in magnitude when controlling for IU-PA (controlled β =.38) -20% of the effect of EPQ-N on symptom measures was explained indirectly by the variance in the two IU subscales

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Dugas, Freeston & Ladouceur (1997), Canada	Main aim: To explore the relationship between IU and Problem Orientation in worry Competing hypotheses: IU is predictive of worry and accounts for contribution made by Problem Orientation OR Problem Orientation is predictive of worry and accounts for the contribution made by IU	285 Psychology undergraduate students, 209 female, mean age 23.8 (SD= 6.7) 76 male, mean age 22.8 (SD= 4)	-Age -Sex -Beck Anxiety Inventory (BAI) -Beck Depression Inventory (BDI abridged) -Intolerance to Uncertainty Scale (IUS) -Social Problem Solving Inventory: Emotional subscale) (SPSI)	-Penn State Worry Questionnaire (PSWQ)	Two separate hierarchical regression analyses	Prediction of variance in PSWQ scores, 1st order of entry: Age & sex 2.3 & 5.8% (-.07 & -.13*), BAI predicted 25.2% (.17), BDI 8% (.05), IUS 16.3% (.36*) and SPSI predicted an additional 4.6% (-.34*) Prediction of variance in PSWQ scores, order of IUS and SPSI switched : Entered fourth, SPSI predicted 15.3% (-.34*) of variance in PSWQ scores. IUS predicted an additional 5.6% (.36*) variance in PSWQ scores
Dugas, Schwartz, Francis (2004), Canada	Main aim: To examine specificity of relationship between IU and worry, whilst including measures for depressive symptom/ cognitions	240 undergraduate students, 189 female,	-Age -Sex -Dysfunctional Attitudes Scale (DAS) -Beck Depression Inventory (BDI)	-Penn State Worry Questionnaire (PSWQ)	Hierarchical multiple regression	-Prediction of variance in PSWQ scores, 1st order of entry: -Age & sex 7.7% (-.01 & -.20*), DAS 17.4% (.19*) and IUS 14.4% (.45*)

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Dugas, Schwartz, Francis (2004), Canada (continued.)	Hypothesis: IU would have a stronger relationship with worry than depression	(female mean age 22.02, SD= 3.29, male mean age 22.06, SD= 2.39)	-Intolerance to Uncertainty Scale (IUS)			Prediction of variance in PSWQ scores, 2nd order of entry (coefficients not reported): -Age & sex 7.7%*, IUS 28.5%* and DAS 2.7%*
Buhr & Dugas (2006), Canada	Main aim: To examine relationship between IU, Intolerance to Ambiguity, Perfectionism and Control Hypothesis: IU will have the strongest relationship with worry, not accounted for by other anxiety-related variables	197 undergraduate students, 152 female, mean age 22.56 (SD= 5.5)	-Intolerance of Uncertainty Scale (IUS) -Scale of Tolerance-Intolerance of Ambiguity (TIA) -Multidimensional Perfectionism Scale (MPS) -Sense of Control Scale (SC)	-Penn State Worry Questionnaire (PSWQ)	Hierarchical multiple regression	Percentage variance of PSWQ scores predicted by independent variables: Age & sex 12% (.1 & .2*), Intolerance of Ambiguity (-.03), Dimensions of Perfectionism (Self-oriented, Socially-prescribed, Other-oriented) (.16*, .03, -.07) and Dimensions of perceived Control (Perceived Mastery, perceived Constraints) (-.1, .02) 22%. IU, entered last, accounted for an additional 14% (.5*)

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
de Bruin, Rassin, van der Heiden & Muris (2006), Holland	Main aim: To establish the psychometric properties of the Dutch translation of the Intolerance of Uncertainty Scale Hypothesis: N/A	-209 students, 168 female, mean age 20.5 (SD= 2.51) -23 individuals with a GAD diagnosis, 16 female, mean age 37.34 (SD 11.54)	-Intolerance of Uncertainty Scale (IUS) -Beck Depression Inventory (BDI) -State Trait Anxiety Inventory-Trait (STAI-T)	-Penn State Worry Questionnaire (PSWQ)	Hierarchical regression analysis	Percentage variance in PSWQ scores explained by each predictor: - Sex and age 5% (.09 & .2*), BDI (.06) & STAI-T (.61*) 41%, IUS 4% (.23*)
Khawaja & Chapman, 2007 (Australia)	Main aim: To explore the prediction of worry by IU, Poor Problem-Solving Confidence, Positive Beliefs about Worry & Negative Thinking Style above and beyond trait anxiety Hypothesis: In controlling for trait anxiety, IU will have a stronger relationship with worry than the other predictors	96 undergraduate students, 83 female, mean age 25.59 (SD/range not provided)	-Anxious Thoughts and Tendencies Scale (ATT) -Intolerance of Uncertainty Scale (IUS) -Problem Solving Inventory: Problem Solving Confidence subscale (PSI-CON) -Positive Beliefs Questionnaire (PBQ) -Trait Anxiety Inventory for Adults Form Y (STAI)	-Penn State Worry Questionnaire (PSWQ)	Separate hierarchical regression analyses for each predictor and a combined model	Percentage variance in PSWQ scores explained in combined model: -Trait anxiety 55% (.74*), IUS (.32*), PSI-CON (-.07), ATT (.39*) & PBQ (.09) 13%

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Sugiura (2007), Japan	Main aim: To assess how well the responsibility to continue thinking predicts worry beyond other relevant variables Hypothesis: Responsibility to continue thinking will be related to positive beliefs about worry, but also account for unique variance in worry	150 Japanese college students (56% female), mean age 19.58 (SD= 1.05)	-Meta Cognitions Questionnaire (MCQ) -Problem-solving related meta cognitions -Intolerance to Uncertainty Scale (IUS) -Problem-solving inventory (PSI) -White Bear Suppression Inventory (WBSI) -The Big Five Scale: Neuroticism subscale (BFS-N) -Consequences of worry scale (COWS)	-Penn State Worry Questionnaire (PSWQ)	Hierarchical regression	-Regression 1 (MCQ as worry belief measure)- % variance in PSWQ scores accounted by each construct: BFS-N 52% (.46*), MCQ & IUS 12% (MCQ positive beliefs -.03, negative beliefs .36*; IUS .05), responsibility to continue thinking & lack of satisfaction with problem-solving process 6% (.32*, -.11) -Regression 2 (COWS as worry beliefs measure)- % variance in PSWQ scores accounted by each construct: BFS-N 52% (.61*), COWS and IUS 6% (COWS positive consequences -.03, negative consequences .17*; IUS .00) and responsibility to continue thinking & lack of satisfaction with problem-solving process 6% (.34* & -.08)

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Khawaja & McMahon (2011), Australia	Aim: To test for relationships between IU & Meta-Worry and GAD, OCD, Social Phobia & Depression symptoms Hypothesis: IU and Meta-Worry would predict symptoms of each disorder	253 University students, 198 female, mean age 25.9 (SD 10.79)	-Anxious Thoughts Inventory: Meta-Worry subscale (AnTI-MW) -Intolerance of Uncertainty Scale (IUS)	-Penn State Worry Questionnaire (PSWQ) -Obsessive Compulsive Inventory-Revised (OCI-R) -Social Phobia Inventory (SPIN) -Depression Anxiety Stress Scale (DASS)	Regression analyses	-AnTI accounted for 13.76% of the variance in PSWQ scores (.50*) and IUS explained 6.1% (.33*) of this variance
Ruggiero, Stapinski, Caselli, Fiore, Gallucci, Sassaroli & Rapee (2012), Italy	Main aim: To explore interactive effects between IU, Negative Beliefs about Worry and Anxiety Control on the prediction of Worry	Clinical group: 119 individuals diagnosed with GAD (90 Italians, 64 female, mean age 34.15 SD 9.74; 29 Australians, 25 female, mean age 37.79 SD 13.08)	-Anxiety Control Questionnaire (ACQ) -Intolerance of Uncertainty Scale (IUS) -Metacognition Questionnaire-30 (MCQ-30)	-Penn State Worry Questionnaire (PSWQ)	Moderated regression (regression with interaction analysis)	-IUS, MCQ and ACQ all significantly predicted variance in PSWQ scores (.31*, .34* & -.26*) -The effect of IU on worry depends on the 'intensity' of Meta-worry and Anxiety Control.

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Ruggiero, Stapinski, Caselli, Fiore, Gallucci, Sassaroli & Rapee (2012), Italy (continued.)	Hypothesis: Interactive effects that significantly predict worry severity will be found	Control group: 54 (19 Italians, 14 female, mean age 37.79 SD 7.96; 35 Australians, 21 female, mean age 37.65 SD 15.73)				When Meta-Worry is kept at its mean, the effect of IU on Worry is particularly strong for low levels of Anxiety Control. The reverse was found when Anxiety Control was kept at its mean in that low levels of Meta-Worry meant IU exerted the strongest influence on worry -In low levels of Anxiety Control and high levels of Meta-Worry, even small levels of IU predict Worry
Stapinski, Abbott & Rapee (2010), Australia	Main aims: -To explore relationship between appraisal of emotional experience and GAD symptoms -To assess unique contributions of emotional dysregulation constructs, whilst controlling for other GAD-relevant variables	-123 GAD-diagnosed treatment-seeking adults, mean age 36.6 (SD= 12.2) -76 control participants, mean age 35.7 (SD 14.1)	-Intolerance of Uncertainty Scale (IUS) -Meta-Cognitions Questionnaire 30 (MCQ-30) -The Affect Control Scale (ACS) -Anxiety Control Questionnaire: Reactions subscale (ACQ-R)	-Penn State Worry Questionnaire (PSWQ)	Hier-archical multiple regressio n for each group	% variance in PSWQ scores explained by each predictor- GAD group: - DASS-D 8% (.1), PCCQ (.26*) MCQ (.25*) & IUS (.13) jointly 26%, ACS (.19) & ACQ-R (.3*) jointly 7% -The full model accounted for 41% of variance in PSWQ scores

Study characteristics	Main aims & hypotheses	Sample	Independent Variables	Dependent Variables	Data Analytic Method/s	Main findings
Stapinski, Abbott & Rapee (2010), Australia (continued.)	Hypothesis: -Fear and negative appraisal of emotions would predict unique variance in worry, over and above established predictors of worry	-71.6% female across both groups	-Probability Cost and Coping Questionnaire (PCCQ) -Depression Anxiety and Stress Scales-Depression subscale (DASS-D)			% variance in PSWQ scores explained by each predictor-Control group: - Similar pattern of results; MCQ, PCCQ and ACS-R uniquely predicted variance in PSWQ scores, beyond shared variance with other predictors (IUS obtained a non-significant β loading of -.09) -Full model accounted for 53% of variance in PSWQ scores
Buhr & Dugas (2012), Canada	Main aim: To contrast relationships between Worry and Fear of Emotions, Experiential Avoidance and IU Hypothesis: Fear of Emotions, Experiential Avoidance & IU would uniquely contribute to the prediction of worry	251 undergraduate students, 160 females, mean age 25.63 (SD= 7.09)	-Intolerance of uncertainty scale (IUS) -Affective Control Scale (ACS) -Acceptance and Action Questionnaire (AAQ)	-Penn State Worry Questionnaire (PSWQ)	Hierarchical multiple regression	Percentage variance in PSWQ scores explained by each variable: Age & sex 5% (-.04 &.16*), IU, Fear of Emotion, Experiential Avoidance. (IUS .33*, ACS-Anxiety .33*, ACS-Depression .05, ACS-Anger .12, ACS-Positive .04, AAQ .18) 47%

Values in brackets denote standardised coefficients
*denotes statistically significant findings

Appendix F- Ethical Approval Letter

UNIVERSITY OF Hull

PRIVATE AND CONFIDENTIAL

FACULTY OF HEALTH AND SOCIAL CARE
T: 01482 464530
E: J.Kelly@hull.ac.uk

Mr. Goran Lukic
Flat 4
20 Marlborough Avenue
Hull
HU5 3JS

REC REF 085
26 July 2012

Dear Goran

Study title: 'Intolerance to uncertainty and attentional bias to threat'

Thank you for submitting the above proposal, with supporting documentation, which has been considered by the Faculty of Health and Social Care Research Ethics Committee at the University of Hull.

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the research on the basis described in the application form.

I wish you every success with your study.

Yours sincerely

pp

Dr Janet Kelly
Chair, Research Ethics Committee
Faculty of Health and Social Care
cc: file

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Appendix G – Participant Information Sheet

Department of Clinical Psychology and
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University of Hull
Hertford Building
Cottingham Road
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Tel: 01482 464106

Information Sheet

Intolerance to uncertainty and attentional threat bias

You are invited to take part in a brief psychological study. Please find below some more details on what will happen. Feel free to ask any questions either before or after participation.

The aim of this study:
This is a study investigating how anxiety and uncertainty can affect attention. The main aim is to investigate whether the way we feel about uncertainty is linked to how we pay attention to things. This kind of research can inform our understanding of mental health problems such as anxiety.

Procedure:
You will simply be required to fill out two questionnaires and then complete a short task on a computer. This task will require you to respond to certain categories of words, whilst ignoring another category of words. After this, you will be asked to rate the personal relevance of the words you saw during the computer task (i.e. how much each one means something to you). The entire procedure should take no longer than about 15 minutes.

Voluntary participation:
Your participation in this research is entirely voluntary, so you can choose to withdraw from it at any point. You can also ask for any information/responses you provide to be destroyed later.

Anonymity:
All data collected will remain anonymous. Your responses to the questionnaires and the computer task will be assigned a code for data analysis. None of the information you provide

will therefore be identifiable as yours when the findings are disseminated to other researchers or submitted for publication.

Data security:
All the information collected will remain confidential, be kept securely at the University of Hull and only the researcher and his supervisor will have access to it. The anonymous data you provide will be held securely in paper form in the Department of Clinical Psychology and Psychological Therapies for up to 5 years.

Potential risks of participation:
One of the questionnaires contains some questions that you might feel are private and they regard difficult feelings such as anxiety and depression. The computer task includes words that could potentially cause some people mild anxiety. If for any reason, you feel yourself becoming upset during participation, please feel free to stop. It would be totally up to you whether you would then want to complete your participation or withdraw at that point.

On one of the questionnaires, scores above a certain number may indicate particular problems with anxiety or low mood. Please indicate on the consent form whether you wish to be informed if your scores suggest heightened anxiety or low mood.

Thank you very much for your participation

Appendix H- Participant Consent Form

Department of Clinical Psychology and
Psychological Therapies
University of Hull
Hertford Building
Cottingham Road
Hull
HU6 7RX
Tel: 01482 464106

Written Consent

By signing this form, I consent to the voluntary participation in this study. I have read the Information Sheet and understand what participation involves. I understand that I can withdraw myself and/or the data I provide at any time.

FULL NAME (please write in block capitals)

_____

SIGNATURE

_____

DATE

_____

Please delete below as appropriate:

I would like / would not like to be informed if my scores on the Hospital Anxiety and Depression Scale are above the typical range

If you have any further questions at a later point, you can e-mail me at G.Lukic@2010.hull.ac.uk or telephone me on 07984304832.

Many thanks once again,

Goran Lukic
(Trainee Clinical Psychologist)

Appendix I – Hospital and Anxiety Depression Scale

HOSPITAL ANXIETY AND DEPRESSION SCALE (HADS)

This questionnaire is designed to help the researcher know how you feel. Read each item and **underline** the reply which comes closest to how you have been feeling in the past week. Don't take too long over your replies; your immediate reaction to each item will probably be more accurate than a long thought-out response.

I feel tense or 'wound up':
Most of the time
A lot of the time
From time to time (occasionally)
Not at all

I still enjoy the things I used to enjoy:
Definitely as much
Not quite as much
Only a little
Hardly at all

I get a sort of frightened feeling as if something awful is about to happen:
Very definitely and quite badly
Yes, but not too badly
A little, but it doesn't worry me
Not at all

I can laugh and see the funny side of things:
As much as I always could
Not quite so much now
Definitely not so much now
Not at all

Worrying thoughts go through my mind:
A great deal of the time
A lot of the time
From time to time, but not too often
Only occasionally

I feel cheerful:
Not at all
Not often
Sometimes
Most of the time

I can sit at ease and feel relaxed:
Definitely
Usually
Not often
Not at all

I feel as if I am slowed down:
Nearly all the time
Very often
Sometimes
Not at all

I get a sort of frightened feeling like ”butterflies” in the stomach:
Not at all
Occasionally
Quite often
Very often

I have lost interest in my appearance:
Definitely
I don’t take as much care as I should
I may not take quite as much care
I take just as much care as ever

I feel restless as if I have to be on the move:
Very much indeed
Quite a lot
Not very much
Not at all

I look forward with enjoyment to things:
As much as I ever did
Rather less than I used to
Definitely less than I used to
Hardly at all

I get sudden feelings of panic:
Very often indeed
Quite often
Not very often
Not at all

I can enjoy a good book or radio or TV programme:
Often
Sometimes
Not often
Very seldom

Source: Zigmond and Snaith, 1983. From 'The Hospital Anxiety and Depression Scale,' *Acta Psychiatrica Scandinavica 67,* 361-70.

Appendix J – Intolerance of Uncertainty Scale

INTOLERANCE TO UNCERTAINTY SCALE (IUS)

You will find below a series of statements which describe how people may react to the uncertainties of life. Please use the scale below to describe to what extent each item is characteristic of you. Please circle a number (1 to 5) that describes you best.

Not at all characteristic of me Somewhat characteristic of me Entirely characteristic of me

1 2 3 4 5

1. Uncertainty stops me from having a firm opinion
2. Being uncertain means that a person is disorganized
3. Uncertainty makes life intolerable
4. It's unfair not having any guarantees in life
5. My mind can't be relaxed if I don't know what will happen tomorrow
6. Uncertainty makes me uneasy, anxious or stressed
7. Unforeseen events upset me greatly
8. It frustrates me not having all the information I need
9. Uncertainty keeps me from living a full life
10. One should always look ahead so as to avoid surprises
11. A small, unforeseen event can spoil everything, even with the best of planning
12. When it's time to act, uncertainty paralyses me
13. Being uncertain means that I am not first rate
14. When I am uncertain, I can't go forward
15. When I am uncertain, I can't function very well
16. Unlike me, others always seem to know where they are going with their lives
17. Uncertainty makes me vulnerable, unhappy or sad
18. I always want to know what the future has in store for me
19. I can't stand being taken by surprise
20. The smallest doubt can stop me from acting
21. I should be able to organize everything in advance

22. Being uncertain means that I lack confidence
23. I think it's unfair that other people seem sure about their future
24. Uncertainty keeps me from sleeping sound
25. I must get away from all uncertain situations
26. The ambiguities in life stress me
27. I can't stand being undecided about my future

Origianl French Version: Freeston, M.H., Rhéaume, J., Letarte, H., Dugas, M.J., & Ladouceur, R. (1994): Why do people worry? *Personality and Individual Differences*, 17 (6), 791-802.

English Version: Buhr, K., & Dugas, M. J. (2002). The intolerance of uncertainty scale: psychometric properties of the English version. *Behavior Research and Therapy*, 40 , 931-945.

Appendix K – Personal Relevance Ratings for Word Categories

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Personal relevance of words

During the computer task, you saw various words. Below, these words have been put into three groups. Please take a look at each group of words. Then, place a mark on the line to indicate how relevant each group is to **current worries or concerns** you are having.

betray disaster deadly bomb hatred guilty blade accuse annoy punishment destruction sin guilt disturb infect

Barely relevant at all — Extremely

alarm anxiety cancer choke injure bullet fight rejection sickness poison bleed surgery hostile aggressive tumour

Barely relevant at all — Extremely

chimney avenue courtyard donate butterfly enzyme fabric arch basin ballet ankle bucket flower breeze ease elbow blanket copper basket concrete cupboard butter gentle ceiling corridor apple grace carpet custom cottage

---

Barely relevant at all

Extremely

Appendix L – Stimulus Words

NEUTRAL Words

Word	Arousal	Frequency	Length
chimney	3.46	916	7
avenue	4.12	943	6
courtyard	4	953	9
donate	4.48	956	6
butterfly	3.47	1136	9
enzyme	4.34	1214	6
fabric	4.37	1245	6
arch	4.37	1248	4
basin	3.83	1314	5
ballet	4	1340	6
ankle	4.16	1363	5
bucket	4.17	1401	6
flower	3.36	1411	6
breeze	4.37	1455	6
ease	2.29	1531	6
elbow	3.59	1533	3
blanket	3.41	1545	7
copper	3.61	1656	6
basket	3.63	1658	6
concrete	4.03	1728	8
cupboard	3.83	1933	8
butter	3.17	2044	6

gentle	4.31	2205	6
ceiling	4.04	2715	7
corridor	3.63	2798	8
apple	4.17	2996	5
grace	3.93	3082	6
carpet	3.66	3104	6
custom	4.66	3276	6
cottage	3.39	3422	7

OCD Words

Word	**Arousal**	**Frequency**	**Length**
betray	7.24	1310	6
disaster	6.33	3318	8
deadly	6.62	865	6
bomb	7.15	1202	4
hatred	6.66	1076	6
guilty	6.04	4233	6
blade	6.07	1442	5
accuse	6.57	4047	6
annoy	5.52	1116	5
punishment	5.93	2418	10
destruction	5.82	2341	11
sin	5.78	1851	3
guilt	5.36	1667	5
disturb	5.8	2574	7
infect	5.38	834	6

GAD Words

Word	Arousal	Frequency	Length
alarm	7.36	2322	5
anxiety	6.72	3129	7
cancer	6.42	4323	6
choke	6.34	862	5
injure	5.53	2617	6
bullet	5.33	1227	6
fight	7.15	3429	5
rejection	6	1484	9
sickness	5.61	1233	8
poison	6.05	1014	6
bleed	5.64	896	5
surgery	6.35	2764	7
hostile	6.44	1644	7
aggressive	5.83	1925	10
tumour	6.51	1560	6

Appendix M- Instructions for Emotional Go/No Go Task

General instructions, displayed at the start of experiment:
In this experiment, you will be shown some words, one at a time. Your task is to press the space bar when you see a word of a certain kind. Before each section of the experiment, you will be informed which kind of words you need to respond to.

The phrase 'END OF BLOCK' will appear on the screen after every 15 words. Instructions for the next 15 words will then appear.

If you have any questions about the experiment, please ask now.

Press any button to start.

Prior to blocks in which Neutral words were the Go trials, the below instructions were displayed:
In this block, press the spacebar as soon as you see a **NEUTRAL** word (e.g. arch, basin, copper). Do not press any key when you see a threatening word (e.g. guilt, annoy, alarm). Respond to neutral words as fast and accurately as possible.

Press any button to begin.

Prior to blocks in which Threat words were the Go trials, the below instructions were displayed:
In this block, press the spacebar as soon as you see a **THREATENING** word (e.g. guilt, annoy, alarm). Do not press any key when you see a neutral word (e.g. arch, basin, copper). Respond to threatening words as fast and accurately as possible.

Press any button to begin.

Appendix N- Counterbalanced orders of Emotional Go/No Go Task

Order 1

	Go Trials	Words included in block
Block 1	GAD	GAD1-11, N1-4
Block 2	N	N5-15, GAD12-15
Block 3	N	N16-26, GAD1-4
Block 4	GAD	GAD5-15, N27-30
Block 5	OCD	OCD1-11, N1-4
Block 6	N	N5-15, OCD12-15
Block 7	N	N16-26, OCD1-4
Block 8	OCD	OCD5-15, N27-30

Order 2

	Go Trials	Words included in block
Block 1	N	N1-11, GAD1-4
Block 2	GAD	GAD5-15, N12-15
Block 3	GAD	GAD1-11, N16-19
Block 4	N	N20-30, GAD12-15
Block 5	N	N1-11, OCD1-4
Block 6	OCD	OCD5-15, N12-15
Block 7	OCD	OCD1-11, N16-19
Block 8	N	N20-30, OCD12-15

Order 3

	Go Trials	Words included in block
Block 1	GAD	GAD1-11, N1-4
Block 2	N	N5-15, GAD12-15
Block 3	N	N16-26, OCD1-4
Block 4	OCD	OCD5-15, N27-30
Block 5	OCD	OCD1-11, N1-4
Block 6	N	N5-15, OCD12-15
Block 7	N	N16-26, GAD1-4
Block 8	GAD	GAD5-15, N27-30

Order 4

	Go Trials	Words included in block
Block 1	N	N1-11, GAD1-4
Block 2	GAD	GAD5-15, N12-15
Block 3	OCD	OCD1-11, N16-19
Block 4	N	N20-30, OCD12-15
Block 5	N	N1-11, OCD1-4
Block 6	OCD	OCD5-15, N12-15
Block 7	GAD	GAD1-11, N16-19
Block 8	N	N20-30, GAD12-15

Order 5

	Go Trials	Words included in block
Block 1	OCD	OCD1-11, N1-4
Block 2	N	N5-15, OCD12-15
Block 3	N	N16-26, GAD1-4
Block 4	GAD	GAD5-15, N27-30
Block 5	OCD	OCD1-11, N1-4
Block 6	N	N5-15, OCD12-15
Block 7	N	N16-26, GAD1-4
Block 8	GAD	GAD5-15, N27-30

Order 6

	Go Trials	Words included in block
Block 1	N	N1-11, OCD1-4
Block 2	OCD	OCD5-15, N12-15
Block 3	GAD	GAD1-11, N16-19
Block 4	N	N20-30, GAD12-15
Block 5	N	N1-11, OCD1-4
Block 6	OCD	OCD5-15, N12-15
Block 7	GAD	GAD1-11, N16-19
Block 8	N	N20-30, GAD12-15

Order 7

	Go Trials	Words included in block
Block 1	OCD	OCD1-11, N1-4
Block 2	N	N5-15, OCD12-15
Block 3	N	N16-26, GAD1-4
Block 4	GAD	GAD5-15, N27-30
Block 5	GAD	GAD1-11, N1-4
Block 6	N	N5-15, GAD12-15
Block 7	N	N16-26, OCD1-4
Block 8	OCD	OCD5-15, N27-30

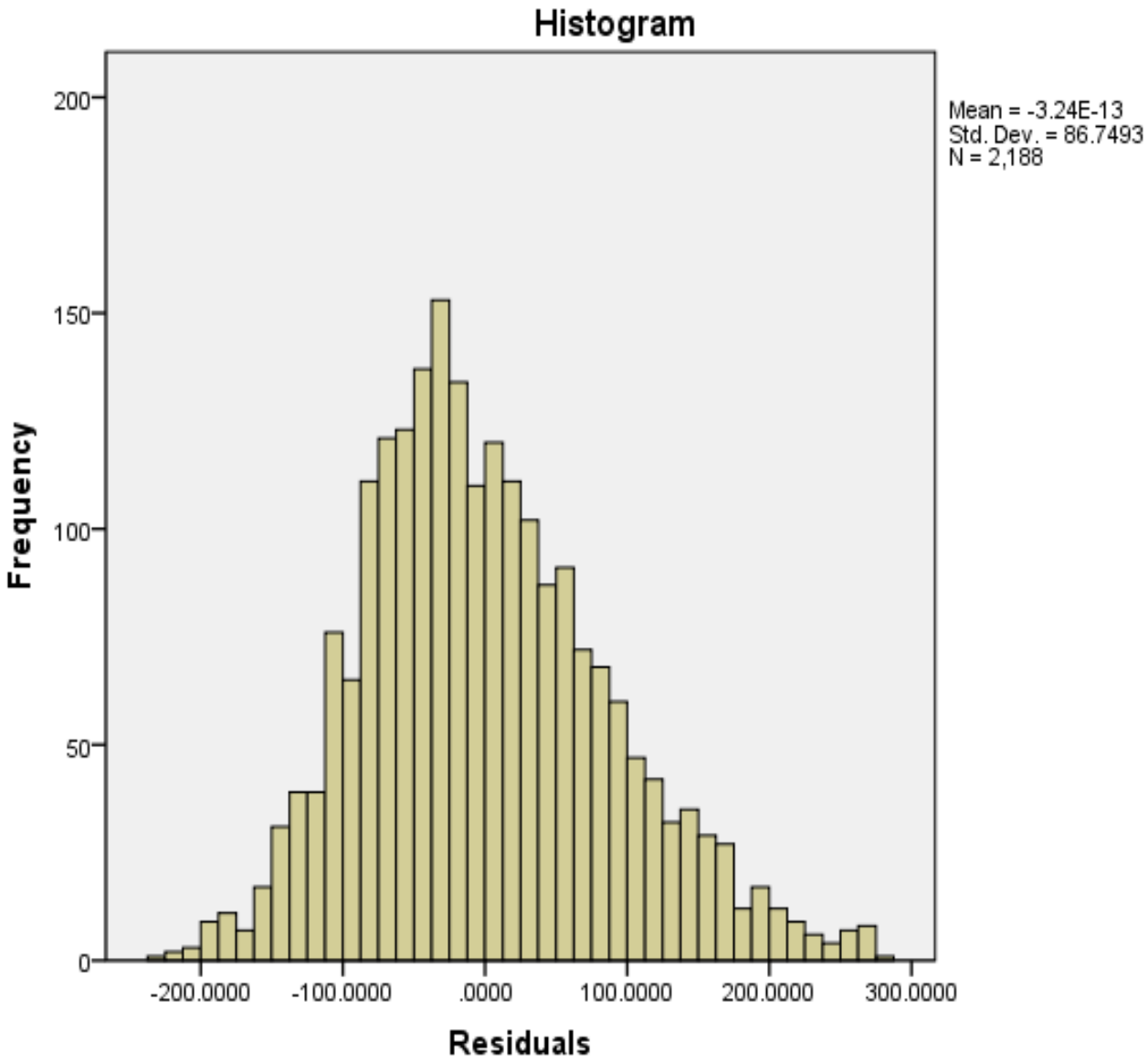
Order 8

	Go Trials	Words included in block
Block 1	N	N1-11, OCD1-4
Block 2	OCD	OCD5-15, N12-15
Block 3	GAD	GAD1-11, N16-19
Block 4	N	N20-30, GAD12-15
Block 5	N	N1-11, GAD1-4
Block 6	GAD	GAD5-15, N12-15
Block 7	OCD	OCD1-11, N16-19
Block 8	N	N20-30, OCD12-15

Appendix O- Histograms showing distribution of residuals for each word category

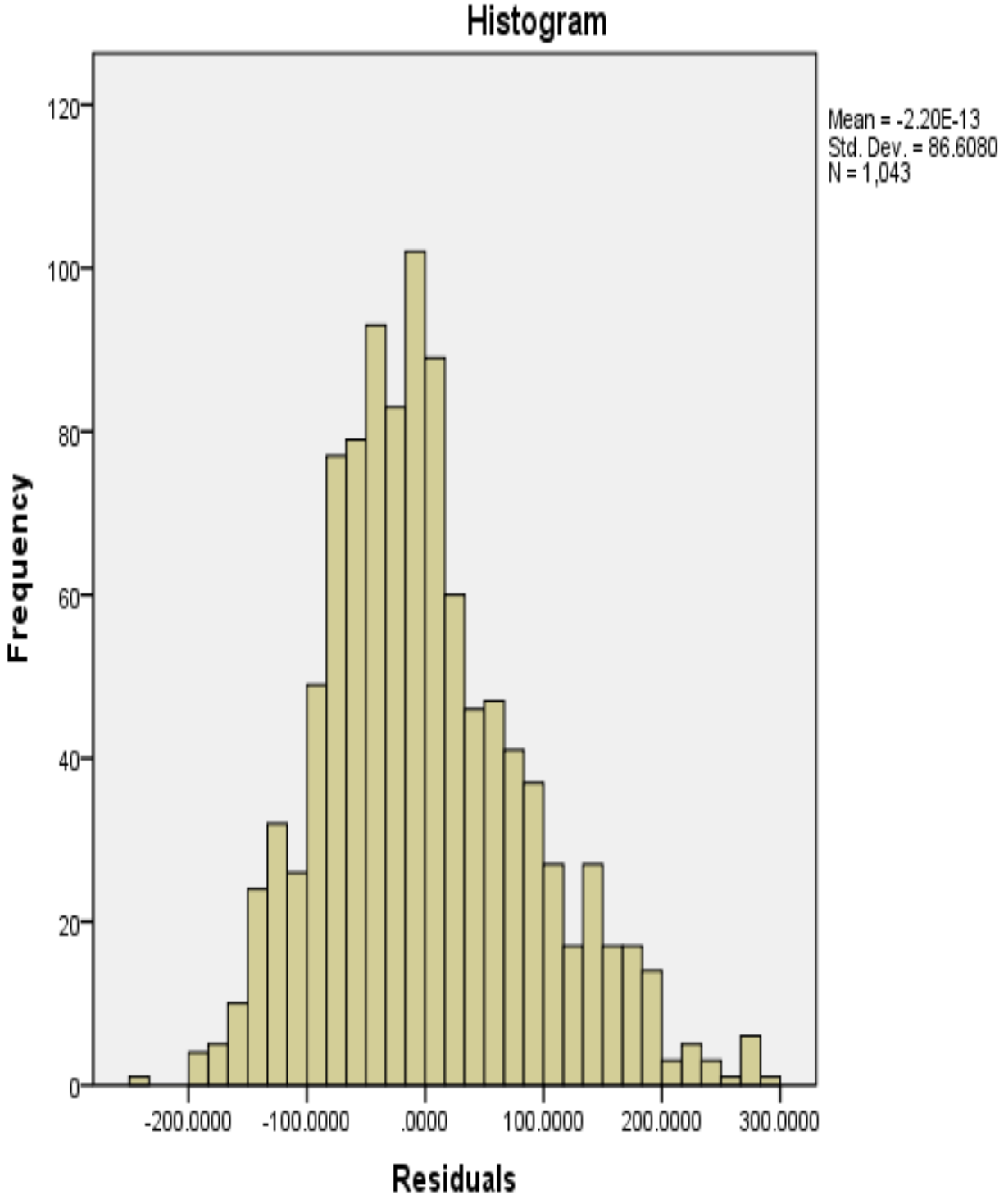
NEUTRAL WORDS

Histogram of distribution of residuals from mixed modeling, when RTs to Neutral words is the dependent variable.



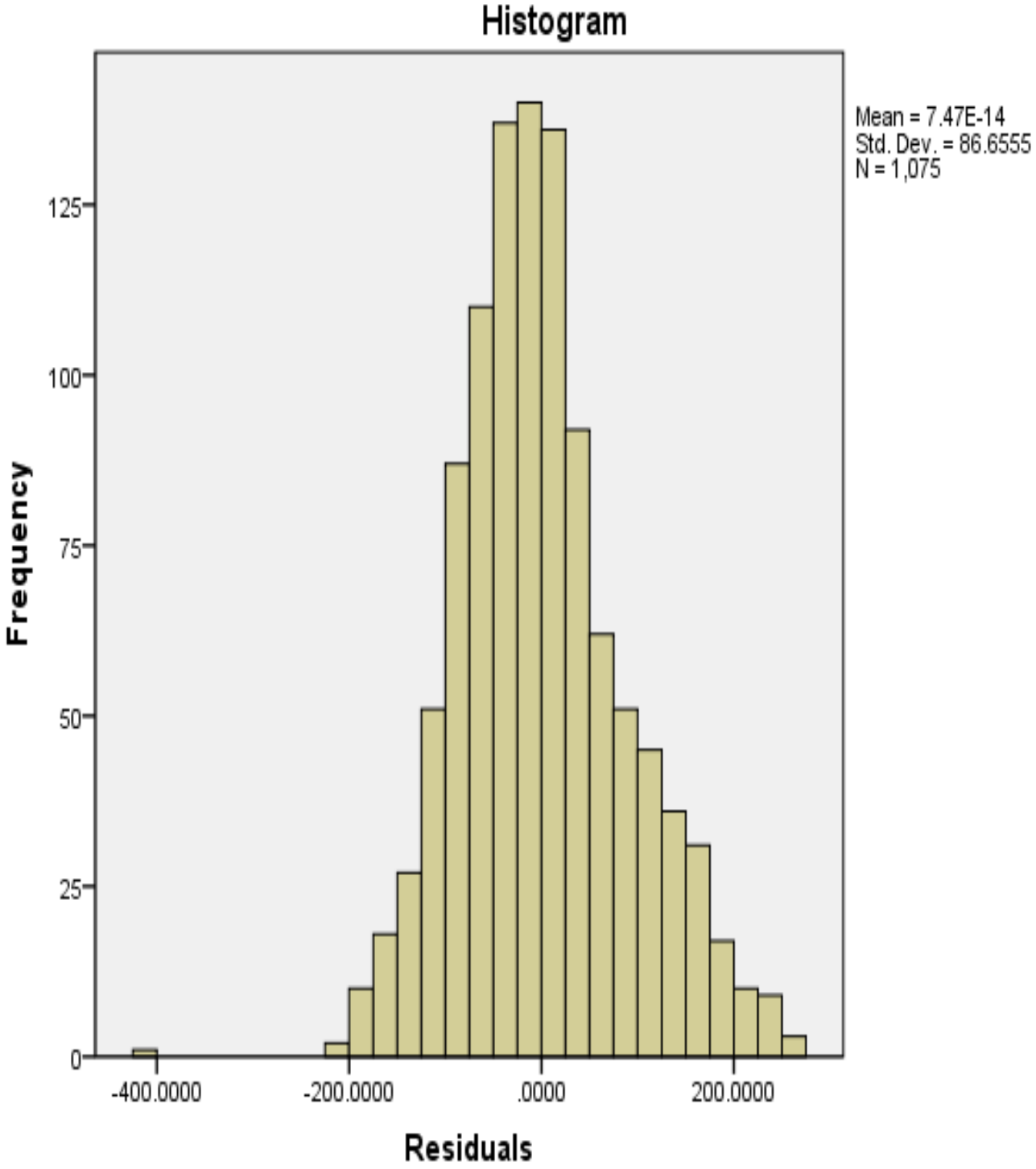
GAD WORDS

Histogram of distribution of residuals from mixed modeling, when RTs to GAD words is the dependent variable.



OCD WORDS

Histogram of distribution of residuals from mixed modeling, when RTs to OCD words is the dependent variable



APPENDIX P- REFLECTIVE STATEMENT

Reflective Statement

Background

Before starting the Doctorate, I was interested in the notion that psychological processes common to everyone are intensified or exaggerated in people who experience mental distress, rather than being categorically 'different'. The general idea of studying a psychological process therefore appealed to me, even before choosing a specific topic area. In then receiving teaching on models of Generalised Anxiety Disorder, I was interested to learn about the IU construct. I think I was dimly aware that my interest was partly sparked by recognising that, in some ways, I could be quite intolerant of uncertainty myself.

I also had an attraction to experimental designs, which influenced the shape my empirical project took. I think I preferred to have a measurable behavioural response in addition to any self-report data I might collect. These two inclinations set the context for both formulating my research question and, later, methodological considerations; I wanted to study IU preferably using some sort of experimental procedure.

Research question

Having picked IU as the general area, I attempted to investigate gaps in the literature through literature searches. Several ideas for adding to the literature on the Intolerance to Uncertainty Model arose from these searches. My two main ones towards the beginning concerned experimentally manipulating mood to see if that would affect levels of IU and further researching if/how IU was involved in difficulties other than generalised anxiety. As it stands, elements of that latter line of thinking ended up being incorporated into the empirical paper, through the use of two threat categories. However, after realising that (at the time) no studies had been published on IU and possible attentional biases, this became my main focus. It built on extant research relating IU to threat, extending this to another cognitive domain. Research supervision was invaluable at

this stage, as I quickly realised I kept wanting to jump ahead to the next stage, when more time was needed to properly think through design factors most pertinent to my research questions. Having decided to look at attention, I had the advantage of having various well-known experimental paradigms at my disposal. The flipside of that was having to familiarise myself with a large literature to work out what kind of experiment would best suit my research objectives.

Design and planning

Initially, I had planned to use the dot-probe task to investigate a potential attentional bias, as I was already vaguely familiar with this task and knew it to be well-established. Helpfully, feedback I received on my final research proposal made me re-evaluate the suitability of this task and steered me into making internal reliability assessment part of my aims. In looking at other kinds of tasks, I came across the Emotional Go/No Go Task, which appeared well-suited to my research objectives. However, deciding how exactly the task should be set up by looking at past research took more time and thinking than I had anticipated. For example, simply choosing stimulus materials turned out to be a mini-project in itself. Realising just how many variables existed, all of which could influence participant's responses, was somewhat disheartening at the time. However, it then led to an acceptance of this inherent limitation, no matter how rigorously one tries to control all relevant variables. Using theory to justify all decisions along the way, e.g. regarding word selection and experimental design such as number of blocks, their order, stimulus timings, counterbalancing etc really crystallised how choice of methodology can affect results. Around the same time I started to think about how the internal reliability of the task could be measured. This involved learning more about what this usually means in psychometric questionnaire research and, considering the nature of the data, whether this method was suitable to the Emotional Go/No Go task.

That the EGNGT had not been used in the way I was intending to use it was simultaneously exciting and nerve-racking. Entering fine-grain levels of analysis to

consider all relevant methodological issues seemed far removed from psychological theories and it was sometimes a struggle to remember the bridge between the two. Reflecting on it now, the continuous flitting between macro- and micro- thinking was probably a useful experience to have had.

Epistemological statement

The last point about relating methodological issues to psychological concepts speaks to the epistemological attitude usually associated with experimental research. My empirical project might best be described as positivist and nomothetic, in that I have tried to 'discover' a relationship in a set of data and then apply this general trend to individuals, who are all unique. Although the empirical project is perhaps best characterised in this way, I fully appreciate the limitations of this approach, especially in its relative inability to capture subjective, phenomenological features of experience, which are equally relevant.

Data collection

It was refreshing to meet participants and have them partake in my study; a welcome break from the desk-job planning phase. Meeting with participants and being asked questions about the research really kept me motivated and more emotionally, I was incredibly grateful to have so many willing participants, who gave up their time to complete the study.

Results

Even though there may have been various reasons for the null result, it was disappointing to not obtain the relationship I had hypothesised. However, as part of my aims were to speak to the reliability of a particular experimental paradigm, I am content my research was able to do so.

Systematic Literature Review

With the literature review, devising a research question, deciding on eligibility criteria of studies and devising a novel quality assessment checklist were the first phases. Then, reading the studies in so much detail and deconstructing them really gave me an insight not just into the validity of the findings but also something of the researcher's beliefs and attitudes towards building theories to explain psychological distress, which I found illuminating. It made me reflect on how clinical hunches, using empirical tools, become translated into theories which become internalised schemas for filtering clinical material during sessions. This made me appreciate anew the importance of remaining critically engaged with the ideas that therapies are built on. In analysing studies, there was also a fairly steep learning curve in properly understanding some of the statistical analyses used. Whilst I found this challenging, it is now useful to have a better understanding of more sophisticated types of statistical analyses and their research uses. On the whole, the literature review provided me with a wealth of perspectives on how measurable constructs might relate to states of distress, which was helpful in diversifying my thinking.

Summary

Ultimately, I learned a lot about research and my approach to a long-term project that I was unaware of. By having to carefully think through every step of my research, I have gained a very useful transferable skill that I am sure I will be to apply in various ways during my career. Time management was crucial in all of it and I would probably have benefitted from setting myself the occasional deadline, which is something to bear in mind for similar situations in the future. Although I had heard from others how much time and energy it took to thoroughly plan, conduct and understand a piece of research, I do not think it was possible to truly appreciate this other than through actually doing it. A major lesson has been to feel comfortable in taking enough time to plan research, to ensure a smoothly running project later on.