EXAMINING SYSTEMATIC INFORMATION PROCESSING AS A MECHANISM OF PERSEVERATIVE WORRY

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Thesis submitted for the degree of Doctor of Philosophy

University of Sussex

Statement

I hereby declare that this thesis has not been, and will not be, submitted in whole or in part to another University for the award of any other degree.

Suzanne Dash

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Preface

Data from this thesis has been published in the following article:

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Summary

The mechanisms accounting for how negative mood, intolerance of uncertainty (IU), and low problem-solving confidence (PSC) increase worrying are poorly understood. One possibility is that these variables result in a detailed, analytical, and cognitively demanding form of information processing, known as systematic processing. This thesis examines whether worry promoters (negative mood, IU, and low PSC) increase an individual's likelihood of deploying systematic processing. Furthermore, the impact of these variables on threat perception and coping beliefs – factors affecting both worry and systematic processing – is explored. Six studies were conducted. The first five utilised experimental manipulations of mood, IU and PSC, whilst the sixth used questionnaires. Systematic processing deployment was indexed by sufficiency threshold measures (confidence that processing goals are satisfactorily accomplished) and a questionnaire.

- Participants induced into a negative mood had raised sufficiency thresholds; they were more likely to deploy systematic processing
- High IU and low PSC manipulations did not *cause* an increase in the likelihood of using systematic processing, but these variables *correlated* with an increased likelihood of deploying systematic processing
- Only negative mood correlated with increased threat perception when regression analyses were conducted controlling for each of the worry promoters
- All three worry promoters correlated with decreased threat coping beliefs
- A small negative correlation was found between worry and systematic processing
- PSC showed some construct overlap with systematic processing.

Consequently, negative mood states may encourage individuals to systematically process threats that they perceive. But worry is also defined by IU and low PSC, factors which diminish self-efficacy appraisals in the form of coping beliefs. These low coping beliefs may serve to dissuade the individual from typically deploying cognitively demanding systematic processing. The implications of these findings are discussed in terms of the role of systematic processing as a mechanism of perseverative worry.

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Common Abbreviations

For ease of reference, frequently used abbreviations are listed below.

AMA	‘as many as can’
ANOVA	analysis of variance
CI	catastrophising interview
GAD	Generalized Anxiety Disorder
HSM	heuristic-systematic model
IU	intolerance of uncertainty
MEPS	Means-Ends Problem-Solving
NFC	need for cognition
PSC	problem-solving confidence
PSWQ	Penn State Worry Questionnaire
VAS	visual analogue scale

An extract from ‘The Battle’

She had to break into the prison where Hope was held hostage by Desperation and free Energy from the grip of Lethargy. These two generals would surely round up the rest of the troops, among them Activity, Achievement and Ambition. They might even mobilise the neighbouring warlords Love, Laughter and Liveliness.

The battlefield is bleak and surreal, like a Dali desert. Each side advances with alarming speed. Doubt confers with Inadequacy and they join forces to attack Self-belief. Guilt earmarks Enjoyment in the line-up. On the other side of the field, Sociability makes a bee-line for Isolation and Cheerfulness gives Grumpiness the finger.

At first glance their numbers seem evenly matched, but as they clash together with a whirring of weapons and war-like shouts an advantage becomes clear. The army of Desperation is fragmented, each fighting for their own selfish ends. They brawl with anything they can get their hands on and distract themselves with their own anarchical destruction.

The armies of Hope and Energy remain focused and united, sallying forward with Courage and Determination at the vanguard. Happiness, the elusive monarch, too fragile to fight, waits and prays at the rear. His bishop Faith stands beside him asking the heavens for victory today. Someone seems to be listening. The battlefield becomes more animated, the sullen sky parts to reveal a glint of blue. The ghosts of Happiness’ predecessors gain vibrancy and breathe again. These monarchs of the past march down Memory hill to spread the word. Hope’s army has been joined by Confidence, that indefinable deal-breaker.

The rout is over as soon as it is started. Lethargy limps off as fast as his languid legs will carry him. Desperation ignominiously flees with a flesh wound. Worry, that slippery turncoat, is taken as a prisoner of war, but will manage to sweet-talk his way to freedom in an hour or two. The battle is won, the enemies are fled and the exhausted soldiers retire to the taverns to celebrate. Humour and Amusement, the ever genial landlords keep the drinks topped up with Hope’s special brew and Laughter puts on a cabaret. No one has noticed Worry slip away into the night.

1 The what, who, when and why of worrying

"*Worry – a God, invisible but omnipotent. It steals the bloom from the cheek and lightness from the pulse; it takes away the appetite, and turns the hair gray*" – Benjamin Disraeli

1.1 General Overview

This thesis opens with an overview of the phenomenon of worry, with particular focus on the role of negative mood, intolerance of uncertainty (IU), and problem-solving confidence (PSC) in worry perseveration. Chapter Two details a different literature, that of systematic and heuristic information processing, and outlines the potential role of information processing styles in perseverative worry. Chapter Three covers the methodological approaches used to study worry and manipulate factors relevant to the worry process. Chapters Four to Eight contain the experimental work conducted for this thesis. Finally, in the general discussion in Chapter Nine, the experimental findings are summarized and integrated with existing theoretical models, before closing with a discussion of the limitations of the work, and suggestions for future research.

1.2 Introduction

This chapter has two purposes. Firstly, it aims to provide an overview of the nature of worry and its significance in psychopathology, most notably Generalized Anxiety Disorder (GAD). Secondly, it introduces the three main independent variables in this thesis (the 'worry promoters'[1]: negative mood, IU, and low PSC) and explores accounts of their role in worry. This provides a framework for the discussion in Chapter Two considering whether systematic processing could be a mechanism between these three key variables and worry perseveration.

1.3 Worry and psychopathology

Worry is something we all do from time to time. The general population has a good understanding of what someone means when they say that they are worried. Alongside depression, the term 'worry' is perhaps the most widely used psychopathology term by lay people. Academically and clinically, worry has been defined as "a chain of thoughts and images, negatively affect-laden and relatively uncontrollable" (Borkovec, Robinson, Pruzinsky,

[1] Throughout this thesis, negative mood, intolerance of uncertainty and low problem-solving confidence are jointly referred to as 'worry promoters', both for ease of expression and to reflect research showing that these variables increase worry levels

& DePree, 1983). Later definitions of worry incorporate problem-solving, e.g., "[worry] is seen as a constructive and appropriate task-oriented process that contributes to the solving of problems and the reduction of anxiety" (Borkovec, et al., 1983; Davey, 1994b, p. 327). The latter interpretation supports the dimensional nature of worry; worry is something that most people experience to a greater or lesser extent. Nonetheless, for some individuals worrying is highly distressing (Vasey & Borkovec, 1992).

Initially, some researchers and clinicians considered worry to be little more than the cognitive component of anxiety (e.g. O'Neill, 1985). However, the inclusion of worry as the cardinal symptom of GAD in the third revised edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III; American Psychiatric Association, 1987), catapulted the status of worry to a phenomenon of interest, and research into worry blossomed. Davey (1993b) demonstrated that worry has its own cognitive profile, characterised by information-seeking, a monitoring cognitive style, and avoidant coping behaviours. Furthermore, worry scores were independent of trait anxiety. Davey, Hampton, Farrell and Davidson (1992) elucidated the differences between trait anxiety and worry. They found that worry correlates with adaptive problem-focused coping strategies and information processing, while trait anxiety correlates with low PSC, poor perceived personal control, taking responsibility for negative outcomes, heightened threat interpretations, and avoidant coping styles.

A diagnosis of GAD is made if an individual presents with excessive worry that has occurred for more days than not during the past six months. The individual must report difficulties controlling worry, and experience three of the following on more days than not during the past six months: restlessness, feeling tired after less exertion than previously, concentration difficulties, irritability, muscle tension, and sleep difficulties. The worry must cause significant distress, and not be solely confined to another Axis I disorder subject matter (e.g., worries about cleanliness in an individual with Obsessive-Compulsive Disorder) (American Psychiatric Association, 2000, DSM-IV-TR, 4th ed., text rev.). High worriers with GAD differ from high worriers without GAD in that those with GAD experience more negative intrusions, have less belief in their ability to remember things, possess more superstitious beliefs about the power of worry, and have raised beliefs about the danger and uncontrollability of worry (Ruscio & Borkovec, 2004).

GAD is highly comorbid with other psychological disorders. Bruce, Machan, Dyck and Keller (2001) report that comorbidity occurs in two-thirds of GAD cases. In their study, only

one participant out of 20 “pure” GAD patients remained free of comorbid conditions through eight years of follow-up. Brown, Campbell, Lehman, Grisham, and Mancill (2001) found that 20% of individuals with an anxiety disorder had comorbid GAD. In terms of mood disorders, Brown et al. (2001) report that 14% of individuals with Dysthymia have comorbid GAD, as do 25% of those with Major Depressive Disorder. These comorbidity figures do not take into account worry that occurs only in the context of a mood disorder (DSM-IV-TR prohibits a GAD diagnosis in these cases), and when such cases are included, comorbidity estimates rise to 57%. Clearly, worry is an issue for many people experiencing psychological difficulties, and is not limited to those with GAD.

Purdon and Harrington (2006) reviewed the role of worry in psychological disorders beyond GAD. They report that it plays a role in the anxious apprehension surrounding social and performance situations seen in Social Anxiety, in the concerns about Panic Attack symptoms in Panic Disorder, and in the fears about bodily symptoms in Hypochondriasis. Furthermore, worry has been implicated in checking and doubting subtypes of Obsessive-Compulsive Disorder (Tallis & DeSilva, 1992). Worry also predicts treatment outcomes in psychosis. Individuals with persecutory delusions report greater worry as measured by the Penn State Worry Questionnaire (PSWQ) (Meyer, Miller, Metzger, & Borkovec, 1990) and also higher levels of anxiety measured using the Beck Anxiety Inventory (Beck, Epstein, Brown, & Steer, 1988), compared to non-clinical controls. Worry and anxiety significantly predicted persecutory delusions at three-month follow-up, with those scoring higher on measures of worry and anxiety at baseline showing less symptom improvement (Startup, Freeman, & Garety, 2007).

High levels of worry do not always occur within the context of GAD. Ruscio (2002) reported that non-GAD high worriers far outnumber high worriers with GAD. Kertz and Woodruff-Borden (2011) found that individuals who exhibit high levels of worry (whether with GAD, with sub-threshold GAD, or without a GAD diagnosis) report poorer physical health, greater levels of stress, and increased sleep difficulties, compared to a control group who did not experience worry or GAD symptomatology. The GAD and sub-threshold GAD groups were indistinguishable on the measures of health, stress, or sleep. Worriers were also twice as likely as non-worriers to report inadequate social support. Given the similarities in the human cost to worriers with or without a diagnosis of GAD, it is important to understand worry beyond the GAD context.

1.4 The nature of worry thoughts

1.4.1 Negative thoughts

Worry predominately consists of negative thoughts, and is rarely experienced as images (e.g. Borkovec, Ray, & Stöber, 1998). Stokes and Hirsch (2010) explored the impact of processing worry using verbal mentation (typical of worry) or imagery mentation (atypical). High worriers who used verbal processing showed a significant increase from time 1 (baseline) to time 2 (after a mentation training phase and a five-minute worry period) in the number of negative cognitive intrusions that they experienced during a five-minute breathing focus period. Conversely, those who had used imagery processing showed a significant decrease in the number of negative intrusions that they experienced. This shows that verbal processing may also maintain, and even increase, negative thoughts.

1.4.2 Worry content

There is conflicting data regarding the topics that worriers worry about. Craske, Rapee, Jackel and Barlow (1989) found that participants with GAD worried more about illness, health, and injury than those without GAD. Sanderson and Barlow (1990) reported that the most common worry themes in people with GAD are family, finances, work and personal illness. Research has moved away from studying the content of worry to studying processes involved in worrying, which is likely to be more useful in determining effective treatments given the heterogeneity found in terms of worry content. Dugas, Freeston, Ladouceur, Rhéaume, Provencher and Boisvert (1998) suggest that the change in focus away from worry content is partly because the DSM-IV criteria for GAD dropped the DSM-III-R criterion that the individual worries about two or more topics. Dugas et al. (1998) also suggest that this change in focus may be attributable to the fact that worry content does not reliably discriminate individuals with pathological versus normal worry experiences. A fairly consistent finding, however, is that worriers generate more worry topics when asked what they worry about (e.g. Hoyer, Becker, & Roth, 2001; Roemer, Molina, & Borkovec, 1997). Dugas et al. (1998) also demonstrated that worriers were more likely to worry about things in the future, particularly remote future events (e.g., their child becoming seriously unwell). Based on the principles of metacognitive theories of emotional disorders, Wells (1995) developed a metacognitive model of worry. The metacognitive model distinguishes between worries (Type 1) and appraisals of worrying (Type 2). An additional distinction is made between metacognitions that are positive beliefs about worry (e.g., ‘worrying keeps me in

control') and negative beliefs about worry (e.g., 'my worrying could make me go mad'), which includes worrying about worrying (meta-worry). Type 2 worry is evident in chronic worriers (Wells, 1994, 1995).

1.4.3 Anticipating threat and solving problems

Worry thoughts commonly involve negative outcome anticipation and attempts at problem-solving. Szabó and Lovibond (2002) used a diary-based approach to examine worry content. Content analysis demonstrated that approximately 20% of the worries listed were related to negative outcome anticipation and approximately 50% were related to problem-solving. This suggests that once the worry process is initiated, individuals anticipate negative outcomes, but then spend significantly longer generating possible solutions to these potential negative outcomes. The relative amount of negative outcome anticipation versus problem-solving content did not vary as a function of worry severity. This provides further support for the notion that high and low levels of worry differ in quantity but have less qualitative differences than a categorical model would suggest.

1.4.4 Catastrophising

During a worry bout, individuals typically generate thoughts about progressively worse outcomes, a process known as catastrophising, which is usually the result of pondering 'what if…?' questions (Kendall & Ingram, 1987). Breitholtz, Westling, and Öst (1998) found that individuals with GAD were significantly more likely to report experiencing thoughts related to mental catastrophes when feeling anxious than individuals with panic disorder. Vasey and Borkovec (1992) considerably advanced the study of catastrophising by developing the catastrophising interview (CI) (see also Davey, 2006a). In this interview, the experimenter begins by asking "What is it that worries you about X?" where X is the participant's current main worry. The experimenter repeats the question, substituting X with the participant's answer to the first question, and so on. For more information on the CI, see Chapter 3 (Section 3.2.2). Vasey and Borkovec (1992) found that worriers generated significantly more catastrophising steps than non-worriers. Furthermore, worriers experienced increased emotional discomfort as the CI progressed whereas non-worriers did not experience a change in emotional discomfort. However, it should be noted that Vasey and Borkovec (1992) did not control for the CI length, and as such, this effect may reflect that increased catastrophising is related to greater distress, rather than a difference in the way in which worriers react to catastrophic thoughts. Davey and Levy (1998b) found that worriers had a general iterative

thinking style as they engaged in catastrophising (perceiving progressively more extreme consequences) for both negative and positive topics. Worriers were also able to catastrophise a new hypothetical worry topic ('being the Statue of Liberty'), which they had no previous experience worrying about. Therefore they could not have 'practised' thoughts about potentially negative outcomes. This finding counters Vasey and Borkovec's (1992) suggestion that worriers generate more steps during the CI because they have more ready available access to memory stores of answers to 'what if..?' questions than non-worriers.

1.4.5 Themes of personal inadequacy

Davey and Levy (1998b) demonstrated that personal inadequacy commonly emerges as a theme in the worries of high worriers. They found worriers frequently couched their catastrophising steps in terms of personal inadequacy, such as "I'll never be the best at anything", "being at the end of my life with no future ahead and not having achieved very much" (Davey & Levy, 1998b, p.582). Davey and Levy (1998a) examined the types of statements associated with catastrophic worrying. They created a questionnaire by asking individuals to list the kinds of thoughts they had when they were thinking about something that made them feel worse. Using factor analysis, they determined that catastrophising is associated with four kinds of internal statements: (1) problem-specific pessimism, e.g., "There just seems to be no solution to this problem"; (2) personal inadequacy/incompetence, e.g., "Everyone can do better than me"; (3) personal despair/hopelessness, e.g., "How will I manage?"; and (4) need to analyse the problem, e.g., "I must consider all the options associated with this problem" (Davey & Levy, 1998a, p.24). These four factors predicted PSWQ scores after controlling for anxiety, depression, PSC and control, suggesting that the internal statements associated with catastrophising are an important part of pathological worry.

1.5 Prevalence and epidemiology of worry

1.5.1 Worry frequency

In a sample consisting of adults and students, 38% reported worrying everyday (Tallis, Davey, & Capuzzo, 1994). The mean worry duration was 5-10 minutes, but some respondents endorsed fleeting worries, while others experienced worries that lasted one-two hours. Forty-two percent of Tallis et al.'s (1994) participants were aware of their worries

occurring at specific times of day. The most frequently endorsed times of worry were 9pm-midnight (32.8%) and midnight-3am (25.9%).

1.5.2 Rates of pathological worry

Assessing precise rates of GAD prevalence is complicated by the changing diagnostic criteria of GAD between the third DSM edition (American Psychiatric Association, 1987) and the current diagnostic criteria (American Psychiatric Association, 2000). Nonetheless, Holaway, Rodebaugh and Heimburg (2006) reviewed the rates of GAD in international population-based surveys, and found an average current rate of 2.03% (range: 0.8%-3.7%), an average 12-month prevalence rate of 2.98% (range: 1.1%-5.1%), and an average lifetime prevalence of 4.99% (range: 1.4%-11.1%).

1.5.3 The worry spectrum

Worry can be a distressing, uncontrollable, catastrophic, perseverative process, but as demonstrated by the high frequency of worry in individuals for whom it does not reach pathological proportions, the worry process can also be normal (e.g., a coping strategy used to assist in problem-solving). Ruscio, Borkovec and Ruscio (2001) demonstrated using taxometric analytic methods that normal and pathological worry are best conceptualized as occupying extreme ends of a single continuum, rather than as discrete entities. Explanations of worry need to account for worry at both ends of the continuum, and high levels of worry both with and without GAD.

1.5.4 Worry across development

The frequency and severity of worry varies across age groups. Younger adults are reported to worry more than older adults, with young females worrying the most (Hunt, Wisocki, & Yanko, 2003). However, this is dependent on the measure of worry. Hunt et al. (2003) found that young adults (18-25) worried more when assessed using the PSWQ, but older adults scored higher on the subscales of health, family concerns and world issues on the Worry Scale for Older Adults – Revised (Wisocki, 1994). The majority of studies examining changes in worry behaviour over time have used cross-sectional designs, and where longitudinal assessment of worry has been undertaken, it has not been across the lifespan, but instead has focused on one age period, such as teenage years (Hale, Klimstra, & Meeus, 2010) or university students (Swerdzewski, 2008).

1.5.5 The role of gender in worry

Females experience (or at least report) greater levels of worry than males (Robichaud, Dugas, & Conway, 2003). An explanation for this finding comes from Barahmand (2008) who demonstrated that, in adolescents at least, positive beliefs about worry were a key determinant of worry levels, and that females were more likely to endorse these beliefs. However, Barahmand (2008) did find that male adolescents were more likely to report greater negative problem-orientation, which is another worry predictor. It is unclear why females hold more positive beliefs about the utility of worry than males. Robichaud et al. (2003) review work by Stavosky and Borkovec (1988), Gove (1980) and Rosenfield (2000), who suggest respectively that worry is seen as a feminine gender role stereotypic trait, that women experience greater levels of stress due to lower-status positions in society and the home, and that females show greater tendencies to internalise versus externalise problems. Robichaud, et al. (2003) found that gender played a role in confidence, as measured by the lack of confidence subscale of the Worry Domains Questionnaire (Tallis, Eysenck, & Mathews, 1992). Robichaud et al. (2003) found that females reported less confidence than males. Females also scored higher on the measure of negative problem orientation, which is contrary to the finding of Barahmand (2008). This contradiction could be due to a number of factors. Firstly, the developmental time frame is different; Barahmand (2008) examined adolescents aged 16-19 and Robichaud et al. (2003) examined students aged 18-37. Secondly, the participants came from different cultures; Barahmand's (2008) participants lived in Iran, while Robichaud et al.'s (2003) lived in Canada. Thirdly, different measures of negative problem orientation were used. Barahmand (2008) used the Negative Problem Orientation Questionnaire, while Robichaud et al. (2003) used the Social Problem-Solving Inventory-Revised Short Form (D'Zurilla, Maydeu-Olivares, & Kant, 1998).

1.5.6 Marital status

Hunt et al. (2003) found that individuals who were single endorsed more PSWQ items than those who were married or widowed. However, as mentioned above, younger individuals report higher levels of worry, and are less likely to be married than older participants. Thus, it is difficult to disentangle the effects of age and marital status.

The research reviewed in this section indicates that worry occurs across demographic groups, but finds that worry is most common in single females in early adulthood. The

experimental work conducted in this thesis utilizes samples representative of this demographic group who are at an increased likelihood of experiencing worry.

1.6 Factors implicated in worry perseveration

Worry can be understood within a biopsychosocial framework; worry is associated with neuroanatomical differences (e.g. Mohlman, et al., 2009), functional brain differences (e.g. Hoehn-Saric, Lee, McLeod, & Wong, 2005), and greater levels of anxious and rejecting parenting (Muris, Meesters, Merckelbach, & Hülsenbeck, 2000). However, worry is predominantly a product of cognition, involving thoughts about imagined negative outcomes and the generation of problem-solving strategies. As such, approaching understanding worry from a cognitive stand-point will probably be the most fruitful avenue and the basis for the most successful psychotherapies for worry-based problems. In this section, three important variables implicated in worry perseveration are covered: negative mood, IU, and low PSC.

1.7 Negative mood

Chronic worriers experience endemic negative mood (Meyer, et al., 1990). A detailed discussion of the conceptualisation of negative mood is beyond the scope of this literature review but in this thesis, the understanding of negative moods is based upon Watson, Clark and Tellegen's (1988, p. 1063) definition that negative mood is "a dimension of subjective distress and unpleasurable engagement". The association between negative mood and worry may emerge from the negative cognitive processes associated with chronic worrying such as negative outcome anticipation (Szabó & Lovibond, 2002), processing negative thoughts (Borkovec, et al., 1998), catastrophising (Davey, 2006a), and personal inadequacy appraisals (Davey & Levy, 1998b). However, a number of studies support the view that, rather than simply being a consequence of worrying, negative mood is a causal contributor. Johnston and Davey (1997) found that inducing a negative mood resulted in significantly more catastrophising steps being generated during a CI than positive or neutral moods. This and similar studies (e.g., Startup & Davey, 2001) demonstrate that negative mood has a *causal* effect on worry perseveration, and is not simply an outcome of worrying.

There are a number of candidate mechanisms that potentially explain why negative mood states increase worry, including that negative mood (1) provides information about whether task goals are met (mood-as-input hypothesis) (e.g., Meeten & Davey, 2011); (2) facilitates retrieval of material that is congruent in valence (Bower, 1991); (3) primes the

retrieval of semantically similar material (Neely, 1977); (4) raises an individual's performance standards (e.g., Scott & Cervone, 2002); (5) increases an individual's desire to understand the cause of their mood with the goal of 'repairing' the negative mood state to a more positive one (Schwarz & Clore, 1983); (6) intensifies the persuasiveness of strong messages (e.g., Briñol, Petty, & Barden, 2007); (7) evokes appraisals of uncertainty (Tiedens & Linton, 2001); and (8) either independently, or as a result of some or all of points 1-7, alters the way in which individuals process information, resulting in systematic information processing (e.g., Bohner, Bless, Schwarz, & Strack, 1988).

1.7.1 Mood-as-input Hypothesis

Worry is typically open-ended; there is no definite end-point. Consequently, an individual must make a decision about whether to continue with their worry bout, or terminate it. These decision processes may be unconscious, but can nonetheless be communicated in verbal form (see Wells, 2006, for the same description of metacognitive beliefs). The decision will be determined by (1) an individual's goal for their worrying (e.g., 'resolve a problem', 'feel prepared', 'feel better'); (2) the stop rules that are derived based on the worry goals (e.g., 'I must continue to worry until I have resolved the problem', 'I must continue to worry until I feel prepared', I must continue to worry until I feel better'); and (3) the information used to decide whether worry goals are met.

There is usually a lack of objective evidence to help the worrier identify if they have, for example, resolved their problem, and instead, it is suggested that individuals use their mood to decide if they have met their worry goals. According to mood-as-input theory, mood provides information about whether the stop rules have been met (Davey, 2006b). Stop rules are criteria for deciding when to stop a task, and as such, are conceptualised as decision rules (e.g., Vaughn, Malik, Schwartz, Petkova, & Trudeau, 2006). For example, if an individual is worrying, they may either apply an 'as many as can' (AMA) stop rule, whereby they believe that they must do as much worrying as possible, or a 'feel like continuing' (FLC) stop rule, which involves stopping when the worry process is no longer something they feel like doing (Davey, Startup, MacDonald, Jenkins, & Patterson, 2005). If an individual is in a negative mood and using an AMA rule, their negative mood suggests that the task has not been completed as much as possible (positive mood is usually experienced when a task is completed), and the individual is likely to persevere at the task. In contrast, an individual in a positive mood would interpret their mood in terms of having completed the task and will stop. For an individual

using the FLC rule, a negative mood would encourage the individual to stop the task sooner than if the individual was in a positive mood, as the negative mood would signal that the task was no longer enjoyable.

Over the past 10 years, a wealth of research has demonstrated that mood-as-input theory can successfully predict patterns of perseveration in analogue samples performing clinically-relevant tasks. Startup and Davey (2001) demonstrated that perseveration at a CI was greatest under a combination of a negative mood and use of the AMA stop rule, and a positive mood and use of the FLC stop rule. Furthermore, Davey et al. (2005) found that high worriers were more likely to use an AMA rule when approaching a worry task, and hence high worriers are more likely to perseverate given that they experience being in a negative mood more frequently than low worriers. Additionally, checking behaviour in OCD has been shown to fit the mood-as-input predictions, with more checking occurring when the AMA rule is deployed in the presence of negative mood, or the FLC rule is deployed in the presence of positive mood (Davey, Startup, Zara, MacDonald, & Field, 2003). Mood-as-input also accounted for patterns of depressive rumination when different moods were induced and stop rules were deployed (Hawksley & Davey, 2010). In terms of clinical populations, the combination of a negative mood alongside AMA stop rule deployment is of greatest significance, given that clinical populations experience heightened negative mood and possess dispositional characteristics that increase AMA deployment, such as perfectionism, IU, inflated responsibility and increased concern about making mistakes (Dugas, Freeston, & Ladouceur, 1997; Stöber & Joormann, 2001b; Tallis, Eysenck, & Mathews, 1991; Wells & Papageorgiou, 1998).

While the empirical data is consistent with mood-as-input theory, there is currently no independent evidence that individuals actually do use their mood as information. Furthermore, mood and stop rules may not be independent; mood may affect the goal an individual has for their worrying, and the subsequent stop rule that is deployed. In addition, it is unclear whether the positive/FLC configuration occurs during perseverative processes relevant to psychopathology. Elevated negative mood in worry is also partially supportive of other theories, which are outlined below.

1.7.2 Mood congruent recall

Some suggest that negative mood states increase worry perseveration because these states facilitate the retrieval of information from memory that is congruent with the mood

state, i.e. mood congruent recall (e.g., Bower, 1991). However, Startup and Davey (2001) instructed participants to generate positive thoughts about a topic (positive aspects of being the Statue of Liberty). Individuals in a negative mood were able to generate more items in this reverse-catastrophising procedure than individuals in a positive mood, suggesting that a negative mood state is more accurately implicated in perseverative worry as a state that is associated with an iterative thinking style, rather than a state that leads to better recall of negative thoughts.

1.7.3 Semantic priming

Semantic priming occurs when individuals are quicker to report items from the same semantic category as the prime. Neely (1977) presented participants with a prime ('bird' or 'xxx') and found that participants were quicker to identify 'robin' as a real word when 'bird' was the prime, rather than 'xxx'. In terms of the role that negative mood has on worry, such effects are likely to occur when word-based vignettes are used to induce mood states. Participants may generate more worry thoughts when in a negative mood because such thoughts emerge more rapidly due to the semantic closeness of the content of the worry with the negative verbal material in the mood induction vignettes. However, semantic priming is less likely to occur when non-verbal materials are used, such as music. Startup and Davey (2003) demonstrated that individuals would persevere with their worry when in a positive mood if they were using the FLC stop rule (i.e. the mood-as-input interaction effect) when music was used to facilitate mood states. As such, this effect is unlikely to be due to semantic priming.

1.7.4 Raised performance standards

Another possible mechanism of the link between negative mood and worry perseveration is that negative mood states may increase an individual's performance standards. Derived in part from the finding that depressed individuals often have performance standards that exceed their self-efficacy beliefs (Ahrens, 1987, cited in Cervone, Kopp, Schaumann, & Scott, 1994), Cervone et al. (1994) examined the role that negative mood states have on performance standards. They induced negative, positive or neutral mood states using vignettes and asked participants to complete a questionnaire indicating their performance standards. Participants in a negative mood generated higher performance standards than participants in a positive or neutral mood. Those in the negative mood group

also demonstrated a greater discrepancy between their relatively high performance standards and their perceived self-efficacy.

Scott and Cervone (2002) examined whether the increased performance standards obtained under negative mood states are the result of affective priming or affect-as-information processes. They focused on the 'discounting hypothesis', which posits that if mood states have identifiable sources that are deemed irrelevant to the current task, then any effect of this mood on the judgement is eliminated. This is presumably because the individual does not use their mood as information. Scott and Cervone (2002) reasoned that, if an affect-as-information process accounts for negative mood's effect on performance standards, then when the mood source is made salient, participants should discount the informational properties of the mood state as irrelevant to their judgements about their performance standards. If an affective priming mechanism is in play, then it should not matter if the mood source is made salient, the spread of activation should still occur between interconnected cognitions, affecting judgements about performance standards. Half of the participants were alerted to the mood induction procedure prior to listening to the mood-inducing vignettes, and half were not. They found that participants in the non-salient negative mood condition reported raised performance standards, but that when attention was drawn to the fact that the negative mood experienced was due to the experimental procedure (salient condition) induced negative mood did not raise performance standards. This is consistent with an affect-as-information process, but does not fit well with affective priming accounts, which indicate that associated networks are primed regardless of the emotional salience. It is plausible that raised performance standards are operationalised within the worry process through the adoption of AMA stop rules. This suggests that mood states and stop rules may not be truly independent. Indeed, Davey and MacDonald (2009) demonstrated that after undergoing a negative mood induction, participants were more likely to endorse using an AMA stop rule.

1.7.5 Understanding and 'repairing' mood states: The role of emotion regulation

Schwarz and Clore (1983) report that individuals in a negative mood have higher motivation to search for information that explains their affective state than individuals in a positive mood. Worry has been proposed as a means of avoiding negative emotional experiences (Borkovec & Inz, 1990). Worriers report that they worry to avoid/prevent

negative occurrences, and individuals with GAD endorse "distraction from more emotional topics" (Borkovec & Roemer, 1995, p. 26) as a reason for worrying.

Mennin, Heimberg, Turk and Fresco (2005) have suggested that the use of worry as a cognitive avoidance technique (Borkovec, 1994) is driven by an individual's response to, and regulation of, emotional experiences. Gross (1998, p.275; cited in Mennin et al., 2005) defines emotional regulation as how individuals influence, control, experience and express their emotions. Individuals with GAD experience more intense emotions, poorer understanding of emotions, greater negative reactivity to emotional experiences, and are less effective at self-soothing (Mennin et al., 2005). Salters-Pedneault, Roemer, Tull, Rucker, and Mennin (2006) also demonstrated that students' PSWQ scores were positively correlated with difficulties in emotion regulation, and PSWQ scores were negatively correlated with emotional acceptance, ability to engage in goal-directed behaviour, impulse control, clarity of emotional experiences, and access to emotion regulation strategies. However, PSWQ scores were not correlated with emotional awareness. High worriers are as aware as low worriers that they are experiencing an emotion; difficulties appear to surround regulating emotional experiences. Research into emotion regulation abilities in worriers is predominantly correlational. It is unclear whether having difficulties with emotion regulation leads to the adoption of avoidance techniques such as worry, or if worrying leads to less ability to effectively regulate emotional experiences.

1.7.6 Intensified persuasiveness of strong messages

Typically, individuals in a negative mood are more persuaded by strong, compared to weak, messages, whereas individuals in a happy mood are equally persuaded by weak and strong arguments as they are less likely to engage in detailed processing of counter-attitudinal messages (Schwarz, 2002). Consequently, individuals in a negative anxious mood state may be more motivated to generate reasons why solutions to their worrisome thoughts are likely to be unsuccessful. Petty, Briñol and Tormala (2002) report that when an individual has predominantly positive thoughts in response to a message, increasing the individual's confidence increases persuasion. Whereas when an individual has predominantly negative thoughts about a message, increasing the individual's level of confidence in their thoughts decreases persuasion. As reported above, worriers experience high levels of personal inadequacy, and these beliefs are likely to be strengthened when in a negative mood (providing confidence in their judgement that they are inadequate), resulting in chronic worriers having less confidence that they can resolve their worries. In a series of experiments

conducted by Briñol, Petty and Barden (2007), participants were presented with strong or weak persuasive arguments, underwent a mood induction procedure, and then completed a thought-listing task. Participants in the sad mood induction condition were less confident in the accuracy of their thoughts than those in a happy mood, consistent with the notion that happiness is associated with self-validation. Consequently, the attitudes formed by individuals in a negative mood were less affected by argument quality than individuals in a happy mood. These differential effects were only found to occur when individuals were motivated to undertake deep processing; when motivation levels were low, participants showed mood effects on attitude formation regardless of the quality of the arguments. Given that worriers believe that worrying is necessary to avoid future threats (e.g., Davey, Tallis, & Capuzzo, 1996) they are likely to be highly motivated to examine worry thoughts.

1.7.7 Uncertainty appraisals

Tiedens and Linton (2001) examined the role of emotions in certainty appraisals. Participants were induced to feel one of four emotions based on valence (positive vs. negative) and level of certainty (certainty vs. uncertainty): disgust (negative, certainty), fear (negative, uncertainty), happiness (positive, certainty), or hope (positive, uncertainty). Following the mood induction, participants were asked to make judgements about how certain they felt about their predictions for the forthcoming Year 2000. Those participants induced to feel emotions associated with certainty (disgust, happiness) were more certain about their judgements than participants induced to feel emotions associated with uncertainty (fear, hope). Mood valence did not affect the participants' judgements. Given that anxiety is a negative emotion related to uncertainty, worriers are likely to have a heightened sense of uncertainty. Worriers are more intolerant of uncertainty than non-worriers (see Section 1.8) and thus may be more motivated to deploy strategies, such as prolonged periods of worrying, to avoid emotions associated with uncertainty.

1.7.8 Increased deployment of systematic information processing

An additional way in which negative mood states may prolong worry periods is by increasing the scrutiny, attention, and effort devoted to processing information. A large body of literature supports the idea that individuals in a negative mood are more likely to deploy systematic (detailed, effortful) processing (e.g. Armitage, Conner, & Norman, 1999; Batra & Stayman, 1990; Bodenhausen, Sheppard, & Kramer, 1994; Bohner, et al., 1988; Bohner, Crow, Erb, & Schwarz, 1992). Furthermore, many of the accounts provided above to explain the

relationship between negative mood and perseverative worry (increased recall of negative thoughts, raised performance standards, a desire to understand negative moods, attention to argument quality, and uncertainty appraisals) are all factors that would increase an individual's motivation to process thoughts about an issue carefully. The notion that systematic processing may be a mechanism explaining the link between negative mood and worry is central to this thesis, and will be covered in detail in Chapter 2.

1.8 Intolerance of Uncertainty

1.8.1 Defining intolerance of uncertainty

Worriers frequently couch their worries in the form of 'what if?' questions. Given that most worries are based on negative things that *might* happen in the future, it is difficult for the individual to know whether they will or won't occur. This 'not knowing' is experienced as an unpleasant state and gives rise to IU. Birrel, Meares, Wilkinson and Freeston (2011) chart the changes in the way IU has been defined. Initially conceived out of the literature on intolerance of ambiguity (cf. Furnham & Ribchester, 1995), the definition has expanded following new insights in the way that IU is linked to worry, the processing biases that are present in those experiencing IU, and the nature of IU as a cognitive vulnerability factor for GAD. Ladouceur, Blais, Freeston, and Dugas (1998) define IU as "the way in which an individual perceives information in uncertain situations and responds to this information with a set of cognitive, emotional and behavioral reactions" (p. 141). Koerner and Dugas (2008) extended this definition by considering IU as a dispositional cognitive vulnerability factor for worry. They define IU as a "dispositional characteristic that arises from a set of negative beliefs about uncertainty and its connotations and consequences" (p. 631).

1.8.2 Intolerance of uncertainty and processing biases

High IU individuals hold processing biases that result in the perception of ambiguous or uncertain events as threatening and intolerable (Butler & Mathews, 1983, 1987), despite the low probability of such events actually occurring (Ladouceur, Talbot, & Dugas, 1997). Significantly, given these processing biases, high IU individuals also perceive negative events as more probable in uncertain situations than low IU individuals (MacLeod, Williams, & Bekerian, 1991). In addition, high IU individuals seek more information before making decisions that they are confident with (Carleton, Sharpe, & Asmundson, 2007).

1.8.3 Associations between intolerance of uncertainty and worry

A number of studies have demonstrated that IU correlates with trait worry[2] (e.g., Buhr & Dugas, 2006). In Dugas et al.'s (1998) cognitive model of GAD, IU plays a central role, and is posited to drive 'what if…?' questioning. Also incorporated in the model are beliefs about worry, poor problem orientation, and cognitive avoidance. Dugas et al. (1998) tested their model to see if these variables could successfully discriminate individuals with and without GAD. IU accounted for the most variance in terms of whether an individual had a diagnosis of GAD or not.

Berenbaum (2010) included IU in his two-phase model of worrying. In this initiation-termination model, the first phase is concerned with threat perceptions, which initiate worrying. The second phase is associated with factors involved in the termination of worry, which Berenbaum (2010) argued is closely related to the acceptance of uncertainty. Consequently, IU is likely to prolong worry bouts as individuals struggle to accept uncertainty.

1.8.4 A causal role for intolerance of uncertainty in worry

Changes in IU precede changes in worry levels during therapy (Dugas & Ladouceur, 2000). Although not a direct assessment of whether IU is involved in the etiology of worry, this finding lends support to the idea that IU at least plays a maintenance role in pathological worrying. To examine whether IU has a causal influence on worry, Ladouceur, Gosselin and Dugas (2000) manipulated IU using a gambling procedure in which participants were motivated to win as much money as possible. One group of participants were told that their odds were better than a previous group's odds (decreased IU) and another group of participants were told that their odds were worse than a previous group's odds (increased IU). Those in the increased IU group reported higher levels of worry than those in the decreased IU group. However, the questions examining IU and worry were linked to the specific gambling task in question, and it is unclear whether this finding extends beyond this particular context.

Deschenes, Dugas, Radomsky and Buhr (2010) manipulated beliefs about IU by informing participants that uncertainty was helpful in solving problems (low IU) or that uncertainty was unhelpful in solving problems (high IU). They found that participants in the high IU group rated worry steps in a CI as significantly more likely than those in the low IU

[2] De Bruin et al. (2007) found that, while IU predicted trait worry, there was little, if any association between IU and idiosyncratic worry bouts.

group. However, no difference was found in CI steps, but this is likely to be due to the experimental method differing from Davey's (2006a) CI methodology. In Deschenes et al.'s (2010) methodology, participants were asked what they would be afraid of if their worry actually happened. This is more likely to make individuals examine whether their worry is actually likely to occur.

1.8.5 Intolerance of uncertainty validity and specificity

Buhr and Dugas (2006) examined the construct validity of IU. They found that worry was more related to IU than to intolerance of ambiguity. Additionally, IU was identified as a better predictor of worry than perfectionism and perceived control, and contributed unique variance not accounted for by these other cognitive factors. Carleton et al. (2007) argue that a dimensional structure underpins IU. Indeed, one of the criticisms of the current IU construct comes from Birrell et al. (2011) who note that current definitions of IU are categorical in nature. Birrell et al. (2011) suggest that two factors underlie IU, as measured by the Intolerance of Uncertainty Scale: (1) desire for predictability and active engagement in seeking certainty (which they argue represents an approach response to uncertainty), and (2) paralysis of cognition and action in the presence of uncertainty (which they claim is an avoidance response to uncertainty).

Questions surround the specificity of IU to worry, and it seems IU is a transdiagnostic characteristic. A number of studies have shown the high IU is present in samples with depression (e.g., Dugas, Schwartz, & Francis, 2004), and IU predicts OCD severity (Calleo, Hart, Björgvinsson, & Stanley, 2010). Nonetheless, some authors have demonstrated that IU is more closely related to worry than to other psychopathologies (Dugas et al. 2004).

1.9 Problem-Solving Confidence and Poor Problem-Orientation

1.9.1 Problem-solving in the worry process

Conceptualisations of worry suggest that worry serves a useful function in terms of problem-solving. For example, Borkovec et al. (1983) wrote that "[the] worry sequence seems to be initiated by a fear stimulus (environmental and/or imaginal) which elicits mental problem-solving activity designed to prevent the occurrence of traumatic future events and/or to devise coping strategies for such events" (p. 10). Furthermore, Mathews (1990) suggested that worry is deployed as a means of searching for ways to avoid aversive stimuli.

However, Mathews (1990) made the important distinction that it is the occasions when normal, adaptive problem-solving is unsuccessful that give rise to the mental processes labelled 'worry'.

1.9.2 Worry as disrupted problem-solving

Davey et al. (1992) proposed that worrying may be an unsuccessful problem-solving strategy due to deficiencies in the problem-solving process. They suggest two potentially deficient aspects: (1) low PSC, and (2) adoption of coping strategies that focus on managing emotional reactions to the stress, rather than dealing with the cause. Davey et al. (1992) administered the PSWQ and the Personal Problem-Solving Inventory (Heppner & Petersen, 1982) and found that worry levels were significantly correlated with low PSC, and also with feelings of low personal control (over problems). However, when trait anxiety was partialled out, worry was no longer significantly associated with the negative aspects of low PSC and low personal control. Instead, with trait anxiety held constant, worry was positively correlated with problem-focused strategies of information seeking and active behavioural coping. In contrast, when worry was held constant, trait anxiety negatively correlated with PSC and perceived control. Given that Davey et al. (1992) found worriers have high levels of trait anxiety, the useful problem-focused strategies that the worrier deploys may be thwarted by the effects of their high levels of trait anxiety on their confidence that they have successfully solved the problem, preventing closure of the problem-solving process. The findings of Davey et al. (1992) support the notion that worrying is related to problem-solving, but it is not immediately apparent why, if worrying is related to positive components of problem-solving, trait anxiety is so highly associated with worrying. Davey et al. (1992) suggest that this is because individuals who are high worriers apply the problem-focused worry process to problems that cannot readily be solved. In situations where the individual has no control over the problem, such as receiving a diagnosis of a terminal illness, the problem-focused approach of information seeking may only confirm the individual's view that the situation is threatening, and fail to provide solutions to deal with the forthcoming trauma.

Further evidence for the link between worry and problem-solving comes from Belzer, D'Zurilla and Maydeu-Olivares (2002). They found that social problem-solving accounted for variations in trait worry (PSWQ) and catastrophising (Catastrophic Worry Questionnaire). More specifically, three dimensions of social problem solving correlated with worry: (1) negative problem orientation; (2) rational problem solving; and (3) impulsivity/carelessness.

The idea that worrying is related to problem-solving is also apparent in the beliefs worriers hold about their worries. Davey et al. (1996) generated the Consequences of Worry Scale (COWS) by asking individuals the ways that worrying made things either worse or better and subjecting their ideas to content analysis. Two groups of participants completed either the negative consequences of worrying scale or the positive consequences of worrying scale. Factor analyses revealed that both the negative and positive beliefs about worry made reference to problem-solving. The negative consequences scale consisted of three factors, one of which was that worrying exaggerates the problem, and the positive consequences scale consisted of two factors, both related to problem-focused coping: (1) worry motivates; and (2) worry helps analytical thinking.

Szabó and Lovibond (2002) suggest that failure to bring problem-solving to a satisfactory conclusion is a mechanism of pathological worry. Solution selection (an index of the participant's view of the success of the problem-solving process) was negatively correlated with trait worry proneness and frequency, and perceived uncontrollability of worry. The authors suggest that engagement in problem-solving is comparable across worry severity levels, but arriving at a satisfactory solution to problems is more difficult for chronic worriers. This difficulty may be because the solutions that chronic worriers generate are genuinely ineffective, or, as reported by Szabó and Lovibond (2002), it may be that their confidence in the solutions that they generate is undermined by IU and/or elevated evidence requirements. Szabó and Lovibond (2002) state "the data provide support for a conceptualization of worry as a thwarted problem solving process, falling on the continuum between a normal, constructive end associated with adaptive problem solving, and a pathological end associated with ineffective problem solving, and possibly, increased negative affect" (p. 176).

Davey and Levy (1998a) generated items for a questionnaire about catastrophising by asking students the following: "when you start to think about a stressful, traumatic or difficult situation that you are faced with (e.g., exams, illnesses, financial problems, problems with relationships, etc), does thinking about these problems sometimes make them feel worse than they were when you started thinking about them? If so, please list below the kinds of things that you say to yourself that make these problems seem worse." (p.23). A factor analysis of responses from 331 students who completed the 45-item questionnaire indicated a four factor solution. Factor 1 (30.3% of variance), consisted of 11 items, which referred to

problem-specific pessimism and perceived negative effects of finding or failing to find a solution (e.g." there just seems to be no solution to this problem"; "whatever I decide to do I will regret"). This factor is not simply related to PSC, but rather it relates to whether the individual thinks that the problem is not inherently controllable. Factors 2-4 related to personal inadequacy, despair/hopelessness, and further analysis of the problem. In the second study in their paper, Davey and Levy (1998a) examined whether these factors were associated with worry-related psychopathology. They found that the first three factors (problem-specific pessimism, personal inadequacy/incompetence, personal despair/ hopelessness) were significantly correlated with trait worry (PSWQ), anxiety (Hospital Anxiety and Depression Scale, HADS), depression (HADS), PSC (PSI), and beliefs about the negative consequences of worrying (COWS). Factors 2-4 (personal inadequacy/incompetence, personal despair/hopelessness, need to analyse the problem) correlated with positive beliefs (COWS), indicating that personal inadequacy/incompetence and personal despair/ hopelessness paradoxically correlate with both positive and negative beliefs about worry.

Davey (1994) asked participants to complete the Coping Inventory for Stressful Situations (CISS; Endler & Parker, 1990), which measures three coping strategies (task-oriented coping, emotional coping, and avoidance coping), the PSWQ, the Worry Domains Questionnaire (WDQ; Tallis, et al., 1992), the State-Trait Anxiety Inventory – trait measure (Spielberger, 1983), Miller Behavioural Style Scale (MBSS; Miller, 1987), Problem-solving inventory (PSI; Heppner & Petersen, 1982), and the Means-Ends Problem-Solving Inventory (MEPS; Platt & Spivack, 1975). PSWQ and WDQ scores correlated significantly with trait anxiety, poor problem-solving and low perceived personal control over the problem-solving process. Effectiveness on the MEPS was not related to worry levels, suggesting that chronic worriers do not have objectively weaker problem-solving skills. The lack of an association between worry and problem-solving ability held at high and low levels of worry, and also when trait anxiety was controlled for.

Davey (1993a) explored different coping strategies for dealing with threats. Two of the coping strategies, threat devaluation and positive reappraisal, were found to relate to adaptive problem-focused strategies. The coping strategy of denial, conversely, was related to problem avoidance. Davey (1993a) found that denial was most common in situations where individuals felt their situation was uncontrollable or where individuals had low PSC.

Consequently, the low PSC that worriers experience is a risk factor for opting to avoid problems rather than engage in more adaptive problem-focused coping strategies.

An additional avenue of research relating to problem-solving and worry is the role that problem orientations play. Robichaud and Dugas (2005) define a negative problem-orientation as "a set of dysfunctional attitudes toward social problem-solving" (p.391). Possessing a negative problem orientation correlates worry, and Dugas et al. (1997) found that it was the emotional problem-orientation subscale (and not the cognitive or behavioural subscales) that predicted worry.

1.9.3 A causal role for poor problem-solving confidence in worry

Studies that have directly manipulated PSC and examined its effect on worry are scarce. Davey, Jubb and Cameron (1996) manipulated PSC by providing false feedback about performance on the Means-Ends Problem-Solving task (Platt & Spivack, 1975). Participants told that they had done badly showed a decrease in PSC and generated significantly more CI steps than participants in the group told that they had done well. Consequently, low PSC appears to play a causal role in worry perseveration.

1.10 Summary and concluding remarks

Worry is a verbal process intimately linked to problem-solving. However, when this problem-solving process is thwarted, for example due to concurrent negative mood, IU, or low PSC, individuals are at risk of perseverative worry. Dominant models of worry emphasise the importance of negative mood, IU, and low PSC in the development of pathological worry. What is unclear is the exact mechanism that explains *how* these variables promote perseverative worry. Davey (2006b) comments "[t]he details of how causal relationships are mediated will be found in *proximal* explanations of the activity of worrying, which attempt to describe the causal interactions between variables which determine the onset, duration and sequential properties of worry bouts" (p. 218). The work in this thesis seeks to explore whether these key variables (1) lead to worry perseveration (i.e. are 'worry promoters'); and (2) result in certain types of information processing styles being deployed that increase worry perseveration. As indicated in the section on negative mood and worry (see Section 1.7.8), one possible candidate is systematic processing. In the next chapter, the theoretical underpinning of systematic processing, the Heuristic-Systematic Model, will be presented and the possible links to worrying will be elucidated.

2 Information processing style and perseverative worry

2.1 Introduction

A great deal of attention has been paid to *what* information worriers process in terms of specific worry topics (e.g. Szabó & Lovibond, 2002) but very little research has been devoted to *how* worriers process this information. The worry promoters outlined in Chapter 1 (negative mood, intolerance of uncertainty, IU, and low problem-solving confidence, PSC) may affect the way that worriers process information related to their worry and the goals that they hold for their worrying. The purpose of this chapter is to explain the theoretical rationale behind exploring whether systematic information processing acts as a proximal mechanism through which negative mood, IU, and low PSC exert their influence on worry. This chapter begins with a brief overview of dual-process models of information processing, before outlining the heuristic-systematic model (HSM). The key determinants of systematic processing will be covered, before turning to consider the application of systematic processing to perseverative worry.

2.2 Dual-process models of information processing

The 1970s and 1980s saw advances in dual-process models of information processing, which were invoked to account for numerous research findings in the social cognition literature that appeared contradictory to one another (Petty & Wegener, 1999). For example, negative mood states often inhibited attitude change (e.g. Zanna, Kiesler, & Pilkonis, 1970, cited in Petty & Wegener, 1999), but on some occasions they facilitated attitude change (e.g. Leventhal, 1970, cited in Petty & Wegener, 1999). A number of different dual-process theories have been proposed (Chaiken & Trope, 1999) but they share in common the assumption that human cognition relies on two modes of processing information: (1) a fast associative processing mode that has low cognitive effort requirements, and (2) a slower mode based on detailed processing which requires high levels of cognitive effort. Despite this shared assumption, the dual-process models differ in regard to their exact definitions of these two processing modes and the relationship between the two processing modes (Chaiken & Trope, 1999).

The two dominant dual-process models to emerge from the social cognition literature are the elaboration likelihood model (Petty & Cacioppo, 1986b) and the heuristic-systematic

model (HSM; Chaiken, Liberman, & Eagly, 1989). The ELM is based on a continuum of elaboration, which refers to the extent a person will think about issue-relevant arguments. At one end of the continuum, the individual will elaborate extensively and generate a lot of issue-relevant thoughts. At the other end of the continuum, an individual will rely on peripheral cues to make their judgement, and will not elaborate on issue-relevant ideas. The ELM contains two processing routes: the central route (elaboration) and the peripheral route (minimal elaboration). The central route requires time, effort, and ability, as recipients try to integrate the message arguments with their existing knowledge. Conversely, the peripheral route is utilised when motivation is low, or there are constraints on time and ability. The peripheral route involves forming attitudes based upon peripheral cues such as the source of an argument, the number of arguments, or the length of an argument. In a test of the ELM, Petty and Cacioppo (1984) manipulated argument strength and the number of arguments that were presented, as well as participant involvement. They observed a three-way interaction, with low involvement participants forming more extreme attitudes following a greater number of arguments, regardless of the strength of the arguments, whereas the high involvement participants showed more extreme attitudes for the large number of strong arguments, but crucially, not for the large number of weak arguments.

Around the time that the ELM was gaining attention, Chaiken and colleagues published theoretical and empirical papers in support of another dual-process model, the heuristic-systematic model (HSM). This model contained one processing route that was essentially identical to the central route of the ELM. Within the HSM, this was called systematic processing. The second processing route was termed heuristic processing, and differed slightly from the peripheral route of the ELM in that people were perceived to use heuristics, simple rules of thumb, in order to assess the validity of messages. Examples of such heuristics include ‘experts can be trusted’, and ‘length [of arguments] implies strength’.

The ELM and the HSM have similarities: (1) both include a process requiring motivation and capacity, and a process that can occur when there are low levels of motivation and/or capacity, (2) both incorporate a ‘least-effort’ assumption, and (3) both acknowledge that motivational (e.g., task importance) and cognitive (e.g., existing knowledge) factors can influence processing (Chen & Chaiken, 1999). The predominant difference between the ELM and the HSM is the way in which the two processing routes are hypothesised to relate to one another. In the ELM, the central and peripheral routes are deemed mutually exclusive. In the

HSM, systematic and heuristic processing can co-occur simultaneously, meaning that they can interact with one another, have additive effects, and bias one another. Furthermore, the HSM allows for multiple motives within its multiple-motive framework, whereas the ELM accounts solely for accuracy-motivated individuals (Chen & Chaiken, 1999). When considering how dual-process models of information processing may apply to the worry context, it is preferable to consider multiple motives. This is because worriers can hold a number of different goals for their worrying. To illustrate, it has been suggested that individuals engage in worry to (1) avoid emotionally-aversive stimuli (Borkovec & Inz, 1990), (2) detect danger (Mathews, 1990), (3) feel prepared for negative outcomes (Borkovec & Roemer, 1995), (4) cope with problems (Davey, et al., 1992), and (5) to do as much as possible about what is worrying them (Davey, et al., 2005). While Bohner, Erb and Siebler (2008) argue that the ELM provides a more complete account of the low-intensity processing mode, this thesis focuses on the role of the high-intensity processing mode in perseverative worrying. Given that the HSM allows multiple-motives, the HSM provides a dual-process account[3] of information processing that is better suited to explain how information is processed by worriers, and thus the HSM has been chosen as the dual-process model of focus.

2.3 The Heuristic-Systematic Model of information processing

Judgements, such as making a decision or forming an attitude, are integral to human cognition. Social cognition models, such as the HSM, acknowledge that individuals are not passive recipients of information, but rather they can process information with varying degrees of cognitive effort. As reported above, the HSM incorporates two processing styles: systematic processing and heuristic processing. Systematic processing involves detailed analysis of information relevant to an individual's judgement. Chaiken et al. (1989) define systematic processing as "a comprehensive, analytic orientation in which perceivers access and scrutinize all informational input for its relevance and importance to their judgement task, and integrate all useful information in forming their judgements" (p.212). Individuals who systematically process pay attention to all relevant information (Chen & Chaiken, 1999), although which information is considered to be relevant will vary, and is affected by an individual's motivation and goals. Chaiken et al. (1989) conceptualize systematic processing

[3] Some authors, e.g., Kruglanski, Thompson and Spiegel (1999), champion single-process models, arguing that forming judgements on the basis of heuristic or systematic processing reflects the same underlying process, an 'if-then' process. Chen and Chaiken (1999) disagree, arguing that systematic processing is not solely 'if-then' processing, and that it involves integrating many, possibly contradictory, 'if-then' associations.

as the high-end of the data processing continuum, and, as such, they state that it requires a fair amount of cognitive capacity and effort.

In different situations, people may focus on a subset of available information which enables use of simple decision rules or cognitive heuristics to formulate their judgements and decisions. This is heuristic processing, and has been contrasted with systematic processing as "a more limited processing mode that demands much less cognitive effort and capacity" (Chaiken et al., 1989, p.213). Heuristic processing is only feasible when heuristic cues are available to the individual. Heuristic cues are defined by Chaiken et al. (1989) as "any variable whose judgemental impact is hypothesised to be mediated by a simple decision rule" (p.216). Chen and Chaiken (1999) describe heuristics as knowledge structures, which are learned and stored in memory. Examples include stereotypes, schemas, and the opinions of others (Tversky & Kahneman, 1974). For example, if someone is trying to assess the frequency of 'event A' occurring, they may use the number of instances that they can remember of 'event A' happening, i.e. the availability heuristic (Chaiken, 1980). The use of heuristic processing is constrained by the availability, accessibility, and applicability of heuristic cues (Chaiken, et al., 1989).

2.3.1 Processing style summary

To summarise, systematic processing is reliant on factual information, leads to judgements formed on the basis of careful examination of arguments, and includes the integration of all useful evidence with information already held by the individual. In contrast, heuristic processing is less effortful, and involves the assimilation of knowledge into existing knowledge structures, such as scripts and schemas. Apart from their distinctively different modes of operation, psychophysiological studies also suggest that systematic and heuristic processing may be supported by functionally distinct brain processes, with systematic and heuristic processing associated with activation of the left and right frontal lobes respectively (Leynes & Phillips, 2008; Leynes, 2002; Nolde, Johnson, & Raye, 1998). The processing styles are similar in that neither is assumed to be wholly objective, and both can enable an individual to achieve their processing goals.

2.4 Sufficient and motivated information processing

Systematic processing requires cognitive effort and consequently will only occur when an individual is motivated to expend cognitive resources on processing information. As such,

an individual's level of motivation is an important determinant of whether systematic is deployed. What is more, the goals that an individual has for processing information (e.g., arriving at a correct judgement, making a popular judgement, or finding information consistent with their current viewpoint), will influence the point at which an individual feels they have processed the information thoroughly enough. The next section focuses on motivation and the sufficiency threshold as determinants of whether systematic processing deployed.

2.4.1 The sufficiency threshold

A central feature of the HSM is the sufficiency threshold principle, which recognizes the trade-off between cognitive efficiency and task goals. While efficiency is important, individuals exert whatever level of effort is required to attain a sufficient degree of confidence that they have satisfactorily accomplished their processing goals (Chaiken et al., 1989). The least effort principle is an essential component of understanding which information processing style individuals will use, and is the basis for the HSM's sufficiency threshold principle. Psychologists such as Allport (1954) argued that individuals constrain their processing in order to preserve cognitive resources and make their way through an information-laden world. Related to the principle of least effort, some theorists argue that humans are cognitive misers, constrained by limited cognitive capacity, and forced to take shortcuts where possible to maintain efficiency (e.g. Fiske & Taylor, 1991). However, use of the cognitive miser concept to explain why systematic processing requires high levels of motivation has been criticised for failing to account for how systematic processing can also occur in low-motivation settings (Maheswaran & Chaiken, 1991).

The HSM provides a fuller account of the role of motivation in determining processing style by employing the concept of a sufficiency threshold. The sufficiency threshold principle extends the work of Simon (1957) who introduced the idea of 'satisficing'. Individuals choose the first option that addresses most of their needs, rather than selecting the optimal solution – "finding a course of action that is 'good enough'" (Simon, 1957, p. 205). Individuals must balance the need to minimize processing demands (maintain cognitive efficiency) with the desire to maximize confidence that they have achieved their task goals. While an individual will rarely be able to achieve complete confidence that they have achieved their goals for processing information, they can strive for a subjectively desired level of confidence. Within the HSM, this desired amount of confidence is termed the sufficiency threshold, and it is

conceptualised as falling along a continuum. Chaiken et al. (1989) state that the exact positioning of the sufficiency threshold (i.e. amount of confidence required) will vary depending on the individual and the situation. Likewise, an individual's actual level of confidence will vary as a function of individual and situational factors, and may change as new information is encountered and processed. The discrepancy between actual confidence and desired confidence is critical when determining which type of processing will be used: "according to the sufficiency principle, motivation for systematic processing is a positive function of the negative discrepancy that exists between actual confidence and the sufficiency threshold" (Maheswaran & Chaiken, 1991, p. 14). Once an individual reaches a level of confidence that matches (or exceeds) their sufficiency threshold, cognitive effort should cease. However, while an individual's actual confidence is below the sufficiency threshold, cognitive effort should be expended in an attempt to reduce the discrepancy between desired- and actual confidence levels.

Chen and Chaiken (1999) highlight predictions that can be drawn from the sufficiency threshold principle. Firstly, systematic processing is more probable as the discrepancy between actual and desired confidence increases. Consequently, situations where this gap is widened, such as when an individual's sufficiency threshold is increased, or actual confidence levels are decreased, should result in greater deployment of systematic processing. Factors that are understood to increase the deployment of systematic processing, such as feeling accountable for one's decisions (see Section 2.7.3), can be understood to operate by raising an individual's sufficiency threshold and increasing the amount of confidence that the individual feels is necessary. The sufficiency principle suggests that individuals will engage in greater amounts of systematic processing when heuristic processing (or small amounts of systematic processing) does not confer the desired level of confidence. This is because systematic processing is generally thought to provide greater confidence in judgements (Bohner, Moskowitz, & Chaiken, 1995; Chaiken, et al., 1989; Chen, Duckworth, & Chaiken, 1999; Chen, Shechter, & Chaiken, 1996). However, on some occasions, this self-efficacy assumption (that greater confidence can be obtained through careful consideration of the information) will not be met, and a discrepancy between actual and desired confidence may not result in systematic processing. Nonetheless, evidence shows that an increased discrepancy between actual and desired confidence tends to lead to the deployment of systematic processing. Alter, Oppenheimer, Epley and Eyre (2007) demonstrated that when an individual experiences difficulty processing a message (e.g., the font is degraded or they are instructed to form a

furrowed brow implying that they are processing a complex message), they show reduced reliance on heuristic cues. The authors argue that metacognitive experiences of difficulty act as an alarm bell that activates more analytic forms of processing, i.e. systematic processing. Additionally, attitudes based on direct experience (which is more similar to systematic processing than use of heuristic cues) are held with more confidence, persist for a longer period of time, and show greater attitude-behaviour consistency (Fazio & Zanna, 1981, cited in Chaiken et al., 1989). This suggests that individuals place greater confidence in judgements made when they have more involvement in the issues, which lends support to the notion that individuals will use systematic processing when they require greater confidence in their judgements.

One strength of the sufficiency threshold principle is that it can account for why systematic processing occurs in low-motivation settings, when desire for a high level of confidence is typically low. The sufficiency threshold principle posits that whenever actual confidence is lower than desired confidence (even if the desired level is quite low) participants will be motivated to deploy systematic processing in an attempt to reach their desired level of confidence. Consequently, Maheswaran and Chaiken (1991) argue that it should be possible to encourage an individual with low motivation to use systematic processing if confidence in heuristic-based judgements is undermined. Indeed, Chaiken et al. (1989) wrote that "the sufficiency principle implies that if a less effortful mode of processing does not afford a sufficiently confident judgment a more effortful mode will be invoked" (p.221). Maheswaran and Chaiken (1991) presented participants with information indicating that a group of consumers either liked or disliked a product. Participants were then provided with a message that described the product in either positive or negative terms. The two pieces of information were presented in a 2 × 2 design so that they could either be congruent (positive consumer review and positive product description; negative consumer review and negative product description) or incongruent (positive consumer review and negative product description; negative consumer review and positive product description). Participants were also either allocated to a high task importance condition, where they were informed that their opinions would strongly influence the company's decision about whether to distribute the product in the area where the participants lived, or to a low task importance condition, where participants were informed that their opinions were relatively unimportant as they would be merged with the opinions of others. The participants' responses to the message were recorded during a three minute thought-listing task. These thoughts were

subsequently coded as attribute-related (reflecting systematic processing) or consensus-related (reflecting heuristic processing). Participants in the high task importance condition demonstrated increased systematic processing (as indexed by more attribute-related thoughts) regardless of whether the product details and the consumer reviews were congruent or incongruent. Conversely, participants in the low task importance condition only demonstrated systematic processing when the product details and the consumer reviews were incongruent. An increase in attribute-related thoughts suggests that individuals are paying more attention to the details about the product (utilising systematic processing), and relying less on the heuristic cues of what other people think (i.e. they are less willing to use the heuristic information). Furthermore, participants reported lower levels of actual confidence (but there was no difference in desired level of confidence) when the message and consumer information were incongruent. Thus the increase in attribute-related thoughts is associated with a greater negative discrepancy between actual and desired confidence, a factor that should promote systematic processing. Therefore, it seems that participants are capable of systematic processing when motivation is low, and that this can be driven by low confidence in heuristic cues, which widens the gap between desired and actual confidence levels.

2.4.2 Forms of motivation

Individuals are economy-minded, and as long as valid heuristic cues are present in the environment, systematic processing will only occur when the individual is sufficiently motivated to justify the extra cognitive expenditure. A number of motivational factors have been identified and were incorporated into the multiple-motive framework of the HSM (Chaiken, et al., 1989). These are typically linked to the goals that an individual has for processing the information. It should be acknowledged that the HSM assumes both systematic and heuristic processing can enable an individual to satisfy their motivational goals (Chaiken et al., 1989). Individuals are likely to hold more than one motive, and the descriptions below should be considered to refer to a *primary* motivation, rather than a sole motivating force (Chen & Chaiken, 1999).

Accuracy motivation.

Chaiken et al. (1989) originally formulated the HSM around the goal of assessing validity of persuasive messages. They describe accuracy motivation as the “desire to form or to hold valid, accurate attitudes” (p.214). Focusing solely on validity-seeking goals allows a

more precise definition of systematic processing to be presented, which is aimed at assessing message validity: “people judge the validity of a message’s advocated position by scrutinizing all relevant information (especially persuasive argumentation) and by thinking about this information in relation to other knowledge they may possess about the object or issue discussed in the message” (Chaiken et al., 1989, p.215).

In terms of heuristic processing, an individual who is validity-seeking will use minimal information alongside heuristic rules that are associated with determining whether the message has a high probability of advocating a position that is valid. For example, when judging the accuracy/validity of a persuasive message, an individual may use heuristic decision rules such as “Experts’ statements can be trusted” (heuristic cue: source expertise), “Consensus implies correctness” (heuristic cue: consensus information), and “Length implies strength” (heuristic cue: message length). The use of such rules may lead individuals who are heuristically processing, with the aim of reaching a valid judgement, to agree more readily with experts and with messages that the majority of other people appear to agree with, without processing the semantics of the persuasive message in detail.

Numerous studies have supported the idea that accuracy motivation can be obtained through more or less effortful information processing (Chaiken, Giner-Sorolla, & Chen, 1996). However, the conception of human motivation as solely striving to form an accurate appraisal of a message is far too narrow, as highlighted by Fiske and Taylor (1991): “cognition serves many masters, and efficient or accurate understanding is only one of them” (p. 555). Chaiken et al. (1989) suggested that the HSM could be applied beyond the persuasion setting and extended to include situations when individuals generate their own ideas. Two other important motivational factors were identified by Chaiken et al. (1989): defence motivation and impression motivation.

Defence motivation.

Individuals can be motivated by a “desire to form or to defend particular attitudinal positions” (p. 234, Chaiken et al., 1989). This is known as defence motivation. Individuals who are motivated to defend particular attitudinal positions have the goal of confirming the validity of these particular attitudinal positions and disconfirming the validity of any other attitudinal positions. Chaiken et al. (1989) claim that defence-motivated individuals use the same heuristics as those motivated by accuracy, they just use them selectively. For example, the defence-motivated individual will use the expertise heuristic as long as the message is

delivered by an expert who advocates the position that they also support, or a non-expert who supports an alternative attitudinal position. Individuals who are defence-motivated but utilise systematic processing will also do so selectively. Defence-motivated systematic processing involves focusing on attitude-relevant information that backs the attitudinal position that the individual wishes to preserve. Alternatively, it may include focusing on information that opposes the unsupported attitudinal position, and lead to less favourable interpretations of information that opposes the favoured position or supports alternative positions. Giner-Sorolla and Chaiken (1997) found that students relied on heuristic cues when their viewpoints were supported by such cues, but used systematic processing when hostile heuristic cues were presented. The use of systematic and heuristic processing in individuals who are defence-motivated (e.g., Chaiken, et al., 1996) supports the inclusion of defence motivation in the HSM framework. Chen and Chaiken (1999) state that the extent of defence-motivated processing is dependent upon (1) how central the threatened attitude is to the individual's sense of self, (2) the presence (or absence) of heuristic cues that relate to defence goals, and (3) individual factors, such as the knowledge that an individual has about a given domain.

Impression motivation.

The third processing goal identified in Chaiken et al.'s (1989) multiple-motive framework is impression motivation. Impression-motivated individuals have a "desire to express attitudes that will be socially acceptable to potential evaluators, both real and imagined" (Chaiken et al., 1989, p. 234). Thus when individuals are impression-motivated their processing goal is to assess whether a particular attitudinal position is more socially-acceptable than alternatives. What is considered socially-acceptable will vary from situation to situation. The desire to hold a socially-acceptable attitude is typically heightened when an individual believes that they may have to share it with others or justify it to others. Furthermore, Chaiken et al. (1989) suggest that impression motivation is more likely when individuals are made aware of interpersonal relationships, or when the identities or group membership of significant others are emphasised. Chaiken et al. (1989) suggest that high levels of impression-motivation can manifest in both systematic and heuristic processing. If an individual's attitudinal position is known, an individual can use a simple agreement heuristic, such as 'agreement facilitates liking'. But similarly, they may apply systematic processing to ensure that their ideas are socially acceptable.

Impression-motivated attitudes are strategic, and although they can become internalised, they more frequently reflect concessions to situational pressures and usually revert to original positions when the situational pressures are removed. In terms of heuristic processing, impression-motivated individuals are likely to use simple rules to select socially-acceptable attitudes, such as 'moderate positions minimise disagreement', 'people generally agree with people they like', and 'agreement facilitates liking' (Chaiken et al., 1989). When processing systematically to achieve the goal of assessing whether an attitudinal position is socially acceptable, the individual gives more extensive consideration to the detail of the attitudinal messages, and whether they are socially-acceptable. Chen, Shechter and Chaiken (1996) found that when participants were instructed to have a pleasant interaction with another individual, impression-motivated individuals expressed attitudes that were similar to those of their partner, reflecting the use of the 'go along to get along' heuristic. It was also found that use of this heuristic biased subsequent systematic processing in impression-motivated participants.

2.5 The relationship between systematic and heuristic processing

Systematic and heuristic processing are both susceptible to constraints that prevent their operation, for example a lack of motivation, or a lack of heuristic cues in the environment, respectively. Alternatively, there are some situations where both types of processing style are applicable, and the necessary requirements are met. The HSM considers two ways in which systematic and heuristic processing impact on one another: (1) interdependent, or interactive, effects, and (2) independent, or additive, effects (for a recent review, see Bohner & Dickel, 2011).

2.5.1 Interdependent co-occurrence

The interdependent relationship between systematic and heuristic processing suggests that there are conditions under which each processing style will influence the impact of the other processing style. Chaiken et al. (1989) highlight three main interdependent effects: (1) the attenuation hypothesis, (2) the bias hypothesis, and (3) the ability of each processing style to meet the sufficiency threshold.

The attenuation hypothesis.

The attenuation hypothesis captures the idea that the impact of heuristic cues can be weakened, or overridden, by systematic processing. Heuristic cues are more persuasive when motivation or ability to use systematic processing is low (Chaiken et al., 1989). Conversely, the impact of heuristic cues is much weaker when motivation and ability to systematically process is high (i.e. attenuation effects occur in these conditions). The attenuation effect may occur because systematic processing highlights information that questions the validity of heuristic processing. For example, an individual may have cues present regarding the length of the arguments presented. Based on the use of the simple decision rule 'length implies strength', longer arguments should be more persuasive. However, systematic processing of the content of the message may reveal that one long message contains many weak arguments, whereas a different, shorter message contains a small number of strong arguments. In such situations, the individual is less likely to use heuristic processing to form their judgement. Examples of heuristic cues' impact being attenuated by systematic processing typically arise when the heuristic cue provides an interpretation that is incongruent with the interpretation derived from systematic processing (e.g., Maheswaran & Chaiken, 1991).

The bias hypothesis.

The bias hypothesis concerns the way in which heuristic cues can influence systematic processing. Such effects are most likely to occur when the message being processed is ambiguous, allowing for different interpretations to be made (Chaiken et al., 1989). Heuristic cues can disambiguate ambiguous sources, and Chaiken et al. (1989) suggest that the mechanism for this is through heuristic cues establishing expectancies about how valid the message is. In these instances, heuristic cues act to bias systematic processing. Chaiken and Maheswaran (1994) demonstrated that source credibility can bias subsequent systematic processing by shaping the appraisal of the message content (i.e. a message is systematically processed more favourably if it is from a credible source). They demonstrated this through the larger number of positive attributes recorded by individuals who had received a message from a credible source, compared to individuals who had not received a message from a credible source.

Meeting the sufficiency threshold.

As highlighted above (Section 2.5.1), the type of information processing style that is deployed is affected by each style's ability to meet the sufficiency threshold. In instances

where heuristic processing does not instil adequate confidence, the individual is more likely to systematically process the information. Similarly, if systematic processing does not provide enough confidence (e.g., the individual lacks ability to successfully systematically process the information), the individual can increase their search for heuristic cues that may help in the attainment of the sufficiency threshold.

2.5.2 Independent co-occurrence

The HSM also assumes that there are conditions under which heuristic and systematic processing can proceed concurrently and relatively independent of one another. Chaiken et al. (1989) describe a situation in which support for the additive effects of heuristic and systematic processing could be obtained. They suggest that if a researcher manipulated a heuristic cue (e.g., source expertise) and an aspect of the message content (e.g., argument quality), and subsequently found main effects of both source expertise and argument quality on the individuals' attitudes, a regression analysis could be conducted to confirm whether the impact of source expertise was mediated by the expertise heuristic and the impact of argument quality was mediated by the valence of thoughts about the message. Chaiken et al. (1989) argue that the reason that there is little empirical support for the additive hypothesis is that in conditions where the 2 × 2 design noted above is used, there are conflicts in conditions where there are strong arguments/non-experts and weak arguments/experts. If an individual is motivated to process systematically, then the heuristics will be invalidated in these two cells. Consequently, the likelihood of demonstrating a main effect of expertise is greatly reduced. The authors recommend comparing heuristic and systematic conditions to conditions where no heuristic cue is present, i.e. observing whether there is a greater effect of source expertise *and* strong arguments on positive post-message attitudes than strong arguments in the absence of the source expertise cue. Such experiments have yet to be conducted.

2.6 Factors determining information processing style

2.6.1 Personal relevance and task importance

Situational factors, such as how relevant a message is, and how important the task is, influence the desired level of confidence and subsequent processing style. Petty, Cacioppo and Goldman (1981) demonstrated that when participants were presented with a personally relevant message (considering policy changes that would be implemented during their time at

university) compared to a message low in personal relevance (considering policy changes that would be implemented in ten years when they would no longer be at university), they processed a message more carefully and were not as influenced by heuristic cues. The same findings were obtained when Chaiken and Maheswaran (1994) manipulated task importance. Participants were either told that their opinions would weigh very heavily in the manufacturer's decision to distribute a product that the participants were asked to evaluate, or that their opinions were not very important as they would be averaged with the opinions of others. Those participants who were told that their viewpoints would be instrumental in the company's distribution policy demonstrated significantly more systematic processing than participants in the low task importance condition. In this instance, systematic processing was indexed by the number of attribute-related thoughts an individual reported during a thought-listing task, and by the number of persuasive arguments that were recalled.

2.6.2 Negative mood

Cognition and affect are intimately linked; Zajonc (1980) argued that "feeling is not free of thought, nor is thought free of feeling" (p. 154). This section will review the evidence that affective states influence the style of information processing that is deployed. First, the effect of induced and naturally occurring mood states on processing styles will be reviewed, before the exploration of studies examining specific mood states.

Numerous studies have demonstrated that negative mood states are associated with extended cognitive processing (Ambady & Gray, 2002; Batra & Stayman, 1990; Tiedens & Linton, 2001). Bohner, Bless, Schwarz and Strack (1988) informed participants that they had either performed well or poorly on a test. Alongside this, participants were also provided with information about how likely they were to perform well/poorly based on the (fictional) percentages scores experienced by previous participants. Bohner et al. (1988) demonstrated that, after receiving negative information about performance on a test, participants generated more causal reasons for the performance than individuals who received positive feedback. This effect occurred regardless of how probable the outcome was. Bohner et al. (1988) argue that this study provides clarity on previously confounded studies containing negative events that were less probable, and they suggest that increased causal reasoning when in a negative mood is not the result of a need to explain unexpected events. Thus, Bohner et al. (1988) suggested that the findings may be due to a general systematic approach to information processing when in a negative mood state and they hypothesised three possible reasons for

why a negative mood state results in greater causal reasoning. Firstly, enhanced causal reasoning may serve a protective function; searching for causal reasons makes it more likely that the individual will identify external and self-irrelevant causes. Secondly, it may enable individuals to avoid similar states in the future. This bears remarkable similarity to the deployment of worrying as a coping strategy for avoiding negative outcomes (Borkovec, 1994). Lastly, Bohner et al. (1988) suggest that causal thinking reduces the intensity of emotions, and can function as a mood control strategy.

Bohner, Crow and Erb (1992) constructed a set-up in which the participants found a coin (positive mood induction) or an onion (neutral mood induction) in a phone booth. A confederate (unaware of the participant's mood state) asked to use the phone before the participant. The confederate either provided a strong argument (their boss would only be in the office for a few more minutes) or gave no reason in the weak argument condition. Participants in the neutral group showed differential processing by indicating greater willingness to let the confederate use the phone first when a strong argument was presented compared to when no reason was given. There was no difference based on argument strength in the willingness to let the confederate use the phone first in the positive mood condition (suggesting that argument quality was not processed). In a second experiment, participants were induced into a negative or positive mood (through false feedback on a test) and then interacted with a confederate who asked for donations to a charity. The request included a manipulation of argument strength (weak vs. strong) and consensus cue (weak - few names on the donation list - vs. strong - many names on the donation list). Individuals in a positive mood were more likely to donate money, and this was not affected by the strength of the arguments or the consensus cue. Conversely, in the negative mood condition, donations were greatly reduced when a weak argument was presented in combination with a weak consensus cue, as compared to the conditions with either a strong argument or a strong cue. The authors argue that this supports the HSM principle that individuals will process and integrate "*all useful information* in forming their judgements" (Chaiken et al., 1989, p.212, italics added by Bohner et al., 1992).

Batra and Stayman (1990) also investigated the effects of positive (vs. neutral) mood on cognitive elaboration and subsequent attitudes. Following a mood induction procedure participants were asked to read an advert for a bank that contained either three strong or three weak arguments. Batra and Stayman (1990) found that the positive mood group

reported less cognitive elaboration (consisting of support arguments and counter-arguments) during a thought listing task than the neutral mood group. It seems that positive mood decreases cognitive elaboration. The positive mood group evaluated the message arguments more favourably than the neutral group (as indicated by the lower counter-arguments: total elaboration ratio). This indicates that a positive mood reduces the number of counter-arguments generated as a function of total elaboration.

Bodenhausen, Sheppard and Kramer (1994) investigated the impact of specific negative moods on processing styles. They used recall of personal memories to induce anger and sadness. Participants underwent a task in which they were asked to take the role of a member of a judicial board. Stereotyped information about the defendants was provided for half of the participants. Ratings were taken of the likelihood of the defendant's guilt. Stereotype activation did not affect the guilt ratings in the sad and neutral mood conditions, but stereotyped individuals were rated as more guilty in the anger mood condition. Bodenhausen et al.'s (1994) study suggests individuals in an angry mood are more likely to use stereotypes, and that individuals in a sad and neutral mood are less likely to rely on stereotyped information. In a second experiment, Bodenhausen et al. (1994) found that participants in an angry mood were more likely to agree with an expert source in a persuasion setting than individuals in a sad or neutral mood. The third experiment indicated a non-significant trend towards individuals in an angry mood agreeing more with trustworthy sources compared to individuals in a sad or neutral mood. Consequently, in all three of Bodenhausen et al.'s experiments, angry negative mood states were found to be more associated with a willingness to use heuristics than sad negative mood states. This fits with the work of Tiedens and Linton (2001) who suggest that it is the amount of certainty associated with an emotion that dictates whether heuristic or systematic processing are deployed, rather than the valence per se. Tiedens and Linton (2001) argue that emotions associated with certainty (happiness, anger) generate heuristic processing, while emotions associated with uncertainty (fear, anxiety, sadness) lead to systematic processing.

The exact mechanisms through which negative moods result in more deliberative processing are unclear. Some argue that it is because negative moods provide information about existing threats that require further consideration (e.g., Scott & Cervone, 2002). If an individual interprets that there is a threat in their environment, it is probable that they will also experience heightened accountability, responsibility, need for cognition, and desire for

control. Consequently one possibility is that negative moods exert their effect on systematic processing by impacting on a whole host of cognitive variables that raise an individual's sufficiency threshold.

2.6.3 Accountability

Accountability is defined as the pressure to justify one's opinions to others. It promotes effortful information processing in an attempt to avoid judgements that could cause embarrassment (e.g., Livingston & Sinclair, 2008). Experimental manipulations of accountability involve informing the high accountability group that they will need to justify their ideas to others (e.g. Erb, Pierro, Mannetti, Spiegel, & Kruglanski, 2007). Tetlock (1983) recognised that the impact of accountability on processing is not consistent; it is dependent in part on whether the participant is aware of the views of the person that they are accountable to. This places the motivating factor of accountability closely in the realm of impression motivation, an idea supported by Chen et al. (1996). Tetlock (1983) argued that if the participant *is* aware, then they can adopt a heuristic-style approach and simply select the socially acceptable viewpoint. However, if the participant is unaware of the views of the person they are accountable to then they may wish to engage in more effortful processing so that they can successfully justify their views. According to this hypothesis, effortful processing should occur in the group of individuals who are justifying their views to an individual whose views are unknown, but not when they are justifying their ideas to an individual described as liberal or conservative. In the latter groups, Tetlock predicted that a tactical attitudinal shift would occur, with the participant moving the attitudes that they have to justify closer to that of the liberal or conservative person. The pattern of results obtained by Tetlock (1983) supported these hypotheses, and suggests that accountability only motivates more effortful information processing when the heuristic of agreeing with the other person's views is not available.

2.6.4 Responsibility

Responsibility also promotes systematic processing. Bohner et al., (1995) have suggested that responsibility increases systematic processing by increasing task importance and raising sufficiency thresholds. Some authors have linked responsibility to Tetlock's (1983) conception of accountability. For example, individuals may engage in "responsible" processing when they are consciously concerned about their reputation as a thinker (1989). Uleman suggests that systematic processing can form part of responsible processing, in which

individuals are motivated to scrutinise information with greater intentional control to ensure it meets accountability standards (for others and themselves). Interestingly, perceptions of responsibility are affected by mood states; individuals induced into a negative mood reported feeling more responsible than participants induced into a neutral mood (Tiedens & Linton, 2001). Chaiken et al. (1989) report that participants given sole responsibility versus shared responsibility for evaluating messages were more motivated to engage in systematic processing.

2.6.5 Need for cognition

Need for cognition (NFC) is defined as "a need to structure relevant situations in meaningful, integrated ways" (Cohen, Stotland, & Wolfe, 1955, p. 291), and individuals who possess high levels of NFC are likely to find systematic processing less aversive in terms of its cognitive expenditure. The ways in which an individual wishes to structure information to make it 'meaningful' and 'integrated' vary as a function of individual and situational factors (Cohen et al., 1955). Batra and Stayman (1990) found that high NFC individuals demonstrated greater elaboration of ideas relating to a message. Cacioppo, Petty, and Morris (1983) provided individuals with messages varying in argument quality. Participants who were high NFC showed a greater impact of argument quality on their post-message attitudes, indicating that they had deployed systematic processing to a greater extent than their low NFC counterparts. Cohen et al. (1955) suggest that situations in which an individual is unable to achieve the amount of cognition that they desire, such as situations that are ambiguous, create frustration. What is more, Cohen et al. (1955) demonstrated that individuals who are high/medium NFC more readily identify situations as being ambiguous than low-NFC individuals. This raised perception of ambiguity is likely to increase an individual's desire to systematically process information.

2.6.6 Desire for control

Desire for control is the motive to control events in one's life. Systematic processing may be deployed in an attempt to maximize control (Burger & Cooper, 1979). Maheswaran and Chaiken (1991) report that situational factors, such as control deprivation, and dispositional factors, like desire for control, increase the extensiveness of message processing. They postulate that this is due to raised sufficiency thresholds, with the consequence that more systematic processing is required in order to meet the sufficiency threshold. Kofta and Sedek (1998) suggest that a loss of control motivates an individual to deploy cognitive

resources in an attempt to try to regain control, and that a loss of control may in fact free up cognitive resources for deployment.

Each of the factors described in Section 2.6 (negative mood, accountability, responsibility, NFC, and desire for control) can be considered systematic processing facilitators, in that they can all act to raise an individual's sufficiency threshold (Cacioppo, et al., 1983; Chaiken, et al., 1989; 1998; Lee, Herr, Kardes, & Kim, 1999; Maheswaran & Chaiken, 1991), as shown in Figure 2.1.

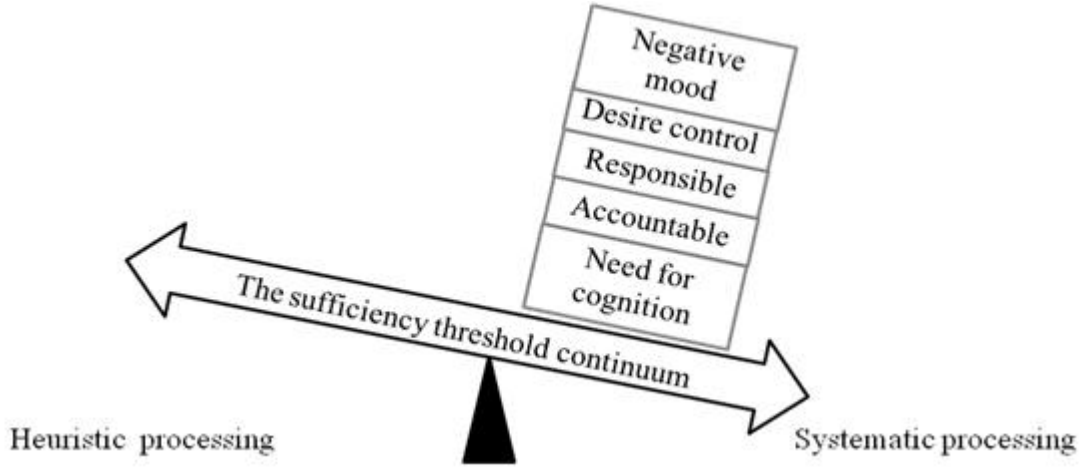


Figure 2.1 Schematic diagram of variables that increase the likelihood systematic processing will be deployed.

2.7 Application of the HSM

The HSM was originally derived as a model of persuasion (Chaiken, et al., 1989), but has since been applied to risk perception (Trumbo, 1999) and decision making, including in clinical health contexts (Steginga & Occhipinti, 2004). Although a full review of the application of the HSM to contexts beyond persuasion is beyond the scope of this literature review chapter, some examples are provided to demonstrate that the key principles of the HSM apply beyond the persuasion setting.

The sufficiency threshold principle has been extended to health/risk settings. Kahlor, Dunwoody, Griffin, Neuwirth, and Giese (2003) demonstrated that the notion that a negative

discrepancy between actual and desired confidence will promote systematic processing extends to health risk perception. They found that the wider the gap between an individual's understanding of risk and the level of understanding that the individual felt was needed to make a decision about health risks, the more likely it was that systematic processing would be deployed. Trumbo (2002) applied the HSM to risk perception (see Figure 2.2), and found that the model had good predictive power for an individual's risk perception.

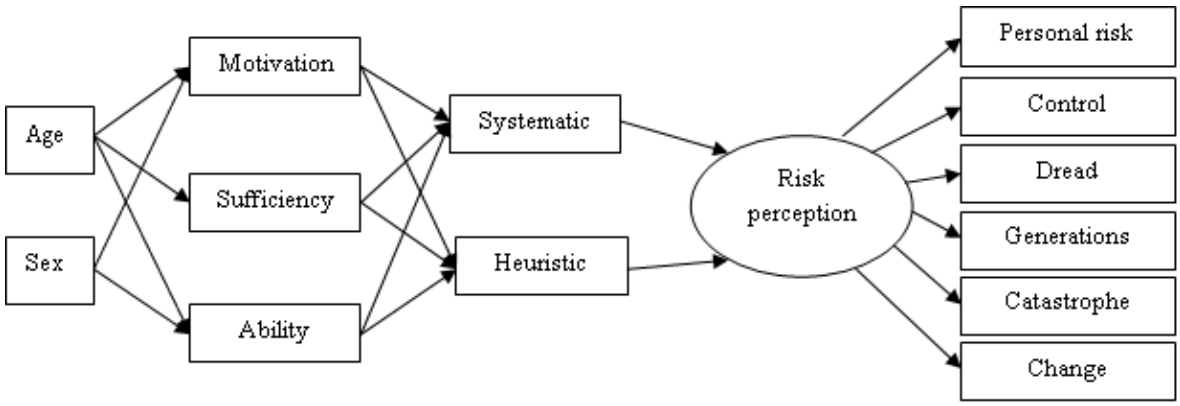


Figure 2.2 Reproduced from Trumbo (2002); the heuristic-systematic model applied to predicting risk perception.

2.8 The HSM and perseverative worry

The application of the HSM to contexts beyond the persuasion setting raises the possibility that applying the HSM to understanding worry perseveration may also be fruitful. Indeed, systematic processing has already been invoked in explanations of the role of negative mood in worry (Davey, 2006b), and AMA stop rule deployment (Startup & Davey, 2001), but until now the role that systematic processing may play in worry has not been explored. This section reviews features of chronic worriers that increase the likelihood that they will deploy systematic processing in relation to their worries, and consequently show extended bouts of worry as they spend longer processing thought content in more detail. The following sections will argue that the characteristics of worriers not only raise sufficiency thresholds, but also decrease actual confidence, making the deployment of systematic processing highly probable in an attempt to resolve this discrepancy.

2.8.1 Similarities between worry and systematic processing

There are many similarities between systematic processing as an effortful form of information processing and chronic worrying. For example as outlined above, systematic processing is associated with raised sufficiency thresholds. An individual will exert increasing levels of analytical effort to attain a degree of confidence that they have achieved their processing goals, and appraisals relevant to responsibility and accountability contribute to raising this 'sufficiency threshold'. Similar processes appear to underlie perseverative worry. First, chronic worriers possess personality characteristics that will raise the threshold for feeling confident that goals associated with judgements and decisions have been successfully met (e.g., perfectionism, IU, inflated concerns over mistakes) (Dugas, et al., 1997; Frost, Marten, Lahart, & Rosenblate, 1990; Pratt, Tallis, & Eysenck, 1997; Stöber & Joormann, 2001a). Worriers also exhibit cognitive appraisal processes known to facilitate systematic processing, such as feelings of responsibility and accountability for outcomes (Wells & Carter, 2001; Wells & Papageorgiou, 1998).

Secondly, metacognitive approaches to understanding pathological worry argue that chronic worriers possess metacognitive beliefs that worrying is a necessary process to engage in to successfully avoid future threats (Borkovec, Hazlett-Stevens, & Diaz, 1999; Davey, Tallis, et al., 1996; Wells, 1995), and such beliefs will inevitably raise sufficiency thresholds to ensure whatever level of effort is required is deployed to successfully engage with the worry and achieve the necessary levels of confidence that the worry has been dealt with. In addition to these processing similarities, systematic processing and worrying appear to share similar functional brain characteristics. Systematic processing appears to be supported by a functionally distinct brain process located in the left frontal lobes (Leynes & Phillips, 2008; Leynes, 2002; Nolde, et al., 1998), and studies have reported evidence that increases in worrying are associated with increased left hemisphere frontal activation (Borkovec, et al., 1998). Furthermore, successful treatment for worry-related diagnoses such as Generalized Anxiety Disorder (GAD) lead to significant reductions in left hemisphere activation (Hoehn-Saric, Schlund, & Wong, 2004). This is consistent with systematic processing and worrisome thought both being predominantly left hemisphere activities (Carter, Johnson, & Borkovec, 1986) involved in the systematic, verbal processing of information.

2.8.2 Raised sufficiency thresholds

Systematic processing is more readily deployed when a discrepancy exists between an individual's actual level of confidence and their desired level of confidence. There are a number of reasons why worriers may possess lower levels of confidence that they have met the goals for their worrying than the level of confidence that they desire. Firstly, worriers exhibit low PSC (Belzer, et al., 2002; Davey, 1994b; Davey, et al., 1992; Davey & Levy, 1998a), and this increases the likelihood that their judgements will be deemed insufficient. Additionally, worriers frequently couch their worries in terms of personal inadequacy (Davey & Levy, 1998a, 1998b), which is likely to give rise to the belief that they have not acquired a sufficient judgement. Furthermore, worriers have been identified as having a negative problem-orientation (Dugas, et al., 1997; Robichaud & Dugas, 2005). A negative problem-orientation will reduced an individual's actual confidence given that this orientation towards problems is associated with a "perceived threat of problems to well-being, self-inefficacy or doubt over one's problem-solving ability, the tendency to be pessimistic about the outcome, and low frustration tolerance" (Robichaud & Dugas, 2005, p. 391).

Individuals who experience high levels of worry exhibit dispositional tendencies that make it more likely that they will have high sufficiency thresholds. One such dispositional tendency is perfectionism. In the past decade, Shafran and colleagues have propelled understanding of perfectionism in psychopathology through their work on 'clinical perfectionism'. This is defined as "the overdependence of self-evaluation on the determined pursuit of personally demanding self-imposed standards in at least one highly salient domain, despite adverse consequences" (Shafran, Cooper, & Fairburn, 2002, p.778). Clinical perfectionism has been identified as a transdiagnostic construct (Egan, Wade, & Shafran, 2011), and while studies have not been conducted in patients with GAD, it seems likely that they will possess elevated levels of clinical perfectionism as has been demonstrated in patients with social anxiety and OCD. Clinical perfectionism occurs in domains that are highly personally relevant to the individual (Shafran, et al., 2002), a factor that is known to raise an individual's sufficiency threshold (e.g. Petty, et al., 1981).

Furthermore, worriers possess raised levels of IU (Ladouceur, et al., 1997), which is associated with seeking more information before being confident when making decisions (Tallis, et al., 1991). Searching for more information has used been used as an indicator of systematic processing in a number of studies (e.g. Kahlor, Dunwoody, Griffin, & Neuwirth,

2006). The fact that individuals with high IU feel the need to consult more information in order to be confident in the decisions that they make suggests that they have raised sufficiency thresholds. Linked to this, worriers also have elevated evidence requirements (Tallis, et al., 1991).

Earlier in this chapter, variables that promote systematic processing were covered (negative mood, accountability, responsibility, NFC, and desire for control). These motivational variables have also been explored in clinical contexts. As reported in Chapter 1, pathological worriers experience negative mood more frequently (e.g. Meyer, et al., 1990), which is likely to trigger systematic processing. There are a number of outcomes of experiencing persistent negative moods that make it more likely that worriers will be motivated to use systematic processing. Firstly negative mood states are associated with increased performance standards (Cervone, et al., 1994; Scott & Cervone, 2002). Negative moods are also associated with an increased desire on the part of the individual experiencing the negative mood to try to understand and repair their mood (Schwarz & Clore, 1983). Furthermore, the negative moods experienced by worriers, sadness and anxiety, are related to uncertainty, and this can result in systematic processing (Tiedens & Linton, 2001).

Responsibility consistently emerges in factor analyses of worry content, appraisals and beliefs (Cartwright-Hatton & Wells, 1997; Langlois, Freeston, & Ladouceur, 2000; Sugiura, 2007), and experimentally increasing responsibility increases worrying (Startup & Davey, 2003). What is more, worriers report feeling responsible for negative outcomes (Davey, et al., 1992). In addition, feelings of accountability predict worry levels of women undergoing cancer screening (Brain, et al., 2008). Desire for control is also related to worry as clinical descriptions highlight worriers' desire to control unwanted thoughts (e.g. Roemer & Borkovec, 1993; Wells, 1995). Evidently, factors that have been identified as facilitators of systematic processing are relevant to worrying. As such, it is possible that systematic processing may underpin worry perseveration.

2.8.3 Motivated information processing

Characteristics of worriers also increase the likelihood that they are motivated to ensure that their appraisal/judgement of a situation is accurate (i.e. high levels of accuracy motivation). For example, worriers believe that worrying is a necessary process to engage in to avoid future threats and problems (e.g. Davey, Tallis, et al., 1996). Furthermore, worriers believe it is important to think about the issues as much as possible when worrying, as

evidenced by their endorsement of use of the AMA stop rule for worry. Worriers endorse specifying that the task must be completed fully and properly (Davey, et al., 2005), again supporting the notion that they will be motivated to attain accurate judgements of whether an issue has been fully resolved, or is still amenable to worrying.

Defence motivation could come into play when worriers seek to defend the beliefs that they hold about worrying. Worry is an unpleasant experience, and chronic worriers experience increasing distress as a worry bout progresses (Vasey & Borkovec, 1992). Cognitive dissonance theory would predict that worriers would hold some positive beliefs about why they worry in order to integrate the negative experience of worry with the compulsion to worry, and thus maintain a sense of internal consistency (Festinger, 1957). Indeed, a number of authors have identified that chronic worriers hold positive beliefs about deploying worry as a coping strategy, including beliefs such as 'worrying keeps me in control', 'in order to get something done I have to worry about it', 'worrying gives me the opportunity to analyse situations and work out the pros and cons', and 'by worrying, I reorganise and plan my time better' (e.g. Borkovec, et al., 1999; Cartwright-Hatton & Wells, 1997; Davey, Tallis, et al., 1996; Wells & Carter, 1999). Thus, worriers may process information about their worries in a way that allows them to continue to hold these positive beliefs about the utility of worry. Additionally, worriers hold a number of strong beliefs about the negative consequences of worry, such as 'worrying increases my anxiety and so decreases my performance', 'worrying makes me irrational', and 'worrying distorts the problem I have and so I am unable to solve it' (Davey, Tallis, et al., 1996). Altering the beliefs that worriers hold about worrying forms a central tenet of metacognitive therapy for GAD (e.g. Wells, 1999). Thus worriers may process information about their worries in a way that allows them to maintain both positive and negative beliefs about worrying.

Impression motivation also appears to be a feature of chronic worriers. The Anxious Thoughts Inventory (Wells, 1994), which was designed as a multidimensional measure of worry, includes a social worry subscale. The social worry subscale consists of items such as 'I worry about saying or doing the wrong thing among strangers' and 'I worry that people don't like me'. Individuals with GAD were found to be comparable to individuals with social anxiety on the social worry subscale, highlighting the importance of social worries in GAD (Wells & Carter, 2001). Furthermore, Purdon and Harrington (2006) highlight the role of worry-type processes in social anxiety, which they claim has anticipatory anxiety as a hallmark feature.

2.8.4 Is worry a form of systematic processing?

While systematic processing and worrying share may factors in common, they are not the same thing. Both represent forms of effortful, analytic thought, but systematic processing is deployed in a broad range of judgement tasks having both personal and social significance. For example, systematic processing can be deployed in decision making, such as treatment decisions in prostate cancer (Steginga & Occhipinti, 2004), and when forming attitudes (Martin & Hewstone, 2003). To this extent, systematic processing might be viewed as a form of analytic thought that many individuals might call worrying, but more properly represents constructive problem-solving in which activities such as logical analysis, problem-solving, information-seeking, and active behavioural coping all play a central role (Davey, 1994b). It is only when this adaptive, analytical process is 'thwarted' that the characteristics of pathological worrying begin to emerge (e.g., increasing emotional discomfort, catastrophising, perceived lack of control over the worry process). If systematic processing is the effortful, analytic, verbally-based thought that many researchers have also used to define worrying (Borkovec & Inz, 1990; Freeston, Dugas, & Ladouceur, 1996), then pathological worrying is additionally defined by those processes that 'thwart' the effectiveness of systematic processing. Such processes may involve low PSC (Davey, 1994b; Davey, Jubb, et al., 1996), metacognitions about the negative consequences of worrying (Wells, 1995), feelings of personal inadequacy (Davey & Levy, 1998b), IU (Dugas, Buhr, & Ladouceur, 2004) and an avoidance coping style (see Berenbaum, 2010, for some further examples of processes that may 'thwart' closure of the worry process).

2.8.5 Advantages of a systematic processing approach to understanding worry

Exploring systematic processing as a mechanism of perseverative worry has the potential to bridge the gap between theories of worry at the level of clinical constructs, such as IU, and explanations of proximal mechanisms that underlie worry perseveration. Indeed, because of its theoretical purity as a functionally-distinct effortful form of analytical thought, systematic processing may be a truly transdiagnostic process that is involved in a range of perseverative, pathological thought processes, including rumination, worrying, brooding, doubting, and hyper-vigilant scanning to name but a few. A better understanding of the proximal mechanisms involved in worry perseveration offers the promise of effective, theoretically-informed and targeted interventions for worry-based mental health problems.

2.9 Summary and concluding remarks

The HSM provides a theoretical basis for understanding how individuals process information. This model has been successfully applied to persuasion, risk perception and decision-making, but has not yet been applied to clinical psychopathology. As reviewed in this chapter, three key dispositional factors exhibited by worriers - negative mood, IU, and low PSC - are all likely to widen the gap between an individual's actual level of confidence and their desired level of confidence (the sufficiency threshold). The HSM suggests that in order to meet their sufficiency thresholds, worriers will deploy systematic processing. This thesis will examine this notion, and explore whether negative mood, IU and low PSC operate through a mechanism of systematic processing.

3 Examining worry and systematic processing: Manipulations and measurements

3.1 Introduction

This thesis examines the role of systematic processing as a mechanism for the impact of negative mood, intolerance of uncertainty (IU), poor problem-solving confidence (PSC) on perseverative worry. However, the ability to answer questions regarding the role of this information processing style in worry is dependent upon the ability to measure both worry and systematic processing, and also the ability to manipulate variables thought to have a causal effect. This chapter reviews existing methods for manipulating and measuring the variables central to this thesis, and accounts for the methodological decisions made in this body of work.

3.2 Measuring worry

Worry is defined as a chain of negative thoughts that feel uncontrollable (Borkovec, et al., 1983). These negative thoughts are often aimed at anticipating threats (Mathews, 1990) and solving problems (Davey, 1994b). Worry thoughts can be catastrophic in nature (Davey & Levy, 1998a), and include themes of personal inadequacy (Davey & Levy, 1998b). Worry is different from trait anxiety (Davey, 1993b), and thus worry requires separate measures to those typically used to assess trait anxiety, such as the State-Trait Anxiety Inventory (Spielberger, 1983). Methods for measuring worry include interviews (e.g. Davey, 2006a), asking participants to report their thoughts (e.g. Borkovec, et al., 1983), and worry diaries (e.g. Szabó & Lovibond, 2006), but questionnaires are the most common method of assessment (e.g. Meyer, et al., 1990).

3.2.1 Worry Questionnaires

Davey (1993b) reports that early attempts had been made to measure worry in specific populations, such as the elderly (Wisocki, Handen, & Morse, 1986), and there were some items in anxiety questionnaires that measured worrying, such as the Anxiety Disorders Interview Schedule (Di Nardo, et al., 1985). Once the need for more specific worry questionnaires was established, the development of worry questionnaires followed two approaches: content measures and frequency/intensity measures.

A number of questionnaires were developed to measure the content of individuals' worries. The items for content-analysis questionnaires were often generated by asking participants to write down things that they worried about (Davey, et al., 1992; Di Nardo, et al., 1985). While this method of item-generation is good in that it is open-ended and enables participants to report worries that the experimenters may not have personally experienced/considered, it does pose the risk that individuals are not defining worry in the same way. For instance, some individuals may feel that their worries include problem-solving processes; others may not. There is also the risk that participants may not appreciate the academic differences between worry and related cognitions, such as obsessions and ruminative thoughts. Consequently, items generated by participants may not solely measure 'worry'. The Student Worry Scale (SWS; Davey, et al., 1992) contains 10 items measuring frequently reported areas of concern for students: financial concerns, academic demands, accommodation, health worries, job prospects, world affairs, personal relationships, religious matters, environmental matters, and evaluation of themselves by others. Additionally, Tallis, et al. (1992) developed a measure not limited to the student population, the Worry Domains Questionnaire (WDQ). The WDQ was derived using cluster analysis of 100 common worries and concerns. It is a 30-item questionnaire with five subscales: relationships, lack of confidence, aimless future, work incompetence and finances. Clearly there is overlap in the content of worries reported by students in the SWS and the participants involved in the development of the WDQ.

However, in terms of assessing individuals who have chronic worry levels, and who may meet diagnostic criteria for GAD, it is perhaps more useful to focus on the nature of the worry thoughts (uncontrollability and excessiveness) rather than the topic of the worries. This is because uncontrollability and excessiveness are key diagnostic criteria in the DSM-IV (American Psychiatric Association, 2000) and these features reliably differentiate non-pathological and pathological worry (Brown, 1997). The Penn State Worry Questionnaire (PSWQ; Meyer, et al., 1990) is undoubtedly the most widely used questionnaire in the worry literature. The PSWQ does not examine the content of an individual's worry, but instead measures features of the worry process, such as frequency and intensity. It consists of 16-items (e.g., 'Many situations make me worry'), which are rated on a 5-point Likert scale ranging from (1) 'not at all typical of me' to (5) 'very typical of me'. The PSWQ has good test-retest reliability (r = .74-.93) (Molina & Borkovec, 1994), internal consistency (α = .90) (Brown, Antony, & Barlow, 1992), and discriminant validity (Meyer, et al., 1990). In terms of

convergent validity, the PSWQ correlates with related constructs: trait anxiety (Davey, 1993b) and depression (Meyer, et al., 1990). Also, providing strong evidence that the PSWQ does indeed measure worry, it has been demonstrated that the PSWQ correlates with other measures of worry, including the Worry Domains Questionnaire (Davey, 1993b), the Anxious Thoughts Inventory (Wells, 1997), the Why Worry? (Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994), and the Consequences of Worry Scale (Davey, Tallis, et al., 1996).

In their review of the PSWQ, Startup and Erikson (2006) considered relative scores among different groups. As expected, non-anxious individuals score lowest on the PSWQ. Analogue GAD participants score higher than non-anxious groups, but not quite as high as diagnosed GAD patients. Individuals with other forms of psychopathology, such as depression and other anxiety disorders, also score very highly on the PSWQ. It appears that the cut-off required to sensitively and specifically distinguish individuals with GAD from individuals without GAD depends upon the sample. Behar, Alcaine, Zuellig and Borkovec (2003) found that a PSWQ score of 45 was a successful cut-off to distinguish treatment-seeking individuals with GAD from non-anxious individuals, but that a higher cut-off of 62 was required when differentiating individuals with GAD in a large student sample.

The PSWQ has been used as an outcome measure to assess changes in worrying after a variety of interventions (e.g., Goldman, Dugas, Sexton, & Gervais, 2007; Borkovec & Costello, 1993; Treanor, Erisman, Salters-Pedneault, Roemer, & Orsillo, 2011). Stöber and Bittencourt (1998) adapted the PSWQ to enable weekly assessment of worry, creating the Penn State Worry Questionnaire-Past Week (PSWQ-PW). The PSWQ-PW has excellent internal consistency ($\alpha = .91$) and convergent validity (Stöber & Bittencourt, 1998). However, the psychometric rigour of the PSWQ-PW was assessed while individuals were undergoing a worry intervention, and as such, they may have had prior expectations that their worry levels would decrease during the course of the assessment period. Furthermore, the PSWQ-PW is not widely used, making comparative data sparse.

Nonetheless, as is always an issue with questionnaire measures, it is nigh impossible to determine whether two individuals both endorsing '5', for example, for a particular question have the same experience of worry. Furthermore, a recent study highlighted that an individual's perception of their own symptoms of depression and anxiety are rank-based according to their perception of the symptoms of their friends around them (Melrose, Brown,

& Wood, 2012). An alternative approach is to try and gauge 'in the moment' worry tendencies, which is attempted in the catastrophising interview (CI).

3.2.2 Worry interviews and sampling

Interviews are commonly used for diagnosing GAD (Turk & Wolanin, 2006). The clinician elicits responses about clients' presenting problems and symptoms through asking the client questions aloud. Two widely-used clinical interviews are the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1997) and the Anxiety Disorders Interview Schedule (Brown, DiNardo, & Barlow, 1994). Whilst these interviews are useful for obtaining information relating to whether the client has a diagnosis of GAD or not, they do not provide an assessment of the proximal features of the individual's worry. Nor do these clinical interviews measure the whole spectrum of worry behaviour, omitting areas such as adaptive, problem-focused worrying. An alternative interview, the CI, has been used in the context of research examining mechanisms of worry. The CI technique provides an objective measure of the "what if...?" questioning style characteristic of high worriers. Originally derived from the de-catastrophising procedure, a therapeutic tool from cognitive clinical psychology (Kendall & Ingram, 1987), the CI procedure has been developed to measure the length and content of a worry bout (Davey, 2006b; Vasey & Borkovec, 1992). In its original form, Vasey and Borkovec (1992) first asked participants to list their current worries and rate them for significance and the amount of time spent worrying about them. They then chose the highest rated worry (for time and significance) and audio taped the following interview, which began by asking the participant 'what is it about X that worries you?' (where X is the participant's highest rated worry). This was followed up with the question 'What about Y would you find fearful or bad if it did happen?' (where Y is the participant's answer to the preceding question). This catastrophising procedure was repeated until the participant (a) refused to continue, (b) was unable to think of any more responses, or (c) repeated the same answer on three consecutive occasions.

This procedure was adapted by researchers at the University of Sussex and has been used in several experiments investigating catastrophic worry (e.g. Davey & Levy, 1998b; Johnston & Davey, 1997; Startup & Davey, 2001). Significant changes from the Vasey and Borkovec (1992) procedure include asking participants to write their answers down rather than audio taping the interview, and just using the first part of the question 'what is it that worries you about X?'. Asking participants to write down their responses encourages

participants to give one answer at a time, rather than a string of ideas that worry them. This modification allows more reliable coding of how many catastrophic steps have been generated. Participants are told there is no right or wrong time to end the interview, and they should end the interview when they choose to. The number of steps generated is taken as a measure of perseveration at the worry task. While the CI is excellent for assessing the catastrophic nature of worry thoughts, it does not lend itself to assessing problem-solving. Thus it is questionable whether the CI captures the entire worry experience. However, the CI is well-suited to assessing the impact of short-term laboratory manipulations on worry behaviour, and has possible applications as both an assessment tool *and* a clinical tool (Davey, 2006a), which cannot be said of traditional worry questionnaires. Furthermore, the CI has validity as a measure of problematic worry, with high worriers (as identified by the PSWQ) generating more steps on the CI than low worriers (Startup & Davey, 2001).

In an attempt to gather information on naturally occurring worry episodes, diary approaches have also been used (Szabó & Lovibond, 2002; 2006). In one study, participants were asked to record all worries that occurred over seven days, or until they reached 10 worries, whichever happened first (Szabó & Lovibond, 2002). These diaries were then scored for frequency and excessiveness (self-reported) of worries experienced during the 7-day period. Despite their advantage in terms of valid real-world worry data, worry diaries are labour intensive, both for the participant and the research team. The use of diaries is also not appropriate for measuring the impact of short-term laboratory manipulations, which are likely to have short-term effects on worry. Other researchers, in an attempt to tap into naturally occurring worry intrusions, have used a thought-sampling technique, where participants were asked at numerous (pseudo-random) time points during a breathing task whether, at the time they were asked, they were focusing on their breathing, distracted by negative thoughts, distracted by positive thoughts, or some other thought (Borkovec, et al., 1983). However, reporting negative thoughts does not in itself indicate that the individual is experiencing a worry thought, specifically. What is more, single snapshots of thoughts do not appear to fit the examination of worry defined as a 'chain' of negative thoughts as well as the CI does.

3.2.3 Summary: worry measures

Measures of worry take many forms, and using multiple measures of worry enables research teams to explore different aspects of worry (e.g., state/trait, excessiveness,

negativity, catastrophising, and problem-solving). Questionnaires have been used to assess the content of worries, but worry content has little predictive power in establishing who will experience worry-related psychopathology. Questionnaires have also been developed that focus on the thoughts worriers have about the worry process, and the beliefs that individuals hold about their worrying. Despite the range of worry questionnaires available, the PSWQ is undoubtedly the most widely-used measure of worry. The PSWQ does focus largely on the maladaptive end of the worry spectrum, at the expense of measuring more adaptive aspects of worrying. Nonetheless, the PSWQ was used in this thesis because it is well-validated, has established norms for different populations, and has been used to assess changes in worry over time.

While questionnaires can provide a good indication of trait worry levels, they are less appropriate when estimating state worry. Alternative measures to questionnaires include diagnostic interviews, but these are similar to the PSWQ in that they focus on the extreme end of the worry spectrum. Diary measures have also been used but they are time consuming, rely upon the participant to remember to complete the diary, and are not suited for assessing the impact of short-term laboratory manipulations on worrying. The CI was used in this thesis because it is the best method for examining the impact of variables on a measure of catastrophic worry in a laboratory setting, allowing a closer exploration of the proximal factors involved in worry perseveration. The CI probably doesn't assess all aspects of the worry process, but using both the PSWQ and the CI provides a more thorough overview of the way in which the independent variables examined in this thesis affect worry.

3.3 Measuring systematic processing

A detailed discussion of the definitions of systematic and heuristic processing was provided in Chapter 2. Broadly speaking, systematic processing is described as "a comprehensive, analytic orientation in which perceivers access and scrutinize all informational input for its relevance and importance to their judgement task, and integrate all useful information in forming their judgements" (Chaiken, et al., 1989, p. 212). Heuristic processing, in contrast, is "a more limited processing mode that demands much less cognitive effort and capacity than systematic processing" (p. 213). The way in which systematic processing is measured, or perhaps more accurately, inferred, varies and a lack of direct measures creates issues when assessing variables that affect systematic processing. However, some techniques are frequently used in the literature to infer whether systematic or heuristic

processing is in use. These techniques include recording the number of thoughts that are listed, examining message recall, thought-listing tasks (with attention on whether attribute/message or consensus/opinion thoughts are reported), looking at differential agreement between weak and strong arguments, correlating message-related thoughts and message-related attitudes, and questionnaires. These methods have been employed in social psychology studies, typically investigating attitude persuasion, and their validity to worry situations should be considered.

3.3.1 Thought-listing

One of the most widely used methods of measuring information processing style is thought-listing. Thought-lists have been coded and analysed in different ways, including (1) the number of thoughts listed (Greenwald, 1968), (2) assessing content of thoughts for attribute versus consensus related thoughts (Maheswaran & Chaiken, 1991), and (3) examining how closely message-related thoughts correlate with attitudes toward the message conclusion (Chaiken, 1980). Martin, Hewstone and Martin (2007) employed thought-listing in their study of the impact of message relevance and levels of orientation on attitudes and message processing. Participants were given a counter-attitudinal message, and then asked to list the thoughts they had while reading the message. Martin et al. (2007) suggest that the higher the ratio of message-congruent thoughts compared to the number of total message-thoughts is an indication of the amount of thought elaboration. Similarly, Maheswaran and Chaiken (1991) analysed thoughts that participants had about a product message and coded them as attribute-related (i.e. features of the product, which they suggest represents systematic processing) and consensus-related (going along with public opinion about the product, which they suggest represents heuristic processing). Thought-listing allows some interpretation of the information processing style that individuals use, but it requires researchers to infer which thought processes led the individual to produce these thoughts. Furthermore, individuals may not write down all their thoughts, and some aspects of processing may not reach conscious awareness, particularly when using heuristics (Chen & Chaiken, 1999). Additionally, given that Chaiken et al. (1989) highlight that both systematic and heuristic processing can result in the same judgments being made, it is unclear how much certainty can be obtained about the type of information processing simply by looking at the thoughts listed by an individual.

Related to thought-listing, some research teams have analysed verbal communication for evidence of systematic and heuristic processing. Steginga and Occhipinti (2004) categorized participants' responses as reflecting heuristic processing if they involved agreeing with expert opinions, and reflecting systematic processing if they demonstrated that the individual considered treatment information (e.g., side effects). However, Hamm (2004) questions whether (1) deferring to an expert counts as a 'heuristic' strategy; (2) it is possible to ascertain if an individual has used heuristic processing simply by assessing whether such ideas have occurred in the patient's self-report account of the decision making process; and (3) patients' decisions were actually consistent with the heuristics identified in their accounts (Steginga & Occhipinti didn't report this).

Other authors have examined indicators of the amount of effort devoted to message processing such as the amount of message recalled successfully (Eagly & Chaiken, 1984; Smith & Shaffer, 1991), and the amount of time spent reading a message (Chaiken, 1980). This can be justified by the argument that systematic processing requires greater cognitive capacity than heuristic processing, and that this extra cognitive capacity requires greater time.

3.3.2 Information processing questionnaires

Griffin, Neuwirth, Giese and Dunwoody (2002) developed a 9-item questionnaire designed to measure systematic and heuristic information processing. Participants indicated their agreement or disagreement with statements, which they were told represented different ways that people deal with information they receive from the media and other sources about risk. A 5-point Likert-type scale response format was used. Heuristic processing was measured by four items, including 'When I encounter information about this topic, I focus on only a few key points'. Systematic processing was measured by five items, including 'After I encounter information about this topic, I am likely to stop and think about it'. Factor analysis supported the two factor solution of a heuristic processing factor and a systematic processing factor. While this questionnaire shows promise for measuring general tendencies towards systematic and heuristic processing, it might not map well onto measuring the processing of worry thoughts, which are typically internally generated risk appraisals, rather than risk information from an external source. The questionnaire has moderate reliability (Griffin, et al., 2002), but the authors did not report examinations of the questionnaire's validity. A questionnaire measure of information processing styles raises some of the same issues that were discussed in relation to using thought-listing, see above. Most importantly, it requires

participants to be aware of the processing styles that they are using, and this may not always be the case. However, it provides an efficient way of assessing the approaches individuals take to the information that they are presented with.

3.3.3 Approximating the sufficiency threshold

An alternative approach to measuring systematic processing deployment is to assess the extent of an individual's sufficiency threshold. Chaiken et al. (1989) account for why a higher sufficiency threshold should result in greater amounts of systematic processing, as outlined in Chapter 2. Consequently, when comparing two groups, those with higher sufficiency thresholds are more likely to engage in systematic processing. This seems a more promising way of examining the role of systematic processing in worry as alternative methods, such as thought-listing, are difficult to code in relation to worry thoughts. Numerous papers manipulate task importance, personal relevance, responsibility, accountability, need for control, or desire for cognition in order to induce systematic processing (Batra & Stayman, 1990; Chaiken & Maheswaran, 1994; Maheswaran & Chaiken, 1991; Petty, et al., 1981; Tetlock, 1983). As such, measuring these variables can provide an indication of an individual's propensity to deploy systematic, as opposed to heuristic, processing.

3.3.4 Summary: Measuring systematic processing

Systematic processing has typically been assessed through thought-listing tasks and the attitude position adopted by the participant. Thought-listing tasks are limited by their reliance on participants to report all their thoughts. Furthermore, interpreting the style of information processing used from the attitudes that individuals settle upon may be ill-advised given that Chaiken et al. (1989) report both systematic and heuristic processing can result in the same outcome. Furthermore, despite Chaiken et al.'s (1989) assertion that the heuristic-systematic model (HSM) is applicable beyond the persuasion setting, the majority of experiments that have examined systematic processing have been conducted around persuasion and attitude formation. Consequently, it can be difficult to map these techniques onto other areas of human judgment, such as risk perception and, in the case of this thesis, personally-generated thoughts. More recently a questionnaire measure has been developed in the risk perception literature (Griffin, et al., 2002). This provides an efficient way of assessing the way in which an individual thinks that they have processed information, without the experimenter having to make inferences in the same way that is required in the coding of thoughts generated in a thought-listing procedure. An adaptation of the Heuristic-Systematic

Processing Questionnaire was used in this thesis. However, individuals need to be aware of what processing styles they have used. Consequently, the experimental studies utilised a novel measure informed by the sufficiency threshold principle of the HSM. Participants reported how much they endorsed cognitive appraisals that are known to raise sufficiency thresholds and promote systematic processing. While this method is fairly indirect, in that no actual measure of information processing is obtained, it is beneficial in that it does not require participants to have conscious awareness of how they processed information (although they do need to report how they feel in regard to the cognitive appraisals) and it does not require the experimenter to code the participants' responses and infer which processing style was used, reducing the subjectivity of measuring systematic processing.

3.4 Manipulating causal variables

3.4.1 Manipulating negative mood

Many techniques have been developed since the mid 1960s for inducing mood states in participants. The earliest of these was the Velten mood induction procedure (e.g. Kenealy, 1986; Velten Jr, 1968), which involves participants reading aloud sixty self-referent statements that progress from neutral to negative. Music (e.g. Pignatiello, Camp, & Rasar, 1986; Västfjäll, 2002), film (Schotte, Cools, & McNally, 1990; Weisenberg, Raz, & Hener, 1998), and vignettes (Mayer, Allen, & Beauregard, 1995) have also all been utilized successfully to induce mood states. Across mood induction procedures, it appears that the effects are stronger for inducing negative mood states compared to positive mood states (Westermann, Spies, Stahl, & Hesse, 1996), although film/story mood inductions, and those involving receiving a gift, appear to induce elation (Gerrards-Hesse, Spies, & Hesse, 1994). In a review of mood induction techniques, Gilet (2008) highlights the existence of simple procedures, which involve one mood induction technique, and combined procedures, involving the use of two or more mood induction techniques. Seemingly, mood induction procedures have an additive effect, with combined mood induction procedures resulting in larger effects than simple procedures.

There are two dominant methodological issues in inducing mood states. The first issue concerns whether mood states induced in the laboratory are representative of naturally occurring moods. Martin (1990) highlights that mood inductions can operate through three different components: cognition (via thought processes), somatic processes (via bodily sensations), and emotion (via the participant's intention to feel a particular emotion). Some

mood induction procedures operate primarily through cognitive (e.g., threat of public speaking to induce anxiety), somatic (asking participants to pose particular facial expressions), or emotion (e.g., autobiographical recall tasks) channels, while some (e.g., self-statement and music) are argued to engage all three processes, which is likely to be more reflective of naturally occurring moods (Martin, 1990). Despite the difficulties in ascertaining whether mood induction procedures induce emotions of a similar quality to those that naturally occur, the alternatives to exploring the role of mood on thoughts and behaviours are also not fully satisfactory. These alternatives include examining individuals who have emotion-based disorders, such as studying depressive individuals as an approximation of negative mood, or testing individuals who are in naturally occurring mood states. The difficulty with both of these alternative approaches is that there are numerous confounds that can account for naturally occurring mood (e.g., medication, temperamental/state differences), which may also impact upon the dependent variables in question. Thus, despite the questions surrounding the representativeness of induced mood states, they allow a better control of extraneous variables and individual differences. The second issue relates to demand characteristics induced through mood induction procedures. Westermann et al. (1996) report that effect sizes for mood inductions measured by self-report are larger than those obtained through behavioural measurements, a fact that they argue demonstrates that there is an element of demand characteristics in the process of inducing moods. Nonetheless, given that the effects are still above zero in the behavioural measurement conditions, mood induction procedures do not solely operate through demand characteristics (Westermann, et al., 1996).

It is important that researchers using mood induction procedures attempt to minimize demand characteristics, while also being mindful that stimuli such as films and music can evoke very different emotional reactions in different people; some participants may find a sketch from Mr Bean hilarious, while others may find it annoying. A promising approach has been developed by Scott and Cervone (2002). They presented participants with vignettes, either about imagining their best friend becoming terminally unwell (sadness mood induction procedure), or imagining their bedroom furniture (neutral control). Participants listened to these vignettes, which lasted around five minutes, through headphones. Given that listening to a sad story in the context of a lab experiment could have alerted some participants to the purpose of the task, Scott and Cervone (2002) added a convincing cover story; participants were told that the experiment was about imagery, and that participants needed to engage with the imagery task before completing a mental imagery questionnaire, which the

participants were told would assess the content and quality of any mental images evoked by the scenario. The benefit of inducing negative mood states in this way is that it allows for a condition that controls for the impact of priming on the dependent variables. Scott and Cervone (2002) told participants in the priming condition that the task was about sentence completion. They then asked participants to complete a sentence rating task while listening to the same information as the individuals in the negative mood group, except the information was presented in the third person rather than first person. Given that priming is one possible explanation for how negative mood leads to increased worry perseveration, the vignette methodology used by Scott and Cervone (2002) was used in the experimental work undertaken in this thesis, to allow an exploration of whether priming is a valid explanation.

3.4.2 Manipulating Intolerance of uncertainty

A detailed discussion of IU and its perceived role in worry was provided in Chapter 1, but IU can be summarized as "the way in which an individual perceives information in uncertain situations and responds to this information with a set of cognitive, emotional and behavioral reactions" (Ladouceur, et al., 1998, p. 141). Ladouceur et al., (2000) conducted the first examination of whether IU could be manipulated in the lab, and what impact this had on worrying. Participants took part in a computerized roulette game. Each participant was required to bet on 15 consecutive trials, with a bet set at $2. All participants received $20 at the start of the roulette task, and the task was fixed so that all participants finished with a total of $14. Bets could be placed in one of three columns of 12 numbers that were either black or red. The experimenter explained the probabilities associated with each bet (1 in 2 for odd vs. even, 1 in 3 for bets placed on a column, and 1 in 36 for a single number). After explaining the rules, participants were told that in this task, they had to place their bets on columns (i.e. a 1 in 3 chance of winning the bet). In order to motivate the participants, they were told that $100 would be donated to charity if they finished with at least $20 at the end of the 15 trials. In the condition designed to increase IU, participants were told that their chances of winning were unacceptable, that previously people had been allowed to bet on colours (so the participants now had worse odds, 1 in 3, versus 1 in 2), and the experimenter commented that they were noticing that the odds of winning were much worse. In contrast, participants in the condition designed to decrease IU were told that previously participants had to place their bets on single numbers (so the participants now had better odds of 1 in 3 versus 1 in 36). The experimenter also emphasized that it was only a game, and that someone at some point would win, so the charity would receive the money eventually. Ladouceur et al.

(2000) report that this manipulation successfully created differences between the two conditions on measures of IU, with the group in the condition designed to raise IU having higher IU scores than the group in the condition designed to reduce IU. While this methodology shows it is possible to generate differences in IU using short laboratory manipulations, this study has been criticized for only measuring worry about the gambling task, and thus it is not clear if the manipulation would have an impact on issues outside the task (Deschenes, et al., 2010).

In an attempt to manipulate participants' beliefs about uncertainty, Deschenes et al. (2010) presented participants with a PowerPoint lecture on problem-solving and either provided positive information about the benefits of uncertainty on problem-solving (designed to decrease IU beliefs), or negative information about the interference of uncertainty on problem-solving (designed to increase IU beliefs). Although Deschenes et al. (2010) did observe difference in IU post-manipulation, this procedure risks confounding problem-solving with IU. This is problematic given the role that PSC plays in worry (see Chapter 1).

A different methodology, which is free of the problems of specificity and confounds with problem-solving comes from Kelly (2009). The manipulation used four sets of two short stories. In one set, the character has high IU. In the other set, the character has low IU. For both sets, there is a male version and a female version. The scenarios are gender-congruent to ensure the participants can relate as fully as possible to the character and their gender-typical attitudes. In each of the scenarios, the character encounters an uncertain situation that has a potentially negative outcome. Participants were given ten minutes to read the stories and try to understand the motivations of the central character, paying attention to how the character responded to his/her challenge. Afterwards, participants were asked to "think of a situation in your own life where you aren't sure whether the outcome will be good or bad" and to briefly describe the situation. After spending five minutes describing their own uncertain life event, participants received the following instructions "We want you to imagine that you are Sean [or Sarah] from the stories you have just read, and that you keep a journal about your thoughts and feelings about key issues and events in your life. Please take fifteen minutes to write a journal entry describing how you would feel if you were Sean [or Sarah] and were experiencing the situation you have just described above. Try to be as detailed as possible in describing how you (Sean [or Sarah]) would feel about the dilemma". After the fifteen minutes had passed, participants were given five minutes to read the diary entry they had written with

an emphasis placed on understanding the feelings of the central character. Kelly (2009) found that this generated differences in IU levels between the two groups, with the group reading about the character with high IU demonstrating higher IU scores than the group who had read about the character with low IU tendencies. This method of IU manipulation was selected for the experimental work conducted in this thesis. Firstly, this method is superior to other methods used in the literature as it is less affected by specificity to a particular task, such as the gambling scenario used by Ladouceur et al. (1997). Rather, this task is applicable to any scenario of the participants' choosing. Secondly, it is not confounded with problem-solving, which was a drawback of the Deschenes et al. (2010) information manipulation, which framed IU as helpful or unhelpful when solving problems.

3.4.3 Manipulating problem-solving confidence

There is a dearth of research involving changing an individual's PSC. Heppner (1988) defines PSC as "self-assurance while engaging in problem-solving activities" (p. 1). Davey et al. (1996) is the only study (to the author's awareness) to emerge from the worry literature that includes a manipulation of PSC, and as such, this method was employed in experiments conducted for this thesis. Davey et al. (1996) manipulated PSC by providing false feedback to participants about their performance on a series of problem-solving tasks. The tasks were taken from the Means-Ends Problem-Solving Test (MEPS; Platt & Spivack, 1975). The MEPS involves presenting participants with the beginning and end of a story and asking them to coherently solve how the protagonist in the scenario could get from the beginning to the end (i.e. complete the middle of the story). After each scenario was completed, the experimenter took the script away to be 'marked'. Participants were presented with a short results paragraph, describing how problem-solving ability was assessed, the mean score for each subscale, and the participant's score for that scenario. Participants who were in the condition designed to increase PSC were consistently told that they had scored higher than the mean score for their age and gender, whereas participants in the condition designed to decrease PSC were consistently told that they had scored lower than the mean score for their age and gender. Davey et al. (1996) found that this procedure resulted in a significant difference between the two conditions on a visual analogue scale measuring how confident the participants felt when they tackled some of the important problems in their lives. The manipulation did not affect feelings of control over the problem, or how readily individuals endorsed approaching problems. It is difficult to examine the reliability and validity of manipulating PSC, given that this is the only manipulation experiment. Even so, Davey et al.

(1996) demonstrate that it is possible to alter an individual's self-reported confidence in their problem-solving ability through providing false feedback.

3.5 Ethical considerations

Worrying can be a distressing experience. Researching worrying in the laboratory requires special consideration of the ethical issues involved in this endeavour. The British Psychological Society has clear guidance on conducting research in an ethical manner, and its principles were adhered to in the work conducted for this thesis. Each experiment was approved by the University of Sussex Life Sciences and Psychology Cluster based Research Ethics Committee (see Appendices A-E for approval certificates). All participants were provided with an information sheet at the start of the experiment. This detailed the nature of the tasks involved in the experiment, such as disclosing personal information (in the CI). Participants were reassured that they could leave the experiment at any time, and without providing a reason for doing so. All participants were fully debriefed about the tasks, the aims of the experiment, and invited to ask questions. Participants were reimbursed for their time in either course credits or money, but the sums were approved by the Ethics Committees, and were not thought to provide a large incentive to engage in a task that the participants would not have wanted to do had the reimbursement not been offered.

The two areas that required the most thought in terms of ensuring that the procedures were ethical were the manipulations and the CI. The manipulations were designed to be short-term and had all been used in previous research. Participants who underwent a negative mood induction were offered a positive mood induction. Those who read the high IU information were given the low IU stories to read. All participants in the PSC were informed that the feedback on the tasks was fictional, and all participants were offered a positive mood induction (it can be just as distressing to discover that the high score you thought you received was false as it can be to be told that you have performed poorly on a task). For the CI, participants were asked to pick a topic that was currently worrying them. In each case, the participant was asked whether they were comfortable discussing it, or whether they would like to pick a different topic. Furthermore, a distress recognition protocol was followed; participants were monitored for signs of distress (such as avoiding eye contact, excessive fidgeting, crying, etc). If any of these signs were identified, the participant was offered the chance to stop the task, and to end the experiment. Finally, while the work conducted for this

thesis was not anticipated to cause any harm to the participants, all participants were provided with the University of Sussex counselling details during the debriefing.

3.6 Summary and concluding remarks

Examining mechanisms of worry requires valid and reliable techniques to manipulate causal variables and to measure the phenomena of interest. This chapter has reviewed the methods used to measure worry and systematic processing, and the procedures used to manipulate negative mood, IU and PSC in an ethical manner. In the experiments reported in this thesis, worry was examined using the PSWQ and the CI. Using these methods together allowed for an examination of trait and state worry. The PSWQ is the most-widely used method of assessing worry and its norms have been more extensively determined than other worry questionnaires. Furthermore, while other state measures exist, such as worry diaries and asking participants to report worry thoughts at pseudo-random intervals, they are less suited to laboratory manipulations. The diary and thought-reporting techniques rely upon the individual experiencing a worry thought, which they might not in the course of the experiment. In contrast, the CI guides the participant to think about a worry thought. As such, it is possible to examine the effect of short-term laboratory manipulations on worrying. In terms of assessing processing styles, participants were asked to report how strongly they endorsed a number of cognitive appraisals that represent their sufficiency threshold for information processing. Higher sufficiency thresholds are associated with greater amounts of systematic processing. This method is preferable to thought-listing as it does not require the experimenter to infer what kind of processing led the individual to write down a particular thought, which is a subjective, difficult process. A questionnaire measure was also used. While the use of questionnaires to measure information processing may be affected by individuals' awareness of their processing styles, this method enables efficient assessment of the way that individuals approach processing information.

Negative mood, IU and low PSC are the independent variables in this thesis. Each of these constructs was manipulated to investigate whether these variables increase sufficiency thresholds. One of the greatest difficulties in inducing moods is ensuring that participants are not aware that it is a mood induction procedure. Tasks that utilize music and videos are often transparent mood inductions, which may increase the participants' demand characteristics. In this thesis, a vignette mood induction procedure was used, with a priming condition to control for any influence that hearing negative words may have. The vignette procedure allowed a

convincing cover story to be presented, namely that the experiment was examining mental imagery processes. There have been few experiments that have tried to manipulate either IU or PSC. The experiments involved the only procedure for inducing PSC that has been published in peer review journals; participants received false-feedback about their performance on a problem-solving task. The IU manipulation utilized vignettes in which a character either exhibited negative views about uncertainty, or positive views. This method relies in part on the participants' identification with the character, as those who can identify with the character are more likely to take on some of their attitudes towards uncertainty. This method of inducing IU improves upon past methods because it does not refer to a single scenario, rather individuals read about a character in two scenarios, and then apply their attitudes to another uncertain situation. Given that worrying is a cognitive process, and many of the factors that affect worrying are also cognitive, measuring these processes with accuracy is a challenge. Nonetheless, using multiple methods of measurement allows a broad assessment of whether systematic processing is a mechanism involved in perseverative worry.

4 Negative mood and appraisals that facilitate systematic information processing

4.1 Introduction

This chapter is designed to explore the mechanism accounting for the association between negative mood and worry. Negative mood is defined as "a dimension of subjective distress and unpleasurable engagement" (Watson, et al., 1988, p.1063). Chronic worriers experience endemic negative mood (Davey, et al., 1992; Metzger, Miller, Cohen, Sofka, & Borkovec, 1990; Meyer, et al., 1990; Tallis, et al., 1991; Wisocki, et al., 1986). As outlined in Chapter 1, this association may emerge from the negative cognitive processes associated with chronic worrying such as negative outcome anticipation (Szabó & Lovibond, 2002), processing negative thoughts (Borkovec, et al., 1998), catastrophising (Davey, 2006a), and thoughts about personal inadequacy (Davey & Levy, 1998b). However, a number of studies support the view that, rather than simply being a consequence of worrying, negative mood is a causal contributor. Johnston and Davey (1997) found that inducing negative mood resulted in significantly more catastrophising steps being generated during a CI than positive or neutral moods. This and similar studies (e.g. Startup & Davey, 2001, 2003) demonstrate that negative mood has a causal effect on worry perseveration, and is not simply an outcome of worrying.

One possible mechanism accounting for the association between negative mood and increased worrying is that negative mood influences the style of information processing that individuals employ. A significant body of literature suggests that when in a negative mood, an individual is more likely to use an analytic processing style (e.g. Ambady & Gray, 2002; Tiedens & Linton, 2001). As described in Chapter 2, within the Heuristic-Systematic Model (HSM) this effortful processing is called systematic processing, which is described as an "analytic orientation in which perceivers access and scrutinize all informational input for its relevance and importance… and integrate all useful information in forming their judgments" (Chaiken, et al., 1989, p.212). The above description of systematic processing has similarities with the persistent, detailed processing of information that characterizes perseverative worrying, and negative mood may exert its causal influence by activating systematic processing. Crucially, while systematic processing is perceived as cognitively demanding, its deployment does not rely on conscious strategies (Chen & Chaiken, 1999), and consequently

the need to scrutinize and integrate potentially relevant information (i.e. systematically process) may seem uncontrollable in the way that worriers perceive of their worrying as uncontrollable (Borkovec, et al., 1983).

An important feature of the HSM relevant to pathological worry is the sufficiency threshold principle, which recognizes the trade-off between cognitive efficiency and task goals. Numerous information processing theories suggest that humans are economy-minded, and wish to satisfy goal-related needs in the most efficient way (Chaiken, et al., 1989; Mischel, 1979; Taylor & Fiske, 1978). While efficiency is important, individuals exert whatever level of effort is required to attain a sufficient degree of confidence that they have satisfactorily accomplished their processing goals (Chaiken, et al., 1989). People cannot be certain that their judgements are correct, but they can achieve a level of confidence that they perceive as reasonable/sufficient. The sufficiency principle is a construct designed to describe the balance individuals strike between minimising their cognitive expenditure and maximising their confidence in their judgements. According to Chaiken et al. (1989), the sufficiency principle "asserts that people will exert whatever level of effort is required to attain a sufficient degree of confidence that they have satisfactorily accomplished their processing goals" (p.221). Variations in the sufficiency threshold occur due to individual differences (some people may require more evidence before making a decision) and situational factors (the task importance). Pathological worriers possess characteristics that would raise their sufficiency threshold including (1) beliefs that worrying is a necessary process to engage in to avoid future threats and problems (Borkovec, et al., 1999; Borkovec & Roemer, 1995; Breitholtz, et al., 1998; Davey, Tallis, et al., 1996; Wells, 1995), (2) use of the 'as many as can' (AMA) stop rule for worry, specifying that the task must be completed fully and properly (Davey, et al., 2005), (3) elevated evidence requirements (Tallis, et al., 1991), and (4) dispositional characteristics such as perfectionism, intolerance of uncertainty (IU), responsibility for negative outcomes, and inflated concerns over mistakes (Dugas, et al., 1997; Frost, et al., 1990; Pratt, et al., 1997; Wells & Papageorgiou, 1998). A raised sufficiency threshold increases the likelihood that systematic processing will be deployed (Chaiken, et al., 1989).

Negative mood is also associated with cognitive appraisals that raise sufficiency thresholds (Keltner, Ellsworth, & Edwards, 1993; Tiedens & Linton, 2001) and this may represent the mechanism by which negative mood facilitates perseverative worrying. These appraisals include accountability, responsibility, desire for control and need for cognition.

Accountability promotes effortful information processing in order to avoid judgements that could cause embarrassment or lower self-esteem (Chen, et al., 1996; Livingston & Sinclair, 2008; Tetlock, 1983). Responsibility is also associated with systematic processing, and Bohner et al. (1995) suggested a mechanism through increased task importance and raised sufficiency thresholds. Desire for control is the motive to control events in one's life and systematic processing may be deployed in an attempt to maximise control (Burger & Cooper, 1979). Finally, need for cognition (NFC) is defined as "a need to structure relevant situations in meaningful, integrated ways" (Cohen et al., 1955, p.291). Those high in NFC may find systematic processing less aversive in terms of cognitive expenditure. Together, responsibility, accountability, NFC and desire for control, give an indication of an individual's sufficiency threshold.

The experiment presented in this chapter is designed to explore whether systematic processing is a mechanism mediating negative mood and worry. This exploration was achieved by exposing participants to a negative (versus neutral) mood induction and assessing the impact of the individual's mood state on a measure of their sufficiency threshold. The sufficiency threshold measure comprises of four cognitive appraisals (accountability, responsibility, NFC, and desire for control), which were chosen because they were identified through a detailed literature search as variables that have been linked with raised sufficiency thresholds. Each variable has been associated with increased systematic processing: accountability (Tetlock & Boettger, 1989), responsibility (Harkins & Petty, 1982), NFC (Cacioppo, Petty, Kao, & Rodriguez, 1986), and desire for control (Pittman & D'Agostino, 1989).

These cognitive appraisals have also been explored in clinical contexts. Responsibility consistently emerges in factor analyses of worry content, appraisals and beliefs (Cartwright-Hatton & Wells, 1997; Langlois, et al., 2000; Sugiura, 2007), and experimentally manipulating responsibility increases worrying (Startup & Davey, 2003). Furthermore, feelings of accountability predict worry levels of women undergoing cancer screening (Brain, et al., 2008). Additionally, clinical descriptions highlight worriers' desire to control unwanted thoughts (e.g. Roemer & Borkovec, 1993; Wells, 1995).

If systematic processing is a mechanism between negative mood and worry, then it would be expected that negative mood would facilitate (1) the endorsement of cognitive appraisals associated with systematic processing. This experiment is the first to examine the

effect of mood states on cognitive appraisals associated with effortful information processing and psychopathology. Specifically, given that negative mood signals a situation has not been successfully dealt with (Carver & Scheier, 1981; Hsee & Abelson, 1991), it was predicted that negative mood would increase reports of accountability, responsibility, NFC, and desire for control, and the composite measure of these variables (the processing sufficiency threshold). Given previous work (e.g. Johnston & Davey, 1997) it was also predicted that negative mood would increase (2) self-report and behavioural measures of worrying, and (3) endorsement of 'as many as can' (AMA) stop rule use. Furthermore, based on the theoretical hypothesis that systematic processing may mediate the relationship between negative mood states and perseverative worry, it was hypothesised that (4) the causal positive relationship between negative mood and worry would be mediated by the endorsement of cognitive appraisals that increase sufficiency thresholds and promote systematic processing.

4.2 Method

4.2.1 Participants

Eighty-six (79 females) University of Sussex undergraduate psychology students participated, aged 18-40 years (M = 19.70, SD = 3.00). Participants were volunteers and were remunerated with course credits.

4.2.2 Materials

Mood manipulation check.

Participants completed two 100-point visual analogue scales (VASs) assessing their mood: 'Please mark a cross along the scale to indicate' (i) 'how sad you feel at the present moment', and (ii) 'how happy you feel at the present moment'.

Systematic processing facilitator scale.

The composite systematic processing facilitator measure was produced by compiling the four VASs assessing accountability, responsibility, desire for control, and NFC. As described above, these cognitive appraisals were chosen as they are linked with increased systematic processing, and emerge in the literature as dominant characteristics of individuals who systematically process (e.g. Cacioppo, et al., 1986; Harkins & Petty, 1982; Pittman & D'Agostino, 1989; Tetlock & Boettger, 1989). An individual's processing sufficiency threshold is dictated by a number of factors, of which responsibility, accountability, NFC, and desire for control are four dominant examples in the literature (e.g. Chaiken, et al., 1989). As such, this

composite score is theoretically meaningful, as the co-occurrence of moderately high scores across these four systematic processing facilitators could increase an individual's sufficiency threshold to the extent that they would persevere with their worrying. See Section 4.3.2 for statistical support for the unitary structure of the systematic processing facilitator measure. A higher score on the systematic processing facilitator measure represents an increased tendency to deploy systematic processing (Chaiken, et al., 1989). The VAS questions were developed by considering the definitions used in the literature, existing measures, and experimental manipulations of the constructs.

Tetlock (1983) defined accountability as "pressures to define one's opinions to others" (p.74). Indeed, experimental manipulations involve informing the high accountability group that they will need to justify their ideas to others (e.g. Livingston & Sinclair, 2008). The VAS question measuring accountability was 'Please indicate on the scale below the extent to which you feel that you may have to justify your worries to others'.

The VAS question measuring responsibility was 'Please mark a cross along the scale to indicate how strongly you hold the belief that if you fail to anticipate (foresee) a potential negative outcome, because you did not worry sufficiently, then you are responsible for the negative outcome'. This was based upon the Responsibility Attitude Scale (Salkovskis, et al., 2000), the most widely used scale of clinically-relevant responsibility beliefs, containing items such as 'If I don't act when I can foresee danger, then I am to blame for any consequences if it happens'.

NFC is the tendency to engage in effortful cognitive endeavours (Cacioppo, Petty, & Kao, 1984; Cohen, et al., 1955). The question developed was 'If you were to start worrying about something right now, to what extent would you want to think over the issue for a long time?', and derived from its definition as a desire to generate thoughts about an issue, which is the basis of items in the Need for Cognition Scale (Cacioppo, et al., 1984).

The desire for control VAS was 'Please mark a cross along the scale to indicate how strongly you hold the belief that it is important to have control over things you worry about', and was based upon Burger and Cooper's (1979) Desirability of Control Scale.

The cognitive appraisals can occur in the absence of worry, and consequently it is important to assess their relevance to a worry context. Accordingly, the VASs were couched in

terms of a hypothetical worry. Participants assessed their reactions to a hypothetical worry, rather than engaging in a worry bout.

Other measures.

Participants completed a VAS measuring deployment of the AMA stop rule (Davey, 2006b) ('Please mark a cross along the scale to indicate how strongly you hold the belief that you will stop worrying when you have worried as much as possible'), as this is likely to be a proximal mechanism through which systematic processing is operationalised during the worry process. Participants completed the Penn State Worry Questionnaire (PSWQ; Meyer, et al., 1990, see Chapter 3 for more details), which is the most widely used valid measure of worry. As outlined in Chapter 3, the PSWQ has been used as an outcome measure to assess changes in worrying after a variety of interventions (e.g. Borkovec & Costello, 1993; Goldman, Dugas, Sexton, & Gervais, 2007; Treanor, Erisman, Salters-Pedneault, Roemer, & Orsillo, 2011). Similarly, the PSWQ was used in the present study as an outcome measure across the mood induction groups. The PSWQ consists of 16-items (e.g., 'Many situations make me worry'), and has good test-retest reliability (Meyer, et al., 1990) and internal consistency (α = .90; Brown, et al., 1992).

4.2.3 Procedure

Stage 1.

After providing consent, participants were randomly assigned to one of three conditions: negative mood (n = 30), neutral mood (n = 30) and cognitive priming (CP; n = 26). Initially, the mood groups were split into high (n = 15) and low (n = 15) saliency. Mood induction saliency was manipulated as individuals may ignore the informational properties of mood if they attribute it to a source unrelated to the task at hand (Schwarz & Clore, 1983). To limit demand characteristics, participants were informed that the study was about mental imagery.

Stage 2 (mood manipulation).

For a review of mood induction procedures, see Chapter 3. This experiment utilized vignettes to induce mood because they allowed for the construction of a convincing cover story that the experiment was investigating imagery, and also enabled the inclusion of a cognitive priming control condition. Vignettes (based on Scott & Cervone, 2002) were played through headphones. The negative mood vignette lasted for 5 min 25 s. Participants in the negative mood group were asked to imagine memories they shared with their best friend, and

their friend becoming terminally ill. The CP group listened to a modified version of the negative vignette, which was slightly shorter at 3 min 42 s because it did not include a few sentences which emphasized that the participant should imagine that the following sentences were happening to them. In the CP vignette, all first person pronouns were substituted by two hypothetical characters, Bill and Joe. So, for example, in the negative mood condition, participants heard the sentence 'Now think about your best friend', while the CP group heard 'Bill and Joe have been good friends'. When the negative mood group heard 'Now imagine that your friend has become progressively ill over the past few months', the CP group heard 'Joe has been feeling progressively ill over the past few months'. Additionally, the CP group rated on a five-point Likert scale the extent that 15 target words were similar to sentences in the vignette. So, for example, the participants were required to rate how similar the sentence 'Bill and Joe have been good friends' is to the word 'comrade', and how closely the sentence 'Joe has been feeling progressively ill over the past few months' is to the word 'sickly'. Participants in the CP group made their ratings in this similarity task on a 5-point Likert scale (1 = 'Not at all similar; 5 = 'very similar'). These ratings were not analysed. Consequently, the CP group heard the same negative words as the negative mood group, but did not experience it in a personally relevant manner. Thus, individuals in the CP group were not expected to show the same level of negative mood or subsequent worry perseveration, forming a control for priming effects. Participants in the neutral mood group were guided to imagine various pieces of their bedroom furniture, for example 'Visualise where your desk is – look at all the objects that are on your desk'. The neutral mood vignette was 3 min 47 s.

Stage 3 (saliency manipulation).

After the vignette, the high saliency groups were told "It can sometimes change your mood listening to vignettes like that". The low saliency and the CP groups were not told anything about the possibility of the vignette affecting their mood. A manipulation of the saliency of the mood induction was included as some research suggests that individuals ignore the informational properties of mood if they attribute it to a transient external source of little relevance to the task at hand (Schwarz & Clore, 1983). The saliency manipulation was designed to ensure that mood awareness was not a determining factor and that participants were not simply responding to demand characteristics.

Stage 4 (VAS questionnaire).

Participants completed the 100-point VASs described in section 4.2.2 measuring mood (sadness, happiness), systematic processing facilitators (responsibility, accountability, desire for control, NFC), and AMA deployment.

Stage 5 (worry measures).

Participants took part in the CI to provide a behavioural measure of perseverative worry (Davey, 2006a; Vasey & Borkovec, 1992), see Chapter 3 for details. Use of the CI alongside the PSWQ allows for both behavioural and self-reported worry, respectively, to be examined. The experimenter begins by asking "what is it that worries you about X?" where X is the participant's current main worry. The experimenter repeats the question, substituting X with the participant's answer to the first question, and so on. Participants are told there is no right or wrong time to end the interview, and they should end the interview when they choose to. The number of steps generated is taken as a measure of perseveration at the worry task. Afterwards, participants completed the PSWQ.

Stage 6 (debrief).

During the debrief participants were asked what they thought the purpose of the vignette was (saliency manipulation check). Participants were debriefed about the experiment's aims and provided with the university's Counselling Service details.

4.2.4 Statistical Analyses

Preacher and Hayes' (2008) script for conducting mediation with multiple mediators was used. In assessing mediation, it is possible to calculate the direct effect of an independent variable (IV) on a dependent variable (DV) (weight c'), and the indirect effect (weight a × b; where a is the effect of the IV on the mediator, and b is the effect of the mediator on the DV) of the IV on the DV through the proposed mediator, which together make up the total effect. When multiple mediators are hypothesized, one multiple mediator model can be used to estimate total indirect effects (i.e. sum of a × b weights for all mediators) and specific indirect effects (i.e. a × b effect for each mediator).

To estimate indirect effects, bootstrapping was used with n = 5000 resamples. Bootstrapping is a nonparametric resampling technique that takes n samples from the full data and calculates the indirect effects in the resamples; it is preferable to the Sobel test due to its greater power (Preacher & Hayes, 2004). For a further discussion of bootstrapping, see

Preacher and Hayes (2008). Percentile confidence intervals (95%) were constructed as they had the best overall performance on Monte Carlo simulations in terms of controlling Type 1 error rates, and exhibiting reasonable power (Biesanz, Falk, & Savalei, 2010). Indirect effects were considered significant in the case that zero was not contained in the confidence intervals (e.g. Roelofs, Huibers, Peeters, Arntz, & van Os, 2008).

4.3 Results

See Table 4.1 for all descriptive statistics.

4.3.1 Manipulation Checks

Mood

One-way analysis of variance (ANOVA) tests revealed a significant difference between the groups on sadness, $F(2, 83) = 23.98$, $p < .001$, and happiness, $F(2, 83) = 13.18$, $p < .001$. Planned comparisons were conducted to follow-up significant ANOVAs (Field, 2009). In the first contrast, the negative mood group [+2] was compared to the neutral mood [-1] and CP [-1] groups. The negative mood group scored significantly higher on sadness, $t(83) = 6.60$, $p < .001$, $r = .34$, and significantly lower on happiness, $t(83) = 7.27$, $p < .001$, $r = .39$, than the neutral mood and CP groups, with medium effect sizes (Cohen, 1992). In the second planned contrast, the neutral mood group [+1] was compared to the CP group [-1]; there was no difference in sadness, $t(83) = -1.83$, $p > .05$, $r = .04$, or happiness, $t(83) = 1.13$, $p > .05$, $r = .02$.

Saliency

A chi-square test indicated that the saliency manipulation did not result in a significant difference in self-reported awareness of the mood changing potential of vignettes across the high and low saliency groups, $\chi^2 (1) = 1.09$, $p = .22$. Consequently, saliency groups were collapsed by valence.

Table 4.1 Descriptive statistics for the mood and systematic processing facilitator measures post mood induction procedure.

	Negative		Neutral		Cognitive Priming	
	M	*SD*	*M*	*SD*	M	*SD*
Sadness***	61.63	17.88	22.00	24.93	33.19	25.16
Happiness***	35.47	18.12	61.20	20.05	55.08	22.53
Accountability**	66.69	18.70	44.83	26.71	54.96	23.66
Responsibility	38.52	25.19	37.10	33.78	22.60	20.22
Desire for control	72.28	15.93	66.43	22.33	72.68	13.75
Need for cognition	63.59	20.62	52.13	25.09	56.20	18.47
Composite systematic processing facilitator measure[1]*	241.07	46.29	200.50	80.73	206.44	35.26
'As many as can' **	45.97	23.78	22.63	26.12	27.08	20.33

*p <.05, **p < .01, ***p < .001. [1]*Note:* Four 100-point VASs combined; score is out of 400, not 100.

4.3.2 Experimental Outcomes

Systematic processing facilitators.

Two participants were identified as outliers on boxplots of the distribution of the composite measure of systematic processing facilitators and were removed (one low-scoring negative mood group participant and one high-scoring CP participant) (see Field, 2009). After excluding outliers: negative group n = 29; neutral group, n = 30; CP group n = 25.

To examine whether the composite measure of systematic processing facilitators is a unidimensional composite measure representing how much processing an individual felt was required to meet their task goals (i.e. their sufficiency threshold), a principal components analysis was conducted. A one-factor solution best reflected the scores on the cognitive appraisal items, as shown in the scree plot in Figure 4.3. This single factor (representing the sufficiency threshold) accounted for 43% of the variance in scores. The loadings of the items on the single factor are shown in Table 4.2.

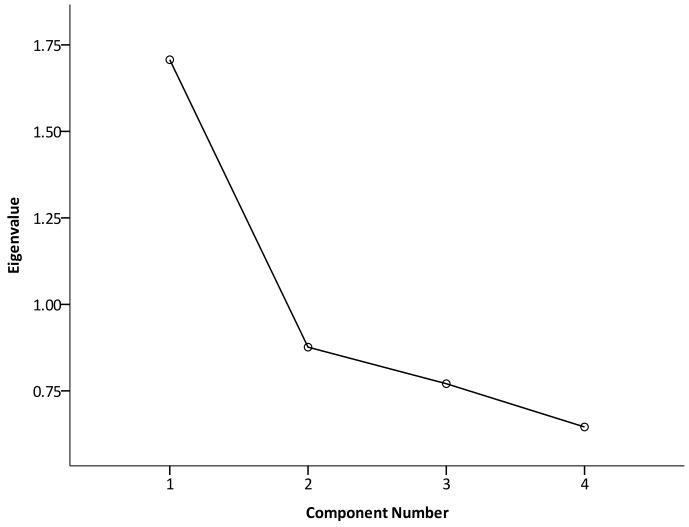


Figure 4.3 Scree plot of eigenvalues for each component in the composite systematic processing facilitator measure scores

Table 4.2 Factor loadings for the composite systematic processing facilitator items

Item	Factor loading
Accountability	0.65
Responsibility	0.61
Desire for control	0.66
Need for cognition	0.70

A one-way ANOVA revealed a significant difference on the composite systematic processing facilitator measure, Welch: $F(2, 52.33) = 5.58$, $p = .01$. Planned comparisons showed that the negative group [-2] scored significantly higher on the composite systematic processing facilitator measure than the neutral [+1] and CP [+1] groups, $t(65.24) = 3.17$, $p < .01$, $r = .37$, with a medium effect size (Cohen, 1992). The neutral [+1] and CP [-1] groups were not significantly different, $t(41.19) = -0.36$, $p > .05$, $r = .06$.

Individual systematic processing facilitators.

To assess the effect of the mood inductions on the separate cognitive appraisals, one-way ANOVAs were conducted with a Bonferroni correction; significant differences were accepted when $p < .013$. All significant one-way ANOVAs were followed up with planned

contrasts. The mood induction had a significant effect on accountability, Welch: $F(2, 51.83) = 6.89$, $p < .01$. The negative group reported significantly higher accountability than the neutral and CP group, $t(72.17) = 3.46$, $p = .001$, $r = .38$, representing a medium effect size (Cohen, 1992). The neutral and CP groups were not significantly different, $t(52.78) = 1.49$, $p > .05$, $r = .04$. When the corrected p-value of $p < .013$ is adhered to, there was no significant effect of the mood induction on responsibility, desire for control, or NFC, $Fs \leq 3.89$, $ps \geq .026$.

To examine whether accountability or the composite systematic processing facilitator measure best predicted PSWQ scores, all four cognitive appraisals and the composite systematic processing facilitator measure were entered into a stepwise regression, with PSWQ as the outcome variable. This procedure was utilised to establish whether the effect of negative mood on the composite systematic processing facilitator measure (and subsequent worry) was purely accounted for by the accountability measure, or whether more variance in PSWQ scores was explained by taking into account individuals' scores on all four VAS measures. A hierarchical method was used, with mood induction condition entered into block 1 using forced entry, and the single VAS items and composite score entered into block 2 using stepwise elimination. In the final model, only the composite systematic processing facilitator was a significant predictor, $t(79) = 5.93$, $p < .001$, $b = 0.11$, $SE = 0.02$, $\beta = .55$, accounting for 36% of PSWQ variance. Mood induction condition did not significantly predict PSWQ scores, $t(79) = 1.63$, $p = .11$, $b = 2.30$, $SE = 1.42$, $\beta = .15$. All other VAS variables were excluded from the final model, ts ≤ 0.76, ps ≥ .45. Therefore, there is merit in the composite systematic processing facilitator measure, and this was included in the subsequent mediation analyses (Section 4.3.4), rather than the single accountability measure.

Worry and stop rule measures.

The PSWQ showed good internal consistency (α = .92). There was a significant effect of mood on PSWQ scores, $F(2, 79) = 4.49$, $p = .01$, and planned contrasts showed that the negative mood group had significantly higher PSWQ scores than the neutral mood and CP groups, $t(79) = 3.00$, $p < .01$, $r = 0.32$ (medium effect size, Cohen, 1992), see Figure 4.4. The neutral and CP groups did not significantly differ, $t(79) = 0.05$, $p > .05$, $r = .01$.

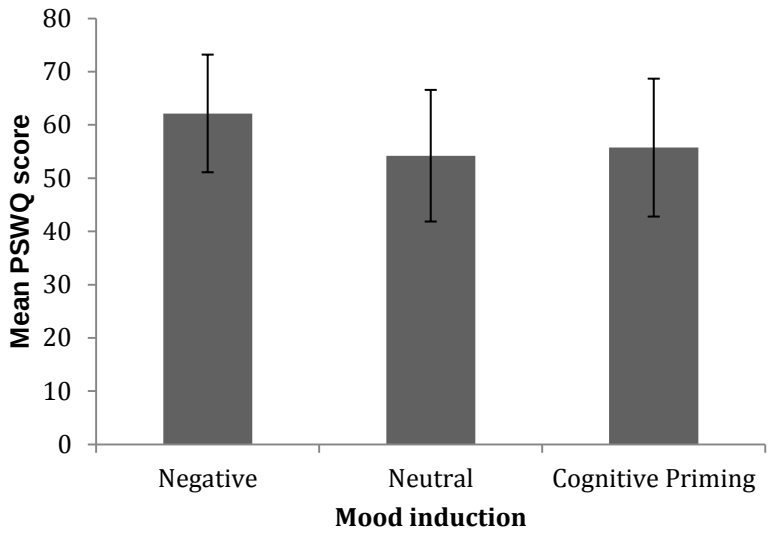


Figure 4.4 Error bar graph showing mean Penn State Worry Questionnaire scores by mood induction conditions

As predicted, the negative mood group generated more catastrophising steps (M = 10.45, SD = 6.25) than the neutral mood (M = 8.20, SD = 4.29) and CP (M = 7.92, SD = 3.46) groups, but these differences did not reach statistical significance, $F(2, 81) = 2.29$, $p = .11$.

The mood induction condition significantly affected AMA stop rule endorsement, $F(2, 81) = 7.91$, $p = .001$; planned contrasts indicated the negative mood group scored significantly higher than the neutral mood and CP conditions, $t(81) = 3.87$, $p < .001$, $r = .40$ (medium effect size, Cohen, 1992), and the neutral mood and CP groups did not significantly differ, $t(81) = -0.69$, $p > .05$, $r = .08$.

4.3.3 Correlational analyses

Given that the standard deviations are quite large for the mood measures taken post-mood induction, and the confidence intervals indicate that there is overlap in the scores for the cognitive appraisals across the mood induction groups, correlation analyses were conducted to examine whether negative mood (sadness VAS) predicted an individual's sufficiency threshold, AMA deployment, and measures of worry. The results are shown in Table 4.3.

Table 4.3 Correlations between negative mood, systematic processing facilitators, and worry

	NEG	ST	ACC	RESP	NFC	DFC	AMA	CI	PSWQ
NEG	1	**.38*****	**.36****	.20	**.25***	.19	**.45*****	**.30***	**.41*****
ST		1	**.68*****	**.69*****	**.65*****	**.58*****	**.50*****	.11	**.58*****
ACC			1	**.26***	**.26***	.18	**.34****	.03	**.39*****
RESP				1	.18	.21	**.44*****	.15	**.37****
NFC					1	**.32****	**.25***	.02	**.43*****
DFC						1	**.24***	.08	**.37****
AMA							1	.001	**.58*****
CI								1	-.03
PSWQ									1

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Note. NEG = negative mood; ST = sufficiency threshold; ACC = accountability; RESP = responsibility; NFC = need for cognition; DFC = desire for control; AMA = 'as many as can' stop rule; CI = catastrophising interview steps; PSWQ = Penn State Worry Questionnaire

It was hypothesised that negative mood would increase cognitive appraisals (prediction 1). While correlations cannot clarify the direction of relationships, they show that increased negative mood is associated with higher scores on the composite cognitive appraisal measure (representing an individual's sufficiency threshold), $r = .38$, $p < .001$. Furthermore, negative mood significantly positively correlated with accountability, $r = .36$, $p < .01$, and with NFC, $r = .25$, $p < .05$. Negative mood did not significantly correlate with responsibility, $r = .20$, $p > .05$, or with desire for control, $r = .19$, $p > .05$. Similarly, it was predicted that negative mood would increase PSWQ scores and CI steps (prediction 2). The correlations indicate that the more an individual endorsed being in a negative mood, the greater the number of steps that they generated on the CI, $r = .30$, $p < .05$, and the higher their scores were on the PSWQ, $r = .41$, $p < .001$. Finally, prediction 3 stated that negative mood would result in greater endorsement of AMA stop rule deployment. Negative mood significantly positively correlated with AMA deployment, $r = .45$, $p < .001$.

4.3.4 Mediation analyses

It was hypothesised that the composite systematic processing facilitator measure and AMA stop rule endorsement may mediate negative mood and PSWQ scores. This was tested using Preacher and Hayes' (2008) macro. Mood induction condition was entered as the

independent variable, and for ease of interpretation, only data from the participants in the negative and neutral mood inductions were entered (Preacher and Hayes' (2008) macro is suitable for dichotomous predictor variables, Hayes & Preacher, 2011). Participating in a negative mood induction was coded as 1, while the neutral mood induction was coded as 0. The mediation results are shown in Table 4.4. Unstandardised coefficients are reported as recommended by Preacher and Hayes (2008). However, to aid interpretation, standardised coefficients are presented in Table 4.5. The indirect effects for all three mediation models have confidence intervals that do not include zero, and as such, can be considered significant point estimates ($p < .05$). This indicates that the a x b pathways account for a significant amount of variance in the relationship between the IV and the DV; in all cases the specified mediating variable mediates the relationship between the specified IV and DV.

Negative mood was significantly positively related to worry (c weight), and to the two mediators (the composite systematic processing facilitator measure and endorsing AMA stop rule use, a weights). The mediators were significantly positively associated with worry when partialling out negative mood (b weights). When the composite systematic processing facilitator measure and the AMA stop rule were analysed simultaneously, both were significant positive mediators of negative mood and worry (all a × b confidence intervals excluded zero, see Table 4.4). The pathway between negative mood and worry was no longer significant when the mediators were included, indicating full mediation.

The AMA stop rule significantly correlated with the composite systematic processing facilitator measure, $r(84) = .50$, $p < .001$. To examine whether multicollinearity was affecting the results, regression analyses were run, with the composite systematic processing facilitator measure and AMA deployment entered as predictors, and worry entered as the outcome. The variance inflation factors (VIF) were 1.00, indicating that multicollinearity did not influence the results (Field, 2009).

Table 4.4 Summary of unstandardised mediation results

	Independent variable (IV)	Mediating variable (*M*)	Dependent variable (DV)	Effect of IV on M (*a*)	Effect of M on DV (*b*)	Direct effects (*c'*)	Indirect effects (*a* × *b*)	Total effects (*c*)
1	Negative mood	Systematic processing	Worry (PSWQ)	40.14*	0.08***	2.20	3.13[a]	8.21*
		AMA		21.01**	0.14*	-	2.88[a]	-
2	Negative mood	Worry (PSWQ)	Systematic processing	8.21	3.39***	12.31	27.82[a]	40.14
3	Negative mood	Worry (PSWQ)	AMA	8.21*	1.06***	12.34	8.68[a]	21.01**

*$p < .05$; **$p < .01$, ***$p < .001$. [a] Confidence intervals do not include zero, significant point estimate ($p < .05$).

Table 4.5 Summary of standardized mediation results

	Independent variable (IV)	Mediating variable (*M*)	Dependent variable (DV)	Effect of IV on M (*a*)	Effect of M on DV (*b*)	Direct effects (*c'*)	Indirect effects (*a* × *b*)	Total effects (*c*)
1	Negative mood	Systematic processing	Worry (PSWQ)	0.31*	0.44***	0.18	0.26[a]	0.66*
		AMA		0.77**	0.31*	-	0.23[a]	-
2	Negative mood	Worry (PSWQ)	Systematic processing	0.67	0.61***	0.18	0.18[a]	0.58
3	Negative mood	Worry (PSWQ)	AMA	0.67*	0.47***	0.45	0.32[a]	0.77**

*$p < .05$; **$p < .01$, ***$p < .001$. [a] Confidence intervals do not include zero, significant point estimate ($p < .05$).

Alternative mediation models.

Post-hoc alternative models are also conceivable, with worry (PSWQ) potentially mediating negative mood and the composite systematic processing facilitator measure, and negative mood and AMA endorsement. Two mediation analyses were performed with mood induction as the predictor, worry as the mediator, and (separately) the composite systematic processing facilitator measure and the AMA stop rule as outcome variables. The results are shown in Table 4.4 (standardized coefficients in Table 4.5). The systematic processing

facilitator model did not fit a mediation model, with non-significant a and c pathways. For the AMA model, negative mood was significantly positively related to worry (a weight) and the AMA stop rule, (c weight). Worry was significantly positively associated with AMA stop rule use when partialling out negative mood (b weight); a × b confidence intervals excluded zero (see Table 4.4). The pathway between negative mood and AMA stop rule use was marginally significant (p = .05) suggesting partial mediation. The partial mediation status, alongside existing empirical evidence, provides stronger support for the initial mediation model, and this is addressed in the discussion.

4.4 Discussion

This experiment tested a potential mechanism mediating negative mood and increased worrying (Buhr & Dugas, 2009; Johnston & Davey, 1997; Startup & Davey, 2001). Experimentally-induced negative mood significantly increased scores on a composite systematic processing facilitator measure, and the endorsement of accountability. However, negative mood did not affect responsibility, desire for control or NFC, although the composite systematic processing facilitator measure (encompassing all four cognitive appraisals) better predicted worry levels than the individual cognitive appraisal ratings. Negative mood positively correlated with NFC, despite no between-group differences being identified. Additionally, negative mood increased (1) the endorsement of deploying AMA stop rules for worrying, and (2) scores on a validated measure of worrying (PSWQ). The CI scores showed a trend that was consistent with the prediction that negative mood would facilitate behavioural worry measures, and negative mood significantly positively correlated with the number of catastrophising steps that an individual generated. The experiment utilized a control condition for priming which indicated that the negative mood effects could not be accounted for simply by priming. Meditational analyses confirmed that the composite systematic processing facilitator measure and AMA stop rule deployment fully mediate negative mood and increased worrying.

These findings confirm the prediction that negative mood facilitates the endorsement of cognitive appraisals that increase sufficiency thresholds and trigger the systematic processing of information, and this analysis suggests a mechanism by which negative mood causes increases in worrying. Many negative moods are known to facilitate the use of an analytic processing style (Ambady & Gray, 2002), especially those associated with uncertainty, not understanding what is happening, and feeling unsure about what will happen

next (Tiedens & Linton, 2001). In this experiment, the negative mood vignette significantly increased sadness (associated with uncertainty) and decreased happiness (associated with certainty), circumstances which facilitate systematic processing (Bodenhausen, et al., 1994). This provides an empirical rationale for predicting that negative mood influences worrying through its effect on systematic processing.

It is interesting to note that in terms of the individual cognitive appraisals only the accountability measure was significantly different between the mood groups. Examination of what these appraisals measure suggests that the need to justify one's worries (accountability) may be much more heavily implicated in appraising worry, as is seen in the psychopathology-relevant Type 2 worry (see Wells, 1995). This provides further support to the notion that negative mood states can increase perseverative pathological worrying. As reported in the literature on heuristic and systematic processing literature (Chen, et al., 1996; Erb, et al., 2007; Livingston & Sinclair, 2008; Tetlock, 1983; Tetlock & Boettger, 1989) when individuals feel high levels of accountability, they feel a greater need to process their thoughts in great detail, possess higher sufficiency thresholds, and are more likely to deploy systematic processing. Thus, the accountability measure may reflect appraisals associated with Type 2 worry; the other VAS measures may better reflect Type 1 worry appraisals. While a greater endorsement of a negative mood was associated with significantly higher self-reported NFC, there were no significant between-group differences. This may reflect that NFC is typically considered a dispositional characteristic (e.g. Cacioppo, et al., 1986), and may be less affected by short-term experimental manipulations.

The relationship between negative mood and PSWQ scores was also mediated by intention to use AMA stop rules. This was independent of the mediating effect of systematic processing appraisals as both represented independent sources of PSWQ variance. This may reflect a separate effect of negative mood inducing higher performance standards (Scott & Cervone, 2002), causing individuals to become relatively dissatisfied with any given level of performance (Cervone, et al., 1994). This may lead to deployment of AMA stop rules ('I must continue with the task till I am sure I have met all my specific goals for the task') rather than 'feel like continuing' (FLC) stop rules ('I will continue with the task until I no longer feel like doing it any more'). One interpretation is that the sufficiency threshold measure indicates the extent that appraisals are triggering systematic processing through a raised processing threshold, whereas AMA deployment represents a more generic measure of an individual's

goals for their worrying (e.g., 'I must worry until I have resolved this problem/feel less anxious'). To some extent these two factors are inter-related, in that systematic processing may be necessary to achieve stringently-defined goals for worrying, but systematic processing is a means to an end and not an end in itself, so the deployment of stop rules will inevitably be affected by a wider range of variables than those that trigger systematic processing.

However, as shown by the alternative mediation models, this is not the only model consistent with the data obtained. Worry also mediated the relationship between negative mood and the AMA stop rule. Worrying may lead to the deployment of the AMA rule, as the task is rationalized to be problematic, and therefore a large amount of cognitive expenditure is warranted. However, mediation models cannot test causation, and therefore the statistical significance of the indirect effects of these alternative models is not evidence in itself that the directional relationship exists (Preacher & Hayes, 2004). The alternative models need to be examined in future experiments that involve experimental manipulations. However, while evidence exists demonstrating a causal effect of AMA stop rules on worrying (Davey, 2006b; Davey, et al., 2005; Startup & Davey, 2001), there is no evidence indicative of a causal effect of worrying on AMA stop rule deployment. Indeed, evidence indicates the opposite effect: as worry persists, worriers turn to deploying FLC rather than AMA stop rules (Davey, Eldridge, Drost, & MacDonald, 2007), supporting the first mediation model over the second, and guiding the predictions of future studies. Furthermore, the experimental procedure involved measuring AMA deployment and the sufficiency threshold, before measuring worry levels, and as such these proposed mediators were activated prior to measuring worry. Additionally, the alternative mediation model, with worry as the mediator and AMA stop rule use as the outcome variable, only indicated partial mediation, compared with full mediation when AMA stop rule use and the composite systematic processing facilitator measure were included as mediators between negative mood and worry.

One potential limitation is that no direct measure of systematic processing was used in the present experiment, and there was a reliance on self-report measures. This is perhaps not surprising because – to the authors' knowledge – there is currently no validated measure of systematic processing as such (see Chapter 3 for a discussion of measures of systematic processing). This issue is addressed in the General Discussion (see Chapter 9).

Although two worry measures were utilized, only the questionnaire measure (PSWQ) exhibited a significant between-group mood effect. The PSWQ is typically considered a trait

measure but is used frequently in clinical research contexts to demonstrate changes in self-perceived levels of worry (Borkovec & Costello, 1993; Goldman, et al., 2007; Treanor, et al., 2011). These results, somewhat surprisingly, indicate that short-term laboratory manipulations, such as mood inductions, can affect participants' responses to supposedly trait measures. Metacognitive theory proposes that appraising worry levels as problematic is a key component of GAD (Type 2 worry, Wells, 1995), and this memory and appraisal bias for worry frequency may act as a mechanism for the onset of Type 2 worry/meta-worry. The behavioural measure (CI steps) showed trends in the predicted directions, with a significant positive correlation obtained between negative mood and CI steps. But differences in the number of CI steps across mood induction groups failed to reach statistical significance. This is probably due to the temporal distance between the mood induction and the CI, which was greater than in previous studies (e.g. Johnston & Davey, 1997). This result does not dispute that negative mood facilitates worrying, which has now been reported in a series of studies (Buhr & Dugas, 2009; Johnston & Davey, 1997; Startup & Davey, 2001), but emphasizes the importance of utilizing a range of worry measures in future studies to allow a more thorough analysis of the factors mediating causal variables and subsequent worrying.

5 Intolerance of uncertainty and appraisals that facilitate systematic information processing

5.1 The role of intolerance of uncertainty in perseverative worry

Intolerance of uncertainty (IU) is defined as "the way in which an individual perceives information in uncertain situations and responds to this information with a set of cognitive, emotional and behavioural reactions" (Ladouceur, et al., 1998, p. 141). The relationship between IU and perseverative worry was reviewed in Chapter 1. Despite its conceptualization as a dispositional characteristic, experiments have demonstrated that IU can be successfully manipulated in laboratory settings (e.g., Ladouceur, et al., 2000). In these experiments, increasing IU increased worry, implicating a causal role for IU in perseverative worry.

The IU mechanism resulting in increased worry is unclear. It has been suggested that IU is the driving force behind the 'what if…?' questioning style that is characteristic of anxious anticipation (Dugas, Gagnon, et al., 1998). In individuals with a diagnosis of GAD, 'what if..?' questioning leads to catastrophising, whereby progressively worse outcomes of the worry topic are perceived. Understandably, this leads to increased subjective discomfort and it is also associated with the belief that such thoughts are more likely to materialise (Vasey & Borkovec, 1992). A related proposal is that individuals with IU possess processing biases that lead to ambiguous events being perceived as threatening and intolerable (Butler & Mathews, 1983, 1987). These biases lead individuals with IU to search for more information, using the 'what if…?' question formulation, to explore the likelihood of negative consequences of uncertainty. It is well established that high IU individuals require more information before feeling confident in their decision making (e.g., Carleton, et al., 2007).

Rosen and Knäuper (2009) explored the impact of IU and situational uncertainty (SU) on information-seeking and worry. They contrast IU and SU as representing trait and state individual differences in response to uncertainty, respectively, and suggest that IU is associated with activation of coping strategies, such as information-seeking, whereas SU is associated with approach/avoidance tendencies surrounding uncertain situations. Rosen and Knäuper (2009) manipulated IU using a false feedback procedure and SU through modifying information that participants were given to read about a fictional illness. They found an interaction between IU and SU; those in the high IU/high SU condition sought the most information and worried the most, while those in the low IU/low SU group sought the least

information and worried the least. Uncertainty-oriented individuals can actually experience an increase in anxiety after information-seeking as uncertainties cannot always be resolved through more information (Rosen, et al., 2009).

'Searching for more information' has been used as an indicator of systematic processing in a number of studies (e.g. Griffin, et al., 2008). Chaiken et al. (1989) state that seeking out and integrating all relevant information is characteristic of systematic processing, and as reviewed above, information-seeking is characteristic of high IU individuals. Therefore, the experiments outlined in this chapter explore whether IU might impact on worry through increased systematic processing.

5.2 Intolerance of uncertainty and the sufficiency threshold

As outlined in Chapter 2, the sufficiency threshold is key in determining the amount of systematic processing an individual engages in. It represents the amount of processing that an individual feels is necessary in order to minimize any discrepancy between the level of confidence that they have in a decision/judgement and their desired level of confidence (Chaiken, et al., 1989). Given that high IU individuals require more information than their low IU counterparts in order to be confident in their decision making (Carleton, et al., 2007; Ladouceur, et al., 1997; Tallis, et al., 1991), high IU individuals may have high sufficiency thresholds (i.e. lower confidence levels than they desire). As sufficiency thresholds increase, it is less likely that heuristic processing will confer sufficient confidence, and as such individuals are increasingly likely to deploy systematic processing (Chaiken, et al., 1989). One strategy, outlined above, that individuals may activate in an attempt to minimise this discrepancy is to seek more information, which may result in the use of 'what if?' thinking in an attempt to consider all possible negative outcomes of a given ambiguous situation.

5.3 Intolerance of uncertainty in relation to systematic processing facilitators

High IU may raise sufficiency thresholds by affecting systematic processing facilitators (see Chapter 2). There has been little, if any, investigation on how finding uncertainty unpleasant affects the appraisals of personal relevance or task importance. Nor has the relationship been explored between IU and feeling accountable, or having higher need for cognition (NFC). Inflated responsibility and IU are both implicated in anxiety. For example, a validated measure of obsessive compulsive disorder (OCD), the Obsessive Beliefs

Questionnaire, has three subscales, two of which tap inflated responsibility and IU (Obsessive Compulsive Cognitions Working Obsessive Compulsive Cognitions Working Group, 2005). But studies have not previously examined the relationship between these variables, and of particular relevance to the current experiments, studies have not assessed whether raising feelings of IU also affects responsibility.

In contrast, there is evidence suggesting a link between IU and the systematic processing facilitator, desire for control, in the context of psychopathology. Freeston, Rhéaume, Letarte, Dugas and Ladouceur (1994) emphasise the role of control processes in their description of the manifestation of IU as "behavioural attempts to control the future and avoid uncertainty" (p.799). This is reflected in the dominant measure of IU, the Intolerance of Uncertainty Scale (Freeston, et al., 1994), which includes items that assess attempts to control future events. Again, considering IU in OCD, rather than worry, Sookman and Pinard (2002) demonstrated an association between IU and a need for control. Moulding and Kyrios (2007) found that IU could be predicted by an individual's control cognitions, and that desire for control was correlated with the obsessive-compulsive sub-domain of IU and perfectionism. Evidence of an association between IU and a strong desire for control has also been found in the context of anorexia nervosa (Sternheim, Konstantellou, Startup, & Schmidt, 2011). It has been suggested that the association between a desire for control and IU might arise because of a form of IU described as a 'need to know what will happen' (Niceli & Castelfranchi, 2001), and Mushtaq, Bland and Schafer (2011) suggest that "the perception and estimation of uncertainty might play a key role in monitoring processes and the evaluation of the "need for control"" (p.249). Thus, there is a theoretical rationale for predicting that IU will raise sufficiency thresholds due to its effects on desire for control, and subsequently result in more systematic processing.

5.4 Experiment 2

5.4.1 Introduction

Experiment 1 (Chapter 4) demonstrated that part of the impact of negative mood on increased worry scores was through a mechanism of a raised sufficiency threshold for processing information. Experiment 2 was designed to examine whether another variable implicated in perseverative worry, IU, also operated through a mechanism of increased information processing thresholds. It was hypothesised that individuals who feel intolerant of uncertainty will strive to minimise uncertainties and gain control through detailed

examination of the issues at hand. Such an approach would raise sufficiency thresholds for processing information, and should result in systematic processing (Chaiken et al., 1989).

The methodology used in Experiment 1 is refined in Experiment 2. Firstly, in Experiment 1, the questions measuring factors that promote systematic processing were couched in terms of a worry, e.g., 'If you were to start worrying about something right now, to what extent would you want to think over the issue for a long time?' Consequently, differences in responses to these questions across the negative mood and neutral mood groups in Experiment 1 could be due to the effect negative mood has on appraising worry, rather than the systematic processing facilitators. To avoid this potential confound, in Experiment 2, participants were provided with a worry vignette and asked how they felt in relation to the vignette without using the word worry, e.g., 'To what extent would you need to think about the issues if you were in [character's name] position?'. Secondly, to improve the construct validity of the VAS questions measuring factors that promote systematic processing, three items were used to measure each factor, rather than the single-item VAS measures used in Experiment 1. Lastly, given that personal relevance and task importance are deemed important factors in determining an individual's sufficiency threshold (Chaiken et al., 1989), VAS measures of these variables were included in Experiment 2.

It was predicted that if systematic processing is a mechanism mediating the relationship between IU and worry, then high levels of IU would facilitate: (1) the endorsement of cognitive appraisals associated with systematic processing and (2) self-report and behavioural measures of worrying. Furthermore, (3) the causal relationship between IU and worry would be mediated by the endorsement of cognitive appraisals that increase sufficiency thresholds and promote systematic processing.

5.4.2 Method

Participants.

Fifty-eight (43 females, 15 males) undergraduate and postgraduate students took part in the experiment, of which 33 students were studying Psychology, and the remaining 25 students were studying a variety of courses at the University of Sussex. The age range was 18-28 (M = 20.34, SD = 2.24). Participants were recruited on a voluntary basis and were remunerated with course credits or compensated for their time at the rate of £5 per hour (the experiment typically lasted 75 minutes and participants were paid £6.25).

Materials.

Manipulation checks.

Participants completed a short questionnaire comprising 100-point VASs. There were three VAS questions measuring IU, which acted as manipulation checks. The first and second items examine negative beliefs about uncertainty, in relation to a specific uncertain situation that the participant had just described, and also to feelings of uncertainty more generally. The third question examines state uncertainty. These items are shown in Table 5.6 and measure the cardinal feature of the IU construct, namely 'negative beliefs about uncertainty and its implications' (Dugas & Robichaud, 2007). To examine both the impact of the manipulation on feelings related to the uncertain situation that the participant described specifically, and extended beyond the situation to more global feelings, items 1 and 2 measure concern about uncertainty in relation to the situation and general feelings of uncertainty, respectively. It is possible that uncertainty when there is the potential for a negative outcome *always* generates negative appraisals. As such, the third item measures current feelings of uncertainty, rather than the appraisals of such uncertainty, to allow an examination of whether it is uncertainty per se, or the appraisals of uncertainty that are affected by the manipulation.

Also included were three questions measuring PSC and mood (see Table 5.6) as these are the other two key independent variables under examination in this thesis. Mood and PSC have been shown to affect worry scores (see Chapter 1), and as such, data was collected to allow these variables to be controlled for. The PSC items are based on the problem-solving subscale of the Personal Problem-Solving Inventory (Heppner & Petersen, 1982). The mood items measured four mood states (sadness, anxiety, arousal and happiness), and were the same as those used in Experiment 1 (see Chapter 4) to allow comparison of the outcomes of IU induction, relative to the mood inductions of Experiment 1.

Table 5.6 Items measuring intolerance of uncertainty, problem-solving confidence, and mood

Construct	Item NB. All items began with 'Please mark a cross along the scale to indicate...'
	IU items
IU-Q1	how concerned you are about the uncertainty of the situation you have described above
IU-Q2	at this moment in time, how much feelings of uncertainty concern you
IU-Q3	how uncertain you feel at this moment in time
	PSC items
PSC-Q1	the extent to which you would like to tackle problems at this moment in time
PSC-Q2	how confident you feel about your ability to solve problems at this moment in time
PSC-Q3	how confident you feel about solving problems related to the situation you described above
	Mood
Sadness	how sad you feel at the present moment
Happiness	how happy you feel at the present moment
Anxiety	how anxious you feel at the present moment
Arousal	how aroused (i.e. awake, alert or stimulated) you feel at the present moment

Worry vignette and systematic processing facilitators questionnaire.

In order to assess whether IU resulted in changes in personal relevance appraisals, it was necessary to design a scenario that participants could judge for personal relevance. Participants read two worry vignettes consisting of a short paragraph that described the worries of a character. There were both male and female protagonist versions, and participants were given the version to match their own gender so that the potential for personal identification with the characters was equal across genders. The worry vignettes were based on real responses to a CI (see Davey, 2006). The vignette topics were 'degree work' and 'finances' based on the observation that these were the two most commonly reported worry topics in the CIs in Experiment 1. The order of the vignettes was counterbalanced across participants.

After reading each worry vignette, participants were asked how much they endorsed VAS items, measuring systematic processing facilitators (personal relevance, task importance, responsibility, accountability, desire for control, and NFC); the items are shown in Table 5.7.

Table 5.7 Items measuring systematic processing facilitators

Factor	Item
Personal relevance 1	To what extent is the passage above personally relevant?
Personal relevance 2	To what extent do you feel that the passage above relates to your life?
Personal relevance 3	To what extent do you see yourself sharing the same thoughts as [name of character]?
Task importance 1	To what extent do you feel the passage above involves an important issue?
Task importance 2	If you were in [name of character] situation, to what extent would the issues described in the passage be a priority for you?
Task importance 3	How significant would these issues be if you were in [name of character] situation?
Responsibility 1	To what extent would you feel responsible if you were in [character's name] position?
Responsibility 2	If you were in [character's name] position to what extent would you believe you should try and prevent the outcomes predicted by [character's name]?
Responsibility 3	To what extent would you think it was your job to think through the consequences of the issues, if you were in [character's name] situation?
Accountability 1	To what extent would you feel accountable if you were in [character's name] position?
Accountability 2	To what extent do you feel that you would have to share your thoughts with others at some point if you were in [character's name] situation?
Accountability 3	Imagine you are in [character's name] position and have to share your thoughts with others. To what extent would you want to make sure you could justify your thoughts to others?
Need for cognition 1	To what extent would you need to think about the issues if you were in [character's name] position?
Need for cognition 2	To what extent do you think the issues described above need deliberating?
Need for cognition 3	If you were in [character's name] situation, to what extent would you spend time thinking about these issues?
Desire for control 1	To what extent would you want someone else to tell you what to do if you were in [character's name] situation?
Desire for control 2	To what extent would you want to have control over the situation?
Desire for control 3	Imagine you were in [character's name] situation, to what extent would you want to do something about it, rather than letting it continue?

The accountability VASs were formed by considering the definition of accountability (i.e. that one will have to justify one's ideas). Consideration was given to how accountability has been manipulated in experiments. A group of participants believe they will have to justify their responses (high accountability) and another group believe their views will remain anonymous (low accountability) (e.g., Tetlock, 1983). The VASs measuring responsibility were based on items from the Responsibility Attitude Scale (RAS: Salkovskis, et al., 2000), a 26-item questionnaire which includes items such as 'I must always think through the consequences of even the smallest actions'. The NFC VASs were based on generating thoughts about an issue, as represented in the Need for Cognition Scale (Cacioppo, Petty & Kao, 1984), which includes items such as 'I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something'. The VASs measuring desire for control were based upon Burger and Cooper's (1979) Desirability of Control scale, which contains items like 'I enjoy having control over my own destiny'. The questionnaire also included one VAS measure of worry: 'How worried would you be if you were in [character's name] position?'

Validated questionnaire measures.

Participants completed the Intolerance of Uncertainty Scale (IUS) (Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994), the PSC subscale of the Problem-Solving Inventory (Heppner & Petersen, 1982), and the Penn State Worry Questionnaire (PSWQ) (Meyer et al., 1990). A full discussion of these measures and their psychometric properties is given in Chapter 3; only brief details are presented here.

Intolerance of Uncertainty Scale.

The IUS (Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994) is a 27-item scale assessing "emotional, cognitive and behavioral reactions to ambiguous situations, implications of being uncertain, and attempts to control the future" (Freeston et al., 1994, p. 791). It consists of items such as 'Uncertainty makes life intolerable' and 'My mind can't be relaxed if I don't know what will happen tomorrow'.

Problem-solving confidence subscale.

The PSC subscale is taken from Heppner and Petersen's (1982) Personal Problem-Solving Inventory. It consists of 11-items (e.g., 'Many problems I face are too complex for me to solve' (reverse-scored), 'I trust my ability to solve new and difficult problems').

Penn State Worry Questionnaire.

Participants completed the PSWQ (Meyer et al., 1990), see Chapter 3. The PSWQ consists of 16-items (e.g., 'Many situations make me worry').

Procedure

Stage 1 (informed consent).

Participants read an information sheet about the nature of the tasks and provided informed consent.

Stage 2 (intolerance of uncertainty manipulation).

Participants were randomly assigned to one of two groups: high IU or low IU. Participants then underwent the IU manipulation, which was based on a procedure used by Kelly (2009) and is designed to manipulate the participants' IU. For a review of this particular IU manipulation compared to manipulations employed in other research on IU, refer to Chapter 3.

This manipulation uses four sets of two short stories (Appendices F-I). In one set, the character has high IU. There is a male version (Appendix F) and a female version (Appendix G). In the other set, the character has low IU. Again, there is a male version (Appendix H) and a female version (Appendix I). The scenarios are gender-congruent to ensure the participants can relate as fully as possible to the character and their gender-typical attitudes. In each of the scenarios, the character encounters an uncertain situation that has a potentially negative outcome.

Participants were given ten minutes to read the stories and try to understand the motivations of the central character. Afterwards, participants were asked to "think of a situation in your own life where you aren't sure whether the outcome will be good or bad" and to briefly describe the situation. After spending five minutes describing their own potentially negative life event, participants received the following instructions "We want you to imagine that you are Sean [or Sarah] from the stories you have just read, and that you keep a journal about your thoughts and feelings about key issues and events in your life. Please take fifteen minutes to write a journal entry describing how you would feel if you were Sean [or Sarah] and were experiencing the situation you have just described above. Try to be as detailed as possible in describing how you (Sean [or Sarah]) would feel about the dilemma". After the fifteen minutes had passed, participants were given five minutes to read the diary

entry they had written with an emphasis placed on understanding the feelings of the central character.

Stage 3 (manipulation checks).

Participants completed the manipulation check VASs.

Stage 4 (vignettes and systematic processing facilitators questionnaire).

Participants were presented with two worry vignettes and a set of questions measuring systematic processing facilitators (these questions were answered twice – i.e. they were completed after reading each worry vignette).

Stage 5 (catastrophising interview).

Participants took part in a worry CI about a current main worry (See chapters 3 for details about the CI).

Stage 6 (validated questionnaires).

Participants completed the IUS (Buhr & Dugas, 2002) the PSI (Heppner & Petersen, 1982), and the PSWQ (Meyer et al., 1990).

Stage 7 (demographics and debrief).

Participants provided demographic information (age, gender, year of study). Participants were debriefed about the true aims of the experiment, participants in the high IU condition were given the low IU stories to read, and participants were reimbursed for their time.

5.4.3 Results

Prior to analysis, composite scores were calculated for the IU and PSC manipulation checks, and each of the systematic processing facilitators (personal relevance, task importance, responsibility, accountability, desire for control, and NFC). The composite measures were calculated by adding together the specific VAS questions designed to measure each of the constructs.

5.4.3.1 Demographics

Chi-square tests revealed no significant difference across the high and low IU groups in terms of the participants' gender, $\chi^2(1) = 0.02$, $p = .89$, subject of study, $\chi^2(22) = 22.32$, $p = .44$, or year of study, $\chi^2(4) = 3.93$, $p = .42$.

5.4.3.2 Manipulation Checks

Prior to analysis, composite scores were calculated for the IU and PSC manipulation check items, where three items had been used to measure each construct.

Intolerance of uncertainty.

Descriptive statistics for the IU manipulation check items are shown in Table 5.8. An independent *t*-test indicated a significant difference between the high IU group (M = 164.67, SD = 64.87) and the low IU group (M = 113.57, SD = 68.17) on the composite of the IUS VAS items, $t(56) = 2.93$, $p = .005$, $r = .13$. Further examination of the individual VAS items using independent *t*-tests (Bonferroni corrected; criterion value of $p < .02$) demonstrated that the high IU and the low IU group differed significantly on two out of the three items. The high IU group scored significantly higher than the low IU group on the items 'the extent at the present time that feelings of uncertainty concern you', $t(56) = 3.01$, $p = .004$, $r = .14$, and 'how uncertain you feel at this moment in time' , $t(56) = 2.73$, $p = .008$, $r = .12$. The VAS item 'the extent of concerns about the uncertainty of the situation' was endorsed more strongly by the high IU group than the low IU group, but this difference did not reach statistical significance, $t(56) = 1.77$, $p = .082$, $r = .05$.

Table 5.8 Descriptive statistics for the intolerance of uncertainty manipulation check items by intolerance of uncertainty condition. Standard deviations are shown in parentheses.

	High IU	Low IU
IU composite*	164.67 (64.87)	113.57 (68.17)
'The extent at the present time that feelings of uncertainty concern you'*	58.37 (26.60)	38.11 (24.44)
'How uncertain you feel at this moment in time'*	50.20 (24.20)	32.14 (26.12)
'The extent of concerns about the uncertainty of the situation'	56.10 (28.00)	43.32 (26.80)

*$p < .01$

Mood.

Descriptive statistics for the mood manipulation check items are shown in Table 5.9. Independent *t*-tests were conducted to examine whether the IU manipulation affected mood states (Bonferroni-corrected *p*-value criterion was adjusted to $p < .013$). The IU manipulation significantly affected sadness, $t(53.53) = 2.11$, $p = .04$, with the high IU group reporting significantly higher levels of sadness than the low IU group. However, the difference on sadness is not significant when the Bonferroni-corrected *p*-value is adhered to. The anxiety

ratings were significantly different, $t(56) = 2.99$, $p = .004$, $r = .14$, with the high IU group reporting significantly higher anxiety levels than the low IU group. There was no significant difference between the high IU group and the low IU group on the measure of happiness, $t(56) = 0.45$, $p = .65$, $r = .001$, or arousal, $t(56) = 0.54$, $p = .59$, $r = .005$.

Table 5.9 Descriptive statistics for the mood manipulation check items by intolerance of uncertainty condition. Standard deviations are shown in parentheses.

	High IU	Low IU
Sadness*	24.97 (19.07)	15.68 (14.26)
Anxiety**	50.73 (26.53)	29.61 (27.33)
Happiness	65.30 (18.73)	67.61 (20.15)
Arousal	56.43 (22.99)	53.04 (24.91)

$^{*}p < .05$, $^{**}p < .01$

Problem-solving confidence.

Descriptive statistics for the PSC manipulation check items are shown in Table 5.10. The IU manipulation did not significantly affect PSC; an independent *t*-test indicated no significant difference on the composite measure of the three PSC VASs, $t(56) = -0.78$, $p = .44$, $r = .01$. Similarly, there were no significant differences when independent *t*-tests were conducted on the individual VAS items: 'Extent you would like to tackle problems', $t(56) = -0.57$, $p = .57$, $r = .006$; 'How confident you feel about your ability to solve problems at this moment in time', $t(56) = -1.20$, $p = .24$, $r = .03$, and 'How confident you feel about solving problems related to the situation you described above', $t(56) = -1.40$, $p = .89$, $r = .03$.

Table 5.10 Mean scores for the PSC manipulation check items and composite by IU condition. Standard deviations are shown in parentheses.

	High IU	Low IU
PSC composite	179.13 (45.79)	189.71 (57.29)
'Extent you would like to tackle problems'	57.37 (24.29)	60.96 (24.06)
'How confident you feel about your ability to solve problems at this moment in time'	60.67 (19.01)	66.79 (19.99)
'How confident you feel about solving problems related to the situation you described above'	61.10 (22.27)	61.96 (24.64)

5.4.3.3 Experimental Outcomes

Prior to analysis, composite scores were computed for each of the systematic processing facilitator variables (personal relevance, task importance, accountability, responsibility, desire for control, and need for cognition) by adding together the three VAS questions for each variable. These composites were also added together to represent an individual's sufficiency threshold. There was a composite score for the coursework questions and a separate composite score for the financial questions. Descriptive statistics for the systematic processing cognitive appraisals are shown in Table 5.11.

Table 5.11 Descriptive statistics for the composite measure of the cognitive appraisals that facilitate systematic processing, shown by worry vignette and intolerance of uncertainty condition

		High IU		Low IU	
	Vignette	*M*	*SD*	*M*	*SD*
Personal relevance	Coursework	165.97	84.23	128.46	82.32
	Financial	152.70	89.96	142.71	82.31
Task importance	Coursework	226.73	59.29	224.21	53.02
	Financial	239.47	43.20	257.93	29.40
Accountability	Coursework	202.90	62.29	219.68	37.90
	Financial	226.97	43.77	236.43	33.55
Responsibility	Coursework	230.90	47.07	234.68	46.69
	Financial	255.47	31.03	261.11	33.09
Desire for control	Coursework	222.30	46.17	234.04	33.78
	Financial	241.87	39.83	244.07	33.97
Need for cognition	Coursework	212.97	54.82	209.75	40.71
	Financial	218.30	50.24	240.32	36.31
Sufficiency threshold[a]	Coursework	1329.00	265.28	1293.11	216.17
	Financial	1380.67	166.21	1447.79	142.59

[a]Composite measure of the six cognitive appraisals associated with increased systematic processing

Coursework.

An independent *t*-test indicated no significant difference between the high and low IU groups on the coursework vignette sufficiency threshold, $t(56) = 0.56$, $p = .576$, $r = .006$. There

were no significant differences between the high and low IU groups on any of the individual systematic processing facilitators following the coursework vignette, *ts* ≤ ±1.71, *ps* ≥ .09. An independent *t*-test indicated no significant difference between the high IU group (*M* = 67.63, *SD* = 23.95) and the low IU group (*M* = 68.79, *SD* = 26.21), on the coursework vignette worry VAS, *t*(56) = -0.18, *p* = .86, *r* = .001.

Financial vignette.

An independent *t*-test indicated no significant difference between the high and low IU group on the financial vignette sufficiency threshold, *t*(56) = -1.65, *p* = .11, *r* = .05. There were no significant differences between the high and low IU groups on any of the systematic processing facilitators following the financial vignette, *ts* ≤ ±1.90, *ps* ≥ .06. An independent *t*-test indicated a significant difference between the high IU group (*M* = 77.23, *SD* = 19.42) and the low IU group (*M* = 87.00, *SD* = 10.93), on the financial vignette worry VAS, *t*(46.31) = -2.38, *p* = .02, *r* = .11. This was against the predicted direction, with the group who received the low IU manipulation reporting that they would feel more worried about the financial scenario than participants in the group who received the high IU manipulation.

Catastrophising interview

An independent *t*-test indicated no significant difference between the high IU group (*M* =7.57, *SD* = 3.28) and low IU groups (*M* = 7.57, *SD* = 4.18) in terms of the number of catastrophising steps that they generated, *t*(56) = -0.005, *p* = .996. The mean number of catastrophising steps is shown in Figure 4.5.

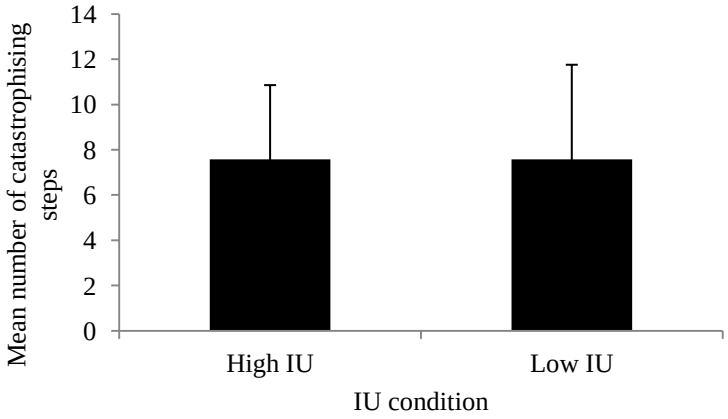


Figure 4.5 Error bar graph showing mean number of catastrophising steps by intolerance of uncertainty condition. Error bars represent one standard deviation.

Validated questionnaire measures.

Independent *t*-tests indicated no significant difference between the high and low IU groups on the validated questionnaires, the IUS, $t(56) = 1.60$, $p = .116$, $r = .04$, the PSWQ, $t(54^4) = 1.48$, $p = .116$, $r = .04$, and the PSI PSC subscale, $t(55^5) = 0.86$, $p = .393$, $r = .02$. Examination of the means (see Table 5.12) suggests that the high IU manipulation increased IU and PSWQ scores, and decreased PSC scores in the predicted direction relative to the low IU manipulation, but that these differences did not reach statistical significance.

Table 5.12 The descriptive statistics for the validated questionnaires shown by IU condition.

Questionnaire	High IU		Low IU	
	M	*SD*	*M*	*SD*
IUS	64.36	22.20	55.79	18.33
PSWQ	53.72	13.72	48.67	11.65
PSC	47.28	7.07	49.57	9.80

5.4.3.4 Correlational analyses

Correlational analyses were conducted to examine whether composite IU predicted an individual's sufficiency threshold, 'as many as can' deployment, and measures of worry. This was because the confidence intervals are quite large for the composite IU measure and the confidence intervals for the sufficiency thresholds for the coursework and financial vignettes indicate that there is overlap across the IU groups. The results are shown separately for the coursework and financial vignettes in Tables 5.13 and 5.14, respectively.

For the coursework vignette, as predicted, IU significantly positively correlated with the sufficiency threshold, $r = .36$, $p < .01$, personal relevance, $r = .41$, $p < .01$, task importance, $r = .30$, $p < .01$, and need for cognition, $r = .26$, $p < .05$. In relation to the coursework vignette, IU did not correlate with accountability, $r = .14$, $p > .05$, responsibility, $r = .08$, $p > .05$, and desire for control, $r = -.06$, $p > .05$. The pattern of results was different for the financial vignette, with IU failing to correlate with the sufficiency threshold, $r = -.03$, personal relevance, $r = .02$, task

[4] The degrees of freedom are smaller for this test as two participants missed items on the scale and hence a total PSWQ score could not be compiled.
[5] One participant did not complete all items of the PSC subscale of the PSI.

importance, *r* = .07, accountability, *r* = -.02, responsibility, *r* = -.08, need for cognition, *r* = .04, and desire for control, *r* = .11, all *ps* > .05.

Table 5.13 Correlations between intolerance of uncertainty, systematic processing facilitators in relation to the coursework vignette, and worry

	IU	ST	PR	TI	ACC	RESP	NFC	DC	CI	PSWQ
IU	1	**.36****	**.41****	**.30***	.14	.08	**.26***	-.06	.06	**.49*****
ST		1	**.66*****	**.88*****	**.66*****	**.78*****	**.77*****	**.41****	-.004	.18
PR			1	**.44****	.14	**.26***	.31	-.03	.13	**.47*****
TI				1	**.53*****	**.66*****	**.74*****	**.41****	-.06	.13
ACC					1	**.65*****	**.45*****	**.52*****	-.18	-.22
RESP						1	**.58*****	**.46*****	-.08	-.15
NFC							1	**.46*****	.01	.20
DC								1	.01	-.16
CI									1	-.02
PSWQ										1

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Note. IU = intolerance of uncertainty; ST = sufficiency threshold; ACC = accountability; RESP = responsibility; NFC = need for cognition; DFC = desire for control; CI = catastrophising interview steps; PSWQ = Penn State Worry Questionnaire

Table 5.14 Correlations between intolerance of uncertainty, systematic processing facilitators in relation to the financial vignette, and worry

	IU	ST	PR	TI	ACC	RESP	NFC	DC	CI	PSWQ
IU	1	-.03	.02	.07	-.02	-.08	.04	.11	.06	**.49*****
ST		1	**.51*****	**.74*****	**.47*****	**.54*****	**.65*****	**.39****	-.21	.10
PR			1	.10	-.08	-.07	.04	.13	-.05	.10
TI				1	.25	**.45*****	**.57*****	**.34*****	-.17	.10
ACC					1	**.42*****	.25	**.28***	-.15	-.18
RESP						1	**.30***	**.50*****	-.23	-.04
NFC							1	**.33***	-.11	.20
DC								1	.02	-.02
CI									1	-.02
PSWQ										1

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Note. IU = intolerance of uncertainty; ST = sufficiency threshold; ACC = accountability; RESP = responsibility; NFC = need for cognition; DFC = desire for control; CI = catastrophising interview steps; PSWQ = Penn State Worry Questionnaire

It was predicted that IU would result in raised scores on self-report and behavioural measures of worry. Correlational analyses do not provide information about the direction of

causation, but the correlational analyses do indicate that IU is significantly positively correlated with PSWQ scores, $r = .49$, $p < .001$, but not with CI steps, $r = -.06$, $p > .05$.

5.4.4 Discussion

Experiment 2 was designed to examine whether experimentally-induced IU had an effect on increased worry scores through a mechanism of raised sufficiency thresholds. High IU individuals seek more information before being satisfied with a judgement and have a strong desire for control over a situation, suggesting that they might deploy systematic processing (Chaiken, et al., 1989). Experiment 2 utilised a manipulation of IU that involved reading about a character who displayed reactions to uncertainty that were either representative of a high IU individual (i.e. who found uncertainty intolerable), or a low IU individual (i.e. who found uncertainty acceptable). Participants then applied this style of appraisal of uncertainty to a personal uncertain situation. The results of Experiment 2 indicate that this manipulation, based on Kelly (2009), was successful at generating significantly different amounts of IU. Participants who read the stories about the high IU characters reported significantly higher levels of IU post-manipulation than participants who read the stories about the low IU characters. However, the high and low IU groups did not differ in their endorsement of appraisals known to facilitate systematic processing (personal relevance, task importance, accountability, responsibility, need for cognition, and desire for control). This finding challenges the hypothesis that individuals with high levels of IU have raised sufficiency thresholds. However, Experiment 2 utilised a slightly different methodology to Experiment 1, which examined systematic processing facilitators in relation to negative mood. In Experiment 2, participants read a vignette about a character before rating how they would feel if they were in that situation in terms of personal relevance, task importance, accountability, responsibility, NFC, and desire for control. Experiment 1 did not use vignettes, and participants were asked about the appraisals in relation to an imaginary worry bout. Thus, Experiment 1 used questions that were self-referent, while Experiment 2 was more indirect, asking how the participant would feel if they were in character X's position. It is plausible that because the worry vignettes were not presented in the first-person in Experiment 2, the participants appraised the situations differently, despite being asked to imagine that they were in that situation.

IU correlated with the sufficiency threshold measure and the cognitive appraisals personal relevance, task importance, and need for cognition. This provides some support for

the notion that IU is related to systematic processing, but the correlational analyses do not allow the idea that systematic processing may cause IU to be dismissed; the direction of causation cannot be established. It may be that when individuals are investing cognitive expenditure into systematic processing, they become less willing to accept uncertainty. This is particularly likely given that individuals usually deploy systematic processing when tasks are perceived as important, and uncertainty is less likely to be tolerated. This pattern was not replicated for the financial vignette. One possibility for the discrepancy is that individuals may have felt that they had more control over worries about their coursework, but less control over worries relating to financial difficulties, which are practically synonymous with being a student. Therefore individuals may have perceived that there was less that they could do about the financial worries, and consequently may have been less willing to deploy cognitively demanding systematic processing (Chaiken, et al., 1989).

Furthermore, the IU groups did not differ on the measures of worry (the PSWQ and the CI). This suggests that the correlation found between IU and PSWQ scores in this study, and others e.g., Buhr and Dugas (2006), either (a) is not in the direction examined in this study (i.e. worry actually causes IU, rather than IU causing worry) and/or (b) experimentally-induced IU is not 'strong enough' to cause changes in self-reported worry. However, the lack of an association with CI steps is consistent with the work of Deschenes et al. (2010) who did not find an effect of IU manipulation on the number of catastrophising steps generated. One possible explanation for this finding comes from de Bruin et al. (2007), who noted that IU was a good predictor of trait worry but was a poor predictor of idiosyncratic worry bouts. The CI can be considered an idiosyncratic worry, and this may be why the IU manipulation did not result in a change in the number of worry steps generated. What is more, the association between IU and worry reported by Buhr and Dugas (2006) involved correlating trait IU (IUS) with trait worry (PSWQ) and as such, it is difficult to disentangle causation. While IU may result in worry perseveration, it is equally unlikely that individuals who frequently worry learn to find uncertainty aversive and unacceptable given that it so frequently co-occurs with worrying. The findings suggest that short-term laboratory manipulations of IU do not mimic the properties of trait IU. Alternatively, reading the vignettes and completing more systematic processing facilitator measures than in Experiment 1 may have resulted in dilution of the effects of IU manipulation by the time the participants completed the PSWQ.

5.5 Experiment 3

5.5.1 Introduction

Experiment 3 was designed to explore whether the different findings obtained between negative mood and IU on systematic processing facilitators in Experiments 1 and 2, respectively, are due to the presentation of a third-person vignette and asking participants to imagine being in that situation (Experiment 2), compared to asking participants to imagine that they are worrying (Experiment 1). To explore this possibility, participants were exposed to a manipulation of IU before completing the systematic processing facilitator VAS measures that were used in Experiment 1. Thus, Experiment 3 was an amalgamation of Experiments 1 and 2 in that participants underwent the same manipulation of IU as in Experiment 2, but the sufficiency threshold measure was the same as in Experiment 1. It was predicted that if systematic processing is a mechanism mediating the relationship between IU and worry in a personally-relevant context, then high levels of IU would facilitate endorsement of cognitive appraisals associated with systematic processing.

5.5.2 Method

Participants.

There were 60 participants (49 females and 11 males) recruited via advertisement posters in the School of Psychology and Brighton and Sussex Medical School, recruitment emails to the University of Sussex International Summer School, and the University of Sussex online participant recruitment system, SONA. The majority of participants were students at the University of Sussex (n = 59; 17 studied Psychology, 42 studied another course at the University of Sussex), while 1 participant reported being employed by the University of Sussex. The age range was 16-29 yr (M = 20.63, SD = 2.30). Participants were recruited on a voluntary basis and were compensated for their time with £3.

Materials.

Most materials in the current experiment were used in the experiments previously described in this thesis; for the manipulation checks and the sufficiency threshold scale see Chapter 4; for the PSWQ see Chapter 3.

The pre-manipulation questionnaire (baseline measures).

A pre-manipulation questionnaire consisting of 100-point visual analogue scales (VASs; 0 = ‘Not at all’, 100 = ‘Extremely’) assessed baseline levels of sadness (‘You feel sad’),

PSC ('You trust your ability to solve new and difficult problems'), and IU ('You feel concerned by uncertainty'). These single-items were based on the cardinal feature of each construct and were embedded amongst seven distracter questions, all ostensibly about general life well-being, e.g., 'you feel that your income limits the choice of where you can live' and 'you feel comfortable showing affection to your friends'. The sadness VAS item was based upon the item ' Please mark a cross along the scale to indicate how sad you feel at the present moment.', which has been used in numerous published studies to demonstrate participants' current level of sadness (e.g. Davey, et al., 2007; Startup & Davey, 2001). The PSC item is taken from the PSC subscale of the Personal Problem-Solving Inventory (Heppner & Petersen, 1982). The IU item was worded to capture an individual's unease about uncertainty, reflecting items in the IU Scale (Freeston, et al., 1994), such as 'Uncertainty makes me uneasy, anxious, or stressed', 'Unforeseen events upset me greatly', and 'I always want to know what the future has in store for me'. Single items were used to avoid alerting participants to the aims of the experiment.

Procedure.

The procedure was very similar to that used in Experiment 1, see Chapter 4. However, rather than undergoing a mood induction, after providing informed consent, participants were randomly assigned to either a high IU condition or low IU condition. Additionally, at the start of the experiment, prior to undergoing the IU manipulation, participants completed the baseline questionnaire (see the Materials section directly above). The IU manipulation was identical to that used in Experiment 2 (see above, this chapter) and is based on a procedure by Kelly (2009). Participants read a vignette about a character who either viewed uncertainty negatively (upward manipulation of IU, the high IU group) or who viewed uncertainty positively (downward manipulation of IU, the low IU group). Participants then described a situation in their own life where they were unsure whether the outcome would be good or bad. The last part of the IU manipulation involved participants writing a diary about their uncertain situation from the perspective of the character that they had read about in the vignette. Following the IU manipulation, participants completed manipulation check questions, which examined how the IU manipulation had altered self-reported IU, as well as mood and PSC – the other two key independent variables examined in this thesis. Participants were then presented with the four VAS questions used in Experiment 1 (Chapter 4) to measure cognitive appraisals that influence an individual's sufficiency threshold: accountability - 'Please indicate on the scale below the extent to which you feel that you may

have to justify your worries to others'; responsibility - 'If I don't act when I can foresee danger, then I am to blame for any consequences if it happens'; need for cognition - 'If you were to start worrying about something right now, to what extent would you want to think over the issue for a long time?'; and desire for control - 'Please mark a cross along the scale to indicate how strongly you hold the belief that it is important to have control over things you worry about'. After completing these VAS scales, participants also completed a VAS about how much they felt that they would keep worrying until they had done as much as possible ('as many as can', AMA, stop rule deployment) , the PSWQ and the IUS.

Participants did not complete a CI in Experiment 3. This was because the focus of this experiment was on whether IU affected sufficiency thresholds when questions examining the sufficiency threshold were phrased in the first-person, rather than the effect of IU on worrying. The manipulation of IU was the same as that used in Experiment 2, and thus no differences were expected in terms of CI steps or PSWQ scores between Experiment 2 and Experiment 3. Consequently, not including the CI in Experiment 3 reduced the time that participants were required to attend the experiment. Additionally, given that the CI was deemed unnecessary, eliminating it from experiment 3 was more ethical, as it meant that participants did not need to engage in an (unnecessary) interview designed to make them worry.

5.5.3 Results

Demographics.

Chi-square tests revealed that there was no significant difference between the high and low IU conditions in terms of gender, $\chi^2(10) = 8.13$, $p = .62$, occupation, $\chi^2(1) = 1.02$, $p = .31$, year of study, $\chi^2(5) = 1.67$, $p = .89$, or subject of study, $\chi^2(3) = 2.17$, $p = .54$.

Baseline Measures.

Independent *t*-tests indicated that there was no significant difference between the high and low IU (IU) groups on the VASs measuring baseline levels of IU, $t(52.14) = 0.65$, $p = .52$, $r = .008$, PSC, $t(57) = 1.22$, $p = .23$, $r = .03$, or sadness, $t(57) = 0.17$, $p = .87$, $r < .001$. See Table 5.15 for descriptive statistics.

Table 5.15 Baseline descriptive statistics for intolerance of uncertainty, problem-solving confidence, and sadness, by intolerance of uncertainty condition.

	High IU		Low IU	
	M	*SD*	*M*	*SD*
IU	55.60	23.65	59.03	16.68
PSC	66.72	12.51	70.97	14.15
Sadness	22.69	18.73	23.57	20.79

Manipulation Checks

All descriptive statistics for the manipulation check VAS items are shown in Table 5.16.

Intolerance of uncertainty.

An independent *t*-test indicated no significant difference between the high and low IU conditions on the IU composite measure, comprised of four 100-point VASs measuring IU, $t(58) = -1.03$, $p = .31$, $r = .02$. Further examination of the single VAS items indicated that there was also no significant difference on the single IU items, $ts \leq -1.62$, $ps \geq .11$. This indicates that the manipulation was unsuccessful in changing levels of IU between the two experimental conditions.

Problem-solving confidence.

An independent *t*-test showed no significant difference between the high and low IU conditions on the PSC composite, comprised of the four 100-point VAS items measuring PSC, $t(58) = 1.24$, $p = .22$, $r = .03$. Closer examination of the single VAS items indicated no significant difference between the high and low IU groups on the item PSC 1, $t(58), = 0.76$, $p = .45$, $r = .01$, but there was a significant difference on the PSC 2 item, $t(58) = 2.05$, $p = .045$, $r = .07$, the PSC 3 item, $t(58) = 2.34$, $p = .023$, $r = .09$, and the PSC 4 item (reverse-scored), $t(58) = -2.03$, $p = .047$, $r = .07$. In all cases, the high IU group reported lower confidence in their problem-solving ability (see Table 5.16).

Mood.

Independent *t*-tests revealed no significant difference between the high IU group and the low IU group on any of the items measuring mood (sadness, happiness, anxiety, arousal, and negativity), $ts \leq \pm 1.31$, $ps \geq .20$.

Table 5.16 Descriptive statistics for the manipulation check items shown by intolerance of uncertainty condition

	High IU		Low IU	
	M	*SD*	*M*	*SD*
IU-Q1	60.87	27.59	53.37	23.82
IU-Q2	58.20	25.86	62.70	20.61
IU-Q3	55.53	23.34	45.50	24.70
IU-Q4	47.83	26.20	40.10	27.94
IU composite	222.43	83.03	201.67	73.52
PSC-Q1	70.70	2-.63	74.37	16.70
PSC-Q2	61.17	15.95	69.97	17.22
PSC-Q3	64.00	13.89	72.93	15.63
PSC-Q4	33.27	16.33	24.77	16.11
PSC composite	229.13	38.92	242.03	41.45
Sadness	22.92	20.62	22.43	20.19
Happiness	69.80	16.95	72.63	20.65
Anxiety	44.97	26.07	36.53	23.88
Arousal	57.10	20.35	53.17	18.63
Negativity	33.43	21.78	27.87	21.42

Correlation analyses.

Given that manipulating IU was unsuccessful, there was no rationale for comparing high and low IU groups on the experimental outcomes. In Experiments 1 and 2, correlations between the independent variable and each dependent variable were examined, in addition to between-group analyses. As such, correlational analyses were conducted with the composite IU scores to examine whether participants' IU score predicted an individual's sufficiency threshold, 'as many as can' deployment, and scores on validated measures of worry, IU and PSC (see Table 5.17).

Table 5.17 Correlations between intolerance of uncertainty, systematic processing facilitators, and worry

	IU	ST	ACC	RESP	NFC	DC	AMA	PSWQ	IUS
IU	1	**.41****	.22	**.36***	**.28***	**.34****	**.27***	**.57*****	**.59*****
ST		1	**.81*****	**.80*****	**.78*****	**.46*****	**.46*****	**.53*****	**.47*****
ACC			1	**.54*****	**.56*****	.15	**.39****	**.36****	**.36****
RESP				1	**.48*****	.17	**.26***	**.39****	**.42****
NFC					1	.13	**.46*****	**.51*****	**.28***
DC						1	.20	.26	**.28***
AMA							1	**.46*****	**.39****
PSWQ								1	**.62*****
IUS									1

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Note. IU = intolerance of uncertainty; ST = sufficiency threshold; ACC = accountability; RESP = responsibility; NFC = need for cognition; DFC = desire for control; AMA 'As many as can' stop rule; PSWQ = Penn State Worry Questionnaire; IUS = Intolerance of Uncertainty Scale.

It was predicted that high IU would result in raised sufficiency thresholds. While correlational analyses do not provide information on the direction of causation, they do illuminate relationships between variables. There was a significant positive correlation between IU composite scores and sufficiency threshold scores, r = .41, p = .001. As IU composite scores increased, sufficiency thresholds also increased (see Figure 5.6).

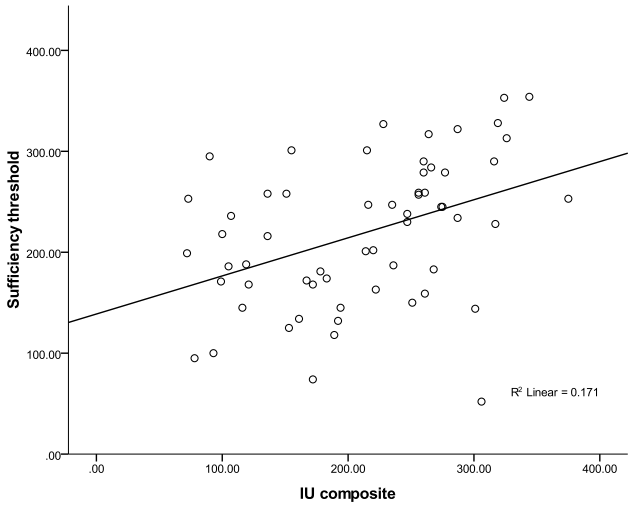


Figure 5.6 Scatterplot showing the relationship between intolerance of uncertainty composite scores and the sufficiency threshold

Turning to examine the individual systematic processing facilitator variables, there was a significant correlation between IU and desire for control, r = .34, p = .007; higher IU scores were associated with a greater desire for control. There was a significant association between IU and responsibility appraisals, with those scoring higher IU composite scores also reporting feeling more responsible, r = .36, p = .004. Need for cognition was also significantly correlated with the IU composite score, r = .28, p = .03; those high in IU were more likely to express a greater need for cognition. Similarly, as IU scores increased, accountability appraisals also increased, but this did not reach statistical significance, r = .22, p = .09.

It had also been predicted that IU would lead to raised worry and AMA scores. There was a significant positive correlation between the IU composite scores and PSWQ scores, r = .55, p < .001. Higher IU composite scores were associated with higher PSWQ scores, as shown in Figure 5.7. The IU composite measure was significantly associated with 'as many as can' deployment, r = .27, p = .04. As IU scores increased, individuals were more likely to deploy the 'as many as can' stop rule. There was also a significant correlation between IU and IUS scores, r = .59, p < .001, indicating that the IU composite measure was representative of the IU construct as measured by the IUS. However, IU composite scores did not significantly correlate with PSC, r = .25, p = .06.

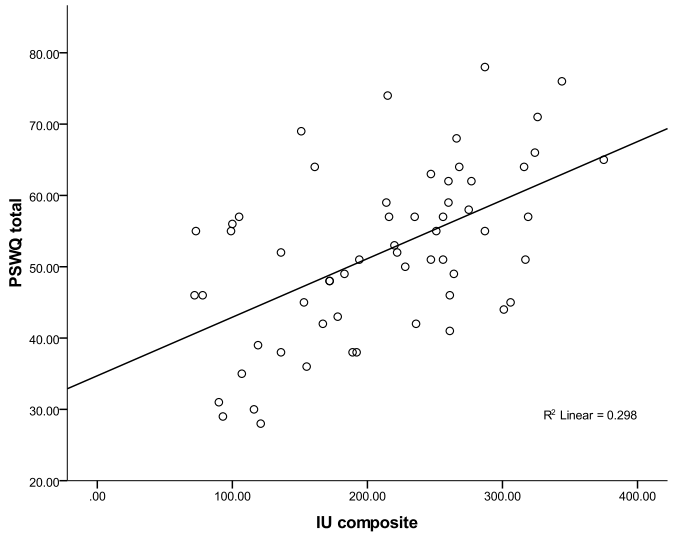


Figure 5.7 Scatterplot showing the relationship between intolerance of uncertainty composite scores and Penn State Worry Questionnaire scores

5.5.4 Discussion

Experiment 3 examined whether manipulating IU would affect an individual's appraisals of variables known to increase systematic processing (accountability, responsibility, need for cognition, and desire for control) in the context of an imagined worry bout. This was in contrast to Experiment 2, where participants, who had undergone an IU manipulation, read a vignette about a third-person character, and were asked to imagine how they thought they would feel if they were in the situation described in the vignette. Experiment 3 used the same IU manipulation as the manipulation used in Experiment 2, derived from Kelly (2009). In Experiment 3, this manipulation proved unsuccessful, and there was no significant difference between the individuals who had undergone the high IU manipulation compared to the low IU manipulation. Interestingly, the means for both the high and the low IU groups were considerably higher in Experiment 3. This might reflect population stratification as the sample for Experiment 2 consisted of students who completed the experiment during the spring term when students were more likely to be settled into the University year, whereas Experiment 3 consisted of more visiting students who were new to the university (attending summer school courses) and was conducted during the summer term. Unfortunately the lack of replication of the induction effect prevented a comparison of the two methods of presenting the systematic processing facilitators (imagining a worry bout versus a third-person vignette).

Given that the IU manipulation did not generate differential IU scores between the two groups, it was not possible to conduct between-group analyses. Despite this, interesting findings emerged when the participants' scores on the composite measure of IU items was correlated with the sufficiency threshold measure. IU significantly correlated with the sufficiency threshold, suggesting that as individuals become less comfortable with uncertainty, they are more likely to deploy systematic processing. This may be in an attempt to discover more information about a situation in the hope that this will enable greater control of a situation and the minimisation of uncertainty. However, given that the findings are correlational, the direction of causation cannot be inferred, and it is also possible that having a raised sufficiency threshold would result in individuals feeling intolerant of uncertainty. After all, high sufficiency thresholds occur primarily when the individual believes that they require great confidence in their decision. This can be in response to the situation being important and personally relevant (e.g., Chaiken et al., 1989), and there may be negative outcomes associated with not meeting the sufficiency threshold (e.g., looking silly in front of

peers – linked to being accountable for one's judgements, or losing control of a situation). In such situations, when sufficiency thresholds are high, individuals are unlikely to tolerate uncertainty that may mean that the judgement that they reach is less than optimal.

In summary, IU is associated with increased sufficiency thresholds in the context of a personally-relevant worry experience. IU was also shown to correlate with self-reported worrying. While the direction of causation cannot be confirmed due to the failure to successfully induce different levels of IU, it can be concluded that IU and sufficiency thresholds are linked, and this raises the possibility that systematic processing may play a role in the link between IU and perseverative worry.

5.6 General Discussion

Taken together, Experiments 2 and 3 highlight the difficulties of reliably manipulating IU, which is considered a dispositional characteristic (e.g. Koerner & Dugas, 2008). Experiment 2 included a successful manipulation of IU, but did not show the expected between-group difference in worry scores as measured by the PSWQ (c.f. Buhr & Dugas, 2006) but IU correlated with scores on the PSWQ. This suggests that either (1) the manipulation was not strong enough to lead IU to cause changes in PSWQ scores, or (2) induced IU differs from naturally occurring IU in the population, and short-term manipulations do not shift an individual far from their dispositional responses to uncertainty. Experiment 3 used the same manipulation procedure as Experiment 2 but it was unsuccessful in generating differential amounts of IU between those exposed to the condition designed to raise IU and those exposed to the condition designed to lower IU.

Despite the difficulties encountered in inducing IU, Experiments 2 and 3 are informative about the role systematic processing may play in relation to IU and worry. In Experiment 2, induced high versus low IU did not change individuals' sufficiency thresholds. Nonetheless, a composite IU measure significantly correlated with sufficiency threshold scores in both Experiments 2 and 3. The correlational nature of the analysis conducted means that it is not possible to draw conclusions about the direction of the relationship. Interestingly, it highlights that the relationship may be in the opposite direction to that suggested at the opening of this chapter. Rather than IU leading to greater amounts of systematic processing, it is plausible that possessing a high sufficiency threshold may increase feelings of IU. Or, it may simply reflect that IU is part of systematic processing, in which an individual strives to integrate all available data to reach a judgment that they are confident in.

Individuals who have dispositionally high sufficiency thresholds (e.g., perfectionistic individuals) are also more likely to find uncertainty unpleasant as it can indicate the sufficiency threshold has not been met. Furthermore, one of the features of systematic processing is seeking more information (e.g. Griffin, et al., 2008), a factor that is related to higher levels of worry (Rosen & Knäuper, 2009). Seeking more information cannot always provide adequate confidence in judgements that contain a lot of uncertainty (which future-based worries typically do), and as such, individuals who are striving for high levels of confidence to meet their high sufficiency thresholds may become intolerant of such uncertainty. Experiments 2 and 3 were not designed to test this direction of causation but this could be examined in future by manipulating the amount of systematic processing an individual engages in.

In Experiment 2, differences were not found in worry levels between the high and low IU groups, which contradicts dominant models of GAD (e.g. Dugas, Gagnon, et al., 1998). However, a measure more akin to trait IU (a composite score of items measuring IU which was not affected by the IU manipulation) correlated with PSWQ scores in both Experiments 2 and 3. Consequently, 'trait' IU may be more strongly related to worry than situational IU. Unfortunately, due to the failure to induce differential amounts of IU in Experiment 3, it was not possible to examine whether the lack of IU affecting sufficiency thresholds and worry in Experiment 2 was due to the use of a third-person vignette. To investigate whether the differences between Experiment 2 and Experiment 3 were due to differences in trait and state IU, 2 × 2 designs such as those used by Rosen and Knäuper, (2009) could be utilised.

In conclusion, IU is related to higher sufficiency thresholds and increased worry levels (Experiments 2 and 3) but does not appear to *cause* raised sufficiency thresholds or worry (Experiment 2), suggesting that systematic processing is not a mechanism through which IU affects perseverative worry. However, IU appears difficult to manipulate reliably, and this questions the value of the findings in Experiment 2 showing IU does not cause raised sufficiency thresholds/increased worrying. The results from Experiments 2 and 3 clearly indicate a relationship between IU and raised sufficiency thresholds but do not allow conclusions to be drawn on whether (1) IU causes raised sufficiency thresholds, or (2) raised sufficiency thresholds cause IU. Either way, full accounts of the role that IU plays in perseverative worry should incorporate the relationship between IU and systematic information processing.

6 Problem-solving confidence and appraisals that facilitate systematic information processing

6.1 Introduction

Problem-solving is pivotal to the way in which some authors define worrying, and a detailed discussion of the role of problem-solving in worry is provided in Chapter 1. Davey (1994b) describes worrying as "a constructive and appropriate task-oriented process that contributes to the solving of problems and the reduction of anxiety" (p.327). Problem-solving has been postulated as the adaptive form of worry (Borkovec, et al., 1983; Mathews, 1990), and worriers endorse beliefs that worrying is a useful process for solving problems. For example, worriers are more likely to report believing that "worrying helps me to solve problems" (Cartwright-Hatton & Wells, 1997) and "worrying gives me the opportunity to analyze situations and work out the pros and cons" (Davey, Tallis, et al., 1996), than non-worriers. Davey, et al. (1992) suggest that worry is deployed as a coping strategy aimed at solving problems, They suggest that it is when this adaptive, problem-solving worry is disrupted that pathological worry occurs. After all, worrying cannot be a successful coping strategy in chronic worriers as chronic worriers experience heightened distress during a worry bout (Vasey & Borkovec, 1992). Davey et al. (1992) suggest two ways in which the problem-solving process may become disrupted in chronic worriers. Firstly, they suggest that worriers may adopt an emotion-focused coping strategy, rather than coping strategies aimed at dealing with the cause of the stress. This is reflected in Robichaud and Dugas' (2005) assertion that worriers have a negative problem-orientation, which they define as "a set of dysfunctional attitudes toward social problem-solving" (p.391). Individuals who possess negative problem-orientations are more likely to experience high levels of worry, and emotional problem-orientation has been identified as a stronger predictor of worry than cognitive or behavioural indicators (Dugas, et al., 1997). Secondly, Davey et al. (1992) suggest that worriers may have low problem-solving confidence (PSC), which prevents successful closure of the worry process. This second factor, low PSC, is the focal independent variable in this chapter. Initially, the role of PSC in perseverative worrying will be examined, before turning to consider whether low PSC affects the deployment of systematic information processing. Experiment 4, presented in this chapter, is designed to explore whether systematic processing is a mechanism accounting for an association between low PSC and perseverative worry.

The role of problem-solving confidence in worry

Davey et al. (1992) examined the relationship between worry and three problem-solving constructs: PSC, approach-avoidance of problem-solving, and perception of personal control over the problem. Worry correlated with lower PSC and less perception of personal control over the problem. The relationship between worry and PSC appears to be driven by high trait anxiety in the worriers. However, objectively, worriers have comparable problem-solving skills (Davey, 1994b). Experimental manipulation of PSC through a false feedback procedure has suggested a causal role for PSC in worry, with those induced into a low PSC state generating more worry thoughts than those induced into a high PSC state (Davey et al. 1996). As such, chronic, perseverative worry can be considered as thwarted problem-solving (Davey, et al., 1992) arising from a lack of confidence at the solution selection stage (Szabó & Lovibond, 2002).

Problem-solving confidence and the sufficiency threshold

Chaiken et al. (1989) emphasise that when an individual has not met their sufficiency threshold, they are more likely to deploy systematic information processing, as described in Chapter 2. The amount of confidence that an individual has in their judgement can be represented by a judgmental confidence continuum. At one point on this continuum is the amount of confidence that an individual *desires* in the judgment that they are making, such as whether they have worried as much as possible, and this is known as the sufficiency threshold. Another important point on this continuum is the amount of confidence that the individual currently has in their judgment, i.e. their *actual* amount of confidence. When there is a negative discrepancy between these two points, with actual confidence being lower than desired confidence, individuals are motivated to try to minimise this discrepancy. The sufficiency principle suggests that individuals will engage in greater amounts of systematic processing (i.e. detailed, integrative processing) when heuristic processing (or small amounts of systematic processing) does not confer the desired level of confidence (Chaiken, et al., 1989). This is because systematic processing is generally thought to provide greater confidence in our judgements (Bohner, et al., 1995; Chaiken, et al., 1989; Chen, et al., 1999; Chen, et al., 1996)

PSC is defined as “an individual’s self-assurance in a wide range of problem-solving activities, a belief and trust in one’s problem-solving abilities (general problem-solving self-efficacy) and coping effectiveness” (Heppner & Lee, 2002, p. 347). Petty, Briñol and Tormala

(2002) suggest that metacognitions – an individual's thoughts and awareness of their own thoughts and thought processes, such as how confident they are in their thoughts – plays an important role in forming judgments. They found that when an individual was confident in the validity of their thoughts, valenced cognitive responses were more predictive of attitudes. When PSC is low, individuals have greater feelings of uncertainty (Tormala, Rucher, & Seger, 2008). This uncertainty means that individuals with low PSC are more likely to feel that they have not met their sufficiency threshold (i.e. their actual confidence in their judgement is lower than their desired confidence), meaning that low PSC should result in a greater deployment of systematic processing. A number of studies have indicated that when individuals feel uncertain, they are more likely to deploy detailed processing (e.g., Weary & Jacobson, 1997). This is probably because when an individual feels certain, they feel confident that they have sufficient knowledge, whereas when they feel uncertain, they are not confident that they have sufficient knowledge, and so seek more information.

An alternative way in which PSC may affect the deployment of systematic processing is through lowering self-efficacy beliefs. The definition of PSC provided above by Heppner and Lee (2002) indicates that when PSC is low, individuals will have little faith in their ability to solve problems and cope with situations they encounter. In other words, an individual with low problem-solving beliefs has low self-efficacy beliefs. Chaiken and colleagues (1989) highlight the importance of self-efficacy beliefs in their Heuristic-Systematic Model. For individuals to justify the deployment of the extra cognitive energy required to process information systematically, they need to have adequate expertise/access to relevant information in memory (e.g. Wood, Kallgren, & Preisler, 1985), i.e. they need to have high self-efficacy. If individuals do not believe that they can obtain extra confidence that they have met their processing goal, such as resolving their worry, they will not be motivated to deploy systematic processing. Evidence that low self-efficacy beliefs lead to less systematic processing comes from Bohner, Rank, Reinhard, Einwiller and Erb (1998). They manipulated feedback to participants about their performance on an evaluative task. Participants in the high self-efficacy group were told their ability was 'very high', whereas participants in the low self-efficacy group were told their ability was 'below average'. Participants with high self-efficacy beliefs showed that they had taken into consideration the quality of the arguments that they were presented with when forming their attitudes, which is indicative of systematic processing, to a much greater extent that individuals with low self-efficacy beliefs. Similarly, Broemer, Jonas and Diehl (2000) found that when a situation contained inconsistencies,

participants with high self-efficacy persevered for longer than participants with low self-efficacy.

Problem-solving confidence in relation to systematic processing facilitators

Given that there is some uncertainty around whether low PSC will promote systematic information processing in an attempt to minimise discrepancies between actual and desired confidence levels, or whether it will reduce efficacy beliefs and reduce the deployment of systematic processing, it is useful to also consider the literature regarding the relationship between PSC and systematic processing facilitator variables. While there has been little, if any, examination of the relationship between low PSC and personal relevance and task importance, it seems reasonable to hypothesise that in situations where a task is more important and personally relevant, an individual will be more motivated to minimise any discrepancy between their actual and desired confidence levels and thus will be motivated to deploy systematic processing. The discrepancy between actual and desired confidence levels is likely to be greater in individuals who have lower 'actual' levels of confidence due to their low PSC reducing their confidence in decisions and solutions that they generate. In terms of responsibility, researchers have demonstrated that scores on the Problem-Solving Inventory (not limited to PSC, but including general behaviours and attitudes related to problem-solving) correlate with higher responsibility levels (Heppner & Anderson, 1985). Interestingly, some of the literature on PSC and responsibility seems to suggest that individuals with low confidence may be *less* likely to deploy systematic processing. Phillips, Pazienza and Ferrin (1984) suggested that those with low PSC were more likely to allocate responsibility to an external agent, and this is complemented by work by Baumgardner, Heppner and Arkin (1986) who demonstrated that self-appraised effective problem-solvers were more likely to view problems they encountered as their own responsibility. This suggests that low PSC is also likely to be associated with lower appraisals of control over a situation, which may motivate an individual to try to obtain greater control over the situation, or could equally mean that an individual feels helpless to control the situation. What is more, individuals who are do not perceive themselves as effective problem-solvers are less likely to enjoy and engage in thinking, i.e. low PSC is associated with lower levels of need for cognition (Heppner, Reeder, & Larson, 1983).

This experiment is designed to examine whether low PSC operates in the same way as negative mood and increases worry through a mechanism of raised sufficiency thresholds. While the actual deployment of systematic processing may be undermined by an individual's lack of self-efficacy beliefs, individuals who have low PSC may still have raised sufficiency thresholds. Individuals with low PSC are particularly likely to have a large discrepancy between their actual and desired confidence levels, as their low PSC will push down their feelings of confidence (i.e. actual confidence levels will be lower). It was predicted that if a greater discrepancy between actual and desired confidence does lead to greater systematic processing of worry-related thoughts, then lower PSC would facilitate (1) the endorsement of appraisals associated with systematic processing, and (2) self-report and behavioural measures of worrying.

6.2 Method

6.2.1 Participants

The participants were 50 University of Sussex undergraduate students (10 males, 40 females), with a mean age of 20.40 (*SD* = 3.34), ranging from 18-36. Participants were recruited on a voluntary basis and were remunerated with course credits or £5 for their time.

6.2.2 Materials and procedure

The materials were the same as those used in Experiment 2 (see Chapter 5). The only exception was that rather than undergoing a manipulation of IU (see Stage 2 of the Procedure, Experiment 2, Chapter 5) participants were randomly allocated to one of two conditions in a PSC manipulation.

Stage 1 (informed consent).

Participants read an information sheet about the nature of the tasks (without disclosing that the experiment is looking at manipulating PSC, and the relationship between PSC with worry and systematic processing), and provided informed consent.

Stage 2 (Problem-solving confidence manipulation)

This manipulation was based on the work by Davey, Jubb and Cameron (1996); for a discussion of the methodology of manipulating PSC, see Chapter 3. Participants were asked to provide solutions to four real-life problem scenarios drawn from the Means-Ends Problem-Solving Test (MEPS; Platt & Spivack, 1975). The MEPS is a means of assessing social problem-

solving ability, and thus it was a convincing task to use in order to make participants think that their problem-solving ability was being assessed. Participants read a short passage in which details of a problematic social scenario were described and the outcome of the scenario was listed. In the MEPS task, participants are required to generate a solution to each problem encountered by the characters in the stories, and in the actual administration of the MEPS, these solutions are then scored for their appropriateness. An example of a MEPS scenario is:

'Henry loved his girlfriend very much, but they had many arguments. One day she left him. Henry wanted things to be better. The story ends with everything fine between him and his girlfriend. You begin the story with his girlfriend leaving him.'

There are six MEPS scenarios, but in order to reduce the time that participants were required to be in the lab, and given that their problem-solving ability wasn't actually being assessed, participants were only provided with four of the problems. These were chosen to ensure that there were two with a male protagonist and two with a female protagonist.

The participants were given fifteen minutes to write the middle of each of the four stories, i.e. how the character in the story gets from the problematic start to the resolved finish. After completing the MEPS scenarios, the participant's sheet was taken away from the laboratory and the participant was told that their answers were being assessed and scored against age and gender-matched norms. To increase the realism of this scenario, the participants were asked to provide their age and gender and this was written onto a score sheet. Following a five-ten minute break, in which the experimenter could realistically read the answers, participants were given the feedback sheet (with false feedback) that was either designed to increase PSC or decrease PSC. Participants were randomly assigned to each condition at the start of the experiment. Those participants in the condition designed to increase PSC were told that they had score in the top 75 percent, with a score of 28 compared to an average score of 17. Participants in the low PSC condition were told that they had score in the lowest 15 percent, with a score of 8 compared to an average score of 17. The feedback sheet contained the following information in a table: age bracket, gender, score, percentile, average score for this band. See Appendix J for an example feedback sheet. The feedback sheet also contained the following sentence "For a _____ aged _____ the average score expected on the Means-Ends Problem-Solving Task is 17. You scored [8/28]. This means you are in the [lowest 15%/highest 75%] for your age and gender." The blanks were filled in with the participants' actual age/gender. If participants questioned their score, they were told

that the scores were calculated by counting up problem-solving strategies, and that this score was converted to an age and gender-matched normalized score. Participants were encouraged to talk to the experimenter about their score at the end of the experiment if they had further questions.

In order to encourage the participants to process the feedback, participants were asked to write a short paragraph discussing the implications of their test results (a cover story was presented that the data was being gathered for a future study into the impact of problem-solving ability).

Stage 3 (manipulation checks).

Participants completed the manipulation check VASs.

Stage 4 (vignettes and systematic processing facilitators questionnaire).

Participants were presented with two worry vignettes and a set of questions measuring systematic processing facilitators (these questions were answered twice – i.e. they were completed after reading each worry vignette). See the Materials section above for details on the worry vignettes and systematic processing facilitator items.

Stage 5 (catastrophising interview).

Participants took part in a worry CI about a current main worry (See Chapter 3).

Stage 6 (validated questionnaires).

Participants completed the Intolerance of Uncertainty Questionnaire (Buhr & Dugas, 2002) the Problem-Solving Inventory (PSI: Heppner & Petersen, 1982), and the Penn State Worry Questionnaire (PSWQ: Meyer et al., 1990) (See Chapter 3 for details).

Stage 7 (demographics and debrief).

Participants provided demographic information (age, gender, year of study). Participants were then debriefed about the true aims of the experiment, those participants in the low PSC were reassured that their scores did not reflect their true performance, and they were offered a positive mood induction.

6.3 Results

6.3.1 Demographics

Chi-square tests revealed no significant difference between the high and low PSC conditions in terms of gender, or subject of study, $\chi^2 \leq 1.33$, $ps \geq .25$.

6.3.2 Manipulation checks

IU and mood were measured in the manipulation check questions, alongside PSC. These are factors known to increase perseverative worry, and thus it is important to assess the purity of the PSC manipulation, and whether it also affects these variables. Prior to analysis, composite scores were calculated for the PSC and IU manipulation check items.

Problem-solving confidence.

An independent *t*-test indicated that the low PSC group scored significantly lower on the composite of the two PSC VASs than the high PSC group, $t(43.08) = -3.36$, $p = .002$, $r = .21$. Further analysis revealed a significant difference between the low and high PSC groups on one of the individual items ('how confident you feel about your ability to solve problems at this moment in time'), $t(35.86) = -4.45$, $p < .001$, $r = .36$. The low PSC group scored significantly lower than the high PSC group. The other VAS item ('extent to which you would like to tackle problems at this point in time') did not reach a statistically significant difference, $t(48) = -1.63$, $p = .11$, $r = .05$, but the means were in the predicted direction. Overall, the PSC manipulation generated differential amounts of PSC between the low- and high PSC group (see Table 6.18).

Table 6.18 Descriptive statistics for the problem-solving manipulation check items by problem-solving confidence condition. Standard deviations are shown in parentheses.

	Low PSC	High PSC
PSC composite*	101.83 (43.50)	135.58 (28.04)
'How confident you feel about your ability to solve problems at this moment in time'**	48.73 (29.16)	72.13 (11.19)
'Extent you would like to tackle problems',	52.35 (27.14)	63.46 (20.39)

*$p < .01$, **$p < .001$.

Mood.

Independent *t*-tests were conducted to examine whether the PSC manipulation affected mood states (see Table 6.19). The low PSC group scored significantly lower than the

high PSC group on happiness, $t(41.62) = -2.53$, $p = .02$, $r = .13$, significantly lower on arousal, $t(46.10) = -2.25$, $p = .03$, $r = .10$, and significantly higher on sadness, $t(41.84) = 2.27$, $p = .03$, $r = .11$. The PSC groups did not differ in anxiety, $t(46.74) = 1.35$, $p = .19$, $r = .10$.

Table 6.19 Mean scores for the mood manipulation check items by problem-solving confidence condition. Standard deviations are shown in parentheses.

	Low PSC	High PSC
Sadness*	29.08 (24.76)	16.04 (15.11)
Anxiety	37.12 (26.58)	28.08 (20.73)
Arousal*	47.54 (24.44)	61.21 (18.29)
Happiness*	61.73 (19.21)	73.00 (11.61)

*$p < .05$.

Intolerance of uncertainty.

Independent *t*-tests examined whether the PSC manipulation also affected IU, another factor known to increase worrying, and a key independent variable examined in this thesis. There was no significant difference between the two PSC groups on the composite IU score, $t(48) = 1.64$, $p = .11$, $r = .05$ (see Table 6.20). Closer inspection of the individual items revealed the low PSC group endorsed one item significantly more than the high PSC group (IU-Q2 'how uncertain you feel at this moment in time'), $t(46.27) = 2.47$, $p = .02$, $r = .12$. There was no significant difference on the other VAS ('how much feelings of uncertainty concern you'), $t(48) = 0.75$, $p = .45$., $r = .01$.

Table 6.20 Descriptive statistics for the intolerance of uncertainty manipulation check items by problem-solving confidence condition. Standard deviations are shown in parentheses.

	Low PSC	High PSC
IU composite	86.23 (49.57)	65.50 (38.76)
'The extent at the present time that feelings of uncertainty concern you'*	45.23 (28.81)	39.67 (22.69)
'How uncertain you feel at this moment in time'*	41.00 (24.61)	25.83 (18.61)

*$p < .05$

6.3.3 Experimental Outcomes

Composite scores were computed for each of the systematic processing facilitator variables (personal relevance, task importance, accountability, responsibility, desire for control, and need for cognition) by adding together the three VAS questions measuring each variable. When added together, these composite scores represented an individual's sufficiency threshold. There was a composite score for the coursework questions and a separate composite score for the financial questions. For comparability with Experiment 2 (Chapter 4), separate analyses were run for the coursework vignette and the financial vignette.

Table 6.21: Means and standard deviations for the VAS composite measures of the cognitive appraisals that facilitate systematic processing, shown by worry vignette and problem-solving confidence condition

		Low PSC		High PSC	
		M	*SD*	*M*	*SD*
Personal relevance	Coursework	166.08	127.97	152.46	82.23
	Financial	139.65	95.04	249.71	39.05
Task importance	Coursework	244.00	100.59	213.71	66.54
	Financial	248.77	34.62	249.71	39.05
Accountability	Coursework	249.62	133.00	201.42	42.25
	Financial	235.00	32.12	234.71	29.95
Responsibility	Coursework	226.23	30.77	222.67	36.85
	Financial	265.54	23.30	259.08	28.68
Desire for control	Coursework	234.96	133.27	202.63	28.55
	Financial	198.15	32.54	205.96	30.40
Need for cognition	Coursework	218.62	102.48	198.00	63.57
	Financial	235.88	43.23	240.67	34.51
Sufficiency threshold	Coursework	1339.50	483.70	1190.88	240.54
	Financial	1323.00	151.61	1302.96	147.19

Coursework.

An independent *t*-test indicated no significant difference between the low and high PSC group on the coursework vignette sufficiency threshold, $t(48) = 1.36$, $p = .18$, $r = .04$. However, the means (see Table 6.21) indicate the low PSC group had higher sufficiency

thresholds than the high PSC group. An independent *t*-test indicated no significant difference between the low PSC group (*M* = 73.42, *SD* = 13.78) and the high PSC group (*M* = 63.21, *SD* = 27.89), on the coursework vignette worry VAS, *t*(32.98) = 1.62, *p* = .12, *r* = .07. Despite not reaching statistical significance, the participants in the low PSC group had higher mean worry scores than those in the high PSC group.

Financial vignette.

An independent *t*-test indicated no significant difference between the low and high PSC group on the financial vignette sufficiency threshold, *t*(48) = 0.47, *p* = .638, *r* = .005. However, the mean sufficiency threshold (see Table 6.21) was higher in the low PSC group than the high PSC group. An independent *t*-test indicated that there was a significant difference between the low PSC group (*M* = 78.96, *SD* = 20.12) and the high PSC group (*M* = 84.63, *SD* = 17.77), on the financial vignette worry VAS, *t*(48) = -1.05, *p* = .30, *r* = .02. This is in the opposite direction to that predicted.

Individual cognitive appraisals

Independent *t*-tests were conducted to examine if there were any differences in scores between the PSC conditions on the individual systematic processing facilitator appraisals (personal relevance, task importance, accountability, responsibility, desire for control, and need for cognition). For both the coursework and the financial vignette, there were no significant differences between the low- and high PSC groups on the systematic processing facilitator appraisals, *ts* ≤ 1.70, *ps* ≥ .10. See Table 6.21 for descriptive statistics.

Catastrophising interview

An independent *t*-test indicated no significant difference between the low PSC group (*M* = 7.58, *SD* = 3.55) and high PSC group (*M* = 8.88, *SD* = 3.90) in terms of the number of catastrophising steps that they generated, *t*(48) = -1.23, *p* = .22, *r* = .03. Catastrophising steps are represented in Figure 6.8.

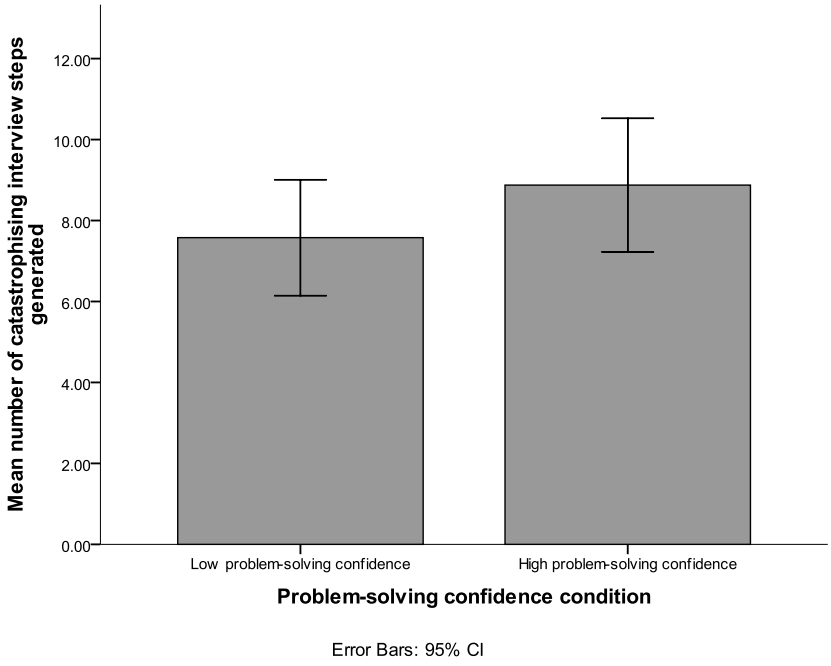


Figure 6.8 Error bar graph showing the mean number of catastrophising steps generated by problem-solving confidence condition.

Validated questionnaire measures

Independent *t*-tests indicated no significant difference between the low and high PSC groups on the validated questionnaires, the PSI PSC subscale, $t(37.20) = -0.98$, $p = .34$, $r = .03$, the PSWQ, $t(46) = -0.56$, $p = .58$, $r = .007$, and the IUS, $t(44) = -0.77$, $p = .45$, $r = .01$. See Table 6.22 for descriptive statistics.

Table 6.22 Descriptive statistics for the validated questionnaires by problem-solving confidence condition

	Low PSC		High PSC	
	M	*SD*	*M*	*SD*
PSC	44.75	8.28	46.67	4.87
PSWQ	52.50	15.61	55.42	20.22
IUS	56.78	17.79	61.13	20.66

6.3.4 Correlational analyses

Correlational analyses examined whether composite PSC predicted an individual's sufficiency threshold and measures of worry. This was because the confidence intervals are quite large for the composite PSC measure and the confidence intervals for the sufficiency thresholds for the coursework and financial vignettes indicate that there is overlap across the PSC groups. The results are shown separately for the coursework and financial vignettes in Tables 6.23 and 6.24, respectively.

Table 6.23 Correlations between problem-solving confidence, systematic processing facilitators in relation to the coursework vignette, and worry

	PSC	ST	PR	TI	ACC	RESP	NFC	DC	CI	PSWQ	PSI
PSC	1	-.20	-.21	-.09	-.23	-.03	-.12	-.13	-.01	-.09	**.49*****
ST		1	**.73*****	**.68*****	**.87*****	**.37****	**.81*****	**.84*****	.02	.18	-.24
PR			1	.21	**.46****	.25	**.66*****	**.47****	.01	**.33***	**-.33***
TI				1	**.58*****	**.30***	**.36****	**.55*****	.01	.20	-.23
ACC					1	.20	**.60*****	**.80*****	.06	.04	-.16
RESP						1	.36*	.06	**.41****	.24	-.03
NFC							1	**.55*****	-.03	.11	-.07
DC								1	-.12	-.02	-.16
CI									1	-.05	.07
PSWQ										1	**-.33***
PSI											1

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Note. PSC = problem-solving confidence; ST = sufficiency threshold; ACC = accountability; RESP = responsibility; NFC = need for cognition; DFC = desire for control; CI = catastrophising interview steps; PSWQ = Penn State Worry Questionnaire; PSI = PSC subscale of the Personal Problem-Solving Inventory.

There was no significant correlation between PSC and either the coursework vignette sufficiency threshold, $r = -.20$, $p > .05$, or the financial vignette sufficiency threshold, $r = -.13$, $p > .05$. Furthermore, PSC did not predict either catastrophising scores, $r = -.01$, $p > .05$, or PSWQ scores, $r = -.09$, $p > .05$. Despite this, the PSI PSC subscale did significantly correlate with worry scores, $r = -.33$, $p < .05$. While the direction of causation cannot be established from these correlational analyses, it was found that as PSC increased, worry levels decreased.

Table 6.24 Correlations between problem-solving confidence, systematic processing facilitators in relation to the financial vignette, and worry

	PSC	ST	PR	TI	ACC	RESP	NFC	DC	CI	PSWQ	PSI
PSC	1	-.13	-.26	-.09	-.15	-.14	-.02	**.49*****	-.01	-.09	**.49*****
ST		1	**.70*****	**.73*****	**.39****	**.65*****	**.66*****	**.66*****	.07	**.41****	-.08
PR			1	.24	-.13	.18	.07	.19	.001	.15	-.13
TI				1	**.48*****	**.59*****	-.004	**.56*****	.24	**.37***	-.01
ACC					1	**.44****	-.07	**.31***	.12	**.33***	-.06
RESP						1	**.42****	.10	.16	**.35***	-.03
NFC							1	.07	.12	**.31***	-.13
DC								1	**-.33***	.11	.25
CI									1	-.05	.07
PSWQ										1	**-.33***
PSI											1

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Note. PSC = problem-solving confidence; ST = sufficiency threshold; ACC = accountability; RESP = responsibility; NFC = need for cognition; DFC = desire for control; CI = catastrophising interview steps; PSWQ = Penn State Worry Questionnaire; PSI = PSC subscale of the Personal Problem-Solving Inventory.

6.4 Discussion

This experiment was designed to examine whether doubts about one's problem-solving ability might result in the deployment of systematic information processing, and lead to prolonged worry about an issue. Participants underwent a false-feedback manipulation designed to induce either low PSC or high PSC. This manipulation was successful, with those allocated to the low PSC group (who received feedback that they had done badly on a problem-solving task) reporting lower levels of PSC than those allocated to the high PSC group (who received feedback that they had done well on a problem-solving task). However, it was not a pure manipulation of PSC as the manipulation also resulted in mood changes and some changes in IU. This is not surprising as low confidence is likely to be associated with feeling negative, and individuals are more likely to be distressed if they feel uncertain about a scenario that they do not feel competent to manage. The impact of the experimental manipulations used in this thesis upon the three causal variables of interest will be explored in Chapter 7.

The results indicated that there was no significant difference between the sufficiency thresholds of those in the low problem-solving group compared to those in the high problem-solving group. Additionally, correlational analyses indicated that state PSC (the composite

problem-solving VAS measure) and trait PSC (as measured by the PSC subscale of the PSI), were not associated with an individual's sufficiency threshold. As such, it cannot be argued that low PSC leads to systematic processing in an attempt to reach raised sufficiency thresholds. This counters the work of Tiedens and Linton (2001), Weary and Edwards (1994), and Weary and Jacobson (1997),who demonstrated that uncertainty results in increased effortful processing.

One possibility is that those low PSC are less likely to deploy systematic processing due to lower self-efficacy beliefs, as suggested by Bohner et al. (1998) and Broemer et al. (2000). While the design of the current experiment aided comparison with other factors implicated in worry (negative mood, Chapter 4, and IU, Chapter 5), in order to examine whether PSC is indeed associated with efficacy beliefs and systematic versus heuristic processing, measures will need to be taken of these variables (see Chapter 8).

Interestingly, this study did not support the work of Davey, Jubb and Cameron (1996) as PSC was not associated with worry as measured by the CI or the PSWQ. One possibility for this is that the manipulation had worn off by the time the participants completed the vignettes and reached the CI stage. In the original study, Davey et al. (1996) administered the CI immediately following PSC and mood manipulations, whereas in this experiment, participants completed the vignettes, which took around 10 minutes, before completing the CI. This issue has occurred in Experiments 1, 3 and 4, and will be covered in the General Discussion of this thesis (see Chapter 9). Alternatively, it may be that without taking trait anxiety into account, PSC is not a useful predictor of worry levels. This possibility is raised by work conducted by Davey et al. (1992) who demonstrated that when trait anxiety was held constant, worry was actually positively correlated with problem-solving strategies of information seeking and active behavioural coping. Indeed, it was trait anxiety that was seen to negatively correlate with PSC. In Chapter 8, questionnaire measures will be examined that can assist in disentangling the relationship between these variables. However, PSC as measured by the PSI correlated with higher PSWQ scores. Thus even though the exact direction of the relationship cannot be clarified in this study, there is a relationship between worry and PSC as described by Davey et al. (1992) and others.

Phillips, Pazienza and Ferrin (1984) and Baumgardner, Heppner and Arkin (1986) suggested that individuals with low PSC were less likely to take responsibility for their judgments. However, this was not supported in the current study. Responsibility appraisals

did not differ between the high and low PSC groups, and there was no significant correlation between responsibility and PSC. This may be an artefact of the experimental design, in that individuals were not given ample opportunity to devolve responsibility to another individual. An experiment which enabled participants to seek advice from others may indicate that lower PSC is indeed associated with lower personal responsibility for judgements.

In conclusion, PSC was not found to affect sufficiency thresholds. As outlined in the introduction to this chapter, low PSC may impact upon the deployment of systematic processing by (1) increasing the discrepancy between actual- and desired amounts of confidence, i.e. a raised sufficiency threshold, or by (2) affecting an individual's beliefs about their ability to meet their sufficiency threshold through systematic processing. The lack of difference between the two PSC groups on the sufficiency threshold could indicate that both opposing processes are in play in the current experiment, and that these act to cancel one another out, resulting in no difference between the two groups. Trait PSC was shown to correlate with worry, emphasising that accounts of perseverative worry should incorporate PSC.

7 Searching for and coping with threats: The role of negative mood, intolerance of uncertainty, and poor problem-solving confidence

7.1 Introduction

This chapter investigates the ways in which the worry promoters - negative mood, intolerance of uncertainty (IU) and problem-solving confidence (PSC) - affect threat perception and perceived ability to cope with threats. The work conducted in this thesis has examined whether the worry promoters lead to systematic processing of information. The results have been mixed; negative mood raised sufficiency thresholds in the context of a worry (Experiment 1), IU correlated with sufficiency thresholds (Experiments 2 and 3) but couldn't be said to *cause* raised sufficiency thresholds, and low PSC did not appear to be related to sufficiency thresholds. In order to gain a better understanding of the way that negative mood, IU, and PSC may affect the worry process, this chapter focuses on two important aspects of worry - threat perception and coping – both of which also play a role in determining the likelihood that systematic processing is deployed. Worry is essentially a response to perceived threat, and is deployed as a coping mechanism. The different findings obtained in Experiments 1-4 may be because negative mood, IU and PSC affect different aspects of worry.

7.1.1 Threat perception in the worry process

As outlined in Chapter 1, threat detection is a component of functional accounts and descriptions of worry (e.g. Borkovec, 1994). Worry arises from cognitive processes involved in anxiety, which function to maintain high levels of vigilance to threats (Mathews, 1990). A number of studies, using various cognitive paradigms, have demonstrated that chronic worriers possess preconscious attentional biases towards threat-related material (e.g., dichotic listening task interference, Mathews & MacLeod, 1986; Stroop colour naming tasks, Mogg, Mathews & Weinman, 1989). The way in which the worry promoters affect threat perception is outlined below.

Negative mood and threat perception.

There is convincing experimental evidence that affective states can influence high-level cognitive processes (for a review, see Blanchette & Richards, 2010). Negative mood can

affect different aspects of threat perception: (1) inflating estimates of threat likelihood and (2) inducing negative interpretation biases of ambiguous stimuli.

Threat likelihood.

Negative mood is associated with appraising situations as more threatening. Johnson and Tversky (1983) induced a negative mood by asking participants to read a newspaper report about a death (caused by fire, homicide, or leukaemia) and then asked participants to estimate the number of fatalities thought to occur annually from 17 causes of death. They found that participants in the experimental condition (compared to the control condition who had not read a story about a death) reported higher estimates of the number of annual fatalities. The average frequency estimates of the experimental group were 74% higher than the control group's estimates. Interestingly, this effect was a global effect of increased risk for the majority of causes of death, rather than for causes of death similar to the cause reported in the story. So, reading about a fatal stabbing increased estimates of the risk of a distantly related death, e.g., tornado, as much as a closely related death, e.g., homicide. However, studies that have utilised integral affect (arising from processing the target stimuli itself rather than a task-unrelated mood induction) have shown specific effects of mood. Lerner, Gonzalez, Small and Fischhoff (2003) asked a nationally representative American sample (n = 973) to describe what it was about the 9/11 terrorist attacks that made them feel either angry or afraid. Individuals were asked to estimate the risk of future terrorist attacks. Individuals who described what had made them afraid reported higher risk estimates for future risks whereas those participants primed to feel angry reported lower risk estimates. Lerner et al. (2003) explain these findings as resulting from the different appraisal patterns associated with the two emotions: fear is associated with uncertainty, while anger is associated with certainty. It is postulated that uncertainty influences judgements and increases risk estimates.

Threat interpretations of ambiguity.

Quasi-experimental studies have indicated that anxious mood states are associated with increased threat detection (e.g., homophone tasks: Eysenck, MacLeod, & Mathews, 1987; recognition memory tasks: Eysenck, Mogg, May, Richards, & Mathews, 1991; reading times for different interpretations: Calvo & Castillo, 2001) but it is difficult to ascertain whether it is the individuals' anxious mood that affects their interpretations of ambiguous stimuli, or some other factor associated with being anxious. There is more convincing evidence for the role of affect in threat detection from studies that have manipulated participants' mood state.

Experiments show induced anxious negative mood states are associated with negative interpretations of ambiguous stimuli using a range of dependent variables: self-report (Constans & Mathews, 1993), spellings (Blanchette & Richards, 2003; Richards, Reynolds & French, 1993), and lexical decision tasks (Blanchette & Richards, 2003). Richards et al. (1993) used a multiple regression analysis to demonstrate that negative mood and trait anxiety provide significant unique contributions to threat interpretations.

The endemic negative anxious affect experienced by worriers provides a possible mechanism for increased threat detection and appraisals, such as those found in Experiment 1, which indicate that a situation needs to be processed in detail using systematic processing. The impact of negative mood on threat detection will be examined in this experiment using self-report visual analogue questions tapping inflated threat perception, and a homophone task, which measures threat interpretation biases to ambiguous stimuli (see section 7.2.2).

Intolerance of uncertainty and threat perception.

Early definitions of IU linked the construct with attempts to control things that may be threatening; IU was defined as "behavioural attempts to control the future and control uncertainty". A number of factors increase the likelihood that an individual with high IU will have heightened threat perception. Firstly, IU is associated with interpreting ambiguous events as threatening and intolerable (Butler & Mathews, 1983, 1987). Secondly, individuals experiencing high levels of IU are more likely to overestimate the probability of negative events occurring (MacLeod, et al., 1991), suggesting that they are more likely to perceive a greater risk of threats. Thirdly, individuals who desire certainty will have greater difficulty accepting the possibility of threatening outcomes occurring (Berenbaum, 2010). This is not just because of the fear of these outcomes but because a high IU individual is unwilling to accept any uncertainty, which is inherent in any uncertain future threat.

Problem-solving confidence and threat perception.

Worriers have been found to have reduced confidence in their problem-solving abilities compared to non-worriers (Belzer, et al., 2002; Davey, et al., 1992). While there has been little explicit examination of whether individuals with low PSC are more likely to have raised threat perception, it has been suggested that worriers may perceive problems as threats, rather than challenges, and that this leads to avoidant coping strategies (Dugas, Letarte, Rhéaume, Freeston, & Ladouceur, 1995). The relationship between PSC and threat perception has not been adequately examined in the literature, but it seems sensible to

predict that low PSC will be associated with increased threat perception as the threshold for feeling that one cannot deal with a situation will be lower (and thus the situation will appear more threatening).

7.1.2 Coping beliefs in the worry process

Borkovec (1994) highlighted the difficulty that worriers experience when they perceive a threat in their uncertain future: being future-oriented, the object of the worry does not, and may not ever, exist, preventing the worrier from using adaptive coping strategies to deal with the threat. Chronic worriers are likely to have their own ways of coping with threats they detect due to raised levels of IU, perfectionism, responsibility appraisals for making mistakes, and elevated evidence requirements (Dugas, et al., 1997; Frost, et al., 1990; Pratt, et al., 1997; Wells & Papageorgiou, 1998). Maldapative coping strategies have been identified in chronic worriers, namely avoidant coping strategies and emotion-focused coping (e.g. Davey, 1993b). Matthews and Wells (2000) suggest pathological worry "directs attention toward monitoring for threat and away from restructuring of maladaptive self-knowledge" (p. 69). Alongside the role that increased threat detection has in the development of perseverative worry, perceived coping abilities also play a crucial role; "chronic and severe forms [of worry] emerge in individuals who diffusely perceive the world to be a dangerous place and who are afraid that they will not be able to cope with the events that their future folds for them" (Borkovec, 1994, p.28). Indeed, Borkovec (1994) describes worry as "a coping response to perceived threat" (p.24).

Paradoxically, anxiety is associated with intial selective attention to threats, and subsequent avoidance of threat stimuli – the 'vigilant-avoidant' pattern (e.g. Garner, Mogg, & Bradley, 2006). This may arise as anxious individuals fear that they cannot cope with the threats that they detect. Numerous studies have shown that worriers use avoidant coping strategies (e.g., Borkovec et al., 1998), which is consistent with functional accounts of worry as a form of cognitive avoidance of even more distressing thoughts and images. Davey et al. (1992) report worrying is associated with using problem-focused coping strategies and an information-seeking problem coping style. Matthews and Funke (2006) suggest that threat appraisals that indicate the threat is beyond personal control result in emotion-focused coping strategies, rather than task-focused coping. This then leads to the worrier engaging in strategies such as self-criticism for failing to anticipate such a threat, and strategies such as wishful thinking. This is in contrast to the problem-focused strategies reported by Davey et al.

(1992). However, discrepancies between these studies are likely to be due to the measures of worrying used: scales that incorporate the constructive continuum of worry-problem-solving, such as the Student Worry Scale and the Worry Domains Questionnaire correlate with problem-focused activities, whereas the PSWQ, which focuses on pathological worrying, does not (Davey, et al. 1992). The way that the worry promoters affect coping beliefs is outlined below.

Negative mood and coping beliefs.

Negative mood does not only affect the interpretations individuals make of the world around them, it also affects the coping strategies that individuals deploy to deal with what they encounter, and the beliefs that they have about their ability to cope. Segerstrom, Taylor, Kemmeny and Fahey (1998) reported that avoidant coping is associated with higher levels of negative mood, and that avoidant coping is likely to mediate the relationship between negative mood and lower levels of optimism.

Intolerance of uncertainty and coping beliefs.

IU has been linked to the activation of coping strategies such as seeking information (Rosen & Knäuper, 2009). In Rosen and Knäuper's (2009) study, participants in the upward IU manipulation condition were exposed to a linguistic manipulation which forced participants to select items on a questionnaire that indicated they had high levels of IU. This was achieved by pairing the high IU items with the qualifier 'occasionally' and the low IU items with the qualifier 'almost always'. This linguistic manipulation was also coupled with false-feedback that they had high levels of IU. Individuals in this high IU condition reported a greater desire to have more information about the topic that they had received information about, and were more likely to take the experiment information sheet with them, but only when they also had high levels of situational uncertainty. However, uncertainty-oriented individuals' (which includes high IU individuals, Sweeny, Melnyk, Miller & Shepperd (2010)) tendency to seek more information when they feel uncertain can actually lead to an increase in anxiety as uncertainties cannot always be resolved through more information (Rosen, et al., 2009).

Problem-solving confidence and coping beliefs.

Worrying may be deployed in an attempt to solve problems, but it may be unsuccessful due to deficiencies in the problem-solving process. Davey et al. (1992) suggest two potentially deficient aspects in the problem-solving processes of worriers: (1) low PSC, and (2) adoption of coping strategies that neglect to deal with the cause of the stress, and

instead focus on managing emotional reactions to the stress. Davey (1993a) explored the role of different coping strategies for dealing with threats. Two of the coping strategies, threat devaluation and positive reappraisal, were found to relate to adaptive problem-focused strategies. The coping strategy of denial, on the other hand, was related to problem avoidance. Davey (1993a) found that denial was most common in situations where individuals felt their situation was uncontrollable or where individuals had low PSC. Consequently, the high levels of low PSC that worriers have been shown to experience is a risk factor for opting to avoid problems rather than engage in more adaptive problem-focused coping strategies

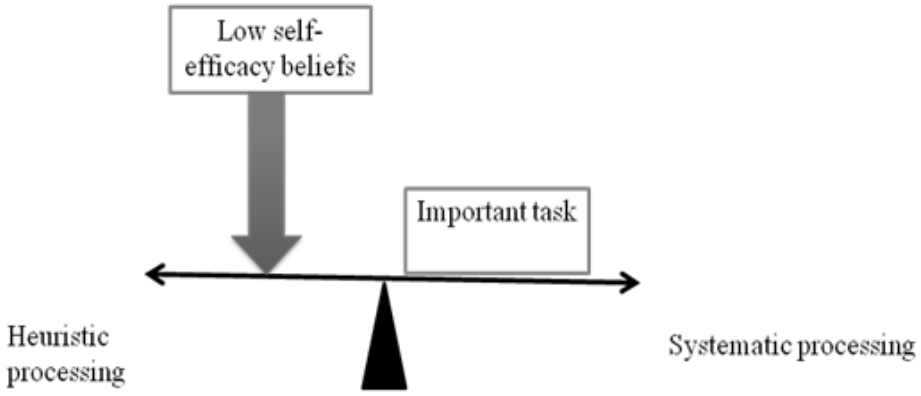
7.1.3 Threat perception and systematic processing

Threat perception and coping beliefs also affect the deployment of systematic information processing. Threat perception raises sufficiency thresholds and thus greater threat perception is associated with an increased tendency to use systematic processing (e.g. Baron, Logan, Lilly, Inman, & Brennan, 1994; Giner-Sorolila & Chaiken, 1997). There is some indication that the impact of threat detection on systematic processing is dependent on the co-occurrence of fear appraisals (Ruiter, Abraham, & Kok, 2001), and this means that individuals who are predisposed to experience greater amounts of fear/negative emotions may be more likely to deploy systematic processing in the context of threats.

7.1.4 Coping beliefs and systematic processing

In contrast to the promoting effect of threat perception on systematic processing, low self-efficacy beliefs, such as believing one cannot cope, are associated with a decreased tendency to use systematic processing as the extra cognitive expenditure is not perceived as worthwhile (Chaiken, et al., 1989). As shown in Figure 7.9, the balance between task importance (how threatening the unresolved worry is) and self-efficacy beliefs will determine the nature of information processing that is deployed.

Figure 7.9 Schematic diagram representing that the balance of self-efficacy beliefs and task importance determines whether systematic or heuristic processing is deployed.



Differential impacts of the worry promoters on threat perception and coping beliefs may account for the different findings obtained in Experiments 1-4 regarding the relationship between factors associated with increased worry and systematic information processing. In an attempt to elucidate the mechanisms involved in perseverative worry, this chapter will focus on the impact of negative mood, IU and PSC on threat perception and coping. Implications for systematic information processing deployment will be considered in the general discussion.

7.1.5 Predictions

Given that threat detection and low coping beliefs are an integral part of worry, it was predicted that negative mood, IU and low PSC would result in (1) increased threat detection (as measured by the frequency and intensity visual analogue scale items, and threat-word spellings on the homophone task), (2) lower perceived ability to cope with any threats that were encountered, and (3) increased worry about threats. The relative contribution of each worry promoter to threat detection and coping beliefs will be examined using regression models. Given that threat detection will typically raise sufficiency thresholds, and only negative mood *caused* raised sufficiency thresholds in Experiments 1-4, it was predicted that (4) only negative mood would result in greater endorsement of appraisals linked to raised sufficiency thresholds (motivation and personal relevance). Furthermore, it was predicted that negative mood would make a greater contribution to threat perception than IU or low PSC.

7.2 Method

Participants.

There were 180 participants (127 females; 53 males) recruited via advertisement posters, recruitment emails to the University of Sussex International Summer School, and the University of Sussex online participant recruitment system, SONA. The majority of participants were students at the University of Sussex (*n* = 171; 100 studied Psychology or Psychology with another subject, 71 studied another course at the University of Sussex), while 8 participants reported being employed (in all cases this was by the University of Sussex), and 1 participant reported being unemployed. The age range was 18-50 yr (*M* = 21.36, *SD* = 4.48). Participants were recruited on a voluntary basis and were compensated for their time at the rate of £5/hour, or with course credits if they were Psychology students fulfilling a course requirement to participate in research.

Materials.

The pre-manipulation questionnaire (baseline measures).

A pre-manipulation questionnaire consisting of 100-point visual analogue scales (VASs; anchors: 0 = 'Not at all', 100 = 'Extremely') was used in order to measure baseline levels of sadness ('You feel sad'), PSC ('You trust your ability to solve new and difficult problems'), and IU ('You feel concerned by uncertainty'). These single-items were based on the cardinal feature of each construct and were embedded amongst seven distracter questions, all ostensibly about general life well-being. Single items were used to avoid alerting participants to the aims of the experiment.

The manipulation check questionnaire.

Participants completed a short questionnaire comprising 100-point VASs. There were five measures of mood (sadness, happiness, anxiety, arousal, and negativity), four items measuring IU, and four items measuring PSC. The questions measuring IU were based on the conceptualisation of IU as "the excessive tendency of an individual to consider it unacceptable that a negative event may occur, however small the probability of its occurrence" (Dugas, Gosselin, & Ladouceur, 2001, p. 552) and the final IU question is an item taken from the Intolerance of Uncertainty Scale (Buhr & Dugas, 2002). The PSC questions were based on the PSC subscale of the Personal Problem-Solving Inventory (Heppner & Petersen, 1982), an 11-item subscale consisting of items such as 'I am usually able to think up creative and effective

alternatives to solve a problem'. See Table 7.25 for the items used to measure mood, IU, and PSC.

Table 7.25 Items measuring mood, intolerance of uncertainty, and problem-solving confidence

Construct	Item
Sadness	You feel sad
Happiness	You feel happy
Anxiety	You feel anxious
Arousal	You feel aroused (i.e. awake, alert or stimulated)
Negativity	You feel negative
IU Q1	You find uncertainty unpleasant
IU Q2	You feel concerned by uncertainty
IU Q3	You feel uncertain
IU Q4	You think it is unfair that there are no guarantees in life
PSC Q1	You would like to tackle problems
PSC Q2	You feel confident about your ability to think up creative and effective solutions to solve a problem
PSC Q3	You trust your ability to solve new and difficult problems
PSC Q4	You feel most problems are too complex for you to solve

Threat and coping VAS questionnaire.

Participants completed a 14-item questionnaire formed of 100-point VASs assessing threat perception and coping beliefs. The questions measured perceptions of threat (intensity and frequency), approach/avoidance of threatening situations, motivation to deal with threats, beliefs about coping ability, worry levels, and personal relevance of the mood induction procedure. The items used in this questionnaire are shown in Table 7.26. The focus of items and the precise wordings were generated through discussion with research colleagues about what constitutes a threat, and the different ways that people may deal with threats. Two questions measured each facet, except for the threat frequency and intensity aspects, which were only measured through 1 item each. The questions were then submitted

to three rounds of piloting to ensure that people were able to answer the items and understood what the questions asked.

Threat and worry items.

The questionnaire began with a definition of what was meant by a threat in this questionnaire: 'In some of the following questions, you will be asked about threat. Please consider threat to be anything that is undesirable and may impact you in a negative way. The use of the word threat should not be considered only in terms of physical threats (e.g., catching an illness, being in an accident), but also in terms of social threats (e.g., upsetting your friends, not knowing anyone at a party) and more general emotional threats (e.g., missing a deadline, running out of money)'. Hence, a broad interpretation of the word threat was emphasised. The threat questions focused on (1) how many threats the individual expected to encounter; (2) how bad the individual felt the threats would be; and (3) how worried the individual was about encountering threats.

Coping items.

The coping questions assessed the ways that an individual can react to a threat (avoidance or approach tendencies) and how well they felt that they would cope with any threats that they encountered. Miller (1987) specifies two key approaches that individuals can take in order to deal with threats: monitoring and blunting. Monitoring is described as information-seeking, and is similar to the notion of approach behaviour. The approach questions were created by considering the principal characteristic of the monitoring style: "the person looks for information within the threatening situation by carefully paying attention to what is happening" (p.18, Muris, van Zuuren, de Jong, de Beurs, & Hanewald, 1994). Blunting refers to distraction and is similar to the idea of avoidance behaviour. The avoidance questions were formed by considering the key feature of the blunting style: "the person avoids thinking about the situation, directs their attention to other things, or tries to forget the situation" (p.18, Muris, et al., 1994). Given that individuals can deploy a number of different coping styles when faced with threats, the questions assessing how well the participants felt that they would cope were phrased in a non-specific way, so as to be applicable to all coping styles. The questions were worded to assess the participants' perceptions of how well they would cope, as self-efficacy beliefs are critical in determining which information processing style is deployed.

Motivation and personal relevance.

VAS responses to threat perception and coping beliefs were anticipated to be affected by how motivated an individual felt and how personally-relevant the situation felt. Therefore questions were also included that assessed motivation and personal relevance.

Assessing the validity of the threat and coping items.

To assess the validity of the threat and coping items, correlations were performed. It was hypothesised that there would be a significant positive correlation between the questions assessing threat likelihood and threat intensity. If negative mood increases all threat appraisals, then it would also be predicted that the threat frequency and intensity items would correlate with the threat spellings on the homophone task. Additionally, it was predicted that the threat worry item would correlate with scores on the PSWQ. To assess the validity of the coping items, correlations were run between the approach/avoidance items and the MBQ monitoring and blunting subscales. It was predicted that the approach items would positively correlate with the MBQ monitoring subscale and that the avoidance items would positively correlate with the MBQ blunting subscale. The questions assessing coping were predicted to be negatively correlated with the worry threat item, with those individuals who felt that they would cope well with the threats being predicted to have lower worry levels about encountering threats. The validity of the personal relevance and motivation items was assessed by examining whether they correlated with one another, as a number of authors have shown that individuals are more motivated to deploy effortful processing when an issue is personally-relevant (e.g. Petty, et al., 1981).

Table 7.26 Items measuring threat and coping beliefs

Construct	Item	Anchor points
Threat frequency	How many things that pose some threat do you think you will encounter over the next week?	None – Many
Threat intensity	On average, how bad do you think the threatening things you may encounter will be?	Not at all – Extremely
Approach Q1	If you encounter a threatening situation over the next week, to what extent will you try to think about this situation?	Not at all – A great deal
Approach Q2	To what extent will you try to focus your attention on thinking about any threatening situations you encounter?	Not at all – A great deal
Avoidance Q1	To what extent will you try to distract yourself from thinking about any threatening situations that you encounter over the next week?	Not at all – A great deal
Avoidance Q2	If you encounter a threatening situation over the next week, to what extent will you seek to avoid thinking about this situation?	Not at all – A great deal
Motivation Q1	Over the next week, to what extent will you feel motivated to deal with threatening situations you encounter?	Not at all – Extremely
Motivation Q2	To what extent will you want to deal with any threats as quickly as possible?'	Not at all – A great deal
Coping Q1	To what extent do you think that you will have the ability to cope with any threatening situations that you encounter over the next week?	Not at all – A great deal
Coping Q2	How well will you cope with any threatening situations you encounter over the next week?'	Not very well - Very well
Worry Q1	To what extent will you worry about any threatening situations you encounter over the next week?	Not at all – A great deal
Worry Q2	If you encounter a threatening situation over the next week, to what extent will you worry about this situation until the threat is dealt with?	Not at all – A great deal

Personal Q1	relevance	To what extent did you personally identify with feelings related to this task?	Not at all – A great deal
Personal Q2	relevance	To what extent are any feelings that you have experienced in the previous stage of this experiment (prior to these questions) relevant to you?	Not at all – A great deal

Homophone task.

Homophone spelling tasks can be used to investigate the interpretation of ambiguous material (see Blanchette & Richards, 2003). This task presents ambiguous words spoken through headphones, and the participant is asked to write down (spell) the word they hear. The version of the homophone task developed by Davey, Bickerstaffe and MacDonald (2006) was used to assess threat interpretation biases in a manner other than self-report questionnaires. Participants heard 64 words, presented three seconds apart. The words were recorded in two audio files; in one, the valenced version of the words were read aloud (e.g., wail), in the other the neutral version of the words were read aloud (e.g., whale). The two recordings controlled for subtle differences in the way that the words were read aloud during the recording. There were 16 words that could be spelt to reflect a negative or a neutral meaning (e.g., die/dye), 16 words that could be spelt to reflect a positive or neutral meaning (e.g., heal/heel), and there were 32 filler items that were not analysed.

The Penn State Worry Questionnaire.

The Penn State Worry Questionnaire (Meyer et al. 1990) was used as a measure of worry frequency. The PSWQ is a 16-item questionnaire including items such as 'Many situations make me worry'. The PSWQ has excellent internal consistency and test-retest reliability (Meyer, et al., 1990). See Chapter 3 for more details.

Monitoring and Blunting Questionnaire

The Monitoring and Blunting Questionnaire (Muris, et al., 1994) was used to assess the construct validity of the approach and avoidance items. It measures participants' tendencies to want to use a monitoring strategy (i.e. searching for more information) or blunting strategy (i.e. distracting oneself from distressing information) when encountering a threatening situation. Muris et al.'s (1994) scale begins by informing the participant that when people are in a threatening situation, they can make use of two sorts of coping strategies: the monitoring strategy and the blunting strategy. Muris et al. describe the

characteristics of the monitoring strategy and the blunting strategy. Participants are then instructed to read ten threatening situations, e.g., 'Late at night, you walk through a deserted neighbourhood of a city. Suddenly, a group of dubious looking people approach you from a side-road'. One of the threat situations was modified: Muris et al. included an item that referred to smoking on a plane. This aspect of the situation was removed to update the question to the current societal context. For each threatening situation, the participants were asked to provide a rating from 0 ('Not at all') to 10 ('Very much') to indicate the extent that they would make use of each strategy. Muris et al. (1994) report that the MBQ has good reliability; the monitoring scale ($\alpha = .71$) and the blunting scale ($\alpha = .80$) both have acceptable internal consistency. Furthermore, the scales have sufficient test-retest reliability (monitoring, $r = .64$, $p < .01$; blunting, $r = .83$, $p < .01$).

Intolerance of Uncertainty Scale.

Participants who underwent the IU manipulation completed the Intolerance of Uncertainty Scale (IUS; Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994). The IUS is a 27-item scale assessing an individual's reactions to ambiguous situations on an emotional, cognitive, and behavioural level, as well as the implications one believes being uncertain has, and attempts to control uncertainty. It consists of items such as 'Uncertainty makes life intolerable'. Participants answer on a five-point Likert scale (1 = 'Not at all representative'; 5 = 'Completely representative'). The IUS has excellent internal consistency ($\alpha = .91$; Freeston et al., 1994) and good test-retest reliability (Buhr & Dugas, 2002).

Problem-solving confidence subscale of the Personal Problem-Solving Inventory.

Participants who underwent a PSC manipulation also completed the PSC subscale taken from Heppner and Petersen's (1982) Problem-Solving Inventory. It consists of 11-items (e.g., 'I trust my ability to solve new and difficult problems'). Participants respond on a 6-point Likert scale. In the original version, low scores indicated behaviours and attitudes associated with successful problem-solving, but in this study, the response scale was arranged so that high scores represented high PSC (1 = 'Does not describe me well'; 6 = 'Does describe me well'). Two items are reverse-scored. The problem-solving subscale has good internal consistency ($\alpha = .85$) and good test-retest reliability (Heppner & Petersen, 1982).

Demographic questionnaire.

Participants answered questions about their age, gender, occupation, their subject and year of study.

Procedure.

Stage 1.

Participants read an information sheet about the study and completed an informed consent form.

Stage 2 (baseline measures).

Participants completed the pre-manipulation questionnaire with questions about sadness, IU and PSC embedded.

Stage 3 (experimental manipulation).

The experiment was run in three stages. Firstly the mood manipulation conditions were run, secondly the IU manipulation conditions were run, and lastly the PSC manipulation conditions were run. The first 60 participants were randomly assigned to either a negative mood induction or a neutral mood induction. Participants 61-120 were randomly assigned to either a low IU manipulation or a high IU manipulation. Participants 121-180 were randomly assigned to either a low PSC manipulation or a high PSC manipulation.

Mood manipulation

The same negative and neutral vignette mood induction procedure was used as in Experiment 1 (the cognitive priming condition was not used in this experiment); See Chapter 4 for a detailed discussion of the mood induction procedure. Vignettes (based on Scott & Cervone, 2002) were played through headphones. Participants in the negative mood group were asked to imagine memories they shared with their best friend, and their friend becoming terminally ill. Participants in the neutral mood group imagined their bedroom furniture. Each vignette lasted approximately 5 min.

IU manipulation.

The IU manipulation was based on a procedure used by Kelly (2009), and is the same as the manipulation used in Chapter 5. For a review of this particular IU manipulation compared to manipulations employed in other research on IU, refer to Chapter 3. This

manipulation uses four sets of two short stories (Appendices F-I). In one set, the character has high IU. In the other set, the character has low IU. For both sets, there is a male version and a female version. The scenarios are gender-congruent to ensure the participants can relate as fully as possible to the character and their gender-typical attitudes. In each of the scenarios, the character encounters an uncertain situation that has a potentially negative outcome.

Participants were given ten minutes to read the stories and try to understand the motivations of the central character. Afterwards, participants were asked to "think of a situation in your own life where you aren't sure whether the outcome will be good or bad" and to briefly describe the situation. After spending five minutes describing their own potentially negative life event, participants received the following instructions "We want you to imagine that you are Sean [or Sarah] from the stories you have just read, and that you keep a journal about your thoughts and feelings about key issues and events in your life. Please take fifteen minutes to write a journal entry describing how you would feel if you were Sean [or Sarah] and were experiencing the situation you have just described above. Try to be as detailed as possible in describing how you (Sean [or Sarah]) would feel about the dilemma". After the fifteen minutes had passed, participants were given five minutes to read the diary entry they had written with an emphasis placed on understanding the feelings of the central character.

PSC manipulation.

The PSC manipulation was based on the work by Davey, Jubb and Cameron (1996) and is the same as the method used in Chapter 6; for a discussion of the methodology of manipulating PSC, see Chapter 3. Participants were asked to provide solutions to four real-life problem scenarios drawn from the Means-Ends Problem-Solving Test (MEPS; Platt & Spivack, 1975). Participants read a short passage in which details of a problematic social scenario were described and the outcome of the scenario was listed. The participants were given fifteen minutes to write the middle of each of the four stories, i.e. how the character in the story gets from the problematic start to the resolved finish.

After completing the MEPS scenarios, the participant's sheet was taken away from the laboratory and the participant was told that their answers were being assessed and scored against age and gender-matched norms. To increase the realism of this scenario, the participants were asked to provide their age and gender and this was written onto a score sheet. Following a five-ten minute break, in which the experimenter could realistically read

the answers, participants were given the feedback sheet (with false feedback) that was either designed to increase PSC or decrease PSC. Participants were randomly assigned to each condition at the start of the experiment. Those participants in the condition designed to increase PSC were told that they had score in the top 75 percent, with a score of 28 compared to an average score of 17. Participants in the low PSC condition were told that they had score in the lowest 15 percent, with a score of 8 compared to an average score of 17. If participants questioned their score, they were told that the scores were calculated by counting up problem-solving strategies, and that this score was converted to an age and gender-matched normalized score. Participants were encouraged to talk to the experimenter about their score at the end of the experiment if they had further questions.

In order to encourage the participants to process the feedback, participants were asked to write a short paragraph discussing the implications of their test results (a cover story was presented that the data was being gathered for a future study into the impact of problem-solving ability).

Stage 4 (VAS questionnaires).

Participants completed the manipulation check questionnaire measuring mood, IU and PSC, and the VAS questionnaire measuring threat and coping.

Stage 5 (homophone task).

Participants were randomly allocated to list A or list B (counterbalanced across groups) and listened to the word list, which was presented through headphones attached to a computer and played through Windows Media Player. Participants wrote down the spelling for each word on a piece of paper.

Stage 6.

Participants completed the MBQ, the PSWQ, and the demographic information sheet. Those participants who underwent an IU manipulation completed the IUS, and those participants who underwent a PSC manipulation completed the PSC subscale of the PSI.

Stage 7.

Participants were debriefed and thanked for participating. All participants were provided with the University of Sussex's counselling service details. Participants who had experienced the negative mood induction of the PSC manipulation were offered a positive

mood induction. Participants who were in the high IU condition were provided with the low IU stories.

7.3 Results

The analyses are designed to assess whether negative mood affects threat and coping appraisals. Firstly, the efficacy of the mood induction procedure (and its effect on the other key independent variables in this thesis) will be assessed. Secondly, a series of Bonferroni-corrected *t*-tests will be conducted to examine whether there are any differences between the negative mood and neutral mood groups on the threat and coping items, as well as on the homophone task. Finally, correlational analyses will be performed to examine if there are relationships between the variables measured in this experiment.

Demographic Statistics.

Chi-square tests revealed no significant difference between the manipulation conditions in terms of gender, $\chi^2(5) = 3.02$, $p = .70$, or occupation, $\chi^2(10) = 10.90$, $p = .37$. Furthermore, a one-way ANOVA indicated no significant difference in the age of participants in different manipulation conditions, $F(5, 174) = 2.14$, $p = .06$. There was, however, a significant difference in the subject of study, $\chi^2(15) = 88.53$, $p < .001$, and the year of study, $\chi^2(25) = 117.78$, $p < .001$. This difference is driven by the mood manipulation condition only including Psychology students. This reflects that participants were more likely to take part in the mood manipulation when course credits were still available for the (first year) Psychology students.

Baseline Measures

One-way ANOVAs indicated no significant difference between the manipulation conditions on measures of sadness, IU or PSC at baseline, $Fs \leq 0.72$, $ps \geq .61$. See Table 7.27 for descriptive statistics.

Table 7.27 Descriptive statistics for the baseline measures of mood, intolerance of uncertainty, and problem-solving confidence by manipulation condition.

Manipulation condition	Sadness	IU	PSC
	M (SD)	*M (SD)*	*M (SD)*
Negative mood	22.97 (22.81)	59.97 (23.52)	64.63 (21.42)
Neutral mood	27.70 (25.75)	52.97 (29.72)	64.53 (23.14)
High IU	29.87 (18.27)	62.07 (26.80)	68.97 (19.44)
Low IU	32.50 (27.59)	58.00 (28.14)	68.20 (18.44)
Low PSC	26.23 (18.70)	62.37 (22.75)	68.03 (14.17)
High PSC	24.77 (19.28)	59.33 (20.97)	63.80 (20.47)

Manipulation checks

One-way ANOVAs revealed significant differences between the manipulation conditions on all the manipulation check items, *Fs* ≥ 2.44, *ps* ≤ .04, with the exception of 'You would like to tack problems', $F(5, 174) = 0.39$, $p = .86$, and the average IU composite item (scores on all four IU items added together and divided by four), $F(5, 174) = 1.29$, $p = .27$. The descriptive statistics are shown in Table 7.28.

The manipulations were not 'pure'; the descriptive statistics shown in Table 7.30 indicate that scores were similar post-manipulation across a number of conditions. However, to minimize Type 1 error rates, comparisons were only conducted between pairs of manipulations: the negative mood group was compared to the neutral mood group on the mood items; the high IU group was compared to the low IU group on the IU items; the low PSC group was compared to the high PSC group on the PSC items. The results are presented below.

Mood.

A series of Bonferroni-corrected ($p < .01$) independent *t*-tests were conducted on the mood ratings taken after the mood inductions. The *t*-tests revealed a significant effect of the mood inductions on sadness, $t(58) = 4.33$, $p < .001$, $r = .24$, happiness, $t(58) = -5.99$, $p < .001$, $r = .38$, anxiety, $t(58) = 3.59$, $p = .001$, $r = .18$, and negativity, $t(56^{6}) = 3.77$, $p < .001$, $r = .20$. There was no significant difference in arousal, $t(58) = -1.15$, $p = .26$, $r = .02$. Participants in the

[6] Two participants failed to complete this item.

negative mood induction group reported feeling significantly sadder, less happy, more anxious and more negative than participants in the neutral mood induction condition.

Intolerance of uncertainty.

An independent *t*-test indicated no significant difference between the high IU group and the low IU group on the composite measure of IU, $t(58) = 0.87$, $p = .39$, $r = .01$. In terms of the single VAS items, the difference between the high and low IU groups approached significance on one question measuring IU ('You find uncertainty unpleasant'), $t(58) = 1.40$, $p = .17$, $r = .03$. There was no significant difference between the high IU and low IU groups on the other single VAS items: 'You feel concerned by uncertainty', $t(58) = 1.15$, $p = .25$, $r = .02$, 'You feel uncertain', $t(58) = 0.18$, $p = .86$, $r < .001$, 'You think it is unfair that there are no guarantees in life', $t(58) = 0.14$, $p = .89$, $r < .001$. These findings indicate that the IU manipulation was not successful in generating significant between group differences. Differences between responses to the IU question used at baseline and as a post-manipulation check question was assessed using a mixed 2(Time: Pre-manipulation vs. Post-manipulation) × 2(IU condition: high vs. low) ANOVA with time as the repeated measures. There was no main effect of time, no main effect of IU condition, and no significant time × IU condition interaction, $Fs \leq .55$, $ps \geq .46$.

Problem-solving confidence.

An independent *t*-test indicated that the low PSC group scored significantly lower on the PSC composite measure than the high PSC group, $t(43.61) = -3.01$, $p = .004$, $r = .17$. The low PSC group scored significantly lower than the high PSC group on 'You feel confident in your ability to think up creative and effective solutions to solve a problem', $t(45.83) = -3.80$, $p < .001$, $r = .24$, and 'You trust your ability to solve new and difficult problems', $t(50.00) = -2.68$, $p = .01$, $r = .13$. There was no significant difference between the low and high PSC group on the items 'You would like to tackle problems', $t(58) = 0.38$, $p = .70$, $r = .002$, and 'You feel most problems are too complex for you to solve', $t(58) = 0.02$, $p = .98$, $r < .001$.

Table 7.28 Descriptive statistics for the manipulation checks by mood induction condition.

	Negative mood *M (SD)*	Neutral mood *M (SD)*	High IU *M (SD)*	Low IU *M (SD)*	Low PSC *M (SD)*	High PSC *M (SD)*
Sadness***	49.93	25.80	31.60	31.33	34.10	23.13
	(19.83)	(23.24)	(18.38)	(27.57)	(20.51)	(18.08)
Anxiety***	50.87	29.07	50.07	46.17	41.53	28.80
	(23.65)	(23.42)	(22.91)	(26.09)	(19.84)	(23.32)
Negativity***	50.67	27.00	36.70	35.03	41.53	25.33
	(23.16)	(24.62)	(19.58)	(26.87)	(19.12)	(14.43)
Arousal	43.33	50.77	57.40	58.73	59.87	66.13
	(23.00)	(27.01)	(19.86)	(16.24)	(16.61)	(17.40)
Happiness***	45.90	72.70	63.27	64.17	60.20	75.77
	(17.36)	(17.29)	(15.55)	(25.11)	(17.96)	(12.03)
Mean IU composite [a] **	60.72	43.14	55.15	50.18	56.03	44.43
	(16.47)	(21.12)	(18.80)	(24.94)	(14.04)	(16.81)
You find uncertainty unpleasant*	64.97	53.47	63.70	64.60	68.03	51.00
	(21.11)	(26.78)	(26.21)	(24.37)	(18.16)	(26.00)
You feel concerned by uncertainty*	65.37	52.50	64.60	56.93	67.03	53.50
	(19.91)	(24.51)	(24.37)	(27.06)	(14.94)	(22.67)
You feel uncertain***	51.30	30.83	54.33	53.13	50.23	33.40
	(21.56)	(23.86)	(22.64)	(28.80)	(19.04)	(20.06)
You think it is unfair that there are no guarantees in life **	61.23	34.82	37.97	37.00	38.80	39.83
	(25.75)	(25.43)	(28.40)	(26.17)	(26.40)	(26.29)
Mean PSC composite [a] **	58.43	65.59	70.09	70.79	63.36	70.36
	(12.84)	(19.57)	(16.03)	(14.25)	(15.51)	(10.32)
You would like to tackle problems	72.90	70.13	76.70	71.90	71.87	73.50
	(21.40)	(24.11)	(18.88)	(18.60)	(11.89)	(20.04)
You feel confident in your ability to think up creative and effective solutions to solve new and difficult problems **	55.40	64.57	64.50	69.73	53.00	70.33
	(20.24)	(21.88)	(20.76)	(14.89)	(21.77)	(12.31)
You trust your ability to solve new and difficult problems **	54.07	64.33	65.80	70.17	65.80	70.17
	(20.30)	(24.77)	(20.83)	(17.84)	(20.83)	(17.84)
You feel most problems are too complex for you to solve **	48.63	33.32	26.63	28.63	26.63	28.63
	(21.91)	(22.49)	(20.49)	(23.25)	(20.49)	(23.25)

*$p < .05$, **$p < .01$, ***$p < .001$. [a] Mean composite of four VASs; Significant difference across groups

Experimental Outcomes.

One-way ANOVAs were conducted with each threat and coping variable entered as separate dependent variables, with manipulation condition used as the independent variable. Given that the IU manipulation was unsuccessful, between-group analyses were only conducted for the mood and PSC groups on the threat perception and coping belief items. The descriptive statistics are shown in Table 7.29.

Approaching and avoiding threats.

There was a significant difference on both approach questions: (Q1) 'If you encounter a threatening situation over the next week, to what extent will you try to think about this situation?', $F(3, 116) = 4.56$, $p = .005$; (Q2) 'To what extent will you try to focus your attention on thinking about any threatening situations you encounter?', $F(5, 174) = 4.36$, $p = .006$. In both cases, Bonferroni post-hoc tests identified a difference between the neutral mood group and the low PSC group; Approach Q1 $p = .04$; Approach Q2 $p = .03$. In both cases, the low PSC group were more willing to approach threats than the neutral mood group – perhaps reflecting a mood repair/maintenance effect. There was also a significant difference between the negative mood and low PSC group on Approach Q2, $p = .008$, with the negative mood group reporting less willingness to approach threats than the low PSC group. A significant difference emerged on one of the avoidance questions, $F(5, 174) = 4.43$, $p = .006$. The negative mood group was significantly more likely to avoid threats than the low PSC group ($p = .04$).

Coping beliefs.

There was a significant difference on one of the perceived coping questions (Q2) ('How well will you cope with any threatening situations you encounter over the next week?'), $F(3, 112) = 2.86$, $p = .04$. However, the conservative Bonferroni post-hoc test, used to compensate for multiple ANOVA tests, did not identify any significant differences between the mood and PSC groups.

Motivation and personal relevance.

There was a significant difference on the first motivation question ('Over the next week, to what extent will you feel motivated to deal with threatening situations you encounter?'), $F(3, 116) = 4.82$, $p = .003$. Bonferroni post-hoc tests indicated that there was a significant difference between the negative mood and neutral mood groups, and between the negative mood group and the low PSC group. Examination of the means (see Table 7.29) indicates that the findings went against the predicted direction; the negative mood group

reported feeling *less* motivated to deal with their worries than the neutral mood group (and the low PSC group).

There was a significant difference on the first personal relevance question ('To what extent did you personally identify with feelings related to this task?'), $F(3, 112) = 2.86$, $p = .04$. Bonferroni post-hoc tests indicated that there was a significant difference between the negative mood group and the low PSC group, $p = .02$. The negative mood group was far more likely to endorse that the mood manipulation was personally relevant than the PSC manipulation, perhaps indicating that the participants in the PSC did not feel that their low marks were representative of their usual problem-solving skills (although the false-feedback was enough to generate lower PSC).

Table 7.29 Descriptive statistics for the threat and coping belief items for the mood and problem-solving confidence conditions

Construct	Question	Negative mood *M (SD)*	Neutral mood *M (SD)*	Low PSC *M (SD)*	High PSC *M (SD)*
Motivation	1**	55.33 (19.69)	70.20 (18.71)	68.57 (14.80)	67.07 (13.45)
	2	65.83 (22.25)	70.93 (27.31)	77.07 (16.28)	75.03 (17.58)
Avoidance	1*	51.30 (24.60)	46.60 (29.08)	38.90 (26.04)	41.77 (26.28)
	2	58.40 (21.09)	56.80 (24.94)	41.47 (22.77)	42.80 (24.42)
Approach	1**	49.50 (18.54)	49.03 (19.98)	62.53 (19.63)	61.63 (17.82)
	2**	52.53 (19.78)	54.50 (23.12)	68.83 (12.61)	57.10 (19.56)
Personal relevance	1*	63.97 (30.80)	56.17 (24.27)	44.87 (22.46)	57.03 (21.14)
	2	55.28 (25.07)	54.21 (22.25)	49.00 (21.65)	52.79 (16.52)
Coping	1	60.50 (20.35)	67.70 (21.23)	69.33 (17.25)	68.73 (12.67)
	2*	53.41 (19.59)	65.38 (21.97)	65.83 (16.45)	65.41 (18.88)
Worry	1	66.20 (20.23)	58.17 (25.07)	59.87 (20.69)	64.90 (20.16)
	2	70.07 (22.04)	66.17 (22.80)	69.59 (13.76)	67.34 (17.48)
Threat	Frequency	46.93 (24.98)	52.93 (24.78)	51.90 (21.24)	57.63 (22.34)
	Intensity	42.23 (25.84)	36.93 (21.08)	39.43 (16.87)	38.33 (21.57)

*$p < .05$, **$p < .001$

There was no significant difference between the mood and PSC groups on the threat frequency/intensity items, motivation Q2, avoidance Q2, cope Q1, personal relevance Q2, or the worry items, $Fs \leq \pm 1.63$, $ps \geq .19$.

Correlation analyses.

There are two reasons for conducting correlation analyses. Firstly, the IU manipulation was unsuccessful; correlational analyses can determine whether there is a relationship between IU and threat perception and coping beliefs, even if the causal direction cannot be determined. Secondly, while the mood inductions and PSC manipulations were successful, the standard deviations for the two mood groups were very large. Consequently, correlations were run (ignoring which condition participants were assigned to). The results are shown in Table 7.32 and are discussed for each worry promoter, below. In order to simplify the analyses, composite measures were used by adding together the two questions measuring each of the constructs (except threat frequency and intensity, which were only measured by a single question each).

Negative mood.

Scores on the VAS measure of feeling negative were significantly positively correlated with threat frequency, $r = .20$, $p = .007$, threat intensity, $r = .27$, $p < .001$, threat spellings on the homophone task, $r = .16$, $p = .03$, and worry about threats, $r = .24$, $p = .001$. Thus, the more negative an individual felt, the more likely they were to (1) think that they would encounter more threats in the next week, (2) think that any encountered threats would be more threatening, (3) interpret ambiguous stimuli as threatening, and (4) report heightened worry about threats. As predicted, negative mood correlated negatively with beliefs about being able to cope with threats, $r = -.43$, $p < .001$. Against the prediction that negative mood would positively correlate with variables known to increase sufficiency thresholds, negative mood was significantly negatively correlated with motivation, $r = -.27$, $p < .001$, and did not correlate with personal relevance, $r = .06$, $p = .41$. The more negative an individual reported feeling, the lower their motivation was to deal with any threats that they encountered, and the lower their beliefs were about their ability to cope. Additionally, negative mood was correlated with avoiding threats, $r = .34$, $p < .001$, and not with approaching threats, $r = -.05$, $p = .49$.

Intolerance of uncertainty.

Scores on the composite VAS measure of IU were significantly positively correlated with estimation of the frequency of threats that would be encountered in the next week, $r = .30$, $p < .001$, the intensity of threats anticipated, $r = .33$, $p < .001$, and worry about threats, $r = .44$, $p < .001$. IU did not correlate with homophone threat spellings, $r = .09$, $p = .22$. The greater

an individual endorsed IU, the more threats they felt that they would encounter in the next week, the more they reported that they would avoid these threats, and the more they reported they would worry about these threats. The composite measure of IU was significantly negatively correlated with coping, r = -.34, p < .001; the more intolerant of uncertainty one was, the less well they felt they would cope with any threats that they encountered. Furthermore, while IU did not correlate with approaching threats, r = .09, p = .22, it was positively correlated with avoiding threats, r = .36, p < .001.

Problem-solving confidence.

Scores on the VAS composite measure of PSC did not significantly correlate with the frequency of threats expected, r = .003, p = .97, the intensity of anticipated threats, r = -.12, p = .12, or homophone threat spellings, r = -.10, p = .17. PSC did correlate with worry about threats, r = .36, p < .001, but this was not in the predicted direction; individuals with high PSC were more worried about threats than those with low PSC. PSC was correlated with coping beliefs, r = .51, p < .001. The greater an individual's PSC, the greater their belief that they would cope with any threats that they encountered. PSC positively correlated with approaching threats, r = .22, p = .004, and negatively correlated with avoiding threats, r = -.35, p < .001. The higher an individual's PSC, the more likely they were to approach threats and the less likely they were to avoid threats.

Table 7.30 Correlations for the worry promoters, threat and coping items, Monitoring and Blunting Questionnaire, Penn State Worry Questionnaire, and homophone scores

	NEG	IU	PSC	TF	TI	COP	APP	AVO	MOT	PR	WOR	MON	BLU	PSWQ	HOM
NEG	1	**.63*****	**-.43*****	**.20****	**.27*****	**-.43*****	-.05	**.34*****	**-.27*****	.06	**.24****	-.07	-.02	.08	**.16***
IU		1	**-.35*****	**-.30*****	**.33*****	**-.38*****	.09	**.36*****	**-.19***	-.02	**.44*****	-.10	-.004	**.29*****	.09
PSC			1	.003	-.12	**.51*****	**.22****	**-.35*****	**.45*****	**-.17***	-.10	**.16***	.04	-.09	-.10
TF				1	**.55*****	**-.20****	.07	**.21****	-.10	**.23****	**.36*****	.05	-.03	**.24****	.003
TI					1	**-.27*****	-.02	**.27*****	**-.22****	.13	**.36*****	-.08	-.11	**.22****	.10
COP						1	**.23****	**-.48*****	**.50*****	-.09	**-.27*****	**.15***	-.003	-.12	-.05
APP							1	**-.45*****	**.35*****	-.13	**.26****	**.21****	-.05	.14	.03
AVO								1	**-.39*****	.13	**.20****	-.13	.10	**.15***	.01
MOT									1	-.04	-.01	**.18***	.01	-.08	-.07
PR										1	.12	.04	-.02	.004	.08
WOR											1	.08	.001	**.49*****	.14
MON												1	**-.33*****	-.04	-.06
BLU													1	.10	-.06
PSWQ														1	-.06
HOM															1

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

NB. NEG = negative mood; IU = intolerance of uncertainty; PSC = problem-solving confidence; TF = threat frequency; TI = threat intensity; COP = coping belief; APP = approach; AVO = avoidance; MOT = motivation; PR = personal relevance; WOR = worry about threat; MON = monitoring subscale of the MBQ; BLU = blunting subscale of the MBQ; PSWQ = Penn State Worry Questionnaire; HOM = number of threat/neutral words spelt as threat words on homophone task.

Relative contributions of the worry promoters to threat perception and coping beliefs.

As indicated by the manipulation check descriptive statistics, and by the finding that between group differences on the outcome measures were often between mood and PSC groups, rather than the two mood groups, or two PSC groups, it is clear that the interactive effects of the variables on threat and coping should be considered. Two hierarchical regression analyses were conducted to examine the relative contributions of negative mood, IU, and low PSC (the predictor variables) to (1) threat perception and (2) coping (the outcome variables). There were two outcome measures of interest. Firstly, this analysis was designed to examine the relative contributions of the worry promoters to threat perception. The threat outcome measure comprised a composite measure of the two threat VAS items taken from the threat and coping VAS questionnaire: 'How many things that pose some threat do you think you will encounter over the next week?', and 'On average, how bad do you think the threatening things you may encounter will be?' Secondly, this analysis was designed to examine the relative contributions of the worry promoters to beliefs about coping. The coping outcome measure comprised a composite measure of the two coping VAS items taken from the threat and coping VAS questionnaire: 'To what extent do you think that you will have the ability to cope with any threatening situations that you encounter over the next week?', and 'How well will you cope with any threatening situations you encounter over the next week?'.

Participants had been exposed to a manipulation of either mood, IU and PSC. In order to control for this, the experimental condition that the participant was assigned to was entered in the first block of the regression model. The predictor items negative mood, IU and PSC were entered using a forced entry method. Two regressions were run, one with threat perception as the outcome variable, and the second with coping beliefs as the outcome variable.

Regression 1: Worry promoters and threat perception.

The final model was a significant fit of the threat perception scores, $F(4, 173) = 4.07$, $p = .004$, and explained 8.6% of variance in threat perception. Table 7.31 shows the regression coefficients for the two steps in the hierarchical regression. In the final model, negative mood was the sole significant predictor of threat perception, $t(173) = 3.46$, $p < .001$. Experimental condition, $t(173) = 1.47$, $p = .15$, IU, $t(173) = -0.46$, $p = .53$, and PSC, $t(173) = 0.58$, $p = .56$, were all non-significant predictors of threat perception.

Table7.31 Regression coefficients for the worry promoter and threat perception model

	b	*SE b*	*β*
Step 1			
Constant	87.27	6.71	
Experimental condition	1.40	1.72	.06
Step 2			
Constant	56.43	17.43	
Experimental condition	2.49	1.70	.11
Negative mood	0.58	0.17	.34*
IU	-0.04	0.06	-.06
PSC	0.12	0.21	.58

R^2 = .004 for step 1: ΔR^2 = .082 for step 2 (p = .002). *p = .001.

Given that the experimental manipulations may have resulted in changes to the distribution of scores for the variables, careful consideration was paid to the assumptions of regression. The tests of assumptions (see Appendix K) indicated that the model was reliable.

Regression 2: Worry promoters and coping beliefs.

The final model was a significant fit of the coping belief scores, $F(4, 170) = 29.45$, $p < .001$, and explained 40.9% of variance in coping beliefs. Table 7.32 shows the regression coefficients for the two steps in the hierarchical regression. In the final model, negative mood, $t(170) = -6.29$, $p < .001$, IU, $t(170) = 5.29$, $p < .001$, and PSC, $t(170) = 6.54$, $p < .001$, were all identified as significant predictors of coping. The results indicate that increased negativity predicts lower coping beliefs. Interestingly, high IU levels predicted higher coping beliefs. High PSC predicted higher coping beliefs. Experimental condition, $t(170) = 0.10$, $p = .90$ did not significantly predict coping beliefs.

Table 7.32 Regression coefficients for the worry promoter and coping beliefs model

	b	*SE b*	*β*
Step 1			
Constant	122.49	5.91	
Experimental condition	2.47	1.52	
Step 2			
Constant	81.81	12.42	
Experimental condition	0.12	1.21	.01
Negative mood	-0.75	0.12	-.50*
IU	0.21	0.04	.41*
PSC	0.12	0.21	.43*

R^2 = .015 for step 1: ΔR^2 = .394 for step 2 (p < .001). *p < .001.

Homophone task.

The homophone task provided another measure of threat interpretation, namely threat interpretation biases of ambiguous stimuli. A three-way mixed 6(manipulation condition) by 2(word type: threat/neutral vs. positive/neutral) by 2(word list: A vs. B) ANOVA was conducted, with word type as the repeated measures variable. There was a significant main effect of homophone type (threat/neutral vs. positive/neutral), $F(1, 168) = 228.88$, $p < .001$. The mean number of words spelt as threat for the threat/neutral words, and positive for positive/neutral words for each manipulation condition are shown in Table 7.33. The means indicate that compared to neutral interpretations, more positive interpretations (M = 10.51, SD = 1.79) were reported than threat interpretations (M = 7.70, SD = 1.83), but this was irrespective of manipulation condition. All other main effects, two-way and three-way interactions were non-significant, $Fs \leq 2.04$, $ps \geq .08$.

Table 7.33 Mean number of words spelt in threat form for the threat/neutral ('threat') and positive form for the positive/neutral ('positive') words, by word list and manipulation condition

	Word type	Negative mood *M (SD)*	Neutral mood *M (SD)*	High IU *M (SD)*	Low IU *M (SD)*	Low PSC *M (SD)*	High PSC *M (SD)*
A	Threat	7.93 (1.71)	7.53 (1.36)	7.40 (1.50)	7.63 (1.89)	7.63 (1.89)	8.21 (1.05)
	Positive	10.80 (0.86)	10.27 (1.71)	9.60 (1.62)	10.60 (2.29)	10.63 (2.00)	11.21 (1.53)
B	Threat	8.40 (2.16)	8.00 (2.04)	7.60 (2.03)	7.86 (2.11)	7.86 (2.11)	7.19 (2.17)
	Positive	9.27 (1.22)	9.60 (1.59)	10.73 (1.62)	11.00 (1.07)	11.14 (1.35)	10.75 (1.84)

Questionnaire measures.

One-way ANOVAs indicated that there was no significant difference between the manipulation conditions on the PSWQ, $F(5, 170) = 0.11$, $p = .99$, the MBQ Monitoring (M) subscale, $F(5, 172) = 0.87$, $p = .50$, or the MBQ Blunting (B) subscale, $F(5, 172) = 1.62$, $p = .16$. Descriptive statistics are shown in Table 7.34. Participants in the IU conditions also completed the IUS. Given that the IU manipulation was unsuccessful, the between-group comparison is meaningless, but the descriptive statistics are shown for information in Table 7.34. The PSC groups also completed the PSC subscale of the PSI. Independent *t*-tests indicated that there was no significant difference between the low PSC group and the high PSC group on the PSC subscale of the PSI, $t(58) = -1.47$, $p = .15$.

Table 7.34 Descriptive statistics for the validated questionnaires by manipulation condition

	Negative mood *M (SD)*	Neutral mood *M (SD)*	High IU *M (SD)*	Low IU *M (SD)*	Low PSC *M (SD)*	High PSC *M (SD)*
PSWQ	53.83 (13.16)	52.92 (13.05)	53.23 (12.53)	53.50 (15.24)	51.97 (13.33)	54.30 (10.27)
MBQ M	61.63 (12.72)	63.48 (14.09)	66.10 (13.69)	63.50 (13.06)	63.17 (14.80)	67.93 (11.93)
MBQ B	55.93 (12.36)	56.28 (13.81)	48.28 (13.79)	54.47 (17.92)	49.50 (14.72)	50.90 (14.75)
IUS	-	-	62.34 (16.71)	57.47 (16.36)	-	-
PSC	-	-	-	-	51.97 (13.33)	54.30 (10.27)

Assessing the validity of the Threat and Coping Questionnaire items.

To assess the construct validity of the threat and coping questionnaire items, a number of correlations were conducted. The threat frequency and threat intensity items correlated with one another as predicted, $r = .58$, $p < .001$. There was also a significant positive correlation between the threat frequency item and worry about threats, $r = .36$, $p < .001$, and the threat intensity item and worry about threats, $r = .36$, $p < .001$. However, there was no correlation between the threat frequency and intensity items and the number of words that were written using the 'threat' spelling on the homophone task, $rs \leq .10$, $ps > .05$. The threat worry item appeared to be a valid measure of worry as it correlated with scores on the PSWQ, $r = .49$, $p < .001$. The approach item had good validity as it correlated with the MBQ monitoring subscale, $r = .21$, $p < .01$. The validity of the avoidance items is questionable as the avoidance score did not correlate with the MBQ blunting subscale, $r = -.05$, $p > .05$. As predicted, individuals who felt that they would cope less well with threats were also more worried about threats, $r = -.27$, $p < .001$, providing some support that the coping items are measuring perceived ability to cope. The personal relevance and motivation items did not correlate, $r = -.04$, $p > .05$, raising questions around the validity of these two items. Consequently, the threat, worry, coping and approach items seem valid, but caution should be taken when interpreting the avoidance, personal relevance and motivation items.

Summary of results.

In summary, the negative mood induction resulted in higher self-reported feelings of sadness, anxiety, and negativity, as well as greater feelings of IU. The negative mood induction decreased motivation to approach threats, and increased desire to avoid threats, compared to the neutral and low PSC group, respectively. Negative mood was significantly positively correlated with anticipated threat frequency and intensity, worry about threats, and desire to avoid threats. Negative mood was significantly negatively correlated with coping beliefs and motivation.

The IU manipulation failed to induce differential amounts of IU between the high and low IU groups. Nonetheless, correlation analyses indicated that scores on a composite measure of IU were significantly positively correlated with anticipated threat frequency and intensity, worry about threats, and desire to avoid threats. IU was significantly negatively correlated with coping.

The low PSC manipulation resulted in lower self-reported PSC, as well as raised feelings of sadness, anxiety, negativity, and IU. Surprisingly, high PSC was correlated with higher worry about threats. Individuals with low PSC were less likely to think that they could cope with threats, were less willing to approach threats, and more likely to avoid threats.

7.4 Discussion

This experiment was designed to explore the influence that negative mood, IU and low PSC have on threat perception and coping beliefs. Firstly the results will be examined in relation to the predictions that negative mood, high IU and low PSC would result in (1) increased threat detection, (2) lower perceived ability to cope with any threats that were encountered, and (3) increased worry about threats. The relative contributions of the worry promoters to threat perception and coping will be discussed, before turning to consider the implications of the findings of this experiment for the role of systematic processing in worry. Lastly, limitations of the experimental manipulations will be discussed.

The relationship between worry promoters, threat perception and coping beliefs

The between-group analyses did not provide support for negative mood and PSC playing a causal role in heightened threat perception and decreased coping beliefs. IU groups were not included in these analyses due to the failed manipulation. One possible reason for why negative mood and low PSC did not alter threat perception and coping beliefs is that, while the manipulations did generate between-group differences in mood and PSC, there was wide variation post-manipulation within groups. This is probably due to some participants finding the mood and PSC manipulation procedures more evocative than others. The correlations provide much stronger support for the role of mood, IU and PSC in threat perception and coping, but do not provide insights into causation.

Prediction 1: Worry promoters and threat perception.

There was partial support, albeit of a correlational nature, for prediction 1, namely that the worry promoters would increase threat perception. Negative mood and IU were both correlated with raised expectations regarding the frequency and intensity of threats that would be encountered over the next week. Negative mood was also correlated with the number of words spelt as threat words when participants listened to ambiguous words (with neutral or threat spellings) as part of a homophone task.

Prediction 2: Worry promoters and coping beliefs.

There was also support from the correlation analyses for the worry promoters being related to how well an individual felt that they would cope with any threats that they encountered (prediction 2). Negative mood, high IU and low PSC were all associated with lower coping beliefs. Furthermore, all three worry promoters were associated with a greater desire to avoid threats. Low PSC was also associated with less willingness to approach threats. The experiment showed that being in a negative mood decreased participants' beliefs about their ability to cope with any threats that they encountered. This is consistent with the idea that negative moods are associated with pessimism (Segerstrom et al., 1998). Negative moods in the context of threats may indicate that the situation is beyond personal control. This leads to more emotion-focused coping strategies, and can include self-criticism for failing to prevent the threat. The decrease in coping beliefs shown by those in a negative mood suggests that the negative mood group may be relying on emotion-focused coping and are critical of their self-efficacy. This explanation is also consistent with feelings of personal inadequacy feeding into the worry process of high worriers (Davey & Levy, 1998). One possible mechanism for this is that negative moods result in semantic activation of memories when similar moods were experienced. If past negative moods have arisen from failures, current negative moods will strengthen associations between the current state and failing to cope.

IU negatively correlated with coping beliefs; individuals who were more distressed by uncertainty were less likely to believe that they would cope if they encountered threats. There have been few, if any, studies in the IU worry literature that have examined the way that IU impacts upon self-efficacy beliefs in relation to coping. The reduced confidence may feed into the feelings of personal inadequacy reported by worriers (Davey & Levy, 1998b). The correlational analyses did not indicate that IU was related to a general tendency to approach or avoid threats, but other coping factors, such as whether coping is emotion-focused or task-focused in high IU individuals could be explored in future experiments.

Low PSC increased the desire to avoid threats, which can be considered as avoidant coping, supporting the work of Davey (1993a).

Prediction 3: Worry promoters and worry about threats.

All three worry promoters were correlated with increased worry about threats (prediction 3). The finding that being in a negative mood is linked to greater worry about

threats is consistent with findings that worriers are more likely to be in a negative mood (Davey et al., 1992; Metzger et al., 1990; Meyer, et al., 1990). However, as the current finding is based on a correlation, it is unclear whether negative mood leads to more worrying, or more worrying leads to a negative mood. In fact, there is literature supporting both assertions (e.g., Johnston & Davey, 1997; Vasey & Borkovec, 1992), and an accurate reflection may be that negative mood functions to initiate and maintain worry bouts. The finding that IU is significantly correlated with worry about threats supports a large literature that implicates IU in worrying (e.g. Buhr & Dugas, 2006; de Bruin, Rassin, & Muris, 2007; Dugas, Gagnon, et al., 1998; Ladouceur, et al., 2000). Again, given the correlational nature of this analysis, it is not possible to comment on whether IU is a causal or outcome variable of worrying, but literature supports IU as a preceding factor of worry (e.g. Ladouceur, et al., 2000). A recent longitudinal study in adolescents supports the notion that there is a bidirectional and reciprocal relationship between IU and worrying, with each accounting for unique variance in the development of the other across time (Dugas, Laugesen, & Bukowski, 2012).

Prediction 4: Negative mood and factors that raise sufficiency thresholds.

Unexpectedly, negative mood was negatively correlated with motivation, and between-group differences indicated individuals in a negative mood were less motivated than individuals with low PSC. This is difficult to rectify with the finding in Experiment 1 that negative moods are associated with raised sufficiency thresholds, which increase the likelihood that systematic processing is deployed. Chaiken et al. (1989) state that individuals must be motivated to deploy systematic processing. Consequently, the finding that motivation levels were lower suggests individuals were actually less likely to deploy systematic processing. This may be due to the wording of the questions, and will be revisited in the General Discussion in Chapter 9.

Relative contributions of the worry promoters to threat perception

When all three worry promoters were included in the same regression model (i.e. they were controlled against one another) that negative mood was the sole significant predictor of threat perception. This supports numerous findings showing that negative mood is associated with threatening interpretations of ambiguous stimuli (e.g., Constans & Mathews, 1993; Blanchette & Richards, 2003; Richards, Reynolds & French, 1993; Blanchette & Richards, 2003; Johnson & Tversky, 1983). This may account for why individuals in a negative mood are

more likely to deploy systematic processing and 'as many as can' stop rules (see Experiment 1, Chapter 4) – it may be an attempt to deal with an increased perception that negative outcomes may arise through unresolved/unmanaged threats.

Relative contributions of the worry promoters to coping beliefs

When the worry promoters were included in one regression model, negative mood, IU, and low PSC were all found to correlate with significant predictors of coping beliefs. As predicted, negative mood has a negative relationship with coping beliefs and PSC has a positive relationship with coping (because high values represent high confidence, thus high confidence is linked to strong beliefs one will cope). IU, on the other hand, has the opposite relationship with coping beliefs than would be expected both from theory and from the results of the correlation analyses. IU was identified as a positive predictor of coping beliefs, indicating that as IU levels increase, coping beliefs also increase. This does not appear to be the result of multicollinearity as VIF and tolerance values were acceptable (Field, 2009). Instead, it appears to suggest that there may be shared variance in IU and the negative mood variable, accounting for the negative relationship identified between IU and coping in correlation analyses. When this variance is accounted for by including negative mood in the regression model, the additional variance that IU contributes actually relates to greater beliefs in coping. It is possible that this is because the individual who has high IU levels will not stop (i.e. they will perseverate, perhaps using an 'as many as can' stop rule, Davey, et al., 2005) until they feel that they have resolved their worry. Consequently, the individual with high IU may learn that they can cope with threats, but using coping methods that are less adaptive than non-worriers/low IU individuals.

Implications for the role of systematic processing in worry

The implications for understanding the role of systematic processing in worry will now be outlined. The regression analyses showed that negative mood was the strongest predictor of heightened threat detection. Experiment 1 showed that negative mood increased a composite score reflecting the sufficiency threshold. This experiment suggests that negative mood may have its effect on processing sufficiency thresholds through increasing the sense that a situation is threatening. Such appraisals, according to the HSM, increase the likelihood information relevant to the situation is systematically processed (Chaiken & Maheswaran, 1994; Bohner et al., 1998). However, the HSM also makes predictions about the role of

believing systematic processing can confer better judgements about a situation. Managing a situation through systematic processing (using information specific to the situation in a detailed manner in order to form a judgement) is similar to task-focused problem-solving, which worriers reportedly use less frequently than non-worriers (Matthews & Funke, 2006). This study found that a negative mood was associated with decreased motivation to deal with a threat and lower perceived coping skills, both of which are likely to thwart the deployment of systematic processing (Maheswaran & Chaiken, 1991; Chaiken et al., 1989). When considering the way in which worry, systematic processing, threat detection and coping relate to one another, it may be that threat detection and systematic processing are processes involved in vigilance to threat, and that if an individual feels that they cannot cope, they deploy worrying as an avoidant coping strategy, i.e. the 'vigilance-avoidance' model outlined in the introduction to this experiment.

Negative mood, IU and low PSC were all associated with decreased coping beliefs. In the HSM, low self-efficacy (such as believing one cannot cope or meet their sufficiency threshold) is linked to less use of systematic processing, and a reliance on heuristic processing. Consequently, this study offers an explanation for why negative mood caused increased sufficiency thresholds in Experiment 1 but IU and PSC did not cause increased sufficiency thresholds in Experiments 2 and 4. This study indicates that the lack of an effect of IU and PSC on sufficiency thresholds may be because they do not increase threat perceptions in the same way that negative mood was found to. A full understanding of the processing style profile of worriers will need to take into account characteristics of worriers that increase the deployment of systematic processing and the characteristics of worriers the decrease the deployment of systematic processing.

The literature on the HSM does not provide exact details of how much of an impact factors that promote systematic processing and factors that demote it have on the final choice of processing strategy. The relationship between the worry promoters and systematic and heuristic processing will be examined in more detail in the questionnaire study in Experiment 6 (see Chapter 8).

Experimental manipulations

Causal accounts of the role of the worry promoters in threat perception and coping beliefs can only be made on the basis of successful experimental manipulations. The mood

and PSC were both successful at generating between-group differences on mood and PSC measures respectively. Unfortunately, the manipulation of IU was unsuccessful at generating differential amounts of IU between the two groups; a clear limitation of this experiment. It is unclear why this manipulation was unsuccessful, although it is consistent with the failure to induce differential amounts of IU in Experiment 3, despite successfully manipulating IU levels with the same procedure in Experiment 2. One possibility is that the composite measure reflected a state part-way between dispositional IU tendencies, and raised/reduced state IU as a result of the manipulation (which may have been partially effective). Thus, the participants' IU appraisals may have returned to baseline by the end of the experiment when they completed the IUS. The mean scores for the IU manipulation check questions appear higher in both the high IU and the low IU groups, compared to the mood and PSC groups. It is possible that writing about an uncertain event in their life raised feelings of IU in participants in both IU groups.

One further methodological limitation of this study is that the manipulations of mood and PSC were not pure. The negative mood induction was also found to increase IU. This supports Tiedens and Linton's (2001) assertion that negative moods such as sadness and anxiety are related to uncertainty. Generally, a negative emotion signals that something is problematic, and when a situation is identified as problematic we are less likely to tolerate feeling uncertain as this may increase the chance of a negative outcome arising; an uncertain individual cannot be sure that their management of the problematic situation is effective. Furthermore, the PSC manipulation did not purely affect PSC levels; mood and IU were also affected by the false-feedback procedure. It seems logical that mood levels may drop (i.e. higher negative mood) when an individual receives feedback that they have performed badly on a test, and it is likely that most occasions where an individual reports low PSC they will also report negative mood. The construct overlap between the worry promoters examined in this thesis will be explored in Experiment 6 (see Chapter 8).

8 Worry and systematic processing: A questionnaire analysis

8.1 Introduction

This chapter seeks to verify the relationships between (1) worry, (2) worry promoters (negative mood, intolerance of uncertainty, IU, and low problem-solving confidence, PSC), and (3) systematic processing, as measured by published questionnaires. Correlation analyses examined the inter-relationships and a principal components analysis examined the number of constructs underlying these variables. Three key relationships were explored: (1) the relationship between worry and systematic processing; (2) the relationship between worry promoters and systematic processing; and (3) the relationship between worry promoters and worry.

Systematic processing and worry have common features and appear to have similar underpinnings. As described in Chapter 2, whether an individual deploys systematic processing is in part dependent upon their sufficiency threshold – the discrepancy between the desired amount of confidence in their judgement and the actual amount of confidence in their judgement. The greater this discrepancy (with actual confidence being lower than desired confidence), the more likely it is that an individual will deploy systematic processing (Chaiken, et al., 1989). A number of factors that raise sufficiency thresholds have been identified in the social psychology literature including responsibility and accountability – appraisals that have also been shown to be elevated in worriers (Wells & Carter, 2001; Wells & Papageorgiou, 1998). Furthermore, a number of dispositional characteristics of worriers are likely to raise their sufficiency thresholds as they strive to ensure they have met their goals successfully, such as perfectionism, IU and excessive concern over mistakes (Dugas, et al., 1997; Frost, et al., 1990; Pratt, et al., 1997; Stöber & Joormann, 2001b). Such characteristics are associated with the deployment of 'as many as can' (AMA) goals for determining when to stop worrying – AMA goals specify that one should continue worrying until as much has been done as possible (e.g. Davey, 2006b). Individuals deploying systematic processing in the context of worry may search for more information about their worry, and try to integrate all relevant information about the threat. What is more, many worriers hold the belief that worry is a necessary process in order to avoid future threats (Borkovec, et al.,

1999; Davey, Tallis, et al., 1996; Wells, 1995), which is likely to raise sufficiency thresholds for making judgements about worry-related situations.

Despite the similarities in the underpinnings of systematic processing and worry, systematic processing is deployed in a broad range of situations, from decision making (Steginga & Occhipinti, 2004) to attitude formation (Martin & Hewstone, 2003). As such, it is possible that systematic processing is more akin to the functional, problem-solving aspect of worry (e.g. Davey, et al., 1992). Davey (1994a) suggests that constructive problem-solving consists of logical analysis, information-seeking and active behavioural coping. Systematic processing may be a part of worrying up until the point that the normal problem-solving processes associated with more adaptive forms of worry become thwarted as pathological worrying sets in. Problem-solving may be thwarted by the worrier experiencing increasing distress (Vasey & Borkovec, 1992), catastrophic thinking (Davey & Levy, 1998b), and feeling that the worry process is uncontrollable (Borkovec, et al., 1983).

Experiments have shown that manipulating negative mood (Johnston & Davey, 1997), IU (Ladouceur, et al., 2000), and (low) PSC (Davey, Jubb, et al., 1996) increases worry perseveration. Negative mood is a promoter of analytic thinking and is implicated in systematic processing deployment (Ambady & Gray, 2002; Tiedens & Linton, 2001). The sorts of negative moods that have been linked to greater systematic processing are those associated with uncertainty. Bodenhausen et al. (1994) compared the impact of a negative mood associated with uncertainty (sadness) compared to a negative mood associated with certainty (anger) on information processing. Individuals in an angry mood were more likely to rely on heuristics (i.e. less likely to systematically process) than individuals in a sad mood. Uncertain negative mood states can inform the individual that they do not understand a situation, and that there is uncertainty about what will happen next (Tiedens & Linton, 2001). The appraisal that uncertainty is unpleasant is associated with information seeking. High IU individuals require more information in order to be confident in their decision making (e.g. Carleton, et al., 2007), suggesting that they possess a higher sufficiency threshold (desired level of confidence). The relationship between PSC and systematic processing is less clear from the literature. On the one hand, one would presume that having low confidence in one's judgements would lead to a greater discrepancy between actual confidence and desired level of confidence, leading to the deployment of systematic processing in an attempt to minimise this discrepancy (Chaiken, et al., 1989). On the other hand, Chaiken et al. (1989) argue that if

an individual does not believe that systematic processing is likely to confer extra confidence (i.e. their perceived self-efficacy is low), then an individual is unlikely to expend the cognitive energy required to process systematically. Consequently, this chapter will not only examine the way in which worry promoters relate to one another and to worrying, but also the way that worry promoters relate to systematic processing, as measured using a questionnaire.

Experiments 1-4 indicate that the manipulations of the worry promoters are not 'pure'. For example, inducing low PSC in Experiment 4 also increased negative mood. Using validated questionnaire measures of these constructs will allow the inter-relationships to be verified. Uncertainty is associated with negative moods relevant to worrying. For example, Tiedens and Linton (2001) focused on the certainty-uncertainty appraisal dimension, and argued that some emotions, such as fear and sadness, are linked to uncertainty, whereas other negative emotions, such as anger, are more associated with certainty. Individuals experiencing a negative mood may appraise this as indicative of uncertainty. Worries are typically concerns about whether bad things will happen in the future. Consequently, experiencing a negative mood, which signals uncertainty, in the context of a worry will probably be unpleasant. Additionally, research shows that problem-solving orientation and IU make shared, as well as unique, contributions to worry (Dugas, et al., 1997).

It is also important to consider how the variables negative mood, IU and low PSC relate to worry; are they separable or integral to the worry process? For example, negative mood appears to be an integral part of worry. Negative mood, was identified as a front-end driver of worry in Experiment 1, but also increases as worry bouts progress (Davey, et al., 2007; Vasey & Borkovec, 1992). The results from Experiments 2 and 4 indicated that IU and low PSC, respectively, did not *cause* increased worrying, but were, nonetheless, positively correlated with worrying. It is plausible that a single factor may underlie worry and the worry promoter variables.

8.1.4 Predictions

Correlational analyses.

A number of relationships were hypothesised to exist between the key variables explored in this thesis. Based on Experiment 1, it was predicted that there would be (1a) a significant positive correlation between worry and systematic processing, and (1b) a significant negative correlation between worry and heuristic processing

It was predicted that negative mood and IU would be (2a) significantly positively correlated with systematic processing, and (2b) significantly negatively correlated with heuristic processing. It was unclear from the literature what the nature of the relationship between PSC and systematic and heuristic processing would be. If it is presumed that having low PSC widens the discrepancy between actual confidence levels and desired confidence levels, then it can be predicted that PSC (high scores indicating high PSC) will be (3a) significantly negatively correlated with systematic processing, and (3b) significantly positively correlated with heuristic processing. Given the literature on self-efficacy and information processing, it was predicted that personal inadequacy would be (4a) significantly negatively correlated with systematic information processing, and (4b) significantly positively correlated with heuristic information processing.

Turning now to consider worry and worry promoter variables, based on the correlations from Experiments 1-5, it was predicted that the worry promoter variables would significantly correlate with worry, and specifically this would be (5a) a positive correlation for negative mood and IUS, and (5b) a negative correlation for PSC (due to high scores indicating a high amount of confidence). It was also predicted that the worry promoter variables would significantly correlate with one another given that the manipulations used in Experiments 1-5 affected more than worry promoter. Specifically, it was predicted that there would be (6a) a positive correlation between negative mood and IUS, and (6b) a negative correlation between PSC and the variables negative mood and IUS.

Principal components analyses.

The possibility that there may be construct overlap between the worry promoters has been raised at various points throughout this thesis. This notion stems largely from the finding that inducing mood, IU or PSC did not only affect mood, IU and PSC respectively, but rather the variables affected one another. In Chapter 2, there was also discussion around whether worry and systematic processing might share the same underpinnings. To understand the role of systematic processing in perseverative worry, it is important to determine that these are indeed separate things, and it is not the case that worry is a form of systematic processing. It was predicted that there would be construct overlap between some of the key variables considered in this thesis and this was examined using an exploratory principal components analysis.

8.2 Method

Participants

A total of 437 participants completed this study. Of these, 351 (80.3%) were female, and 86 were male (19.7%). Participants were aged 18-48 (M = 20.44, SD = 4.18). In terms of occupation, 433 participants reported being students at the University of Sussex (55 of these students reported also having a part-time job, and 1 reported having a full-time job). There were 393 people who reported studying psychology (or another subject with psychology), and 9 who reported studying a course other than psychology. There were 31 participants who reported that they were a student who did not specify the course that they were taking. The remaining four participants reported being in part-time employment (n = 2), full-time employment (n = 1), or unemployed (n = 1). All participants completed the study voluntarily. Those participants who studied psychology were remunerated with course credits.

Materials

In order to assess the relationship between worry, worry promoter variables, and systematic and heuristic processing, questionnaire measures were identified in the literature and administered to the participants. The most widely-used measures were selected. Details on these questionnaires are provided below. Worry was assessed using the Penn State Worry Questionnaire because this is the most widely used measure of worry frequency and worry-related distress that is irrespective of worry content, and is well validated (e.g. Brown, 2003; Brown, et al., 1992; Davey, 1993a). The Worry Stop Rule Checklist was also selected as this can indicate pathological worrying, with individuals who worry more deploying stringent rules for stopping their worrying when they have done as much as they can on a task (Davey, et al., 2005). Worry measures that focused on process, rather than content, were selected as it is aspects of the worry process that are most likely to be affected by the variables in question (negative mood, IU, poor PSC), which in turn increases the likelihood of elucidating potential mechanisms of perseverative worry. To measure the worry promoters, three well established questionnaires were utilised. Negative mood was assessed using the Positive Affect and Negative Affect Scales (Watson, et al., 1988), IU was assessed using the Intolerance of Uncertainty Scale (Freeston, et al., 1994), and poor PSC was assessed using the PSC subscale of the Personal Problem-Solving Inventory (Heppner & Petersen, 1982).

Turning to consider systematic and heuristic processing, there are few self-report measures of information processing styles. The scale used comes from the work conducted by Griffin, Neuwirth, Giese and Dunwoody (2002). In order to assess the validity of the Heuristic

Systematic Processing Questionnaire (HSPQ), measures of variables known to influence systematic processing (as reviewed in Chapters 2 and 4) were included: need for cognition and desire for control were measured using well established scales, the Need for Cognition Scale (Cacioppo, et al., 1984) and the Desirability of Control Scale (Burger & Cooper, 1979), respectively. To the author's knowledge, responsibility has not been assessed using questionnaires in the information processing literature, so a well-established measure of responsibility (the Responsibility Attitude Scale, Salkovskis, et al., 2000) used in the clinical literature was utilised. No questionnaire measure of accountability was identified, so accountability appraisals were not assessed in this study. Lastly, personal inadequacy was assessed using the most widely-used questionnaire measure, the Brief Symptom Inventory (Derogatis & Melisaratos, 1983).

Penn State Worry Questionnaire.

The Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990) is the most widely used valid measure of worry. It consists of 16-items (e.g., 'Many situations make me worry') and participants respond on a five-point Likert scale (1 = 'Not at all typical'; 5 = 'Very typical of me'). Five items are reverse-scored and total scores range from 16-80. Startup and Erickson (2006) report mean scores of 44.27 (*SD* = 11.44) for a group screened as *not* having GAD, 47.42 (*SD* = 13.40) in a student sample, and 67.16 (*SD* = 9.16) in a sample diagnosed with GAD. The PSWQ has good test-retest reliability (Meyer et al., 1990) and internal consistency (α = .90; Brown, Antony, & Barlow, 1992).

Worry Stop Rule Checklist.

The Worry Stop Rule Checklist (Davey, et al., 2007; Davey, et al., 2005) is a 19-item questionnaire assessing thoughts people have when deciding whether to continue or stop worrying. It has a two-factor structure, with one subscale representing an 'as many as can' (AMA) approach (10 items) including items such as 'I must find a solution to this problem, so keep thinking about it', and the second subscale representing a 'feel like continuing' (FLC) approach (9 items) including items such as 'Don't worry about it, things will get better'. Participants respond using a five-point Likert scale (1 = 'Not the kind of thing I think at all'; 5 = 'I think of this kind of thing a lot'). Scores are given for each subscale, and range from 10-50 for AMA and 9-45 for FLC. The subscales have good internal consistency: AMA α = .88, FLC α = .83 (Davey et al., 2007) but test-retest reliability has not been examined.

Positive and Negative Affect Scales.

The Positive and Negative Affect Scales (PANAS) (Watson, et al., 1988) consists of two subscales: (1) negative affect; (2) positive affect. The negative affect scale consists of items such as 'scared', 'distressed', and 'nervous'. The positive affect scale includes 'excited', 'inspired', and 'proud'. Participants respond on a five-point Likert scale (1 = 'Very slightly or not at all', 5 = 'very much'). Watson et al. (1988) report that they have used the PANAS with the following time periods: 'Moment', 'Today', 'Past few days', 'Week', 'Past few weeks', 'Year', and 'General'. The 'today' option was used in this study. The moment/today rating has good internal consistency (Negative affect subscale α = .85; Positive affect subscale α = .89). The PANAS has acceptable test-retest reliability (Watson, et al., 1988). Scores are calculated for each subscale, ranging from 10-50.

Intolerance of Uncertainty Scale.

The Intolerance of Uncertainty Scale (IUS; Freeston, Rheaume, Letarte, Dugas, & Ladouceur, 1994) is a 27-item scale assessing "emotional, cognitive and behavioral reactions to ambiguous situations, implications of being uncertain, and attempts to control the future" (Freeston et al., 1994, p. 791). It consists of items such as 'Uncertainty makes life intolerable'. Participants respond on a five-point Likert scale (1 = 'Not at all representative'*;* 5 = 'Completely representative'). Total scores range from 27–135. Freeston et al. (1994) found the IUS reliably distinguished individuals with GAD from those without GAD. The IUS has excellent internal consistency (α = .91; Freeston et al., 1994) and good test-retest reliability (Buhr & Dugas, 2002).

Problem-solving confidence subscale of the Personal Problem-Solving Inventory.

The PSC subscale is taken from Heppner and Petersen's (1982) Problem-Solving Inventory. It consists of 11-items (e.g., 'I trust my ability to solve new and difficult problems'). Participants respond on a 6-point Likert scale. In the original version, low scores indicated behaviours and attitudes associated with successful problem-solving, but in this study, the response scale was arranged so that high scores represented high PSC (1 = 'Does not describe me well'; 6 = 'Does describe me well'). Two items are reverse-scored. The problem-solving subscale has good internal consistency (α = .85) and good test-retest reliability (Heppner & Petersen, 1982).

Heuristic Systematic processing Questionnaire.

To assess general tendencies to use systematic or heuristic processing, participants completed Griffin, Neuwirth, Giese and Dunwoody's (2002) questionnaire designed to measure systematic and heuristic processing of information in response to information about an environmental hazard. The questionnaire has two subscales. One measures systematic processing (five items) and includes items such as 'After I encounter information about this topic, I am likely to stop and think about it'. The second subscale measures heuristic processing (four items), e.g., 'There is far more information on this topic than I personally need'. The questionnaire was adapted so that rather than answering the questions after reading information about hazards of fish consumption, the questionnaire referred more generally to people's preferences – the word 'this' was replaced with 'a'. Participants respond on a five-point Likert scale (1 = 'strongly disagree'; 5 = 'strongly agree'). Scores are provided for each subscale separately, ranging from 5-25 for the systematic processing subscale, and 4-20 for the heuristic processing subscale. Normative scores, and examination of the scale's internal consistency and test-retest reliability are not reported in the original publication. The two subscales measuring systematic processing and heuristic processing were supported through a factor analysis, which indicated a two-factor structure (Griffin, et al., 2002).

Responsibility Attitude Scale.

The Responsibility Attitude Scale (RAS: Salkovskis, Wroe, Gledhill, Morrison, Forrester, Richards, Reynolds, & Thorpe, 2000), is a 26-item questionnaire and includes items such as 'I must always think through the consequences of even the smallest actions'. The RAS measures responsibility beliefs, particularly elevated responsibility associated with obsessive-compulsive disorder. Participants respond using a 7-point Likert scale. In its original form, the RAS used the anchor points 1 = 'Totally agree' and 7 = 'Totally disagree', and scores were averaged by the 26 items, so that participants were given a score from 1-7. In this study, to increase the ease of interpretation, the scale was altered so that high scores represented high levels of responsibility (1 = 'Totally disagree'; 7 = 'Totally agree'). Participants were then given a total score ranging from 26-182. The RAS has excellent internal consistency ($\alpha = .92$) and test-retest reliability (Salkovskis, et al., 2000). The RAS was selected as a well-validated responsibility measure. However, it is derived from work with clinical populations. Thus, while it represents a continuum of responsibility appraisals, its derivation from clinical psychology means that it may be confounded with measures of worry.

Need for Cognition Scale (NFCS, Cacioppo, Petty, & Kao, 1984).

The Need for Cognition Scale (Cacioppo, Petty & Kao, 1984) is an 18-item questionnaire that assesses an individual's tendency to engage in effortful cognitive activity, and their enjoyment of this. The 18-item version is based on the 34-item version developed by Cacioppo and Petty (1982). It includes items such as 'I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something' (reverse-scored). Participants respond on a four-point Likert scale (1 = 'Completely false'; 4 = 'Completely true'). Scores range from 18-72. There are nine reverse-scored items. Test-retest reliability was not reported, but the scale has excellent internal consistency (α = .90).

Desire for Control Scale.

Burger and Cooper's (1979) Desirability of Control Scale (DCS) is a 20-item scale designed to assess the extent that an individual desires control over events in their life. Items include 'I would prefer to be a leader rather than a follower'. Participants respond on a seven-point Likert scale (1 = 'The statement doesn't apply to me at all'; 7 = 'The statement always applies to me'). Five items are reverse-scored, and total scores range from 20-140. The DCS has good test-retest reliability and internal consistency (α = .80) (Burger & Cooper, 1979).

Interpersonal Sensitivity subscale of the Brief Symptom Inventory.

The Interpersonal Sensitivity subscale is taken from the Brief Symptom Inventory (Derogatis & Melisaratos, 1983), which is itself a revised version of the Symptom Checklist-90 (SCL- 90) (Derogatis, 1977). According to Derogatis and Melisaratos (1983), the Interpersonal Sensitivity subscale "focuses on feelings of personal inadequacy and inferiority. Self-deprecation, feelings of uneasiness, and marked discomfort during interpersonal interactions are characteristic of persons with high levels of interpersonal sensitivity" (p. 596). This measure of personal inadequacy consists of four items, e.g., 'feeling inferior to others'. Participants respond on a five-point Likert scale (0 = 'not at all'; 4 = 'extremely'). In this study, scores were added across the four items, providing total scores that could range from 0–16. The Interpersonal Sensitivity subscale has adequate internal consistency (α = .74) and test-retest reliability (Derogatis & Melisaratos, 1983).

Procedure

This experiment was conducted online, and the participants had no direct contact with an experimenter. Participants signed up for the experiment using SONA (the University of Sussex participant recruitment system), which directed the participant to the Bristol Online

Survey site. Participants were informed about the nature of the study and provided informed consent by selecting a tick box. Participants completed the questionnaires listed above. Participants were then provided with debrief information and thanked for participating.

8.3 Results

Descriptive statistics

Descriptive statistics are provided for each of the questionnaires in Table 8.35. The questionnaires were administered electronically, and all items were programmed to be compulsory. However, on extracting the data from the software, it was found that there was missing data for each of the questionnaires (sample sizes shown in Table 8.35).

Table 8.35 Questionnaire descriptive statistics

Questionnaire	*n*	*M*	*SD*	Range
PSWQ	400	53.60[7]	11.71	19-80
AMA	436	26.30	8.40	10-50
FLC	436	24.91	8.63	9-45
NEG	430	17.73	7.57	10-49
POS	433	24.51	7.80	10-47
IUS	406	64.89	21.47	27-131
PSC	437	44.75	8.29	22-66
SP	437	9.93	2.69	5-23
HP	437	12.62	2.66	6-20
RAS	392	101.39	25.24	26-175
NFC	411	47.08	8.17	18-70
DC	407	88.12	13.77	39-133
PI	437	11.43	3.84	4-20

Note. PSWQ = Penn State Worry Questionnaire; AMA = 'as many as can'; FLC = 'feel like continuing'; NEG = PANAS negative affect subscale; POS = PANAS positive affects subscale; IUS = Intolerance of Uncertainty Scale; PSC = Problem-solving confidence; SP = systematic processing; HP = heuristic processing; RAS = Responsibility Attitude Scale; NFC = Need for Cognition; DC = Desirability of control; PI = personal inadequacy scale.

[7] An error meant that two of the PSWQ items were worded incorrectly. Consequently, PSWQ: 'My worries overwhelm me' (Q2) and 'When I am under pressure, I worry a lot' (Q6) were removed from the analyses.

Scale Total Correlations

Pearson correlation coefficients were obtained to examine the relationship between the total scores on each of the measures: PSWQ, SR Checklist (AMA subscale; FLC subscale), PANAS (Negative affect subscale; Positive affect scale), IUS, PSC, HSPQ (Systematic processing subscale; Heuristic processing subscale), RAS, NFC, DC, and Personal Inadequacy. Correlations are shown in Table 8.36.

- **(1a)** Prediction 1a was not supported. Worry was correlated with systematic processing, r = -.11, p < .05, but in the opposite direction to the prediction. Higher worry levels were associated with a lower tendency to deploy systematic processing.
- **(1b)** Prediction 1b was not supported; worry did not negatively correlate with heuristic processing, r = .07, p > .05. Higher levels of worry were not associated with generally less deployment of heuristic processing.
- **(2a)** Contrary to prediction 2a, there was no significant correlation between IU and systematic processing, r = .06, p > .05. Additionally, negative mood was not significantly correlated with systematic processing, r = .01, p > .05. However, positive mood was significantly negatively correlated with systematic processing, r = -.15, p < .01.
- **(2b)** Opposing prediction 2b, negative mood was not significantly negatively correlated with heuristic processing, r = .09, p > .05, nor was IU, r = -.05, p > .05.
- **(3a)** Prediction 3a was supported; there was a significant negative correlation between PSC and systematic processing. The lower an individual's PSC the greater the likelihood they would report a tendency to deploy systematic information processing, r = -.33, p < .001.
- **(3b)** Prediction 3b was supported; PSC was significantly positively correlated with the tendency to use heuristic processing, r = .24, p < .001. As an individual's self-reported confidence in their problem-solving increased, they were increasingly likely to report using heuristic processing.
- **(4a)** Prediction 4a was not supported; there was no significant correlation between personal inadequacy and systematic processing, r = .006, p > .05. Participants who endorsed higher feelings of personal inadequacy were not less likely to deploy systematic processing.

Table 8.36 Correlations between total scores on the worry and systematic processing measures

	PSWQ	AMA	FLC	NEG	POS	IUS	PSC [a]	SP	HP	RAS	NFC	DC	PI
PSWQ	1	**.45*****	**-.47*****	**.36*****	**-.12***	**.54*****	**-.34*****	**-.11***	.07	**.38*****	-.04	**-.14****	**.48*****
AMA		1	**-.34*****	**.35*****	**.12***	**.60*****	**-.11***	**-.16****	.001	**.50*****	.07	.07	**.40***
FLC			1	**-.17***	**.12***	**-.39*****	**.31*****	-.02	-.04	**-.34*****	-.02	**.12***	**-.25*****
NEG				1	-.06	**.48*****	**-.23*****	.01	.09	**.27*****	.01	-.06	**.48*****
POS					1	**-.14***	**.32*****	**-.15****	.08	-.06	**.22*****	**.19*****	**-.12***
IUS						1	**-.42*****	.06	-.05	**.49*****	**-.22*****	**-.20*****	**.55*****
PSC [a]							1	**-.33*****	**.24*****	**-.17****	**.56*****	**.65*****	**-.35*****
SP								1	**-.26*****	**-.18*****	**-.35*****	**-.34*****	.01
HP									1	.03	.41	**.24*****	-.04
RAS										1	.09	.01	**.40*****
NFC											1	**.58*****	**-.13****
DC												1	**-.19*****
PI													1

[a]PSC subscale, high scores represent high PSC. *$p < .05$, **$p < .01$, *** $p < .001$.

PSWQ = Penn State Worry Questionnaire; AMA = 'as many as can'; FLC = 'feel like continuing'; NEG = PANAS negative affect subscale; POS = PANAS positive affects subscale; IUS = Intolerance of Uncertainty Scale; PSC = Problem-solving confidence; SP = systematic processing; HP = heuristic processing; RAS = Responsibility Attitude Scale; NFC = Need for Cognition; DC = Desirability of control; PI = personal inadequacy scale.

- **(4b)** Prediction 4b was not supported; there was no significant correlation between personal inadequacy and heuristic processing, r = -.04, p > .05. Participants who reported high levels of personal inadequacy were not more likely to use heuristic processing.
- **(5a)** In support of prediction 5a, there was a significant positive correlation between worry and negative mood, r = .36, p < .001, and between worry and IU, r = .52, p < .001.
- **(5b)** Prediction 5b was supported; there was a negative correlation between PSC and worry, r = -.34, p < .001.
- **(6a)** Prediction 6a was supported; there was a significant positive correlation between negative mood and IU, r = .48, p < .001. Higher levels of negative mood are associated with higher levels of IU.
- **(6b)** Prediction 6b was supported; there was a significant negative correlation between PSC and negative mood, r = -.23, p < .001, and between PSC and IU, r = -.42, p < .001. Lower PSC is associated with both higher amounts of negative mood and higher levels of IU.

Additional correlations of interest.

Although beyond the predictions of this study, it is interesting to observe that AMA deployment, which may represent the way that systematic processing manifests in the worry process, is significantly positively correlated with negative mood, r = .35, p < .001, and IU, r = .60, p < .001, and negatively correlated with PSC, r = -.11, p < .05. Those who are in a negative mood, have high levels of IU, and low levels of PSC are more likely to endorse AMA stop rule use. Furthermore AMA was also negatively correlated with the systematic processing subscale of the HSPQ, r = -.16, p < .01. This indicates that as AMA endorsement increases, participants are less likely to use systematic processing.

Personal inadequacy significantly positively correlated with AMA endorsement, r = .40, p < .001, negative affect, r = .48, p < .001, IU, r = .55, p < .001, and the RAS, r = .40, p < .001. Personal inadequacy significantly negatively correlated with PSC confidence, r = -.35, p < .001, FLC endorsement, r = -.25, p < .001, positive affect, r = -.12, p < .05, and NFC, r = -.13, p < .05. In summary, the worry promoters correlate with higher feelings of personal inadequacy, as do worry, AMA and responsibility appraisals. High levels of FLC endorsement, positive affect and NFC, in contrast, are associated with lower feelings of personal inadequacy.

The correlations regarding the systematic processing facilitators and the measures of systematic processing and heuristic processing are somewhat counterintuitive. There was a significant negative correlation between responsibility and systematic processing, r = -.18, p < .001, and between NFC and systematic processing, r = -.35, p < .001, indicating that individuals are less likely to deploy systematic processing when they have high levels of responsibility or a strong NFC. There was no significant correlation between desire for control and systematic processing, r = -.002, p > .05. NFC positively correlated with heuristic processing, r = .41, p < .001, and as did desire for control, r = .01, p > .05. This suggests that individuals who desire high levels of cognition are more likely to use heuristic processing. There was no significant correlation between responsibility and heuristic processing, r = .03, p > .05. The pattern of results between the 'systematic processing facilitators' (which do not seem to have facilitated systematic processing) and HSPQ items raises some important questions around the validity of the HSPQ, which will be considered in the discussion.

In summary, the correlations indicate that the worry promoters are indeed related to worry, but negative mood, IU, and worry are not positively correlated with systematic processing. If anything, worry is negatively correlated with systematic processing, suggesting worriers do not have a general tendency to deploy systematic processing.

Principal components analysis

A principal components analysis with direct oblimin rotation was conducted to examine the factor structure of worry, worry promoters and systematic processing. It was intended to answer the following three questions: (1) Is worry a separate construct to systematic processing? (2) Are the worry promoters separate from systematic processing? (3) Are the worry promoters separate to worry or an integral part of the worry experience, reflecting a shared underlying factor?

The items from the PSWQ, the HSPC, the IUS, the negative mood subscale of the PANAS, and the PSC subscale of the PSI were entered into the principal components analysis. only those variables pertaining to the key questions were included to ensure the analysis had an adequate number of participants per variable.

The KMO statistic (0.94) was 'superb' according to Hutcheson and Sofroniou (1999), supporting the use of factor analysis. Similarly, Bartlett's test of sphericity supports that factor analysis is appropriate, $\chi^2(2346) = 17593.17$, p < .001.

Kaiser's (1960) criterion for extracting factors with eigenvalues above 1 was deemed unreliable as the condition of average communalities exceeding 0.6 was not met (Field, 2009). Examination of the scree plot (Figure 8.10) indicated a four-factor solution. Consequently, the principal components analysis was re-run, with a four-factor extraction specified. The factors extracted, and the items with loadings greater than .4 are shown in Table 8.37.

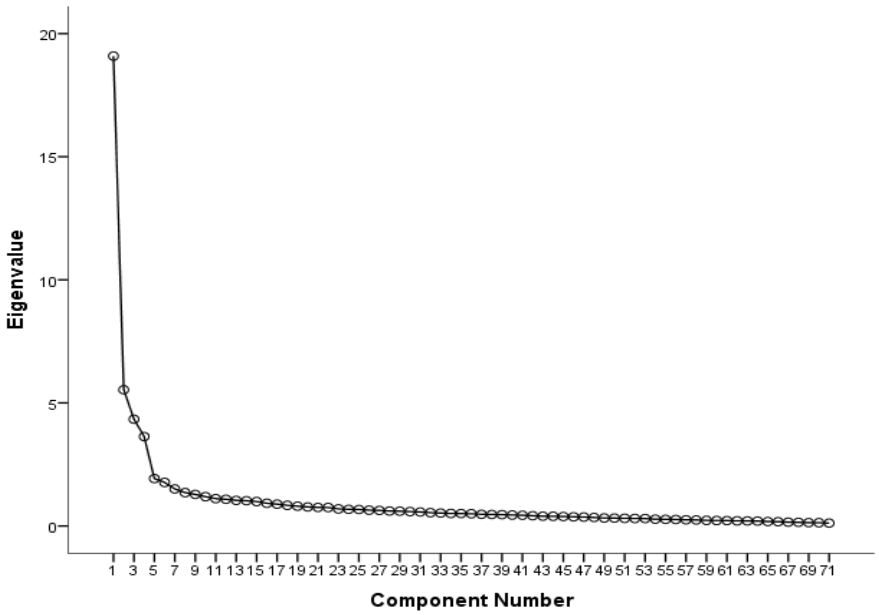


Figure 8.10 Scree plot showing the components and their corresponding eigenvalues for the worry, worry promoter, and information processing items.

Table 8.37 Factor loadings for the worry, worry promoter, and information processing items

Item	Factor			
	1	2	3	4
Factor 1: IU				
IUS-Q26: The ambiguities in life stress me	.79			
IUS-Q10: One should always look ahead so as to avoid surprises	.76			
IUS-Q25: I must get away from all uncertain situations	.76			
IUS-Q15: When I am uncertain, I can't function very well	.75			
IUS-Q14: When I am uncertain, I can't go forward	.75			
IUS-Q19: I can't stand being taken by surprise	.73			
IUS-Q17: Uncertainty makes me vulnerable, unhappy or sad	.73			
IUS-Q7: Unforseen events upset me greatly	.73			
IUS-Q18: I always want to know what the future has in store for me	.72			
IUS-Q27: I can't stand being undecided about my future	.72			
IUS-Q9: Uncertainty keeps me from living a full life	.71			
IUS-Q5: My mind can't be relaxed if I don't know what will happen tomorrow	.70			
IUS-Q6: Uncertainty makes me uneasy, anxious or stressed	.70			
IUS-Q21: I should be able to organize everything in advance	.69			
IUS-Q12: When it's time to act, uncertainty paralyses me	.68			
IUS-Q13: Being uncertain means I am not first rate	.67			
IUS-Q3: Uncertainty makes life intolerable	.65			
IUS-Q11: A small unforeseen event can spoil everything, even with the best planning	.65			
IUS-Q8: It frustrates me not having all the information I need	.64			
IUS-Q20: The smallest doubt can stop me from acting	.64			
IUS-Q22: Being uncertain means that I lack confidence	.61			
IUS-Q24: Uncertainty keeps me from sleeping soundly	.60			
IUS-Q4: It's unfair having no guarantees in life	.59			
IUS-Q2: Being uncertain means that a person is disorganised	.51			
IUS-Q23: I think it's unfair that other people seem to be sure about their future	.50			
IUS-Q16: Unlike me, others seem to know where they are going with their lives	.45			
IUS-Q1: Uncertainty stops me from having a strong opinion	.41			
Factor 2:Dealing with problems and information				

PSC-Q6: Given enough time and effort, I believe I can solve most problems that confront me	.75	
PSC-Q2: I have the ability to solve most problems even though no solution is immediately apparent	.73	
PSC-Q5: When I make plans to solve a problem, I am almost certain that I can make them work	.72	
PSC-Q8: I trust my ability to solve new and difficult problems	.69	
PSC-Q7: When faced with a novel situation I have confidence that I can handle any problems that may arise	.68	
PSC-Q11: When I become aware of a problem, one of the first things I do is try and find out exactly what the problem is	.64	
PSC-Q1: I am usually able to think up creative and effective alternatives to solve a problem	.63	
PSC-Q9: After making a decision, the outcome I expected usually matches the actual outcome	.61	
HSPQ-Q3: After thinking about a topic, I have a broader understanding	-.57	
HSPQ-Q8: When I see or hear information about a topic, I rarely spend much time thinking about it	.52	
PSC-Q4: I make decisions and am happy with them later	.51	
HSPQ-Q4: When I encounter information about a topic, I read or listen to most of it, even though I may not agree with its perspective	-.45	
HSPQ-Q1: After I encounter information about a topic, I am likely to stop and think about it	-.43	
HSPQ-Q2: If I need to act on a matter, the more viewpoints I get the better	-.41	
Factor 3: PSWQ		
PSWQ-Q5: I know I should not worry about things, but I just cannot help it		-.77
PSWQ-Q4: Many situations make me worry		-.72
PSWQ-Q13: I notice that I have been worrying about things		-.70
PSWQ-Q14: Once I start worrying, I cannot stop		.69
PSWQ-Q10: I never worry about anything		-.69
PSWQ-Q7: I am always worrying about something		-.69
PSWQ-Q3: I do not tend to worry about things		.64
PSWQ-Q15: I worry all the time		-.64
PSWQ-Q9: As soon as I finish one task, I start to worry about something else I have to do		-.62
PSWQ-Q8: I find it easy to dismiss worrisome thoughts		.63

PSWQ-Q12: I have been a worrier all my life			-.62	
PSWQ-Q16: I worry about projects until they are done			-.59	
PSWQ-Q11: When there is nothing more I can do about a concern, I do not worry about it any more			.58	
PSWQ-Q1: If I do not have enough time to do everything, I do not worry about it			.53	
Factor 4 negative affect				
PANAS-Q7: Scared				.80
PANAS-Q20: Afraid				.79
PANAS-Q13: Ashamed				.69
PANAS-Q2: Distressed				.66
PANAS-Q4: Upset				.65
PANAS-Q18: Jittery				.65
PANAS-Q15: Nervous				.64
PANAS-Q6: Guilty				.62
PANAS-Q8: Hostile				.58
PANAS-Q11: Irritable				.55
Eigenvalue	19.09	5.53	4.34	3.63
Note. Only loadings greater than .4 are shown				

Five items did not have loadings greater than .4 on any of the factors: HSPQ-Q9 'If I need to act on a matter, the advice of one expert is enough for me'; HSPQ-Q5 'It is important for me to interpret information about a topic in a way that applies directly to my life'; HSPQ-Q6 'When I encounter information about a topic I focus on only a few key points'; PSC-Q3 'Many problems I face are too complex for me to solve' (Q3); PSC-Q10 'When confronted with a problem, I am unsure of whether I can handle the situation'.

Factor one contains 27 items that represent IU, containing all 27 items from the IUS. The items loading on this factor are shown in Table 8.37. The IU factor (IUS scale) accounted for 19.09% of the variance. The IUS had excellent internal consistency, $\alpha = .96$, (Field, 2009).

Factor two contains 14 items (see Table 8.37), which appear to represent dealing with problems and information. Factor 2 contains nine items from the PSI PSC subscale and four items from the HSPQ systematic processing subscale. The systematic processing items were reverse-loaded. Factor 2 also included one item from the heuristic processing HSPQ subscale: 'When I see or hear information about a topic, I rarely spend much time thinking about it'.

This factor accounted for 5.53% of the variance. The dealing with problems and information factor had good internal consistency, α = .77.

Factor three represents worry, and contains all 14 items that were included from the PSWQ (see Table 8.37). Items reflecting high worry levels were reverse-loaded, while reverse-scored items on the PSWQ did not have reversed loadings. The worry factor accounted for 4.34% of the variance. The worry factor had excellent internal consistency, α = .92.

Factor four represents negative affect. It contains all 10 items of the PANAS negative affect subscale. The negative affect factor accounted for 3.63% of the variance. The negative affect factor had excellent internal consistency, α = .88.

8.4 Discussion

This questionnaire study explored the relationships between: (1) worry and information processing styles; (2) worry promoters (negative mood, IU, and low PSC) and information processing styles; (3) the worry promoters, and their relationship with worry. Potential relationships were investigated through correlation analyses. A principal components analysis was also conducted to examine the factor structure of the variables. Of particular interest was whether the variables emerged as separate factors, or whether a one-factor solution, indicating a shared underlying construct, fitted the data better.

It was predicted that worry would positively correlate with systematic information processing and negatively correlate with heuristic processing. Worry significantly negatively correlated with the general measure of systematic processing. Consequently, this suggests that worriers have a general tendency to avoid deploying systematic processing. This does not negate the possibility that worriers may deploy systematic processing when considering information related specifically to worry thoughts (as indicated in the raised sufficiency thresholds in Experiment 1). Future studies could examine whether adapting the measures to reflect systematic processing about worries/threat information shows a positive relationship with worry frequency and distress. It is important to recognise that at the extreme end, the PSWQ is a measure of pathological worry (Fresco, Mennin, Heimberg, & Turk, 2003), and it may be that systematic processing is associated with more adaptive forms of worry-like processes, such as problem-solving. AMA stop rule endorsement was also negatively correlated with systematic processing. AMA is closely related to perseverative, catastrophic

worry, and worriers have been shown to deploy AMA stop rules for their worrying more readily than non-worriers (Davey, et al., 2005; Startup & Davey, 2001). This finding indicates that individuals who are likely to worry more are in actual fact less likely to use systematic processing. While this seems at odds with the finding that negative mood states cause raised sufficiency thresholds, one possible explanation for this is that other characteristics that accompany worry, such as thoughts of personal inadequacy (Davey & Levy, 1998b), mean that the worriers do not feel confident that systematic processing will assist them in reaching their sufficiency threshold/enable them to do 'as much as they can'. According to Chaiken et al. (1989) this lack of belief in systematic processing assisting in the attainment of the sufficiency threshold will prevent the extra cognitive energy being expended on systematic processing, and the individual will use heuristic processing instead. Worriers may deploy AMA stop rules as a way of identifying all of the things that could go wrong, rather than attempting to strategise and select solutions for these potential problems based on systematic processing. Another possibility is that AMA deployment requires greater cognitive energy, and thus the worrier has less working memory resources available. Indeed, research supports the notion that worriers have lower working memory (Hayes, Hirsch, & Mathews, 2008; Leigh & Hirsch, 2011). Low working memory is associated with greater reliance on a processing system with less capacity demands (i.e. heuristic processing within the HSM), and less use of a processing system with high capacity demands (i.e. systematic processing within the HSM) (Neys, 2006). Additionally, the correlations between measures known to promote systematic processing (responsibility, NFC and desire for control) suggest that this particular measure of systematic processing is tapping something different. This is because these measures were negatively correlated with systematic processing, rather than positively correlated, as would be predicted. One possible explanation is that these 'promoters' actually relate to appraisal processes designed to increase systematic processing, rather than reflecting the systematic processing itself.

There was a significant negative correlation between PSC and systematic processing, indicating that individuals with low PSC were more likely to endorse using systematic processing. Consistent with this, there was a significant positive correlation between PSC and heuristic processing, suggesting that individuals who are confident in their problem-solving are more likely to report using heuristic processing. These results indicate that when individuals are not confident that they have solved a problem adequately, they are more likely to think carefully about the problem, seek more information, and relate information to

existing knowledge (i.e. systematically process). Thus, it appears that low PSC does not undermine an individual's general tendency to use systematic processing. However, it must be stressed that the direction of causation is not clear from the correlational analysis. It may well be that individuals who find systematic processing does not enable them to meet their sufficiency threshold develop low PSC. There was no significant correlation between negative mood and the information processing styles, or between IU and the information processing styles.

Participants' scores on the PSWQ were significantly correlated with the worry-related variables in the predicted direction: negative mood and IUS were positively correlated with PSWQ scores, and high PSC was negatively correlated with PSWQ. The worry promoter variables also correlated with one another in the predicted manner: PANAS negative affect scores were significantly positively correlated with scores on the IUS, and both the PANAS negative affect scores and the IUS scores were significantly negatively correlated with high PSC.

The principal components analysis did not support a one-factor solution; four separate factors emerged representing IU, dealing with problems and information, worry, and negative affect. This highlights that worry and systematic processing are indeed different processes, despite their similarities in terms of being verbally-based analytical processes involving raised sufficiency thresholds, and overlapping neuroanatomical regions. Where construct overlap is apparent is between systematic processing and low PSC. The items from these two scales loaded onto the same factor (Factor 2: Dealing with problems and information). This implies that systematic processing may be more linked to the problem-solving aspects of worry, and this will be revisited in the general discussion (Chapter 9).

Lastly, there are limitations in this study, which should be addressed in future work. Firstly, the measures used were a mixture of trait measures and a state measure (the PANAS). Using questions about specific worry-related incidents would provide a better understanding of the role that systematic processing plays in perseverative worry. Secondly, the measure of systematic processing and heuristic processing has not been used in this general way before, and there are questions around its psychometric properties. It would be useful to validate this questionnaire by correlating it with additional measures of systematic processing (such as thought-listing, time taken to consider the issue and information presented, etc). Thirdly, the participants in this study were predominantly a female, student sample. It is possible that

students experience a heightened period of worry during their studying (the PSWQ mean score is quite high), which may interfere with the general relationships that exist between these variables at other developmental time-points. However, it seems unlikely that sample characteristics are responsible as the ranges of scores on the questionnaires (see Table 8.37) occupy the full spectrum of possible scores. Lastly, it may be that individuals are not very aware of their reliance on systematic and heuristic processing (particularly heuristic processing) and are reporting what they think they would do, rather than what they actually do. However, if this was the case, it would seem likely that worriers who frequently display high levels of perfectionism (Stöber & Joormann, 2001b) and elevated evidence requirements (Tallis, et al., 1991) would report using systematic processing more than non-worriers, rather than the other way around as found in this study.

In summary, this study has demonstrated that worriers are generally less likely to deploy systematic processing. Secondly, this study supports the evidence for pathological worrying being associated with negative mood, IU, and low PSC. Lastly, this study does not support the notion that negative mood is associated with general use of systematic processing. Instead, a positive mood was associated with greater endorsement of systematic processing. This may reflect the general measure of systematic processing used. A measure that was tailored to a specific, threatening situation may have resulted in the predicted pattern of results. Low PSC was found to be related to deploying more systematic processing, and there appears to be some construct overlap between PSC and systematic processing. This may reflect that problem-solving is intimately linked to systematic processing, and some individuals feel that they need to deploy careful processing to compensate for a (believed) lack of problem-solving skills.

9 General Discussion

9.1 Introduction

This thesis aims to enhance understanding of the role that negative mood, intolerance of uncertainty (IU) and low problem-solving confidence (PSC) have in worry perseveration. In particular, it investigates whether systematic information processing (Chaiken, et al., 1989) is a proximal mechanism through which these worry promoters exert an effect on worry perseveration.

Negative mood, IU, and low PSC have been shown to increase worry perseveration (Davey, Jubb, et al., 1996; Johnston & Davey, 1997; Ladouceur, et al., 2000; Startup & Davey, 2001). However, little is known about the mechanisms accounting for these findings. One possible mechanism is systematic information processing, which is defined as "a comprehensive, analytic orientation in which perceivers access and scrutinize all useful information in forming their judgments" (Chaiken, 1980, p. 212). As outlined in Chapter 2, there is empirical support for negative mood increasing the deployment of systematic processing (Ambady & Gray, 2002; Batra & Stayman, 1990; Tiedens & Linton, 2001). Furthermore, there is a theoretical rationale for suggesting that worry promoters should raise sufficiency thresholds. Firstly, negative mood states provide information about existing threats that require further consideration (Cervone, et al., 1994; Scott & Cervone, 2002). Secondly, individuals with high IU require more information when making decisions (Rosen & Knäuper, 2009), which fits with the notion that systematic processing involves searching for, and integrating information. Finally, low PSC may widen the gap between an individual's desired and actual confidence levels, triggering systematic processing (Chaiken, et al., 1989). This thesis has included experimentally manipulating the worry promoters and examining the impact that they have on an individual's sufficiency threshold (which determines whether systematic processing is deployed), threat perception (which is linked to an individual's sufficiency threshold), and coping/self-efficacy beliefs (which can thwart deployment of systematic processing if they are low). Additionally, this thesis has examined relationships between worry, the worry promoters, and systematic processing. This chapter will review the findings from the experimental work and consider implications regarding the role of systematic processing in worry. There will then be a discussion of the limitations of the

experimental work conducted in this thesis, before recommendations are made for future work.

9.2 Main findings: A review

Experiment 1: Negative mood and appraisals that facilitate systematic information processing

Experiment 1 examined whether systematic processing may be a mechanism through which negative mood increases worry. A mood induction based on a procedure used by Scott and Cervone (2002) generated differential mood states amongst participants, who then completed a measure of their sufficiency threshold. The sufficiency threshold represents the amount of processing that an individual feels is necessary in order to minimize any discrepancy between the amount of confidence that they have in their decision/judgement and their desired level of confidence (Chaiken, et al., 1989). When considering worry, this may refer to an individual's confidence that they have met their goals for worrying. Participants also completed behavioural and self-report measures of worry. Individuals induced into a negative mood state reported higher sufficiency thresholds than individuals induced into a neutral mood state, indicating that individuals in a negative mood state were more likely to deploy systematic processing. This supports and extends previous work showing that negative mood states increase systematic processing (Ambady & Gray, 2002; Armitage, et al., 1999; Batra & Stayman, 1990; Bodenhausen, et al., 1994; Bohner, et al., 1988; Bohner, et al., 1992; Tiedens & Linton, 2001). Inclusion of a cognitive priming mood induction indicated that these findings could not be explained simply by priming, as the cognitive priming group (who did not experience the same mood changes but heard the same negative words) did not show raised sufficiency thresholds. The negative mood group also more readily endorsed using an 'as many as can' (AMA) stop rule for worrying (whereby the individual strives to do all that they can before ceasing to continue with a task). Following the mood induction, self-reported worry was greater in the negative mood group than in the neutral mood group. A mediation analysis indicated that an individual's sufficiency threshold and their endorsement of deploying an AMA stop rule fully mediated the link between negative mood and worrying. This experiment is consistent with work showing that negative mood can cause perseverative worry (Johnston & Davey, 1997; Startup & Davey, 2001), and suggests that raised sufficiency thresholds are a mechanism for this.

Experiments 2 & 3: Intolerance of uncertainty and appraisals that facilitate systematic information processing

The aim of Experiment 2 was to explore whether IU also exerted an effect on worry through a mechanism of systematic processing. IU was hypothesised to raise sufficiency thresholds because it is associated with increased information-seeking (Rosen & Knäuper, 2009) and a strong desire to control uncertain situations (Freeston, et al., 1994). Participants underwent either a high or low IU manipulation using vignettes containing a character who exhibited either negative or positive appraisals of uncertainty, respectively (based on Kelly, 2009). The IU manipulation was successful at generating differential amounts of IU between the high and low IU groups. IU correlated with PSWQ scores, but not CI steps. Furthermore, there was no difference between the high and low IU groups on self-report or behavioural measures of worry. This counters earlier experimental manipulations which indicated that experimentally increasing IU caused increases in worry (Ladouceur, et al., 2000). The lack of group differences on the CI is consistent with an experiment conducted by Deschenes et al. (2010), who failed to find that inducing IU increased the number of steps generated on the CI. Also, while IU correlated with sufficiency thresholds for one worry vignette, it did not for the other worry vignette. Nor were there differences between the groups on the sufficiency thresholds for either vignette. Experiment 2 measured an individual's sufficiency threshold in a different way to Experiment 1, and this could explain why IU was not found to increase sufficiency threshold levels. The change in assessment of the sufficiency threshold was to enable assessment of personal relevance and task importance. It also meant that the questions could be phrased in a way that didn't include the word 'worry', which was a potential confound of Experiment 1. In Experiment 1, participants were asked to imagine that they were worrying, and then were asked to think about appraisals related to systematic processing (e.g., accountability: 'the extent to which you feel that you may have to justify your worries to others'). In Experiment 2, participants read two vignettes in which a character was worrying about their finances or coursework. After reading the vignettes, participants were asked to imagine they were the character in the story, and were asked to think about appraisals related to systematic processing (e.g., accountability: 'Imagine you are in [character's name] position and have to share your thoughts with others. To what extent would you want to make sure you could justify your thoughts to others?'). A number of studies have highlighted that systematic processing is more likely when a situation is personally relevant (Chaiken, et al., 1989; Chen & Chaiken, 1999; Smith & Shaffer, 1991), and

it is plausible that asking participants to read a third-person vignette reduces the motivation to systematically process.

Experiment 3 was conducted in order to determine whether differences in methodology may explain why negative mood caused increased sufficiency thresholds (Experiment 1) while IU did not (Experiment 2). Thus, Experiment 3 was an amalgamation of Experiments 1 and 2 in that participants underwent the same manipulation of IU that participants underwent in Experiment 2, but the measure of the sufficiency threshold was the same as that used in Experiment 1 (i.e. it was based on questions phrased in the first-person, rather than imagining a third-person character). The IU manipulation was unsuccessful in Experiment 3, despite using the same methodology as the successful manipulation in Experiment 2. Consequently, correlation analyses (rather than between-groups analyses) were examined. IU significantly positively correlated with sufficiency thresholds, AMA deployment, and worry. This is the first experiment to explicitly demonstrate that IU correlates with AMA deployment, and supports previous research detailing an association between IU and worry (e.g. Buhr & Dugas, 2006; de Bruin, et al., 2007).

Experiment 4: Problem-solving confidence and appraisals that facilitate systematic information processing

Experiment 4 was designed to investigate whether a third worry promoter, low PSC (Davey, Jubb, et al., 1996), might increase worry by affecting systematic processing deployment. The literature did not clearly predict whether low PSC would increase or decrease systematic processing. It could be anticipated that low PSC would increase systematic processing as low confidence results in a greater discrepancy between actual and desired confidence levels. Alternatively, low PSC might decrease systematic processing because low levels of confidence in oneself having the ability to resolve a situation through systematic processing leads to increased reliance on heuristic processing (Chaiken, et al., 1989). Participants underwent a PSC manipulation utilising false-feedback (based on Davey, Jubb, et al., 1996). Participants who were informed that they had done poorly on the problem-solving task reported lower PSC than participants who were told that they had performed well on the problem-solving scenarios. The results indicated that there was no significant difference between the low and high PSC groups on the sufficiency threshold measures or the worry measures. However, scores on the PSC subscale of the Personal Problem-Solving Inventory were negatively correlated with PSWQ scores, indicating that lower PSC is

associated with higher worry levels. The results suggest that low PSC is related to perseverative worry, but did not replicate the finding that low PSC is a causal factor.

Experiment 5: The impact of worry promoters on searching for and coping with threat

Given that the findings from Experiments 1-4 generated mixed results about the role of systematic processing in perseverative worry, Experiment 5 was designed to explore whether the worry promoters may influence different aspects of the worry process, namely threat detection and coping with threats. The same manipulations were used as in Experiments 1-4, and participants completed measures relating to threat detection and coping beliefs. Threat detection is linked to increased systematic processing (e.g. Baron, et al., 1994), while low self-efficacy/coping beliefs are associated with reduced systematic processing (Chaiken, et al., 1989).

Experiment 5 demonstrated that an induced negative mood state was associated with reduced motivation and coping beliefs, but not with increased threat detection, compared to a neutral mood state. However, there was wide variation in the negative mood scores following the induction, and when correlation analyses were conducted, negative mood predicted higher levels of expected threat frequency, threat intensity, desire to avoid threats, worry about threats, and personal relevance. These are all factors likely to increase the deployment of systematic processing. Additionally, negative mood predicted low coping beliefs and motivation, factors which may thwart the deployment of cognitively demanding systematic processing. However, the finding that low mood predicted low motivation is a likely effect of the way the questions were phrased; participants may not be motivated to deal with issues *quickly* as they may wish to take care and consider the issues.

Despite successful use of the IU manipulation in Experiment 2 and in work conducted by Kelly (2009) the IU manipulation did not generate differences in IU between the 'high' and 'low' participants. Correlation analyses indicated that IU was associated with increased worry and lower coping beliefs. IU was also positively correlated with threat frequency and intensity estimations, but not with threatening interpretations of ambiguity.

The PSC manipulation generated significant differences on measures of PSC, but not between-group differences in threat perception or coping beliefs. However, PSC correlated

with coping beliefs; individuals with low PSC felt less equipped to cope with threats. PSC did not correlate with threat estimations.

Regression analyses examined the relative contributions of worry promoters to threat perception and coping beliefs. Negative mood was identified as the sole worry promoter that significantly predicted threat perception. This supports numerous findings showing that negative mood is associated with threatening interpretations of ambiguous stimuli (e.g., Constans & Mathews, 1993; Blanchette & Richards, 2003; Richards, Reynolds, & French, 1993; Johnson & Tversky, 1983). This may account for why individuals in a negative mood were found to be more likely to deploy systematic processing and deploy AMA stop rules (Experiment 1) – it may be an attempt to deal with an increased perception that negative outcomes may arise through unresolved/unmanaged threats. It also suggests that the association between IU and increased threat estimations is accounted for by negative mood related to the IU experience.

Experiment 6: Worry and systematic processing: A questionnaire analysis

This work has focused on the role that systematic processing plays in worry, and has examined whether worry promoters act as systematic processing facilitators or thwarters. Experiment 6 investigated the relationships between measures of worry, worry promoters, and systematic processing. It also aimed to clarify the ways the worry promoters relate to one another. Participants completed questionnaire measures of worry, worry promoters and information processing styles. Worry negatively correlated with systematic processing, as did AMA deployment. These results show that worriers do not possess a general tendency to deploy systematic processing. The results may be different if a threat context was provided. Negative mood correlated positively with IU and negatively with PSC, and IU negatively correlated with PSC. Systematic processing negatively correlated with PSC, and there was some indication that these two constructs overlap as they were identified as occupying the same factor in a principal components analysis. This suggests an intimate link between systematic processing and problem-solving, and this may mean that systematic processing plays a greater role in adaptive problem-solving worry.

9.3 Theoretical implications

This thesis attempts to expand understanding of the mechanisms involved in perseverative worry, focusing on systematic information processing as a candidate mechanism. Specifically, this thesis has examined whether negative mood, IU, and PSC increase sufficiency thresholds, threat perception and coping beliefs. In this section, the three worry promoters will be considered in turn.

9.3.1 Negative mood

Negative mood increased sufficiency thresholds and threat perception, both of which promote systematic processing. Interestingly, negative mood was associated with lower levels of motivation and coping beliefs, which reduce the likely deployment of systematic processing. The relationship between negative mood and worry was supported in Experiments 1 (PSWQ) and 5 (worry about threats), but negative mood did not increase catastrophising steps (Experiment 1).

Experiment 1 supported work demonstrating an association between endemic negative mood and perseverative worry (Davey, et al., 1992; Metzger, et al., 1990; Meyer, et al., 1990; Tallis, et al., 1991; Wisocki, et al., 1986), and research showing that inducing negative mood increases worry (in this instance, as reported on the PSWQ) (Johnston & Davey, 1997; Startup & Davey, 2001). In Chapter 1, several possible mechanisms were outlined to account for the role of negative mood in worry.

One suggested mechanism accounting for negative mood increasing worry is systematic processing (Davey, 2006b; Startup & Davey, 2001). The work conducted in Experiment 1 supports the notion that systematic processing plays a role in perseverative worrying. Negative mood raised sufficiency thresholds in a worry context. Furthermore, systematic processing was identified as a pathway between negative mood and worry, with the raised sufficiency threshold partially mediating this association. One way in which systematic processing may be manifested in the worry process is in the 'what if...?' questioning that characterises catastrophic worry. Indeed, the finding in Experiment 5 that negative mood increases threat perception, when taken in conjunction with the notion that worriers have higher sufficiency thresholds, suggests that worriers may be comprehensively analysing their current situation for threats, posing 'what if...?' questions. This may result from being in a negative mood, but would probably also increase distress and negative affect.

Negative mood decreased motivation in Experiment 5. This finding is challenging to reconcile with the idea that worriers are deploying systematic processing, which requires high levels of motivation. One possible explanation focuses on the way the motivation questions were framed. One of the questions asked participants the extent to which they would want to 'deal with any threats as quickly as possible'. While this can be construed as representing motivation, in that it is seemingly at odds with doing nothing about an issue, it does not sit easily with what is known about worriers and individuals with Generalized Anxiety Disorder (GAD). Such individuals prefer to take care over issues, and a question tapping task importance, rather than the speed with which someone wished to remove an unpleasant issue would perhaps get better at the kind of motivation that might underlie worriers' deployment of systematic processing. Worriers are more inclined to ensure a task is done properly, rather than quickly. For example, worriers have elevated evidence requirements (Tallis, et al., 1991), and worrying is associated with the deployment of AMA stop rules (Davey, et al., 2005), which specify that an individual must complete a task properly before stopping.

While Experiment 1 provides evidence that systematic processing can mediate the link between negative mood and worrying, Chapter 1 outlined a number of other potential mechanisms that the work conducted in this thesis informs. These mechanisms include (1) mood provides information about whether task goals are met (mood-as-input hypothesis) (Davey, 2006b; Meeten & Davey, 2011), (2) negative mood states prime the retrieval of semantically similar material (Neely, 1977), and (3) negative mood evokes appraisals of uncertainty (Tiedens & Linton, 2001). Experiment 1 provided further information regarding conceptualization of the mood-as-input hypothesis, which states that mood and stop rules operate together to determine how long someone will persevere with a task. In early formulations of the mood-as-input hypothesis, mood and stop rules were treated as if they were independent (Startup & Davey, 2001). Later formulations queried this assumption, and postulated that mood and stop rules may in fact be interdependent (Davey, 2006b). Experiment 1 shows that individuals in a negative mood are more likely to endorse using an AMA stop rule (which leads to greater perseveration when experienced in conjunction with negative mood) than individuals in a neutral mood. While inducing people to experience an AMA stop rule in the context of a positive mood is important for establishing proof of principle of the mood-as-input theory, this may not represent a naturally occurring state outside of the laboratory. Raised sufficiency thresholds cannot fully explain why negative

mood states result in AMA stop rule endorsement because Experiment 1 identified the sufficiency threshold and AMA deployment as separate mediators, both contributing independently to reported worry.

Experiment 1 also provides information that the role of negative mood on worry is not purely the result of priming, with negative mood leading to the retrieval of negative thoughts (e.g. Neely, 1977). Individuals who underwent a cognitive priming procedure heard the same negative words as individuals in the negative mood induction, but did not experience the words in a first-person manner. Such individuals did not show raised sufficiency thresholds or higher PSWQ scores. Consequently, accounts of the role of negative mood in worry should not be limited to priming accounts.

Lastly, Experiment 5 demonstrated that negative moods can cause uncertainty in individuals. Participants who underwent negative mood inductions scored significantly higher on the question 'how uncertain do you feel?' than individuals who had undergone the neutral mood induction. This supports the work of Tiedens and Linton (2001), and highlights the importance of considering uncertainty appraisals when conceptualizing the informative properties of negative mood states.

9.3.2 Intolerance of uncertainty

IU was correlated with sufficiency thresholds in Experiments 2 and 3. However, between-group differences based on the experimental manipulation of IU were not observed in Experiment 2 (and could not be examined in Experiment 3 due to the unsuccessful IU manipulation). Consequently, while it is apparent that IU is related to higher sufficiency thresholds, it cannot be claimed that IU *causes* increases in sufficiency thresholds. IU was predicted to raise sufficiency thresholds given that individuals with high levels of IU have been shown to search for more information before feeling confident in their decisions (e.g. Carleton, et al., 2007; Rosen & Knäuper, 2009). One possibility is that the increased deployment of systematic processing, which results from worriers being in a negative mood actually increases IU. Future studies will need to be conducted in which different amounts of systematic processing are induced and the effects on IU are examined. Alternatively, IU and sufficiency thresholds may correlate because of their common relationship with negative mood.

IU was correlated with increased threat perception and was associated with lower coping beliefs, a factor that makes the deployment of systematic processing less likely. IU may relate to threat perception by triggering 'what if...?' thinking, which should raise more threat possibilities in the mind of the worrier (Dugas, Gagnon, et al., 1998). The results indicate that worry is inherently difficult to cope with as the things that individuals tend to worry about are typically future based concerns, which by their very nature are uncertain. For an individual who is intolerant of uncertainty, this may be an overwhelming situation, resulting in the individual feeling that they will not be able to cope.

IU was related to worry in Experiments 2, 3, 5 and 6, but the lack of a reliable IU manipulation method prevented conclusions from being drawn about the causal link between IU and worry. However, the principal components analysis conducted in Experiment 6 suggests that worry and IU are separable factors. Considering the role that systematic processing may play in worrying, it is possible that when an individual deploys systematic processing due to their raised sufficiency thresholds and threat perception, they are increasingly convinced that the issue is an important one (which justifies the cognitive expenditure). As such, the individual is less likely to tolerate uncertainty in their thoughts. It would be interesting to examine whether feelings of IU increase as the worry bout progresses, which would indicate that uncertainty becomes less acceptable as the cognitive investment in the worry increases. Given the results obtained in this thesis, it would appear that if IU does cause increases in worrying, it operates through a mechanism other than systematic processing.

9.3.3 Problem-solving confidence

Low PSC correlated with a general tendency to deploy systematic processing, but inducing low PSC did not affect sufficiency thresholds. This would seem to indicate that there is a relationship between PSC and systematic processing, but the more likely direction is that the systematic processing of information related to worry thoughts causes lower PSC. Individuals who deploy systematic processing in an attempt to deal with worries may suffer reduced confidence as many worries cannot be 'solved' because of their very nature as future-based problems that have not yet occurred (Borkovec, 1994). However, an alternative explanation is that an association exists between PSC and systematic processing because these factors are both associated with negative mood.

Low PSC was not found to increase threat perception but did reduce coping beliefs. It is not surprising that low PSC resulted in participants feeling that they would be less able to cope, given that PSC is defined as "belief and trust in one's problem-solving abilities (general problem-solving self-efficacy) and coping effectiveness" (Heppner & Lee, 2002, p.347). Low PSC was also associated with higher worry scores. Perhaps individuals with low PSC believe deploying worry as a coping strategy will deal with their problems. After all, many worriers hold beliefs that worrying will help them to solve problems (Cartwright-Hatton & Wells, 1997; Davey, Tallis, et al., 1996).

9.3.4 Worry promoters and systematic processing

Overall, the results from the experiments in this thesis indicate that negative mood states may encourage individuals to systematically process the greater number of threats that they perceive. In this sense, systematic processing can be considered as a potential mechanism, alongside AMA deployment. However, worry is accompanied by diminished self-efficacy/coping beliefs (influenced by all three worry promoters) and may serve to dissuade the individual from typically deploying cognitively demanding systematic processing. This may explain why high levels of worry correlated with less endorsement of systematic processing. Interestingly, only experimentally-induced negative mood raised worry levels. While IU and PSC were found to correlate with worry, experimental manipulations of IU and PSC did not cause changes in worry. Consequently, negative mood appears to be more of a front-end driver of worry than IU or PSC. It may be that being in a negative mood leads the individual to detect a greater number of threats, which raises their sufficiency threshold. In an attempt to minimize the discrepancy between their desired amount of confidence and their actual amount of confidence, worriers may deploy systematic processing. This involves careful, analytical and detailed consideration of worry information. However, as worry thoughts are generated, the individual experiences increasing distress, IU and low PSC. These diminish an individual's beliefs that they can cope with the situation, and may result in the individual abandoning systematic processing in favour of heuristic processing, such as 'how do I feel about this?' (affect heuristic) (Slovic, Finucane, Peters, & MacGregor, 2007).

9.3.5 Worry and systematic processing

There are a number of reasons for predicting an association between systematic processing and worry. Human beings are economy-minded and will only deploy cognitively-demanding systematic processing when their sufficiency threshold is high enough to warrant

the energy expenditure (Chaiken, et al., 1989). The sufficiency threshold was conceptualised by Chaiken et al. (1989) as a 'judgement confidence continuum', with higher confidence requirements resulting in the deployment of systematic processing. In terms of worrying, this may link to worriers' confidence that they have met the goals for their worrying. Worriers are likely to possess high sufficiency thresholds given that worry is associated with the belief that worry is necessary to engage in to avoid future threats and problems (Borkovec, et al., 1999; Borkovec & Roemer, 1995; Breitholtz, et al., 1998; Davey, Tallis, et al., 1996; Wells, 1995), deploying AMA stop rules (Davey, et al., 2005), and a number of dispositional characteristics such as IU, perfectionism, elevated evidence requirements, heightened feelings of responsibility for negative events, and inflated concern over mistakes (Dugas, et al., 1997; Frost, et al., 1990; Pratt, et al., 1997; Tallis, et al., 1991; Wells & Papageorgiou, 1998). In addition, appraisals of responsibility and accountability have been identified as important in systematic processing (Bohner, et al., 1995; Tetlock, 1983; Tetlock & Boettger, 1989) and worry (Brain, et al., 2008; Langlois, et al., 2000; Startup & Davey, 2003). What is more, worry and systematic processing have both been identified as predominantly left-hemisphere activities (Leynes & Phillips, 2008; Leynes, 2002).

9.3.6 Do worriers deploy systematic processing?

Experimental findings contained in this thesis provide some indication that worry promoters are related to systematic processing. Negative mood was shown to increase sufficiency thresholds (Experiment 1), which mediated the link between negative mood and worry. In Experiments 2 and 3, IU correlated with an individual's sufficiency threshold. Low PSC was also identified as correlating, and overlapping, with systematic processing deployment (Experiment 6). However, the work carried out in this thesis does not indicate that there is a general tendency by worriers to deploy systematic processing. Firstly, there was a negative correlation between worry and systematic processing in Experiment 6. Secondly, AMA stop rule endorsement (e.g. Davey, et al., 2005) negatively correlated with a general tendency to deploy systematic processing (Experiment 6). Furthermore, the links that were established between worry promoters and systematic processing were not replicated across the experimental work conducted in this thesis. The finding that negative mood and IU were associated with raised sufficiency thresholds when examined using manipulations and visual analogue scale items was met with non-significant correlations when mood, IU and systematic processing were measured using questionnaires.

9.3.7 Are there different kinds of worry processes?

This raises the question of whether there may be different kinds of worry processes, some of which are affected by systematic processing, and others which are not. Worry is a chain of negative thoughts about future, uncertain events (Borkovec, et al., 1983), but it can also take the form of catastrophic thinking (Davey & Levy, 1998a). In other situations still, worrying may be more akin to problem-solving (Davey, 1994b). Given that negative mood has been shown to increase systematic processing in a broad range of contexts (Chaiken, et al., 1989; Chen & Chaiken, 1999), it seems possible that systematic processing will play a role in the aspect of worry that is most applicable to settings beyond the worry context, namely problem-solving. It was found in this thesis that being in a negative mood and IU led to greater perception of threats. Threat detection is associated with raised systematic processing, which may manifest as problem-focused, analytical thinking, in order for individuals to ensure that they reach sufficient confidence that they have successfully dealt with the threats.

Despite the similarities between systematic processing and problem-solving worry, they are not the same things. Both represent forms of effortful, analytic thought, but systematic processing is deployed in a broad range of judgment tasks having both personal and social significance. To this extent, systematic processing might be viewed as a form of analytic thought that many individuals might call worrying, but more properly represents constructive problem-solving in which activities such as logical analysis, problem-solving, information-seeking, and active behavioral coping all play a central role (Davey, 1994b). It is only when this adaptive, analytical process is 'thwarted' that the characteristics of pathological worrying begin to emerge (e.g., increasing emotional discomfort, catastrophising, feelings of lack of control over the worry process). If systematic processing is the effortful, analytic, verbally-based thought that many researchers have also used to define worrying (Borkovec & Inz, 1990; Freeston, et al., 1996), then pathological worrying is additionally defined by those processes that 'thwart' the effectiveness of systematic processing. Such processes may involve poor PSC (Davey, 1994b; Davey, Jubb, et al., 1996), metacognitions about the negative consequences of worrying (Wells, 1995), feelings of personal inadequacy that infiltrate the worry process (Davey & Levy, 1998b), IU (Dugas, Buhr, et al., 2004), a narrow negative focus (Gasper & Clore, 2002), and an avoidance coping style (see Berenbaum, 2010, for some further examples of processes that may 'thwart' closure of the worry process; Davey, 1993b; Meyer, et al., 1990).

9.3.8 Summary

Participants induced into a negative mood were found to be more likely to deploy systematic processing. High IU and low PSC manipulations did not cause an in increase the likelihood that an individual would deploy systematic processing, but these variables were correlated with an increased likelihood of deploying systematic processing. When the relative contributions of the worry promoters were examined in the context of threat and coping, only negative mood correlated with increased threat perception, while all three worry promoters were found to correlate with decreased coping beliefs. When a general measure of systematic processing was used, a small negative correlation was found between worry and systematic processing. Consequently, while negative mood states may encourage individuals to systematically process the greater number of threats that they perceive, worry is also defined by IU and low PSC, factors which do not in themselves raise sufficiency thresholds. Instead, IU and PSC diminish self-efficacy beliefs (coping) and may serve to dissuade the individual from typically deploying cognitively demanding systematic processing. Evidently, systematic processing is a candidate mechanism for explaining part of the impact of negative mood on worry, but does not account for the mechanisms of IU and PSC in the context of processing information about worries.

9.4 Limitations of the current research

The experiments reported in this thesis were intended to elucidate whether systematic processing is a proximal mechanism accounting for the relationship between worry promoters and perseverative worry. The results have given some indication that worry promoters may be linked to systematic processing, but the evidence is far from conclusive. This may be due to the theory being more complex than a simple linear relationship, with worry promoters acting both to facilitate and thwart systematic processing depending on the specific situation, or when the worry promoters are considered in conjunction. However, the mixed results may also reflect that there are methodological factors that may have influenced the findings, and these issues should be taken into consideration when interpreting the results presented in this thesis.

9.4.1 Measuring systematic processing

The experiments presented in this thesis used an indirect estimation of systematic processing by approximating an individual's sufficiency threshold. This method is based upon the assumption that higher sufficiency thresholds lead to greater amounts of systematic

processing (e.g. Chaiken, et al., 1989). Additionally, the likelihood of deploying systematic processing was inferred from threat detection, based on the theoretical assumptions that this increases systematic processing (e.g. Baron, et al., 1994), while having low confidence in one's ability to reach the sufficiency threshold through systematic processing was presumed to decrease its deployment (e.g. Chaiken, et al., 1989). Lastly, a questionnaire was adapted from the risk perception literature (Griffin, et al., 2002). While it is positive that a number of different methods have been used to estimate an individual's likelihood of deploying systematic processing, the results presented in this thesis rest in part upon the assumption that approximations of sufficiency thresholds map onto actual use of systematic processing. Furthermore, the measures used in this thesis rely upon self-report. Individuals are potentially unaware of the processing styles they use in any given situation (see Chen & Chaiken, 1999, for a discussion of conscious versus unconscious awareness of processing styles). Ideally a more direct measure of systematic processing would have been employed, but there is currently no validated measure of systematic processing. Future studies examining systematic processing in worrying could utilise thought-listing methods (e.g. Maheswaran & Chaiken, 1991), but it is unclear what thoughts an individual would need to record to indicate that they had systematically processed worry-relevant information, rather than heuristically processed the information. The problem is compounded by the idea presented by Chaiken et al. (1989) that both systematic and heuristic processing are capable of leading to the same outcome. Thus, an individual who lists a thought about a threat/worry may have generated that thought through systematic or heuristic processing.

9.4.2 Manipulating worry promoters

In order to examine the causal impact of worry promoters on sufficiency thresholds, the majority of the Experiments in this thesis included experimental manipulations, in which participants were exposed to something aimed to change their mood, IU, or PSC. The ability to accurately identify causal pathways is reliant upon successful manipulations of the constructs in question. This thesis utilised a manipulation of IU which involved participants reading about a character who either reported positive appraisals of uncertainty (intended to generate low IU) or negative appraisals of uncertainty (intended to generate high IU). Participants were then asked to write about an uncertain event in their own life through the perspective of the character in the story. This IU manipulation was based on the work of Kelly (2009), who found it a successful way to manipulate IU. Similarly, recent work by Meeten, Dash, Scarlet and Davey (2012) successfully used this manipulation to generate between-

group differences in IU. However, in this thesis, the findings are less encouraging. The use of the IU vignettes alongside the diary entry was successful in Experiment 2, but unsuccessful in Experiments 3 and 5. This limits the conclusions that can be drawn in Experiments 3 and 5, and also suggests that the findings of Experiment 2 should be interpreted cautiously as the manipulation does not seem to be particularly reliable. Possible reasons for the lack of reliability include participants selecting different topics to write about (Experiments 3 and 5 were conducted later in the academic year, which may have resulted in more students choosing to write about 'exams' as their uncertain topic, reducing variance), and individual differences in the participants selecting to take part in experiments at different times in the year (participants who took part to fulfil a course credit early in the academic year may be different to participants who undertook this later on in the academic year).

Additionally, while the mood and PSC manipulations were successful at generating between-group differences, these manipulations still had two limitations. Firstly, in both cases, the variation within groups was extremely large. Secondly, the manipulation procedures were not pure, in that the PSC manipulation also affected mood. The large variation within groups may mask the impact of the variable on the measures taken, while the issue of manipulations affecting a wide range of appraisals related to worry limits the ability to draw firm conclusions about the impact of any one particular worry promoter.

An additional methodological step, which may have strengthened the experiments that used manipulations, would be to introduce absolute criteria to ensure that participants have sufficiently been affected by the manipulation to warrant being included in a particular experimental group. For example, participants in the negative mood group in Experiment 1 could have been required to reach a score on the sadness VAS of greater than 50 (where 0 = 'not at all'; 100 = 'extremely'). If they did not reach/exceed this score, they would be excluded from the experiment. This would provide greater certainty that the participants in the experimental groups had raised (or decreased depending on which group they were allocated to) subjective experiences of the psychological phenomena that the manipulations were designed to alter (mood, IU and PSC). One potential disadvantage of using absolute criteria is that it raises the possibility that, if a manipulation is not very effective, only those individuals who have high trait levels of the variable that is being manipulated will exceed the cut-off. Such participants are likely to be different for many reasons, and the basic premise of experimental methodology (participants being identical to one another for all intents and

purposes except for the experimental manipulation) begins to break down. Selecting participants in an experimental study that reach a specific criterion for inclusion after the manipulation runs the risk of selecting a group that is now not a random selection of the relevant population. For example, participants that meet a criterion of 50 on the sad VAS scale may possess other cognitive or emotional attributes that cause the individual to exceed 50, and these other cognitive or emotional attributes (not the variable that is being manipulated) may cause the observed experimental effects. In future studies, one possible solution would be to use baseline measures of the constructs of interest, and ensure that, once all those participants who did not fulfil the absolute criteria for the group that they were randomly assigned to are removed from the sample, all of the groups are equal on these baseline measures.

9.4.3 Measuring worry

Two methods for measuring worry were used in this thesis: (1) the PSWQ and (2) the CI. The PSWQ is a trait measure of frequency and excessiveness of worry, while the CI measures iterative worry thoughts. In Experiments 1-3, no differences were observed between participant groups on the CI. This may be due to the CI coming later in the experiment than it has done in experiments that have found effects of worry promoters on catastrophic worry (e.g., Johnston & Davey, 1997; Meeten et al. 2012). Using the PSWQ to measure state worry is not ideal, as it was designed to be a trait measure (Meyer, et al., 1990). Nevertheless, it has been used successfully in clinical contexts to measure therapeutic change (Borkovec & Costello, 1993; Goldman, et al., 2007; Treanor, et al., 2011). The finding that a short-term negative mood induction raised scores on the PSWQ (Experiment 1) was surprising. However, this apparent mood-induced memory and appraisal bias of one's worrying may link to metacognitive theory of worry in GAD and account for the onset of Type 2 worry/meta-worry (Wells, 1995). The results of Experiment 1 suggest that the test-retest reliability of the PSWQ would likely be much lower if administered in different mood states. It may be preferable in future studies to use a modified version of the 1-week version of the PSWQ, the Penn State Worry Questionnaire-Past Week (Stöber & Bittencourt, 1998) or the past-day version (Joos, et al., 2012), although these were not used in this thesis as there is less available data on its psychometric properties or comparative sample scores.

9.4.4 Analogue, female samples

The participants were predominantly young, female, university students. Given that the focus of this thesis was on mechanisms of perseverative worry, the extension of the findings obtained with this specific sample to those affected by GAD, which is characterised by excessive, uncontrollable worry, should be considered. Young, single females have been identified as having the highest levels of worry of all the groups examined in the work by Hunt, Wisocki and Yanko (2003). Therefore, the samples used in this thesis may show elevated worry levels compared to the general population. Ruscio (2002) demonstrated that highly distressing amounts of worry can occur in those without a clinical diagnosis of GAD, lending support to the use of undiagnosed individuals. What is more, this thesis represents the first attempt to examine the role of systematic processing in worry, and attempting to establish proof of principle in an analogue sample is an appropriate initial step. Nonetheless, in order to examine whether, for example, negative mood also increases sufficiency thresholds in individuals with GAD, future studies should consider using these paradigms with clinical populations.

9.4.5 Statistical Power

Power calculations can be conducted to determine the minimum sample size required to detect an effect of a specified size. Experiments 1-4 conducted in this thesis had sample sizes of approximately 60 participants in each. This is consistent with published work (Davey, et al., 2007; Davey, et al., 2003; Hawksley & Davey, 2010) that has used 60 participants in studies employing experimental manipulations. Given the exploratory nature of the work contained in this thesis in applying the HSM to perseverative worry, it was difficult to calculate the required sample size using power calculations because the magnitude of the expected effects of systematic processing were unknown. Consequently, sample sizes were based on those used in published work examining psychopathological mechanisms. Pilot studies would have enabled better estimates of the required sample size (Lenth, 2001). Post-hoc power calculations would enable greater certainty that the experiments conducted in this thesis were adequately powered. To ensure that future studies are adequately powered, the information gleaned from the experiments in this thesis should be used in a priori power calculations to determine the required sample sizes for future work.

9.5 Further studies

The experiments included in this thesis raise interesting questions worthy of future consideration. Firstly, the heuristic-systematic model (HSM) does not specify what balance of factors that promote or thwart systematic processing manifest in the deployment of systematic processing. Future work should aim to determine whether the raised sufficiency thresholds of worriers result in the deployment of systematic processing. This will require the development of procedures that provide a more direct measurement of systematic processing and can be applied to the worry context. Secondly, future experiments could enhance procedures for manipulating constructs related to worry by systematically examining which manipulations work for whom, and when, and which manipulations provide the purest manipulation of only the particular construct of interest. Thirdly, while this thesis has focused on systematic processing, the HSM also includes heuristic processing, and the heuristics that are relevant to the worry process could be examined. Lastly, Experiment 1 indicated that mood states affect the goals an individual has for their worrying, and the relationship between mood states and goals could be examined in a clinical population. Similarly, Experiment 6 indicated that the worry promoters are linked to one another, and it would be interesting to examine whether these relationships are greater in magnitude in clinical populations.

9.6 Clinical implications

The work conducted in this thesis has implications for clinical work with individuals who are experiencing worry-based problems. The findings highlight the importance of considering the goals that individuals have for their worrying when working clinically, as negative mood and IU were both found to increase AMA endorsement. Furthermore, attention should be paid to the appraisals that worriers hold about the importance of their task, such as feeling accountable and desiring control, as these raise sufficiency thresholds, increasing the likelihood that an individual will feel the need to consider worry thoughts in detail. Thus, the findings support the use of cognitive-behavioural therapy and metacognitive therapy for GAD, and also emphasise the need for treatments focusing on the role of low mood and the treatment of comorbid depression.

9.7 Final conclusions

The research described in this thesis has implications for the ways in which negative mood states, IU and low PSC are thought to relate to perseverative worry. Research from

social psychology has indicated that sufficiency thresholds are important in determining whether an individual deploys systematic processing (Chaiken, et al., 1989). Despite worriers possessing a large number of characteristics that should increase their sufficiency thresholds, it was found that negative mood had the greatest influence on systematic processing, while other worry promoters – IU and low PSC – were not found to cause raised sufficiency thresholds. This is consistent with previous work showing that negative moods lead to increased systematic processing (e.g., Ambady & Gray, 2002). Negative mood may operate on perseverative worry through a mechanism of systematic processing, but this mechanism does not seem to account for IU and low PSC, and worriers do not show a general tendency to deploy systematic processing.

Worry can be conceived as a multifaceted phenomenon, consisting of problem-solving, threat anticipation, and chains of catastrophic, negative thinking (Borkovec et al., 1983; Davey, 1993, Mathews, 1990). The work conducted in this thesis suggests that negative mood may operate on worry through the proximal mechanism of systematic processing, which also functions in other psychological processes, such as decision making and forming attitudes. It is an exciting prospect that raised sufficiency thresholds and increased systematic processing may provide an account of a proximal mechanism of perseverative worry, derived from core psychological processes. This may help to explain why worry is such a universal phenomenon. Future research should examine whether other factors that have been associated with chronic worrying, such as IU and low PSC, do so through their role in thwarting systematic processing, resulting in normal functional worry becoming maladaptive, or whether they operate through other mechanisms.

10 References

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11 Appendices

11.1 Appendix A: Experiment 1 ethical approval certificate

University of Sussex

School of Life Sciences Research Governance Committee

CERTIFICATE OF APPROVAL

Title of Project	Mood as input and perseverative worry: The role of negative mood on worry and systematic processing facilitators
Principal Investigator	Graham Davey
Student	Suzanne Dash
Collaborators	
Duration of approval (not greater than 4 years)	6 months

This project has been given ethical approval by the School of Life Sciences Research Governance Committee.

NB. If the actual project start date is delayed beyond 12 months of the expected start date, this Certificate of Approval will lapse and the project will need to be reviewed again to take account of changed circumstances such as legislation, sponsor requirements and University procedures.

Please note and follow the requirements for approved submissions:
Amendments to protocol.

- Any changes or amendments to approved protocols must be submitted to the committee for authorisation prior to implementation.

Feedback regarding the status and conduct of approved projects

- Any incidents with ethical implications that occur during the implementation of the project must be reported immediately to the Chair of the committee.

The principal investigator is required to provide a brief annual written statement to the committee, indicating the status and conduct of the approved project. These reports will be reviewed at the annual meeting of the committee. A statement by the Principal Investigator to the Committee indicating the status and conduct of the approved project will be required on the following date(s):

December 2009, 2010…….

Signed: …….. …Jennifer Rusted……..
Chair of the Research Governance Committee

Date: ……25 September 2009…….

11.2 Appendix B: Experiments 2 and 4 ethical approval form

University of Sussex
School of Life Sciences Research Governance Committee

CERTIFICATE OF APPROVAL

Title of Project	Investigating a processing account of worry: The role of intolerance of uncertainty, problem-solving confidence, and mood on worry and systematic processing facilitators
Principal Investigator	Graham Davey
Student	Suzanne Dash
Collaborators	
Duration of approval (not greater than 4 years)	11 months

This project has been given ethical approval by the School of Life Sciences Research Governance Committee.

NB. If the actual project start date is delayed beyond 12 months of the expected start date, this Certificate of Approval will lapse and the project will need to be reviewed again to take account of changed circumstances such as legislation, sponsor requirements and University procedures.

Please note and follow the requirements for approved submissions:
Amendments to protocol.

- Any changes or amendments to approved protocols must be submitted to the committee for authorisation prior to implementation.

Feedback regarding the status and conduct of approved projects

- Any incidents with ethical implications that occur during the implementation of the project must be reported immediately to the Chair of the committee.

The principal investigator is required to provide a brief annual written statement to the committee, indicating the status and conduct of the approved project. These reports will be reviewed at the annual meeting of the committee. A statement by the Principal Investigator to the Committee indicating the status and conduct of the approved project will be required on the following date(s):

December 2010…….

Signed: …….. …Jennifer Rusted……..
Chair of the Research Governance Committee

Date: ……22 January 2010…….

11.3 Appendix C: Experiment 3 ethical approval form

Life Sciences & Psychology Cluster based Research Ethics Committee CERTIFICATE OF APPROVAL	
Reference Number:	GDSD0711
Title of Project:	Intolerance of uncertainty and systematic processing
Principal Investigator:	Graham Davey
Student:	Suzanne Dash
Collaborators:	
Duration of Approval **(not greater than 4 years)**	3 months
Expected Start Date:*	1st August

This project has been given ethical approval by the Life Sciences and Psychology Cluster based Research Ethics Committee (C-REC).

*NB. If the actual project start date is delayed beyond 12 months of the expected start date, this Certificate of Approval will lapse and the project will need to be reviewed again to take account of changed circumstances such as legislation, sponsor requirements and University procedures.

Please note and follow the requirements for approved submissions:

Amendments to protocol.

- Any changes or amendments to approved protocols must be submitted to the C-REC for authorisation prior to implementation.

Feedback regarding the status and conduct of approved projects

- Any incidents with ethical implications that occur during the implementation of the project must be reported immediately to the Chair of the C-REC.

The principal investigator is required to provide a brief annual written statement to the committee, indicating the status and conduct of the approved project. These reports will be reviewed at the annual meeting of the committee. A statement by the Principal Investigator to the C-REC indicating the status and conduct of the approved project will be required on the following date(s):

December 2011……

Authorised Signature	Jennifer Rusted
Name of Authorised Signatory **(C-REC Chair or nominated deputy)**	**Jennifer Rusted**
Date	25 July 2011

11.4 Appendix D: Experiment 5 ethical approval form

Life Sciences & Psychology Cluster based Research Ethics Committee
CERTIFICATE OF APPROVAL

Reference Number:	GDSD0211
Title of Project:	The impact of negative mood, intolerance of uncertainty and problem-solving confidence on threat perception and perceived ability to cope with threat
Principal Investigator:	Graham Davey
Student:	Suzanne Dash
Collaborators:	
Duration of Approval (not greater than 4 years)	6 months
Expected Start Date:*	March 2011

This project has been given ethical approval by the Life Sciences and Psychology Cluster based Research Ethics Committee (C-REC).

*NB. If the actual project start date is delayed beyond 12 months of the expected start date, this Certificate of Approval will lapse and the project will need to be reviewed again to take account of changed circumstances such as legislation, sponsor requirements and University procedures.

Please note and follow the requirements for approved submissions:

Amendments to protocol.

- Any changes or amendments to approved protocols must be submitted to the C-REC for authorisation prior to implementation.

Feedback regarding the status and conduct of approved projects

- Any incidents with ethical implications that occur during the implementation of the project must be reported immediately to the Chair of the C-REC.

The principal investigator is required to provide a brief annual written statement to the committee, indicating the status and conduct of the approved project. These reports will be reviewed at the annual meeting of the committee. A statement by the Principal Investigator to the C-REC indicating the status and conduct of the approved project will be required on the following date(s):

December 2011……

Authorised Signature	Jennifer Rusted
Name of Authorised Signatory (C-REC Chair or nominated deputy)	**Jennifer Rusted**
Date	7 March 2011

11.5 Appendix E: Study 5 ethical approval form

University of Sussex

School of Life Sciences Research Governance Committee

CERTIFICATE OF APPROVAL

Title of Project	Relationships between measures of anxiety and constructs known to increase perseverative worrying
Principal Investigator	Graham Davey
Student	Suzanne Dash
Collaborators	
Duration of approval (not greater than 4 years)	

This project has been given ethical approval by the School of Life Sciences Research Governance Committee.

NB. If the actual project start date is delayed beyond 12 months of the expected start date, this Certificate of Approval will lapse and the project will need to be reviewed again to take account of changed circumstances such as legislation, sponsor requirements and University procedures.

Please note and follow the requirements for approved submissions:

Amendments to protocol.

- Any changes or amendments to approved protocols must be submitted to the committee for authorisation prior to implementation.

Feedback regarding the status and conduct of approved projects

- Any incidents with ethical implications that occur during the implementation of the project must be reported immediately to the Chair of the committee.

The principal investigator is required to provide a brief annual written statement to the committee, indicating the status and conduct of the approved project. These reports will be reviewed at the annual meeting of the committee. A statement by the Principal Investigator to the Committee indicating the status and conduct of the approved project will be required on the following date(s):

December 2009…….

Signed: …….. …Jennifer Rusted……..

Chair of the Research Governance Committee

Date: ……16th October 2009…….

11.6 Appendix F: Male high intolerance of uncertainty script

Sean's pension dilemma

Sean has recently been giving serious thought to his financial security when he retires. Although he is only in his late 20's, Sean wants to make the right decisions now to allow him to retire early and use his pension to fund his living costs as well as a six month holiday. With the recent changes to pension laws, he has set up his own self-managed fund so that he can save on management fees. Sean has identified a range of investment options for his pension money, including term deposits in the bank, property and the share market.

When the time came to determine how he wanted to invest his pension however, Sean found that the returns which could be generated from each of the investment options were not guaranteed and could fluctuate substantially depending on a variety of issues, ranging from international issues such as terrorism, through to local issues such as the availability of land. Even term deposits with banks were not always guaranteed the same returns, with new offers advertised nearly every day.

Sean didn't really think that it was fair that such uncertainty should exist, believing that for something as important as a pension, returns should be guaranteed. As Sean pored over the mass of information he collected about different shares and property prices he found himself thinking that it wasn't really acceptable that the prices should fluctuate so widely and with so little discernable pattern. He also found that he was unable to organise things as well as he would have liked because his pension projections were always changing as the returns he expected also changed.

The more Sean investigated the different options, the more stressed he became with the uncertainty of the returns. Some shares would go up, but some shares would go down, some properties would appreciate while others would lose their value, even interest rates fluctuated from time to time. Sean found himself becoming more and more stressed about the different options, never sure about which would give him the best return on his pension. Whenever he thought about his pension he found that he would get worked up about it and was unable to relax.

Even though Sean was unable to determine the returns accurately because of changes in the market, he was not helped by a lack of available information for some of his investment options. One thing which frustrated Sean in particular was a lack of information about the sale prices of recently sold properties.

Given all the uncertainty with the investments, Sean found it very difficult to settle on a decision. Even though he believed he had considered all the possible options, he still couldn't bring himself to invest his pension money because he couldn't be 100% sure of the outcome. Even though he had evaluated all the available information he was not confident in his decisions and the remaining uncertainty was enough to stop him from investing his money.

Sean's dating dilemma

Sean was recently out with a group of his mates, having a few drinks on a Friday evening at his favourite bar. After a while, Sean noticed an attractive woman across the room whom he thought seemed to be looking back at him, although he wasn't completely sure as by this stage he had had a few drinks. Even though Sean wanted to approach the woman and offer to buy her a drink, he felt unable to act because he wasn't sure of how she would respond. Only after the woman's glances had progressed to more lingering eye contact did Sean begin to feel more comfortable about approaching the woman. Only after the woman's demeanour left Sean with no doubts that she wanted to speak with him, was he able to approach the woman and offer to buy her a drink. Sean felt though that it shouldn't be the case that he had to take the chance to approach the woman, and would have been more comfortable if she had approached him. As the evening went on, Sean felt that he and the woman were getting along well, an impression confirmed when she gave him her number before leaving.

Because he was busy for the rest of the weekend, Sean had to wait until late the following week before he thought about calling the woman he met at the bar. By this stage however, Sean had become anxious about calling her as he couldn't really help feeling uncertain about the likelihood that the woman would still want to go out on a date with him. Sean didn't really think it was fair that this uncertainty should exist, and chastised himself for not having arranged a date earlier when he was more certain of how she would respond; he even resolved to avoid this situation in future and to arrange a date immediately, when he was more sure of achieving a positive outcome. As days went by without calling her, Sean started feeling that he was less of a man because he wasn't sure about how she would respond if he called her. As days turned into weeks without calling her, Sean eventually reached the point where he gave up on the idea of a date with the woman because he couldn't gather the confidence to put aside his uncertainty and call her.

11.7 Appendix G: Female high intolerance of uncertainty script

Sarah's pension dilemma

Sarah has recently been giving serious thought to her financial security when she retires. Although she is only in her late 20's, Sarah wants to make the right decisions now to allow her to retire early and use her pension to fund her living costs as well as a six month holiday. With the recent changes to pension laws, she has set up her own self-managed fund so that she can save on management fees. Sarah has identified a range of investment options for her pension money, including term deposits in the bank, property and the share market.

When the time came to determine how she wanted to invest her pension however, Sarah found that the returns which could be generated from each of the investment options were not guaranteed and could fluctuate substantially depending on a variety of issues, ranging from international issues such as terrorism, through to local issues such as the availability of land. Even term deposits with banks were not always guaranteed the same returns, with new offers advertised nearly every day.

Sarah didn't really think that it was fair that such uncertainty should exist, believing that for something as important as pension, returns should be guaranteed. As Sarah pored over the mass of information she collected about different shares and property prices she found herself thinking that it wasn't really acceptable that the prices should fluctuate so widely and with so little discernable pattern. She also found that she was unable to organise things as well as she would have liked because her pension projections were always changing as the returns she expected also changed.

The more Sarah investigated the different options, the more stressed she became with the uncertainty of the returns. Some shares would go up, but some shares would go down, some properties would appreciate while others would lose their value, even interest rates fluctuated from time to time. Sarah found herself becoming more and more stressed about the different options, never sure about which would give her the best return on her pension. Whenever she thought about her pension she found that she would get worked up about it and was unable to relax.

Even though Sarah was unable to determine the returns accurately because of changes in the market, she was not helped by a lack of available information for some of her investment options. One thing which frustrated Sarah in particular was a lack of information about the sale prices of recently sold properties.

Given all the uncertainty with the investments, Sarah found it very difficult to settle on a decision. Even though she believed she had considered all the possible options, she still couldn't bring herself to invest her pension money because she couldn't be 100% sure of the outcome. Even though she had evaluated all the available information she was not confident in her decisions and the remaining uncertainty was enough to stop her from investing her money.

Sarah's dating dilemma

Sarah was recently out with a group of her girlfriends, having a few drinks on a Friday evening at her favourite bar. After a while, Sarah noticed an attractive man across the room whom she thought seemed to be looking back at her, although she wasn't completely sure as by this stage she had had a few drinks. Even though Sarah wanted to approach the man, she felt unable to act because she wasn't sure of how he would respond. Only after the man's glances had progressed to more lingering eye contact did Sarah begin to feel more comfortable about approaching the man. Only after the man's demeanour left Sarah with no doubt that he wanted to speak with her, was she able to approach the man and ask if he wanted to buy her a drink. Sarah felt though that it shouldn't be the case that she had to take the chance to approach the man, and would have been more comfortable if he had approached her. As the evening went on, Sarah felt that she and the man were getting along well, an impression confirmed when he gave her his number before leaving.

Because she was busy for the rest of the weekend, Sarah had to wait until late the following week before she thought about calling the man she met at the bar. By this stage however, Sarah had become anxious about calling him as she couldn't really help feeling uncertain about the likelihood that the man would still want to go out on a date with her. Sarah didn't really think it was fair that this uncertainty should exist, and chastised herself for not having arranged a date earlier when she was more certain of how he would respond; she even resolved to avoid this situation in future and to arrange a date immediately, when she was more sure of achieving a positive outcome. As days went by without calling him, Sarah started doubting herself because she wasn't sure about how he would respond if she called him. As days turned into weeks without calling him, Sarah eventually reached the point where she gave up on the idea of a date with the man because she couldn't gather the confidence to put aside her uncertainty and call him.

11.8 Appendix H: Male low intolerance of uncertainty script

Sean's pension dilemma

Sean has recently been giving serious thought to his financial security when he retires. Although he is only in his late 20's, Sean wants to make the right decisions now to allow him to retire early and use his pension to fund his living costs as well as a six month holiday. With the recent changes to pension laws, he has set up his own self-managed fund so that he can save on management fees. Sean has identified a range of investment options for his pension money, including term deposits in the bank, property and the share market.

When the time came to determine how he wanted to invest his pension however, Sean found that the returns which could be generated from each of the investment options were not guaranteed and could fluctuate substantially depending on a variety of issues, ranging from international issues such as terrorism, through to local issues such as the availability of land. Even term deposits with banks were not always guaranteed the same returns, with new offers advertised nearly every day.

Sean thought it was fair that such uncertainty should exist, believing that for something as important as pension, returns should be determined by the time and effort put into identifying the best performing options. As Sean pored over the mass of information he collected about different shares and property prices he found himself comfortable with the fact that the prices fluctuated so widely and with so little discernable pattern. Although his pension projections were always changing because the returns he expected also changed, Sean nonetheless felt he was adequately organised to accommodate this.

The more Sean investigated the different options, the more comfortable he became with the uncertainty of the returns. Some shares would go up, but some shares would go down, some properties would appreciate while others would lose their value, even interest rates fluctuated from time to time. Sean found himself becoming less and less stressed about the different options, even though he was never sure which would give him the best return on his pension. Whenever he thought about his pension he noticed that he was calm and collected and actually found it quite relaxing.

Even though Sean was unable to determine the returns accurately because of changes in the market, he was not helped by a lack of available information for some of his investment options; in particular, information was unavailable regarding the sale prices of recently sold properties. Not knowing all this information didn't bother Sean though because he accepted

that he probably wouldn't be able to get all the information he needed and would have to base his judgements on incomplete information.

Even though there was a lot of uncertainty with the investments, Sean found it reasonably easy to settle on a decision. After he believed he had considered all possible options, he felt comfortable investing his pension money even though he couldn't be 100% sure of the outcome. Feeling that he had evaluated all the available information he was confident in his decisions and the remaining uncertainty was not enough to stop him from investing his money.

Sean's dating dilemma

Sean was recently out with a group of his mates, having a few drinks on a Friday evening at his favourite bar. After a while, Sean noticed an attractive woman across the room whom he thought seemed to be looking back at him, although he wasn't completely sure as by this stage he had had a few drinks. Even though Sean wasn't sure of how the woman would respond to his advances, he felt comfortable approaching the woman and offering to buy her a drink. Sean thought that it was ok that he had to take the chance to approach the woman, and wasn't concerned that she hadn't taken the first step. As the evening went on, Sean felt that he and the woman were getting along well, an impression confirmed when she gave him her number before leaving.

Because he was busy for the rest of the weekend, Sean had to wait until late the following week before he thought about calling the woman he met at the bar. Even though there had been quite a delay, Sean was comfortable about calling her, although he couldn't help feeling uncertain about the likelihood that the woman would still want to go out on a date with him. Sean realised that this uncertainty was a necessary part of the dating game, and wasn't concerned that he hadn't called her earlier in the week when he was more certain of how she would respond; in fact, although he would have been more certain of a positive reaction from the woman earlier in the week, if the same situation occurred in the future, Sean didn't think that he would do anything differently. As yet more days went by before he had the opportunity to call her, Sean felt good about himself that he wasn't concerned that he didn't know how she would respond. As days turned into weeks without calling her, Sean eventually found the time to call her, and was quite confident, even though he really had no idea how she might react given he had taken so long to call her.

11.9 Appendix I: Female low intolerance of uncertainty script

Sarah's pension dilemma

Sarah has recently been giving serious thought to her financial security when she retires. Although she is only in her late 20's, Sarah wants to make the right decisions now to allow her to retire early and use her pension to fund her living costs as well as a six month holiday. With the recent changes to pension laws, she has set up her own self-managed fund so that she can save on management fees. Sarah has identified a range of investment options for her pension money, including term deposits in the bank, property and the share market.

When the time came to determine how she wanted to invest her pension however, Sarah found that the returns which could be generated from each of the investment options were not guaranteed and could fluctuate substantially depending on a variety of issues, ranging from international issues such as terrorism, through to local issues such as the availability of land. Even term deposits with banks were not always guaranteed the same returns, with new offers advertised nearly every day.

Sarah thought it was fair that such uncertainty should exist, believing that for something as important as pension, returns should be determined by the time and effort put into identifying the best performing options. As Sarah pored over the mass of information she collected about different shares and property prices she found herself comfortable with the fact that the prices fluctuated so widely and with so little discernable pattern. Although her pension projections were always changing because the returns she expected also changed, Sarah nonetheless felt she was adequately organised to accommodate this.

The more Sarah investigated the different options, the more comfortable she became with the uncertainty of the returns. Some shares would go up, but some shares would go down, some properties would appreciate while others would lose their value, even interest rates fluctuated from time to time. Sarah found herself becoming less and less stressed about the different options, even though she was never sure which would give her the best return on her pension. Whenever she thought about her pension she noticed that she was calm and collected and actually found it quite relaxing.

Even though Sarah was unable to determine the returns accurately because of changes in the market, she was not helped by a lack of available information for some of her investment options; in particular, information was unavailable regarding the sale prices of recently sold properties. Not knowing all this information didn't bother Sarah though because

she accepted that she probably wouldn't be able to get all the information she needed and would have to base her judgements on incomplete information.

Even though there was a lot of uncertainty with the investments, Sarah found it reasonably easy to settle on a decision. After she believed she had considered all possible options, she felt comfortable investing her pension money even though she couldn't be 100% sure of the outcome. Feeling that she had evaluated all the available information she was confident in her decisions and the remaining uncertainty was not enough to stop her from investing her money.

Sarah's dating dilemma

Sarah was recently out with a group of her girlfriends, having a few drinks on a Friday evening at her favourite bar. After a while, Sarah noticed an attractive man across the room whom she thought seemed to be looking back at her, although she wasn't completely sure as by this stage she had had a few drinks. Even though Sarah wasn't sure of how the man would respond to her advances, she felt comfortable approaching the man and asking if he wanted to buy her a drink. Sarah thought that it was ok that she had to take the chance to approach the man, and wasn't concerned that he hadn't taken the first step. As the evening went on, Sarah felt that she and the man were getting along well, an impression confirmed when he gave her his number before leaving.

Because she was busy for the rest of the weekend, Sarah had to wait until late the following week before she thought about calling the man she met at the bar. Even though there had been quite a delay, Sarah was comfortable about calling him, although she couldn't help feeling uncertain about the likelihood that the man would still want to go out on a date with her. Sarah realised that this uncertainty was a necessary part of the dating game, and wasn't concerned that she hadn't called him earlier in the week when she was more certain of how he would respond; in fact, although she would have been more certain of a positive reaction from the man earlier in the week, if the same situation occurred in the future, Sarah didn't think that she would do anything differently. As yet more days went by before she had the opportunity to call him, Sarah felt good about herself that she wasn't concerned that she didn't know how he would respond. As days turned into weeks without calling him, Sarah eventually found the time to call him, and was quite confident, even though she really had no idea how he might react given she had taken so long to call him.

11.10 Appendix J: Example problem-solving feedback sheet

Problem-Solving Ability Feedback Sheet

You have just completed the Means-Ends Problem-Solving Test. Below, are your scores. If you require any more information, please speak to the experimenter at the end of the experiment.

Age bracket	
Gender	
Score	
Percentile	
Average score for this band	

For a _____ aged _____ the average score expected on the Means-Ends Problem-Solving Task is _____. You scored _____. This means you are in the __-_____ for your age and gender.

11.11Appendix K: Regression assumption tests

Regression 1: Worry promoters and threat perception

There were an acceptable amount of outliers, with only 6 cases (3.33%) having standardised residuals falling outside of ±2, and only 1 case (0.56%) with a standardised residual falling outside ±2.5 (Field, 2009). The distribution of the threat scores approximated the Normal distribution, as shown in the histogram (Figure X) and P-P plot (Figure X).

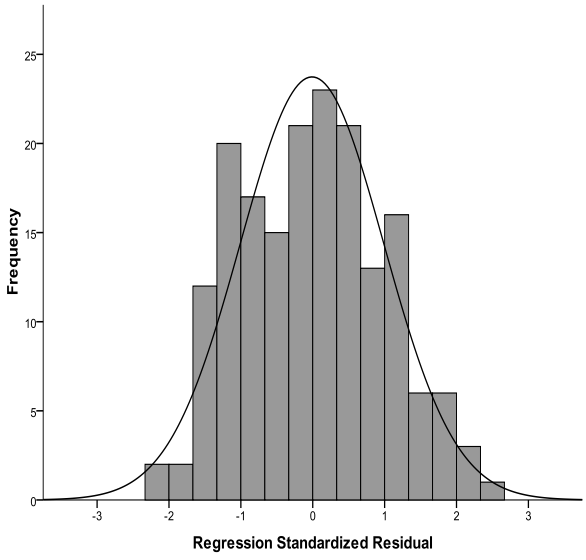

Figure 11.11 Histogram of threat residuals

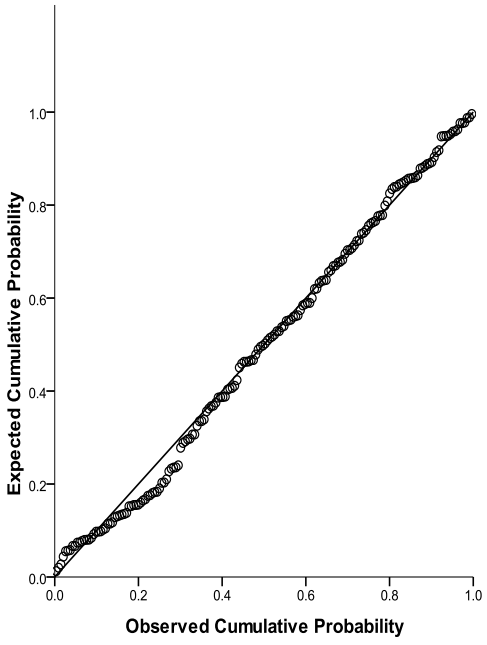

Figure 11.12 P-P Plot of threat residuals

The assumptions of linearity, homoscedasticity and independence of errors also appear to have been met because the residual *z*-score vs. predicted *z*-score plot (Figure 11.13) shows an absence of funnelling. The Durbin-Watson statistic was 2.10, which is very close to Field's (2009) recommended criterion of 2, and well within the recommended boundary of 1-3, which supports that the residuals are independent. Furthermore, it does not appear that the predictor variables are affected by multicollinearity because all VIF values are below 10 (Field, 2009): VIF = 1.05 (experimental condition), 1.85 (negative mood), 1.70 (IU), and 1.23 (PSC). As such, despite the inclusion of data following experimental manipulations, the model appears to be a reliable fit of the data.

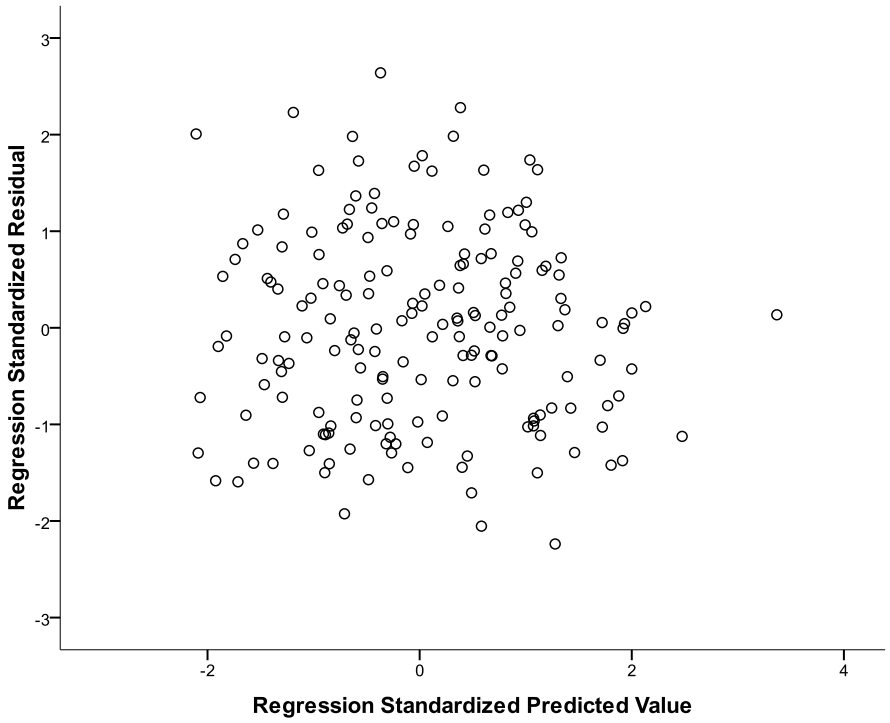

Figure 11.13 Scatterplot of standardised residuals against predicted residuals for threat

Regression 2: Worry promoters and coping beliefs

The standardised residuals indicate concerns about outliers: 15 cases (8.33%) had standardised residuals falling outside of ±2, 8 cases (4.44%) with a standardised residual falling outside ±2.5, and 3 cases with a standardised residual outside ±3 (Field, 2009). Despite this, the distribution of the threat scores approximated the Normal distribution, as shown in the histogram (Figure 11.14) and P-P plot (Figure 11.15).

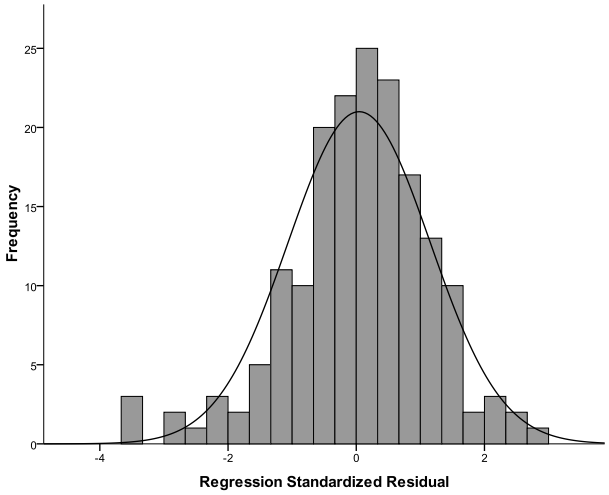

Figure 11.14 Histogram of coping residuals

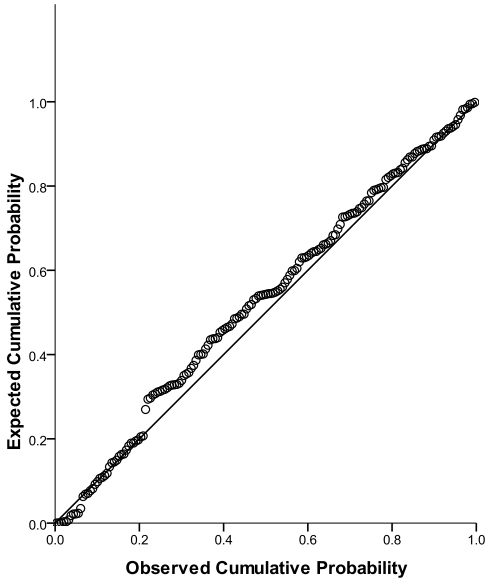

Figure 11.15 P-P Plot of coping residuals

The assumptions of linearity, homoscedasticity and independence of errors also appear to have been met because the residual z score vs predicted z score plot (Figure 11.16) shows an absence of funnelling. The Durbin-Watson statistic was 1.81, which is in the region of Field's (2009) recommended value of 2, and well within the recommended boundary of 1-3, which supports that the residuals are independent. Furthermore as reported above, it does not appear that the predictor variables are affected by multicollinearity because all VIF values are below 10 (Field, 2009): VIF = 1.05 (experimental condition), 1.85 (negative mood), 1.70 (IU), and 1.23 (PSC). As such, despite some indications that there may be more outliers than typical (perhaps due to the use of experimental manipulations of the predictor variables) overall the model appears to be a reliable fit of the data.

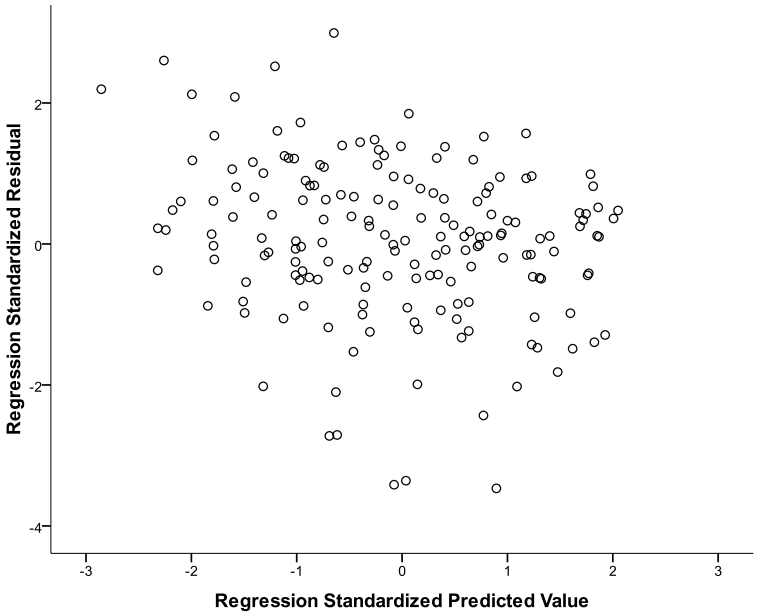

Figure 11.16 Scatterplot beliefs of standardised residuals against predicted residuals for coping beliefs