The Effect of Induced Mood on Interpretation Biases in High and Low Trait Anxious Participants

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Submission Date: July 2009

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Acknowledgements

There are several people that I would like to thank and without whose support this work could not have been possible.

Professor Malcolm Adams and Dr Laura Hoppitt have both been amazing in stepping in half-way through this thesis, with their support and guidance in conducting the analyses and in reading several drafts. I most certainly could not have completed this and on time, without their patience and time. Dr Helen Buxton, my original UEA supervisor has been an enormous support throughout, even after leaving UEA she has continued to read drafts, provide guidance and even when it all seemed very overwhelming, made it all seem achievable. Thank you also to Lorna Shelfer, a fellow UEA trainee, whose organised and proactive approach, helped to get this study underway.

I also have my long suffering husband to thank for patiently hanging in there, whilst undertaking this long journey and for still being there at the end! My friends and family have also been amazing throughout, providing a welcome distraction in between working.

Finally and most importantly, I would like to express my heartfelt gratitude to Dr Bundy Mackintosh, whose passion and enthusiasm for research drew me to this area and this study. Bundy has led me through the research, with tireless patience and fervour. Even though Bundy has sadly been away for the latter part of this study, it is in large part due to the time already devoted, knowledge imparted and an amazing research team around her that the study was able to proceed smoothly in her absence.

Abstract

Introduction

Empirical research has demonstrated that interpretation biases have a causal effect on levels of anxiety (Mathews & Mackintosh, 2000). The dual process model of mood regulation (Forgas & Ciarocchi, 2002) however proposes that there would be an interaction between interpretation biases and anxiety. Within this model, clinical anxiety can be understood as a failure to evoke effortful, mood regulatory strategies. No previous research has explored the interaction between interpretation biases and mood, in both high and low trait anxious individuals, within a dual process model framework.

Experiment One

Interpretation biases using the ambiguous scenario method, were measured following a positive mood induction in both high (n=17) and low (n=21) trait anxious participants, and subsequent effects on high and low positive affect were measured. Both groups demonstrated a mood congruent response bias, however this did not serve to maintain changes in positive affect. The theoretical implications of these findings and the limitations of the methodology are discussed.

Experiment Two

The findings of experiment one were extended upon, with interpretation biases being measured following an anxious mood induction, in high (n=15) and low (n=20) trait anxious participants. Both high and low anxious participants demonstrated an increasingly mood incongruent interpretation bias over time. There was some evidence of a more positive response bias amongst low trait anxious participants. A subsequent decrease in negative affect was interpreted as evidence of mood decay rather than mood regulation. The reported

results are discussed in relation to the dual process model and evidence for an interaction between interpretation biases and anxiety.

General Discussion

The results of this study provide evidence of the benefits of exploring cognitive biases within a dual process model framework. The failure to find differences between high and low anxious participants is discussed in relation to methodological limitations with suggestions for areas of further research.

CHAPTER 1: INTRODUCTION

1.1 Summary of the Chapter

In this chapter, two separate areas of research will be brought together to explore whether their respective findings could facilitate our understanding of the cognitive processes involved in the regulation of anxiety. Research within clinical and cognitive psychology has contributed a great deal to our understanding of the processes involved in the regulation of anxiety and differences in the cognitive processes of anxious and non-anxious individuals. In particular, a growing area of research has shown that the ways in which ambiguous information is interpreted differs between high and low anxious individuals (e.g. Butler & Mathews, 1983) and can be manipulated to produce congruent effects on anxiety (e.g. Mathews & Mackintosh, 2000). However, the causal relationship between anxiety and interpretation biases has yet to be fully explored, with further research needed to determine whether, as is suggested within models of mood regulation, there is an interaction between interpretation biases and anxiety, with each exerting influence over the other. Models of mood regulation may provide a useful framework within which to explore the relationship between anxiety and interpretation biases, in particular the hedonistic (Larsen, 2000a), contextual (Erber & Erber, 2000) and dual-process models of mood regulation (Forgas, 2000). These models suggest that there would be an interaction between anxiety and interpretation biases, with anxiety influencing interpretations, which in turn influences anxiety. Each of these three models suggest differing motivations for mood regulation, namely hedonistic concerns (i.e. to feel good), social and contextual factors or an interaction between intra- and inter-personal demands, respectively. Although these models are primarily concerned with normal processes of mood regulation, there is evidence within the literature on depression in particular (e.g. Beevers, 2005), to suggest that these models could also be useful in exploring dysfunctional mood regulation. There has been, at present, little

research exploring the interaction between anxiety and interpretation biases explicitly, taking account of the evidence from models of mood regulation. Nor has there has been any research exploring how the mood regulatory effects of interpretation biases may differ between high and low anxious individuals. This has important implications for the application of interpretation bias training to interventions for clinical anxiety, by further expanding our understanding of normal processes and how exactly these differ in anxious individuals, in order to develop more sophisticated and targeted interventions.

In this chapter, a brief overview of the research into interpretation biases in anxiety is provided and some of the difficulties in inferring a causal relationship are discussed in relation to models of mood regulation. These models of mood regulation are presented in turn in section 1.4, with conclusions as to how these models might facilitate an understanding of the relationship between anxiety and interpretation biases. A more detailed review of the literature on interpretation biases is then provided, with particular gaps in the literature highlighted, which are central to determining whether interpretation bias is a mood regulatory strategy. The clinical implications for this research are proposed, followed by the aims and specific research questions to be addressed in sections 1.9 to 1.11.

1.2 Mood Regulation and Interpretation Biases

An interpretation bias is the phenomenon observed when individuals presented with an ambiguous scenario, will tend to make either neutral or negative inferences about the meanings of that scenario. For example, when a friend walks past you in the street without acknowledging you, you may interpret this as the friend just not seeing you (neutral interpretation) or that they were ignoring you (negative interpretation). As will be discussed further in section 1.6, the available evidence demonstrates that interpretation biases of anxious individuals tend to be more negative than non-anxious individuals (e.g. Butler & Mathews, 1983). In order to demonstrate the causal effects of interpretation biases on

anxiety, procedures have been developed to train either a positive or negative interpretation bias which have been shown to have congruent effects on levels of anxiety in non-anxious participants (e.g. Mathews & Mackintosh, 2000). These studies are grounded within cognitive theories of mood, which propose that it is the cognitive processes which lead to the change in mood (e.g. Beck, 1995). However, models of mood regulation, suggest that there is a more complex relationship between cognitions and mood, with mood influencing cognitions, which in turn influence mood. This has yet to be explored within the research into interpretation biases and anxiety. In drawing together these two, distinct areas of research, this chapter will begin within an overview of the three main models of mood regulation.

1.3 Defining and Measuring Mood

In understanding how moods are regulated, it is helpful to firstly establish a clear definition of what a mood is. Often within the literature, the term is used interchangeably with emotion and affect. Although they are overlapping and related constructs, there are important differences with regards to the aetiologies, functions, with differing effects on cognition and behaviour and consequently, how they can be regulated.

1.3.1 Distinguishing Moods from Emotions

Parkinson, Totterdell, Briner and Reynolds (1996) and Beedie, Terry and Lane (2005) have provided comprehensive summaries of the literature in this area, outlining the defining features of a mood and how these, in particular, distinguish moods from emotions.

Most frequently, moods are defined by their duration, with moods lasting much longer than emotions (e.g. Ekman, 1994; Nowlis, & Nowlis, 1956; Watson & Clark, 1994). Parkinson et al (1996) also distinguish moods and emotions according to the 'time pattern', with changes in mood being much more insidious and more gradual to change, whereas emotions have a clearer onset and offset pattern (Watson & Clark, 1994).

Moods are said to differ from emotions in regards to their 'intentionality' (e.g. Berkowitz, 2000; Bless & Schwartz, 1999; Ellis & Moore, 1999), which is similar to Parkinson et al's (1996) 'directedness'. Both refer to the understanding that emotions are generally directed at a particular object, whereas moods are not. Moods tend to be more general states that can affect behaviour and cognitions about many objects. For example, anxiety caused by the presence of a spider, will lead to anxiety and behaviours directed towards the spider. An anxious mood however, may have no definable cause and thus is not directed towards anything in particular, yet will influence most of behaviours, such as withdrawing from other people and activities.

A further feature is that of 'consequences' referred to by Beedie et al (2005) which is also subsumed within Parkinson et al's (1996) feature of 'directedness'. Some authors have reported that emotions will lead to changes in behaviour or 'action-tendencies' (Frijda, 1986), whereas moods will lead to changes in cognitions and cognitive biases. Moods and emotions are also said to differ by what causes them, with emotions generally having quite specific triggers, be they external or internal to the individual. Moods on the other hand may be as a result of a series of events or triggers (e.g. Averill & Nunley, 1992; Elster, 1996). For example, a series of minor criticisms or failures at work may accumulate in time to create a more general depressed mood. The awareness of the causation of moods and emotions has been referred to also, with emotions seeming to have specific and salient causes, whereas the triggers for moods may be so many and relatively minor, so as to not enter conscious awareness (e.g. Clark & Isen, 1982; Isen, 1984; Zajonc, 1980).

The function of moods and emotions is highlighted by both Parksinson et al (1996) and Beedie et al (2005). Emotions serve the function of providing information about the world and environment around us, for example anxiety signals to us that it is dangerous and need to act accordingly. Moods however, provide information about the self and thus will

bias cognitions, rather than behaviour (e.g. Clore, 1994; Morris, 1992). As in the above example, a depressed mood from several failures at work, may provide information about the individual's capabilities and bias their cognitions to create an attentional bias towards other failures at work. Finally, there is also evidence regarding the physiological differences between emotions and moods, which are in line with the observed difference in regards to 'directedness' (e.g. Ketai, 1975; Levenson, 1994). Emotions tend to have fairly predictable physiological consequences, for example anxiety will trigger the 'fight or flight' response, with raised heart rate, blood pressure and respirations, for example. Moods however, have no such discernable physiological changes associated with them.

1.3.2 Structure of Mood

Having reviewed the differences between moods and emotions, the question then arises as to the structure of moods. Unlike emotions, which have clear onsets, facial expressions, behaviours and physiological consequences, moods are much more subtle and therefore harder to categorise. There are a number of models of the structure of moods (e.g. Russell, 1980; Watson & Tellegen, 1985; Schlosberg, 1952), which are reviewed by Parksinon et al (1996). It is generally agreed that mood varies along two dimensions, that of pleasantness- unpleasantness and high-low activation or arousal (Parkinson et al, 1996). From these two dimensions, circumplex models of affect have been developed, with affective states situated around the circumplex, depending on the degree of activation and pleasantness (e.g. Russell, 1980). For example, fear can be regarded as an unpleasant mood with high activation whereas contentment is high in pleasantness and low in activation. Watson and Tellegen (1985) refer to these dimensions as positive (PA) and negative (NA) affect, reflecting degrees of pleasantness and engagement with the environment. The affective states are largely based on self-report and word-meanings and broadly give rise to eight categories, with examples shown in Table 1.1.

Table 1.1

Categorisation of Affective Terms, Based on Watson and Tellegen's (1985) Circumplex Model of Affective States

	Negative Affect	Pleasantness	Positive Affect	Engagement
High	Fearful Nervous	Happy Pleased	Excited Peppy	Astonished Surprised
Low	Calm Relaxed	Lonely Sad	Drowsy Sleepy	Quiet Still

1.3.3 Positive and Negative Affect: Related Constructs?

It would seem that it would be perfectly possible to experience both positive and negative affect at the same time, for example the happy, excitement of starting a new job mixed with the fear and anxiety of what might be to come, suggesting some independence of the two constructs. Such a suggestion is supported by fMRI studies, which have demonstrated that there are separate neural pathways for positive and negative affect (Davidson, 1998). This is also important at the individual level, where it is claimed that there are tendencies to attend to either positive or negative affect, which roughly correspond to the personality traits of extraversion (attending to PA) and neuroticism (attending to NA; e.g.Eysenck, 1967; Larsen, 2000a; Larsen & Ketelaar, 1989). Other studies however, suggest that there are degrees of dependence, with high levels of positive or negative affect excluding any experience of the other, whereas in the context of milder moods, there may be elements of both positive and negative affect, as in the previous example (e.g. Diener & Emmons, 1984; Diener & Iran-Nejad, 1986).

The evidence suggesting that there is some independence of PA and NA, with individual differences as to the preference for attending to one or the other, may have important implications for considering how moods are regulated or dysregulated. This will

be considered in more detail in the following section in relation to models of mood regulation.

1.4 Models of Mood Regulation

There are three main models of mood regulation: hedonistic, contextual and dual-process models, each of which emphasise the importance of different motivations for regulating mood, namely hedonistic concerns (i.e. to feel good), contextual demands (i.e. according to the demands of the situation) or a combination of these and other concerns, as in the dual-process model. Each of these models will be described below with consideration as to the evidence of each.

1.4.1 Hedonistic Model of Mood Regulation

1.4.1.1 Description of the Model

Larsen (2000a) one of the main proponents of the hedonistic model, suggests that mood regulation is part of a modular process of self-regulation, whereby several self-regulatory process occur in parallel, with mood being just one of these, and all of these modules are regulated by a 'self-control executive function' (see Figure 1.1).

Larsen suggests that all of these modules are driven by the same basic hedonistic desire to increase pleasure and decrease pain. Each of these modules will have both short- and long-term goals, which may be conflicting and there will be individual differences as to the relevance of each. For example, with regards to regulation of eating, there may be a short term goal of pleasure from eating, which conflicts with the long term goal of health and weight loss, which may be of more or less relevance to the individual depending on a variety of factors, such as life stage for example. The model proposes that for individuals there are certain set-points or goals for mood and individuals will be constantly comparing their current state with the desired state. Where there are discrepancies, cognitive or behavioural

strategies will be employed to bring mood in line with the desired state. Some of the responses may be automatic and some will be conscious and effortful. There will also be individual differences as to how much discrepancy is tolerated before strategies are employed to regulate mood.

Figure 1.1

Diagrammatic Representation The Hedonistic Model Of Mood Regulation, Adapted from Larsen (2000b), pp. 221

Although Larsen has not expanded particularly on the nature of these self-regulatory processes (in common with all of these proposed models), he does review the evidence in support of the main hypothesis of a hedonistic drive to maximise pleasure, with a particular focus on increasing pleasure rather than decreasing pain.

1.4.1.2 Critical Review of the Evidence for a Hedonistic Model

Larsen (2000b) refers to a number of other studies which suggest that most people, most of the time, will try to and in fact do, achieve a relatively positive mood. Studies have suggested that most people, most of the time, feel pleasant (Myers & Diener, 1996). Larsen

therefore concludes that their regulatory systems must be set to helping them achieve these 'pleasant' states. Also, most people report happiness to be their most important goal in life, which is consistently found across several different cultures (Diener, 2000). Meyers (2000), in a large review paper, also reported for most people, their general mood state is 'slightly positive'. Larsen also cites several other studies which report that most people are happy and most people wish to be happy (Cacioppo & Gardner, 1999; Diener & Diener, 1996; Watson, 2000; Zelenski & Larsen, 2000). This, it is argued, demonstrates that there is unlikely to be a regulatory system that would promote a 'neutral' or negative mood.

In terms of individual differences which could lead to dysfunctions of mood regulation, Larsen (2000a) refers to research which suggests that the experience of positive and negative moods is not correlated, i.e. experiencing more pleasant affect, does not lead to experiencing less negative affect and proposes that disorders of mood regulation are due to lack of positive affect rather than too much negative affect. For example, Davidson (1998) demonstrated the different hemispheric localisation of activation in the prefrontal cortex for positive and negative affect, suggesting two separate processes and pathways. Research into the personality constructs of extraversion and neuroticism, suggests that in extraversion, mood regulation is focussed on increasing pleasure, whereas in neuroticism, mood regulation is focussed on decreasing pain, or negative affect (e.g. Depue, 1996; Zelenski & Larsen, 1999). Underlying both these processes is the hedonistic principle of increasing pain and decreasing pleasure, but with very differing outcomes for subjective well-being.

On examination of the studies cited, the evidence for a bias towards positive affect is not quite as clear as Larsen seems to portray. Cacioppo and Gardner (1999) studied the affective system from an evolutionary perspective. The authors refer to a 'positivity offset', which is the tendency for a neutral or mildly positive evaluation of an unknown object and an 'approach tendency' for which there are evolutionary advantages resulting in humans being

curious about and exploring their environment. Cacioppo and Gardner also refer to a 'negativity bias', whereby there is a heightened sensitivity and responsiveness to negative stimuli. Although this study would seem to suggest that there are evolutionary advantages to being in a positive mood most of the time, there is also evidence for advantages to negative affect by being vigilant to threat and quick to respond with negative affect, which is not necessarily in line with a hedonistic model.

Diener and Diener (1996) reviewed evidence from several large scale studies where individuals were asked to rate on a single Likert scale how happy or satisfied they were, from which the authors observed a slightly positive bias. One could question how reliable such retrospective reports of general 'happiness' are, and in using just a single-item of 'happiness' to estimate general mood, there could be a bias in responses towards reporting happiness. In a defence of using a single item of happiness in the aforementioned study, the authors reported that such measures do correlate highly with other measures of subjective well-being (SWB), on the assumption that being happy leads to greater SWB. However, this then calls into question Larsen's (2000a) proposal that there are individual differences in whether people are focussed on positive or negative affective states, as this study would imply that individuals are generally focussed on levels of positive affect. It should also be noted that the positive bias was only 'slight', which without information about experiences of negative moods, could also be interpreted as people still spending a lot of their time in negative or neutral moods, which would also be counter to the hedonistic model's principles. Larsen, Diener and Emmons (1985) using a cross-sectional design, found that time spent being happy, across a number of different samples, was 65% at the most. However, in drawing on this as evidence for a hedonic system of mood regulation, there is an oversight of the still significant amount of time spent in a negative or neutral mood (at least 35% of the time).

In a more recent study, Kuppens, Realo, and Diener (2008) observed that this relationship between positive affect and SWB was actually mediated by how individualistic the society was, with participants in individualistic societies being more sensitive to experiences of negative affect in relation to SWB, which would actually be supportive of the proposed differential focus on positive or negative affect. The evidence from this study would also imply that the hedonistic principle is not universal and that social and cultural factors have an important influence over whether positive and negative moods are tolerated, accentuated or regulated.

In looking to other experimental evidence in regards to this model, the evidence is overall not supportive of a purely hedonistic model. According to this model, in an attempt to maintain a hedonic balance, positive moods should be maintained, leading to congruent cognition and behaviour, whereas negative moods should be regulated, leading to incongruent cognition and behaviour. There is in fact a wealth of evidence within memory research which demonstrate mood congruent memory in both positive and negative moods (e.g. Bullington, 1990; Josephson, Singer, & Salovey, 1996; Reidy & Richards, 1997). Hepburn, Barnhofer, and Williams (2006) also demonstrated mood congruent effects for predicted valence of future events after both positive and negative mood inductions. Mood congruent effects of negative moods have also been demonstrated for causal inferences and attribution (Forgas & Locke, 2005), social judgment (Mayer & Hanson, 1995) and learning (Rinck, Glowalla, & Schneider, 1992). Some studies have found no effect of negative moods on cognition (e.g. Gayle, 1997; Levy & Mineka, 1998).

There is also evidence that mood-congruent cognition and behaviour is mediated by numerous different individual differences, such as trait anxiety (Levy & Mineka, 1998), depression (Joormann & Siemer, 2004), extraversion/introversion (Tamir, 2009), attachment style (Pereg & Mikulincer, 2004), 'self-complexity' (Sakaki, 2004), self-esteem (Heimpel,

Wood, Marshall, & Brown, 2002; Smith & Petty, 1995), affect acknowledgement (i.e. repressors/sensitizers; McFarland & Buehler, 1997) and other personality characteristics (Rusting, 1999).

Tice and Baumeister (1993) using self-reports, found that there are times when individuals will choose to get into a bad mood and get out of a good mood, contrary to the hedonistic model. Tice and Bratslavsky (2000), in reviewing the evidence for motivators of mood regulation, report on at least six different types of mood regulation, which includes maintaining negative moods, and only three of these are hedonistic types. The authors therefore suggest that whilst there are times where hedonistic goals will drive mood regulation, suggesting it may even be most of the time, there is also evidence for other goals of mood regulation, which should be incorporated into models of mood regulations.

1.4.1.3 Summary

In consideration of the evidence, it would appear that whilst hedonistic principles may drive mood regulation for some people, some of the time, to conclude that it is an over-arching motivator is likely to be an oversimplification of a much more complex process and minimises the importance of social, contextual and individual factors in determining the goals of mood regulation, and therefore how and when mood is regulated. In taking a quite opposing position, Erber and Erber (2000) describe a contextual model of mood regulation, where the goal of mood regulation is not mood itself, but rather to change behavioural and cognitive outcomes.

1.4.2 Contextual Model of Mood Regulation

1.4.2.1 Evidence Contrary to the Hedonistic Model

Erber and Erber (2000) suggest that mood regulation is principally driven by social and contextual demands and the need to change our behaviour to meet these demands. This

perspective seeks to account for the impact of different social pressures on mood regulation which is somewhat overlooked in the previous model. The authors cite several studies which shed doubt on the hedonistic principle of mood regulation and provide supporting evidence for the importance of contextual factors.

1.4.2.2 Critical Review of the Evidence for Social and Contextual Motivators

Erber and Tesser (1992) demonstrated that when in a 'sad' mood, participants reported feeling less sad after 10 minutes of completing complex mathematical problems. However, for participants who were given a simple task or no task, the 'sad' mood was maintained after the 10 minutes. If the hedonistic principle were correct, they argue, participants in the no task condition would also have regulated their own moods spontaneously. Erber and Therriault (1994) reported similar findings, using physical exercise as a mood regulating strategy, where mood was regulated during a challenging exercise task and maintained during an easy exercise task. These more challenging tasks, they argue, facilitate mood regulation by preventing participants from engaging in mood-congruent cognitive processes, as was believed to be the case in the other simple-task and no-task conditions. Erber and Erber (2000) therefore suggest that the main motivator of mood regulation is not to change the mood, as the hedonistic model proposes, as if it were, all the participants in the above studies would have shown evidence of regulating a sad mood, whereas in the absence of demanding tasks, they maintained their mood throughout.

Erber and Erber (2000) explored the effects of the social demands of a situation on motivating mood-regulation and they cite several studies exploring this; they refer to what they term the 'coolness effect'. For example, Erber, Wegner, and Therriault (1996) demonstrated that following a mood induction, participants chose mood-congruent tasks when they believed they would complete the tasks alone, whereas those believing they would complete the task with a stranger, chose mood-incongruent tasks, irrespective of whether the

induced mood was positive or negative. This effect was also true when participants were led to believe the stranger was either 'happy' or 'depressed'. This would seem to suggest that in the presence of strangers, the tendency is to regulate towards a neutral mood – the 'coolness effect', which may have advantages in such social situations. The authors suggest that our own mood state and the consequent cognitive effects, may interfere with social interactions and our own mood may seem inappropriate if we subsequently find the other in a contrasting mood state. Therefore, it would seem to be most appropriate to attenuate our mood prior to such interactions.

Commons and Erber (1997) demonstrated that there are differences in mood regulation when the anticipated interaction is with a stranger as opposed to a romantic partner. As predicted, following positive or negative mood inductions, stranger-interactions led to the choice of mood incongruent tasks, whereas anticipated interactions with romantic partners, led to the choice of mood congruent tasks. Further extending the hypothesis that social situations influence mood regulation, the authors also demonstrated the propensity towards mood regulation in the perceived presence of a critical other, and mood-maintenance in the perceived presence of an accepting other. Mood-regulation is also mediated by the anticipated contextual demands of the situation, not only social. For example, similar effects were found in anticipation of a cognitively demanding task (Erber & Erber, 1994) or where accuracy was required (Therriault, Erber, & Oktela, 1996).

1.4.2.3 Summary

The evidence for the contextual model of mood-regulation is definitely compelling and provides an insight into the contextual-motivational aspects of mood regulation. However, in considering the contextual motivators of mood regulation, there is an oversight as to how mood regulation might be affected by internal processes. It would seem unlikely that a sad mood would be maintained indefinitely until social demands determined otherwise,

As suggested by Buss (2000), the common desire to be happy is a goal in and of itself, which suggests that mood could also be a motivator of mood regulation. It would seem that there is therefore a need for a model which assumes a position between these two extremes and incorporates both the internal motivators of the hedonistic model and the social motivators of the contextual model. Forgas (2000) has proposed such a model, referred to as the dual-process model of mood regulation.

1.4.3 Dual Process Model of Mood Regulation

1.4.3.1 Description of the Model

Forgas's dual-process model of mood regulation (e.g. Forgas, 2000; Forgas & Ciarrochi, 2002) would appear to be a more sophisticated representation of mood regulation, incorporating ideas from both the above models. The process of mood regulation is viewed as a homeostatic process, whereby mood can be attenuated or accentuated, consciously or unconsciously, in response to both internal and external demands. Whilst the two previous models acknowledge that there will be individual differences in mood-regulation, these individual differences or 'person features' are clearly incorporated within this model. A diagrammatic illustration of the dual-process model is presented in Figure 1.2.

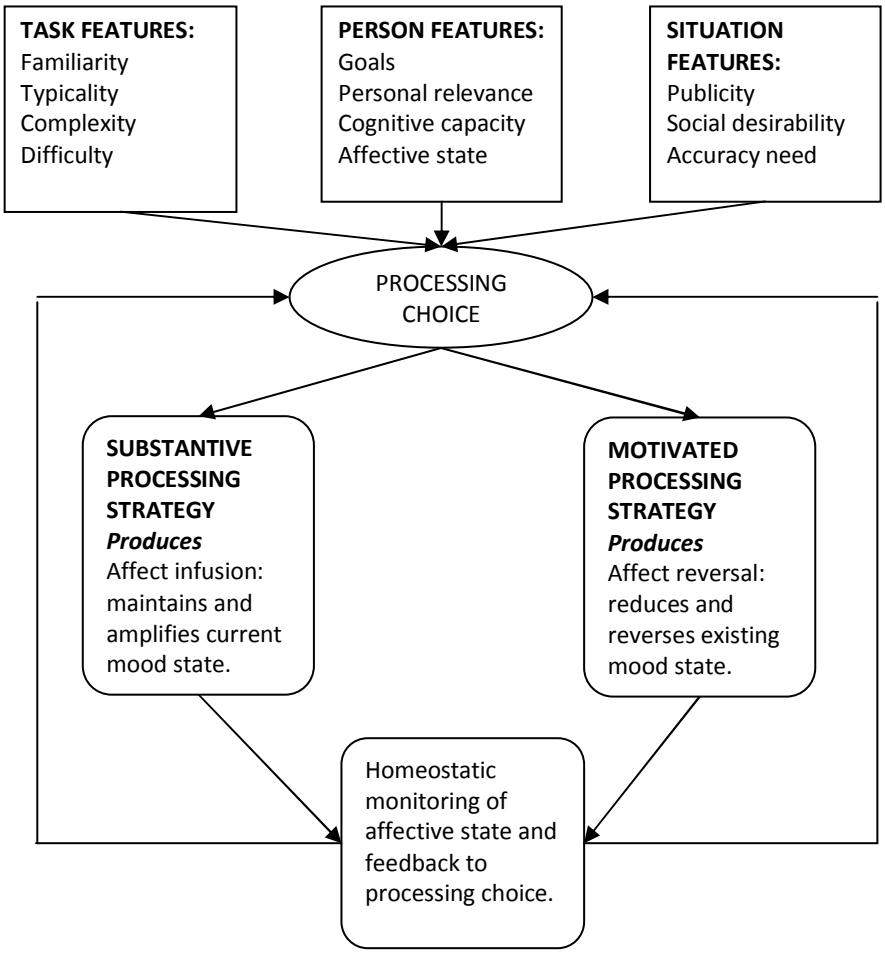
This model takes into account the situational and individual factors that will determine whether and how mood is regulated. It also allows for the explanation of mood congruent and incongruent responses and processes, automatic and effortful processes and changes in mood congruency over time.

This model proposes that initially, mood will result in automatic and effortless processing, that is congruent with the mood, in what they term substantive processing. This is in line with associative network theories of memory (Bower, 1981), where the induced affect will automatically trigger similarly valenced cognitions, through network activation,

leading to mood congruent cognitive biases and thus promoting 'affect infusion', i.e. maintenance or amplification of the mood. For example, when confronted with a belligerent colleague at work who causes us to experience anger at their behaviour, substantive processing will lead to the activation of congruent, negatively valenced memories of similar experiences, such as all the times we've had arguments with that colleague, which will maintain that negative mood or exacerbate it. These processes are automatic, preconscious and effortless, resulting in mood congruent cognitions and behaviours and subsequently maintenance of the mood.

Figure 1.2

Illustration of Forgas and Ciarrochi's (2002) Dual Process Model of Mood Regulation, pp. 338



The second form of processing is the motivated processing strategy, which occurs temporally after substantive processing. This is described as a more deliberate, effortful and slower process that serves to regulate mood and results in incongruent cognitions and behaviour. As in the above example where we experience anger at a belligerent colleague, whilst initial substantive processing will lead to congruent biases, depending on a variety of internal and situational factors, it may not be desirable or appropriate to maintain that mood. For example, this difficult colleague may in fact be your boss and so motivated strategies would be employed to attenuate the negative mood, using mood-incongruent cognitive or behavioural strategies, such as focusing on the pay rise that will result if you can keep your cool.

Why and when motivated processes are employed, will depend on a number of individual and situational factors, as summarised in Figure 1.2. Forgas and Ciarocchi (2002) state that motivated processing is more likely when the task is of personal relevance (Forgas & Fiedler, 1996), if people are aware of the cause or consequence of the mood (Berkowitz, Jaffee, Jo, & Troccoli, 2000), certain individual differences (e.g. Rusting, 2001) or if the mood is experienced as highly aversive. The intensity of the mood for example, may determine whether it is desirable to try to regulate it, or if it is so overwhelming that the cognitive resources may not be available to regulate the mood. Motivated processing is effortful and so the individual will need to be motivated and have cognitive resources available to engage in this type of processing. Situational and social factors will influence the individual's motivation to regulate their mood. For example whilst it may be perfectly acceptable to feel sad and cry with one's romantic partner, such displays of mood and emotion, may not be appropriate in a meeting at work and so one is more likely to engage in motivated processing in the latter situation.

These processes are thought to operate within a homeostatic feedback loop, where mood is constantly kept in check and regulated in line with the demands of situational and internal factors. Again using the belligerent colleague example, whilst recalling the time they fell over drunk at the Christmas party (motivated processing), may take the sting out their current behaviour, it may improve mood a little too much, which may also be inappropriate, if for example it led you to laughing at them. Thus, mood will be constantly monitored and regulated through either substantive or motivated processes. In terms of internal motivators, this model also proposes an internal thermostat for mood, where irrespective of external demands, if mood reaches levels that are intolerable for the individual, motivated processing may also be used to maintain mood within set limits. These thresholds may differ for each individual and moods may be relatively more unchecked in the absence of external and social pressures. Although this is a relatively new model of mood regulation, there is a growing body of evidence in support of it (e.g. Beevers, 2005), which will be reviewed below.

1.4.3.2 Critical Review of the Evidence in Support of a Dual Process Model

Forgas and Ciarrochi (2002) carried out a series of experiments whereby a happy, sad or neutral mood was induced in participants. There then followed a sentence completion task, whereby participants were presented with an incomplete sentence consisting of a name followed by 'is', i.e. 'Dan is…' and were required to complete 120 sentences or continue until they ran out of descriptors. Mood was measured pre and post mood induction and again following the sentence completion task. The authors demonstrated that in both positive and negative mood conditions, there were congruent changes in mood following the mood induction, followed by a return to baseline after the sentence completion task. In the analyses of the sentences, they demonstrated that in both happy and sad conditions, descriptors were initially congruent with mood but in the final sentences, descriptors were mood-incongruent, suggesting initially substantive processes followed by motivated processes, in order to

regulate mood. In a second experiment the authors demonstrated the same effect in a word completion task, where participants were given the first letter and asked to generate adjectives. In both experiments, participants in a neutral mood generated equal numbers of congruent and incongruent descriptors or words in both halves of the task. In their final experiment, similar methods were used, although the measure of mood regulation was to generate as many self-descriptors as possible to complete the sentence 'I am…', a procedure which again demonstrated mood congruent, followed by incongruent self-statements. The initial generation of congruent followed by incongruent statements, would indicate as is proposed by this model that following initially congruent strategies, motivated processing is elicited, which serves to regulate mood.

In these experiments, it is possible that during the latter tasks, mood is decaying naturally and that cognitive processes are simply changing congruent to mood. Alternatively, as discussed by Erber and Erber (2000), the cognitive demands of the task could simply be preventing mood congruent processes, rather than a change in congruent to incongruent. The authors however argue that the pattern of change and such a significantly incongruent bias at the end of the task is unlikely to be the result of mood decay or distraction. They also highlight that participants' responses did not become gradually more incongruent over time, as mood decay or distraction would suggest, but that there was a sudden and significant change towards incongruence, which became more incongruent over time.

In a study by Sedikides (1994), there was also a reported change in mood congruency over time. After a mood induction procedure, where dysphoric, happy or neutral moods were induced, participants were asked to write self-descriptive essays. As the dual process model would predict, self-descriptions were initially mood congruent, becoming increasingly incongruent over time.

Beevers (2005) has conducted a review of the literature into depression in relation to the dual process model. It is proposed by Beevers, that individuals with depression have a cognitive bias towards negative associative processing information about the self (equivalent to Forgas' construct of substantive processing). Whilst motivated processing would normally overcome this negative bias, because of either the high cognitive load or negative associative processing, the cognitive resources are not available to correct it or motivated processing is inadequate to overcome the effects of the associative or substantive processing. This leads to a downward spiral into depression, whereby negative associative processing, leads to activation of negative cognitions and deterioration in mood. There is evidence within the literature, to support this model of vulnerability to depression, albeit not directly related to the dual process model. For example, it has been demonstrated that negative mood can impair cognitive resources (Ellis, Moore, Varner, & Ottaway, 1997; Ellis, Ottaway, Varner, Becker, & Moore, 1997). Teasdale (1988) has also demonstrated the spiralling feedback loop of cognition and mood, whereby mood reduces cognitive resources, which impairs motivated processing, substantive processing continues, leading to an increase in dysphoria and further depletion of cognitive resources.

Also supporting a dual process model of depression, Rude, Wenzlaff, Gibbs, Vane, and Whitney (2002) using a prospective design, demonstrated that performance on a sentence completion task under cognitive load, was a significant predictor of depressive symptoms 4-6 weeks later. This demonstrates the importance of having available cognitive resources in order to manage mood and stave off depressive symptoms.

Haeffel et al. (2007), employing both cross-sectional and prospective designs were able to demonstrate the importance of substantive and motivated processing in predicting depressive symptoms following stressful life events. In the first experiment, participants' responses to a lab-based stressor were measured, to which their immediate affective

responses were best predicted by their substantive processing. However, over a 5 week period, their response to stressors was best predicted by motivated processing styles. These results also lend support to the dual-process model of vulnerability to depression, through the demonstration that those immediate, substantive processes predict immediate affective responses, whereas the slower, more effortful, motivated processes predict affect in the longer term, suggesting their importance in vulnerability to depression. It also highlights the importance of individual differences in the ways in which mood is regulated.

1.4.3.3 Summary

Although the dual-process model provides a more comprehensive framework for understanding mood regulation, the number of potential factors influencing choice of processing strategy would make it particularly difficult to make predictions about the processing choice in any given situation, which is acknowledged by the authors (e.g. Forgas & Ciarocchi, 2002). However, in looking to evidence from the hedonistic and contextual models, some insight into the differing intra-individual motivators and contextual factors which may influence mood regulation can be gained.

1.4.4 Summary of Models of Mood Regulation

In summary, there are three main models which seek to explain why moods are regulated. The first, hedonistic model has much in common with the early cognitive theories, proposed by for example, Beck (1976) and Clark and Isen (1982), which suggest that negative moods will be regulated and positive moods maintained in a constant strive to increase pleasure and decrease pain. However, the available evidence would suggest that mood regulation is more complex than simply trying to reduce negative affective states at all costs, with several studies showing maintenance of negative moods through mood congruent processes. As discussed, the evidence used to support these models has been reported in a

slightly biased way, with the minimisation of the evidence which suggests that people also spend a significant proportion of the time in a negative mood, the evolutionary advantages of negative mood and the influence of social and contextual factors. The contextual model of mood regulation, refuting that mood regulation is motivated by mood and internal factors, demonstrates the significant effect of social and contextual factors on mood regulatory strategies. In bringing together these two perspectives and trying to account for the more subtle regulation of mood that occurs outside of conscious awareness, the dual process model does provide a more comprehensive framework from which to explore both normal and disordered mood regulation and has been applied to models of depression (e.g. Beevers, 2005) and grief (Stroebe & Schut, 1999) with growing evidence of its utility.

In the following section, the specific application of a dual-process model of mood regulation to an understanding of the interaction between anxiety and interpretation biases, with consideration of hedonistic and contextual concerns, will be explored, along with a discussion as to whether there is any empirical evidence at present which would refute or lend support to a dual process model of anxiety regulation.

1.5 Mood Regulatory Effects of Interpretation Biases According to a Dual Process Model

According to the dual process model, if, as is hypothesised, interpretation biases are a cognitive strategy employed to regulate an anxious mood, the following observations should be made. When in an anxious mood, interpretation biases should be initially congruent with the mood. If motivated, and with the necessary cognitive resources available, individuals should then switch to incongruent interpretation biases, leading to mood regulation and a reduction in anxiety. This latter effect has been widely researched, with changes in interpretation biases, leading to changes in anxiety. This suggests that interpretation biases may serve to regulate mood, as discussed further below. However, as

discussed in section 1.6.4, further research is still needed to determine the causality, and whether there is in fact an interaction, as proposed by the dual process model.

1.6 Interpretation Biases

1.6.1 Interpretation Biases in Clinical Populations

Much of the research into interpretation biases within clinical populations has focused on anxiety and anxious interpretations. Beck (1976) first suggested that anxious individuals were more likely to interpret ambiguous information in a threatening manner and subsequent research has supported this hypothesis (e.g. Butler & Mathews, 1983; Clark et al., 1997; Harvey, Richards, Dziadosz, & Swindell, 1993; McNally & Foa, 1987; Stopa & Clark, 2000). This finding has important implications with the hypothesis that it is these biased interpretations that lead to the experience of anxiety and should therefore, be the target of interventions. However, these observations do not imply causality and so further empirical studies were required to explore this relationship between anxiety and interpretation biases.

1.6.2 Experimental Research into Interpretation Biases

1.6.2.1 Measures in Interpretation Biases

In order to measure interpretation biases, and investigate them within experimental settings, a range of methods has been devised to provide quantitative evidence for biased interpretations. One particular method that is often used is the homophone task. Homophones are two words that have two different spellings and meanings, but when spoken, sound the same, for example, ‘die’ and ‘dye’. In this method, participants are presented with the word auditorily and are asked to write it down, revealing whether they have made a neutral (dye) or threat (die) interpretation (e.g. Eysenck, MacLeod, & Mathews, 1987; Mathews, Richards, & Eysenck, 1989). Another variation of the basic homophone method, involves asking participants to make sentences using the homophones to reveal the

interpretation they have of the word (Richards, Reynolds, & French, 1993). In these cited studies, it has been shown that anxious individuals are more likely to select the negative meaning than the non-anxious controls.

Similar findings have also been reported using the homograph method (e.g. Richards & French, 1992). A homograph is a word that has two differing meanings depending on the context, for example the word 'rose' could refer to the noun meaning a flower or the adjective as in 'she rose up from her chair'. Homographs can be used to measure interpretation biases with the use of those that have both a neutral and threat related meaning. For example 'batter' could refer to the noun, as in 'batter for pancakes' or to the verb as in to 'batter somebody'. Richards and French (1992) presented homographs as a single priming word, followed by a lexical decision task, whereby participants were asked to decide whether a letter-string was a real or nonsense word. The real, target words were related to either the threat or neutral interpretation of the homograph. For example 'batter', could be followed by the word 'pancake' (neutral) or 'assault' (threat). Individual's interpretation biases could then be inferred by the speed with which they made the lexical decision for threat versus neutral interpretations. In this study, as would be predicted, anxious participants demonstrated a bias towards the anxious interpretations whereas the non-anxious participants had a bias towards the neutral meanings.

The homograph and homophone methods are not always the most ideal methods for measuring interpretation biases as there are a limited number of homographs and homophones within the English language and even fewer with both a neutral and a threatening interpretation. It is also the case that those with both threat/neutral meanings tend to pertain only to threats to the physical self rather than social/ego threats. This is an important factor given that although some individuals may be anxious about physical threats, as in panic (Reiss, Peterson, Gursky, & McNally, 1986) and health anxiety (e.g. Warwick &

Salkovkis, 1990); for many it is socially threatening situations that cause the greatest anxiety, as in social anxiety (e.g. Halford & Foddy, 1982; Glass, Merluzzi, Biever, & Larsen, 1982).

To allow for more control over the types of threat pertained to, more sophisticated methods were devised using ambiguous scenarios or sentences. For example, MacLeod and Cohen (1993) presented participants with ambiguous sentences, followed by disambiguating sentences which gave either a positive or negative resolution to the sentence. The authors found that anxious participants had much quicker reading times for the negative than the neutral interpretation. The ambiguous sentence procedure has been replicated several times and has been shown to be a robust measure of interpretation biases in anxiety (Calvo & Castillo, 1997; Calvo, Eysenck, & Castillo, 1997; Hirsch & Mathews, 1997; Eysenck, Mogg, May, Richards, & Mathews, 1991).

Despite the strong evidence of negative interpretation biases amongst anxious populations, these studies do not demonstrate whether these biases are causal in the development or maintenance of anxiety, are as a direct result of being anxious or as suggested by the dual process model, an interaction between both.

1.6.2.2 Training Interpretation Biases

Grey and Mathews (2000) demonstrated that interpretation biases could be trained within experimental settings and later this was extended upon by Mathews and Mackintosh (2000) using more realistic methods of training biases, i.e. the ambiguous scenario method. In a series of experiments by Mathews and Mackintosh (2000), participants were assigned to either the positive or negative bias training condition. In order to train an anxious or neutral interpretation bias, both groups were presented with several ambiguous scenarios with the last word left as a fragment for the participants to complete. The word fragment had only one

solution which gave either a positive or negative resolution to the scenario, depending on the assigned condition. For example:

> Your partner asks you to go to an anniversary dinner that their company is holding. You have not met any of their work colleagues before. Getting ready to go, you think that new people you will meet will find you (boring/friendly).
>
> Mathews and Mackintosh (2000), pp.604.

Participants were given equal numbers of physical and social threat scenarios to control for this as a potential confounding variable. Participants were presented with 64 such scenarios, with either a positive or negative outcome, depending on the condition they were assigned to (i.e. positive or negative). Following the training for interpretation biases, all participants were then tested for interpretation of novel stimuli, using the sentence recognition task. This involved the presentation of ambiguous scenarios as in the training, although the word fragment this time did not disambiguate the scenario. Participants were then asked to answer a comprehension question about the scenario, in order to ensure active processing and encoding of the scenario. For example:

> The Local Club
>
> You are invited for a night out at a local club, although you don't know any of the members very well. As you approach the door you can hear loud music and noisy conversation, but as you enter the room it is quiet for a
>
> m_m_nt (moment)
>
> Do you know most of the club members?
>
> Mathews and Mackintosh (2000), pp. 604.

After reading 20 different scenarios, participants were given a recognition task, based on the 20 ambiguous test items. For each scenario, participants were shown four different sentences and were asked to rate how similar in meaning the sentences were to the original scenarios on a scale of 1-4. These four sentences included a positive and a negative foil that were unrelated to the original meaning and a positive and a negative target that were similar to the original in meaning. Below are examples of these sentences, which relate to the above scenario. Participants with a negative interpretation bias would be expected to rate the negative targets as more similar and those with a positive interpretation bias, to rate the positive targets as more similar in meaning. Through the inclusion of both target and foil items, it enabled the authors to rule out the possibility that they were observing a response bias (high recognition of both congruent target and foil items) and that it was a genuine interpretation bias (higher recognition of congruent target items only).

Negative Foil	As you enter the room someone asks you why you are there.
Negative Target	As you enter the room everyone stops and stares at you.
Positive Foil	As you enter the room someone greets you warmly.
Positive Target	As you enter the room the music stops for a moment.

Mathews and Mackintosh (2000), pp. 604.

The authors demonstrated that the training phase led to congruent changes in interpretation biases of novel stimuli in the testing phase. There was also some evidence for congruent changes in mood, with participants in the negative condition significantly increasing in anxiety but no significant reduction in anxiety in the positive condition. The authors also reported on a comparison with a neutral-mood control condition, the results of which suggested that positive training led to reduced recognition of negative items and negative training led to reduced recognition of positive items.

A possible interpretation of these results was that the training procedure itself had direct effects on mood, which due to mood-congruent network activation (Bower, 1981) led to congruent recall on the test items. However, Mathews and Mackintosh (2000) reported on a further experiment employing a longer delay between training and interpretation tests to ensure the decay of any potentially induced moods, thus demonstrating that in the absence of a change in mood, there were still congruent changes in interpretation biases, significantly so for the negative condition. This would suggest that a change in mood is not necessary for a change in interpretation biases, which strengthens the evidence for interpretation biases having a causal effect on anxiety. This also suggests that biased interpretations occur at the time of encoding the ambiguous scenarios, rather than at the recall stage, which causes the change in mood, rather than mood changing the interpretation biases.

This experimental training procedure has been replicated and extended upon several times by Mathews and colleagues. It has been demonstrated that essential to the change in anxiety as well as interpretation biases is the active generation of interpretations in the training, through completion of the word fragments (Mathews & MacLeod, 2002; Mathews & Mackintosh, 2000). The effects of the training on tests of interpretation biases have been shown to endure across time and contexts (Mackintosh, Mathews, Yiend, Ridgeway, & Cook, 2006; Yiend, Mackintosh, & Mathews, 2005). Wilson, MacLeod, Mathews, and Rutherford (2006) also demonstrated the effects of interpretation bias modification on the vulnerability to stressors in an experimental design, where negative bias training led to increased emotional reactivity to a stressful video. This would seem to support the argument for a causal role of interpretation biases on anxiety.

The experimental paradigm has been further developed to explore whether positive interpretation biases could be trained in clinically or high anxious participants, and what effects this has on anxiety levels. Mathews, Ridgeway, Cook, and Yiend (2007) trained high

anxious participants over four sessions, in a positive bias, with the results demonstrating a more positive interpretation bias of novel stimuli and a reduction in trait anxiety as compared to an untrained control group. Murphy, Hirsch, Mathews, Smith, and Clark (2007) used the training procedure with socially anxious participants, with effects seen on interpretation biases following training, but the effect on anxiety was not replicated. The effects on mood were found to be enhanced when imagery was used as opposed to verbal processing of the training material (Holmes, Mathews, Dalgleish, & Mackintosh, 2006). A later study, which employed positive feedback for benign interpretations in a group of socially anxious individuals in an 8-week training programme, successfully demonstrated a more positive bias and a reduction in social anxiety, as compared to a control group (Beard & Amir, 2008).

1.6.2.3 Summary of the Effects of Interpretation Biases on Anxiety

The evidence for interpretation biases having a causal effect on anxiety vulnerability is very compelling and the above findings show a robust and consistent phenomenon. In summary, the findings demonstrate that high anxious individuals have a significantly more negative interpretation bias than low anxious individuals. Both negative and positive interpretation biases can be trained in non-anxious participants, which generalise to novel stimuli and have congruent effects on anxiety. Clinically anxious participants can also be trained in a more neutral interpretation, with mixed findings as to the effects on anxiety, although the research is still in the early stages.

1.6.3 Inferring Causality of Interpretation Biases in Anxiety

There are still some unexplored areas which are important to investigate before concluding that interpretation biases have a causal effect on anxiety as there are some particular methodological issues with the training and testing of interpretation biases. Due to the nature of the tests of interpretation bias used, it is not possible to establish whether biases

have changed over time, as it is not possible to repeat these tests within the same experiment, due to practice effects. However, given the robust findings comparing positive, negative and neutral training, this is perhaps less of a concern. Although the evidence would seem to suggest otherwise, it cannot be ruled out that the training procedures are actually influencing anxiety which in turn has a congruent effect on interpretation biases through the activation of congruent cognitive processes. It would seem fairly plausible that reading 64 statements about personally relevant, embarrassing or threatening situations, could leave people feeling rather more anxious, which may in turn, influence how they interpret new information.

Within the literature reviewed thus far, there still remains some question as to the nature of the causal relationship between anxiety and interpretation biases, of which there are three main possibilities to be considered. As is suggested above, interpretation biases could be causal in creating anxiety, which would imply that the training procedures only affect the interpretation biases of new stimuli, which then leads to a change in anxiety. Another plausible hypothesis could be that anxiety has a causal effect on interpretation biases, in which case the training directly affects anxiety and interpretation biases change as a result. However, Mathews and Mackintosh (2000) argue against this explanation, given that biases were still observed long after any effects on anxiety had decayed. Alternatively and theoretically in line with the dual process model, there still remains the possibility of an interaction between anxiety and interpretation biases, whereby anxiety leads to more anxious interpretations, which then leads to an increase in anxiety.

1.6.4 Evidence of the Causal Effects of Anxiety on Interpretation Biases

In order to explore the hypothesis that there is an interaction between anxiety and interpretation biases, having already examined the evidence for the effect of biases on anxiety, a further review was conducted to explore what effects anxiety has on interpretation biases. Relatively few studies were identified that had attempted to explore the effect of

induced mood on interpretation biases. Those that were found to be of relevance are reviewed below.

Calvo, Eysenck, and Castillo (1997) exposed high and low test-anxious participants to an evaluative stress procedure, where participants were told that their performance in the experiment would be evaluated against other students and would provide a measure of intelligence and academic success. Using a variation of the ambiguous scenario method, participants were presented with ambiguous scenarios pertaining to physical-, ego- or no-threat situations, followed by a disambiguating sentence, which either confirmed or disconfirmed the threat interpretation. Under evaluative stress conditions, high trait anxious participants showed slowed reading of the disconfirming sentences and faster reading of the confirming sentences for the ego-threat items only, as compared to the low trait anxious participants. This suggests that induced anxiety does have an effect on interpretation biases, with high anxious participants showing a mood-congruent bias. Through an analysis of the time-course of these biases, the authors also demonstrated that the bias occurs 'on-line' in the processing stage, rather than at retrieval. It was also observed that the interpretation biases were not automatic, as with attentional biases, but seemed to occur during post-lexical selection or during elaboration of the threat meaning.

Expanding upon the above study, Calvo and Castillo (1997) examined the differences in interpretation biases among high and low trait anxious participants under stressful and neutral conditions. The authors found that interpretation biases were only evident in the high anxious participants in the stressful condition, suggesting these biases were only activated temporarily when anxiety was induced. The authors also showed the temporal sequence of biases, whereby initially all meanings are activated (i.e. no bias is present) and only after a delay of 1,250 milliseconds are biased interpretations selected.

In both Calvo et al. (1997) and Calvo and Castillo's (1997) studies, it was demonstrated that there is an effect of induced anxiety on the interpretation biases of high anxious participants under stressful conditions. Contrary to the hypothesis that interpretation biases are a mood regulating strategy, there was no evidence of an incongruent interpretation bias, as would be expected according to the dual process model. However, it is difficult to interpret from the results what effects were observed on anxiety levels at any stage in the procedure, thereby making any conclusions regarding mood regulation more difficult. Firstly, because the test for biases was also the method for inducing anxiety (on the pretence that it was a measure of intelligence), anxiety was only measured prior to the procedure and at the end. Therefore, it is not known whether the differential effects on the latter anxiety measures were as a result of mood induction or the regulatory effects of interpretation biases. Therefore, the observation of no interpretation biases in the low anxious group is potentially because they did not experience any increase in anxiety, therefore had no reason to employ regulatory strategies. Alternatively, as changes in interpretation biases were not measured as a function of time, it could, as suggested by the dual process model, be that biases were initially congruent with an increase in anxiety, changing to incongruent and subsequently reducing anxiety levels, which if the case, such effects would have been lost in the analysis.

Davey, Bickerstaffe, and MacDonald (2006) induced a range of emotions (disgust, anxiety, happy, neutral) in a student population and measured subsequent interpretation biases using the homophone-spelling method. Mood was induced by presenting imagery vignettes simultaneous to mood congruent music. The authors observed a mood congruent interpretation bias, with participants in the anxious and disgust conditions interpreting significantly more ambiguous homophones as threat related, as compared to participants in the neutral and happy conditions. This suggests that an induced negative mood led to mood congruent interpretation biases, with no effects seen for positive moods. As in the previous

studies, the effect of time on interpretation biases was not measured, therefore any changes occurring over time, would have been lost in the analysis, resulting in an apparent neutral interpretation bias. Unfortunately, the authors also did not measure final mood following the test for interpretation biases, therefore it is not possible to ascertain what effect the interpretations biases had on subsequent mood, i.e. did the negative interpretation bias serve to maintain the negative mood. This study does however, provide evidence that induced moods do have an effect on interpretation biases, which would warrant further research.

Using a related experimental paradigm, Blanchette and Richards (2003) examined the hypothesis that contextual cues may influence interpretation biases in an induced anxious state. Participants rated their pre-task emotional state, and were then allocated to either the anxious or control condition. In the anxious condition, participants were told that their performance was being video-taped whilst they completed the homophone-spelling task. In the non-anxious condition, participants were just asked to complete the homophone-spelling task. Whilst completing the homophone spelling task, participants were presented with a contextual cue on a computer screen, for example the threat/neutral homophone 'Die/Dye' was presented with either 'Death' (threat cue) or 'Hair' (neutral cue). On completion of the spelling task, participants again rated their current mood before completing a recognition task for the contextual cues. The authors reported that there was no effect of anxiety on mood congruent or incongruent interpretation biases. What the authors did observe was that induced anxiety led to increased reliance on the contextual cue when presented both supraliminally and subliminally. Blanchette, Richards, and Cross (2007) replicated these findings using ambiguous facial expressions as a test for interpretation biases. The results from these experiments provide an interesting, added dimension to the interpretation bias literature with the addition of contextual cues. However, in terms of the particular questions posed here as to the direction of the relationship between anxiety and interpretation biases, it

does somewhat confuse the matter. It is possible that reliance on the contextual cues, was as a result of an attentional bias. It has been established that heightened anxiety leads to an attentional bias (e.g. Mathews & MacLeod, 2002), which may be what is observed here with the contextual cues. As attentional biases are automatic, whereas interpretation biases are selected (Calvo & Castillo, 1997), it is quite possible that in these studies what is actually observed is the preferential reliance on attentional biases over interpretation biases in a threatening situation. It may also be the case that the particular mood induction procedure employed may have led to an increased desire for participants to try and get the task 'right', as they were being videoed, which led to an increased reliance on contextual cues. In these studies, therefore it is difficult to ascertain the how much of the observed differences are due to attentional biases and it cannot be concluded that mood does or does not have an affect on interpretation biases.

Salemink, van den Hout, and Kindt (2007a) conducted an experiment with the specific aim of establishing the causal relationship between anxiety and interpretation biases. However, the authors appear to have essentially replicated the studies by Mathews and Mackintosh (2000), by training interpretation biases and then measuring interpretation bias of novel stimuli and changes in anxiety. The authors reported a non-significant congruent change in anxiety levels. The authors did include one modification to the procedure in that they asked participants whether they were aware of the valence of the training phase, which it appears they were, although this finding has not been reported in previous studies (Mathews & Mackintosh, 2000). In their analysis it suggests that the relationship between the test for interpretation bias and training is partially mediated by explicit awareness of the valence of the training. However, this might not necessarily imply that they were aware of being primed to respond in particular ways in the testing phase, as this was not explicitly measured.

Extending on the results of the above studies, Salemink, van den Hout, and Kindt (2007b), questioned whether due to the methods of training and testing of interpretation biases being very similar, participants were learning a method-dependent strategy, i.e. were being trained to respond to the ambiguous scenarios in a particularly valenced way. For this reason, they assessed interpretation biases using less direct methods: the extrinsic affective Simon task (EAST; De Houwer, 2003) and the Ambiguous Social Situations Interpretations Questionnaire (ASSIQ: Stopa & Clark, 2000). Whilst they showed that the training had an effect on state and trait anxiety, they failed to fully replicate the findings on tests for interpretation biases. In a post-hoc power calculation, the authors found that their sample lacked sufficient power and suggested that the EAST may not have been a sensitive enough measure of interpretation biases. The ASSIQ was designed to measure differences between clinical and non-clinical populations, which again may account for why it was not sensitive enough for use with a normal population. In these two studies, although the authors had attempted to explore whether interpretation biases were causal in changes in anxiety, there is little additional evidence for either possible explanation beyond that which had already been established in previous studies, such as by Mathews and Mackintosh (2000). The effect on mood as a result of the stress-inducing procedure was mentioned only briefly, suggesting that high trait anxious participants were more anxious after the mood-induction than the low-trait anxious participants. Due to the ambiguity of how the mood data is reported, it is not possible to draw any conclusions as to the effect of mood on interpretation biases.

1.6.4.1 Summary of the Evidence

In summary, there is limited evidence for the causal effects of anxiety on interpretation biases and no evidence for the subsequent effects on anxiety. It has been shown that high anxious individuals have a more negative interpretation bias than low anxious individuals. There is also evidence to suggest that these biases are only activated

under stress and are not as a result of an automatic process, i.e. threatening interpretations are selected rather than automatically activated. In one study, it has been shown that induced mood has a congruent effect on interpretation biases, although how mood is then affected as a result of these biases, was not measured. In none of these studies, has the variable of time been included in the analyses of interpretation biases subsequent to mood induction, which is particularly relevant to the dual process model. Through analysing the bias data without time as a variable, some important differences or changes in biases over time could have been overlooked. As the specific interaction between anxiety, interpretation biases and subsequent effects on anxiety, proposed by the dual process model, has yet to be explored, there remains a large gap in the literature.

1.6.5 Exploring the Interaction between Interpretation Biases and Anxiety

In an attempt to overcome some of the difficulties with establishing the causal relationship between anxiety and interpretation biases, some preliminary and as yet unpublished undergraduate studies have begun to explore the relationship further (personal communication, B.Mackintosh, October 2007). In three separate studies, non-clinical, non-anxious, participants were exposed to either a positive or negative mood induction, followed by the ambiguous scenario test for interpretation biases (Hunter, Mackintosh, & Eckstein, 2006; Vinnicombe, Mackintosh, & Eckstein, 2006) or the homograph interpretation bias test (Segal, Parry, Hoppitt, & Mackintosh, 2006). In each of these studies, a mood incongruent response bias was observed in the negative mood condition, with no effects observed for the positive mood condition. The effect on mood was also particularly interesting when comparisons were made of the mood ratings at three points during the procedure: pre and post mood induction and post-interpretation bias testing. The authors reported a congruent effect on mood following the mood-induction, followed by a return to baseline mood rating in both conditions.

Although in these studies, there was no evidence for an interpretation bias after induced mood, there are some methodological issues which may have affected the results reported. Participants were exposed to 'mood inducing music' throughout the test for interpretation biases in order to maintain the mood induced by the film, which may have simply been distracting, as was indeed reported by their participants. It may also have been the case that although music is known to be effective in inducing moods (e.g. Bruner, 1990), which music for which mood is thought to be due to personal tastes and conditioning (Crozier, 1997). Therefore, the music potentially could have had incongruent effects on mood and thus the effect on interpretation biases. In exploring these effects with a dual process model framework, it would be anticipated that any effects seen, may change over time, therefore these effects may have been lost in the study, without the inclusion of time as a variable. Finally, it is also expected that participants high in trait anxiety, would respond differently to those low in anxiety, therefore by not separating the groups accordingly any effects may have been lost. Therefore, from the results of these preliminary studies it cannot be determined whether the results are supportive or not of the dual process model and the hypothesised interaction between anxiety and interpretation biases.

1.7 Clinical Relevance of Research

Current research into interpretation biases and mood regulation models has already proven to be of clinical importance, which it is hoped could be further enhanced through combining the two areas in future studies and promoting our understanding of how anxiety disorders are maintained. The finding that interpretation biases can be manipulated to produce congruent effects on anxiety, has led to the development of interventions for use within clinical populations, namely cognitive bias modification (CBM; e.g. Mathews et al., 2007; Beard & Amir, 2008), which is proving to be a promising intervention. Through the repeated exposure of clinically anxious individuals to neutral interpretations of ambiguous

scenarios, individuals have gone on to demonstrate more neutral interpretations with a subsequent reduction in anxiety.

Models of mood regulation have also provided a framework within which to understand normal processes of mood regulation and how exactly these processes go awry and lead to the development of mood disorders. For example, in the application of the dual process model to depression, this has provided a framework within which to understand how difficulties in disengaging from substantive processing exaggerates the negative mood, which in turn reduces the cognitive resources available to regulate mood, leading to a downward spiral of depression (Beevers, 2005). If this model could also be applied to anxiety, then this could provide an understanding of how the particular processes could make an individual more vulnerable to anxiety, with more targeted interventions to prevent or break this downward spiral. Such research should be able to demonstrate the differences in mood regulation between clinically and non-clinically anxious individuals, in order to explore how the process differs between individuals and if it is indeed a failure to evoke motivated processing strategies. If it can be shown that the process of interpretation biases is a mood regulatory strategy that changes over time from congruent to incongruent, with subsequent changes in anxiety then this would lend further support to the use of CBM in clinical populations. In understanding how the process breaks down in anxious individuals, for example if it is only when under stress or it is a general difficulty with mood regulation, then more targeted CBM interventions could be developed to increase the generalisability of the intervention.

1.8 Summary of Areas for Further Research

In order to begin to explore whether interpretation biases may be a mood regulatory strategy employed to reduce an anxious mood and whether high anxious participants fail to engage in motivated processing in order to regulate their mood, within a dual process model

framework, further research is required in this area. Such research, extending the findings of the undergraduate studies, should involve the induction of an anxious mood, in both high and low anxious participants, with measures of interpretation biases recorded as a function of time to gauge whether low anxious participants do show a change from substantive to motivated processing and how this differs from the responses of high anxious participants. Measures of mood should also be taken at baseline, following mood induction and finally following tests for interpretation biases, to explore what, if any, effect the biases have on mood.

As discussed in relation to the conflicting findings of the hedonistic and contextual models, it may be that the motives of mood regulation could differ as a result of internal factors or social factors. The dual process model acknowledges that it can be difficult to predict which factor will drive mood regulation and in which direction (Forgas & Ciarrochi, 2002). Therefore, consideration needs to be given to controlling for the contextual demands of the situation, in order to be able to drawn conclusions as to what might motivate participants to regulate mood. This may be achieved though the inclusion of a positive mood condition, in addition to an anxious mood condition. If, as the hedonistic model suggests, internal, hedonistic concerns will motivate mood regulation, then it should be observed that mood maintaining strategies are employed in a positive mood, whereas mood regulatory strategies should be employed in the negative mood condition. However, if as the contextual model suggests, contextual demands will determine whether mood is regulated or maintained then it should be that no differences in regulation are observed between the positive and negative conditions. For example, if the task is perceived as easy, mood should be maintained, where as if it is challenging, mood should be regulated, irrespective of whether an anxious or positive mood was induced. In also considering Larsen's (2000a) proposal that there are separate pathways for positive and negative affect, and disorders of mood regulation

are as a result of a focus on the negative pathways, it would also be interesting to observe whether there are differences in the responses of the high and low anxious participants to the positive mood induction, to observe whether high anxious individuals regulate a positive mood more than low anxious participants, due to a tendency to focus on the negative interpretation. Alternatively, as suggested by Beevers (2005) in relation to the dual process model of depression, is the dysregulation of mood due to an inability to disengage from substantive processing when in a negative mood, rather than any difficulties maintaining a positive mood?

1.9 Aims of the Current Study

This study aims to compare the effects of induced positive and anxious moods on high and low trait anxious participants' interpretation biases and the subsequent effect of these biases on mood. As the dual process model suggests that cognitive processes will change from congruent to incongruent for mood regulation to take place, the proposed study will examine interpretation biases as a function of time, with the test for interpretation biases split into two equal halves. It would be predicted that in the anxious mood induction condition, high trait anxious participants will be unable to engage in effortful motivated process and therefore demonstrate mood congruent biases throughout the test, whereas low anxious participants will show a change from congruent to incongruent biases. It would also be predicted that as a result of failing to engage in motivated processing, high trait anxious participants' mood will not return to baseline following the test for interpretation biases, whereas low anxious participants' mood will. In the positive mood induction condition, in line with the findings in relation to the dual process model of depression, it would be expected that both high and low trait anxious participants will demonstrate mood congruent interpretation biases throughout, with a positive mood being maintained at the end.

1.10 The Proposed Study

In order to address the above aims for this study and in extending on the undergraduate studies, the following procedure is proposed.

Two experiments will be conducted, firstly exploring the effects of exposure to a positive mood induction and a second experiment to explore the effects of an anxious mood induction. In both experiments, mood will be measured prior to the mood induction, immediately following and after the test for interpretation biases. In both experiments, both high and low trait anxious participants will be included. In analysing the effects of mood on interpretation biases, the effects during the first half of the test will be compared with those in the second half, to explore whether biases change over time. There are also some methodological issues which it is hoped could be addressed in order to control for particular extraneous variables.

Firstly, the selection of a mood induction procedure in the undergraduate studies was based on the authors' own experiences and piloted on a small sample. The authors also used a combination of video clips and music to induce and maintain a mood, which was found to be unsuccessful for some participants. Whilst there is considerable evidence that video clips are effective in inducing moods, the use of music is less well established and may have acted as a confounding variable, altering the induction of the desired mood. With regards to the use of videos, there is published evidence, based on larger samples, demonstrating which film clips are most effective at inducing specific moods (Hewig et al., 2005). The use of evidence-based procedures could also increase the likelihood that specific moods are induced, i.e. anxious moods, which may have been a possible extraneous factor in the earlier studies.

In measuring mood, the undergraduate studies used an eight item visual analogue scale, referring to different affective states, all of which were averaged to provide a single

measure of mood valence on one continuum, i.e. positive or negative. This may have biased the results reported as any differential effects on particular moods, i.e. effects on anxious but not on happy moods, may have been lost. It is therefore proposed that in this study, items related to the particular moods induced are selected for each experiment and examined separately to further exclude the possibility of a change on one scale being obscured by a lack of change on another. The scales selected for the positive mood induction will equate to high positive affect (PA) and low PA and for the anxious mood condition, to high negative affect (NA) and low NA.

As this study will be recruiting a sample of low trait anxious participants, there is a possibility that selecting participants based on a low trait anxiety score alone, could lead to the inclusion of some participants with a repressive coping style, which could have significant effects on the observed outcomes. The effects of anxiety and self-reported anxiety in repressors, has been well-reported in the literature (e.g. Derakshan & Eysenck, 1999; Derakshan, Eysenck, & Myers, 2007). Repression is a means of defense against intolerable anxiety, whereby the individual, unable to tolerate the anxiety, unconsciously represses the experience of anxiety. This results in the individual appearing to be anxious to others, with all the physiological and behavioural responses, yet the individual is unaware of any subjective experiences of anxiety. In procedures comparing high and low anxious individuals, this is important to be aware of, as repressors will self-report being low anxious yet behave and respond in ways akin to high anxious participants (Lambie & Baker, 2003), which has the potential to reduce any effects observed between the two groups. It is therefore proposed that participants in this experiment are screened for and excluded if a repressive coping style is indicated.

In measuring interpretation biases, it is proposed that the ambiguous scenario method be used. As discussed in section 1.6.2.1, this will allow for control over the number

of physical and social threat items included. This was the method employed in the undergraduate studies, therefore it is fair to conclude that the ambiguous scenario method would also be an appropriate measure in this study.

In line with previous research into interpretation biases using the ambiguous scenario method as a test for biases (e.g. Mathews & Mackintosh, 2000), an interpretation bias would be evident from an interaction between recognition ratings of the target/foil items and the valence of the items (positive or negative), i.e. a negative interpretation bias would be evident from high recognition ratings of negative target items and low recognition ratings of positive target items, with no significant differences in the recognition of positive or negative foil items.

1.11 Research Questions and Hypotheses

Two separate experiments are proposed, with the first experiment comparing high and low trait anxious participants' responses following an induced positive mood and the second experiment, comparing high and low anxious participants' responses following an induced anxious mood. In both experiments, mood will be measured at baseline (time one), then following the mood induction procedure (time two) and finally, after the test for interpretation biases (time three). The test for interpretation biases will measure participants' recognition ratings across each half of the test (first and second half of test) and in response to item valence (positive or negative) and both target and foil items. The following hypotheses are therefore proposed in relation to the effects on mood and on interpretation biases:

Experiment One – Positive Mood Induction

1. Low Trait Anxious Participants

a. Participants will report a significantly more positive mood at time two, than at time one, and a significantly more positive mood at time three than time one, as evidenced by an increase on high PA items and a decrease on low PA items.

b. Participants will maintain a positive interpretation bias across both halves of the test, as evidenced by a two way interaction between item valence and target/foil items, with no effect of test half.

2. High Trait Anxious Participants

a. Participants will report a significantly more positive mood at time two, than at time one, and a significantly more positive mood at time three than time one, as evidenced by an increase on high PA items and a decrease on low PA items.

b. Participants will maintain a positive interpretation bias across both halves of the test, as evidenced by a two way interaction between item valence and target/foil items, with no effect of test half.

Experiment Two – Anxious Mood Induction

1. Low Trait Anxious Participants

a. Participants will report a significantly more anxious mood at time two, than at both times one and three, as evidenced by an increase in high NA items and a decrease in low NA items.

b. Participants will show an initially mood congruent, negative interpretation bias in the first half of the test and a significantly more incongruent, positive interpretation bias in the second half of the test, as evidenced by a three way interaction between test half, item valence and target/foil items.

2. High Trait Anxious Participants

    a. Participants will report a significantly more anxious mood at time two, than at time one, with mood at time three remaining significantly more negative than at time one, as evidenced by an increase in high NA items and a decrease in low NA items.

    b. Participants will show a mood congruent, negative interpretation bias at times one and two, with evidence only of an interaction between item valence and target/foil items, with no effect of test half.

CHAPTER 2: EXPERIMENT ONE

2.1 Methods

2.1.1 Overview of Chapter

There are eight sections within this chapter. In section 2.1.2 an overview of the design is presented, followed by a description of the sample and recruitment process in section 2.1.3 and an outline of the inclusion and exclusion criteria. Section 2.1.4 highlights the ethical considerations for this study. Details of the measures used in the study and the rationale for their use is presented in section 2.1.5. Then follows an account of the mood induction procedure and the justification for its use in section 2.1.6. An overview of the method used to measure interpretation biases and an explanation for its use in this study is discussed in section 2.1.7. Section 2.1.8 provides a comprehensive and detailed account of the experimental procedure. Finally, the planned analyses are described in section 2.1.9. Details and copies of all, except copyright materials, used in this study are provided in Appendices A-R and are signposted throughout this chapter.

2.1.2 Design

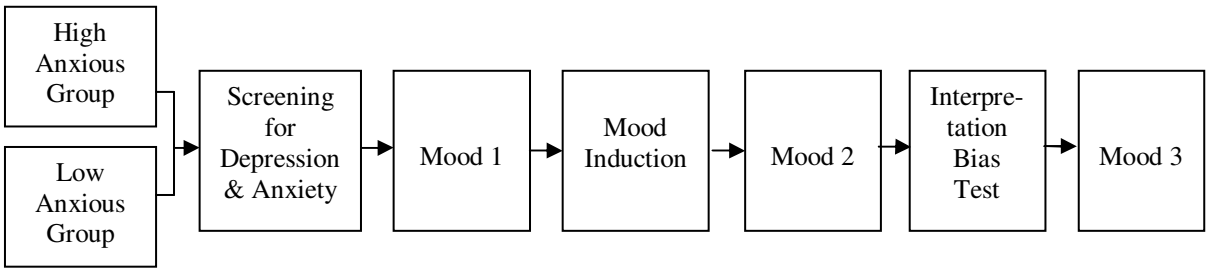
The stated hypotheses were tested using a 2 x 3 mixed-design to assess changes in mood over time, with mood rating as the dependent variable, anxiety (high or low) as the between-subjects variable and time (3) as the within-subjects variable. In order to explore interpretation biases, a 2x2x2x2 mixed model design was employed, with recognition ratings as the dependent variable, anxiety (high or low) was the between-subjects variable and the within-subjects variables were item valence (positive or negative), target/foils and test half (first or second half).

Participants were allocated to either the high or low trait anxious group, based on screening measures for anxiety. Participants' trait anxiety and depression scores were

measured initially, followed by a baseline mood assessment. All participants were then exposed to a positive mood induction procedure, after which mood was again measured. All participants completed the test for interpretation biases followed by a final measure of mood. Figure 2.1 below outlines the design of this study.

Figure 2.1

Flow Diagram of Study Design, Showing Temporal Sequence of Events



2.1.3 Participants

2.1.3.1 Sample Size

There has been no previous research using this procedure with both high and low trait anxious participants, therefore it was not possible accurately to predict the power and required sample size. Based on results from Segal et al. (2006) and Hunter et al.'s (2006) similar studies, it might reasonably be expected that an effect size of between 0.50 and 0.89 for the test of interpretation biases could be achieved. Therefore, based on the more conservative estimate of 0.50, a minimum of 12 participants per group would be required (please refer to Appendix A for power calculation). Hunter et al. (2006) using only low anxious participants demonstrated a significant effect with 20 participants per condition. As this particular procedure has not been reported before, a more conservative sample size of 20 per group was aimed for (total of 40 participants).

Six participants were also recruited to the piloting procedure in order to ensure the selected mood induction procedure evoked the desired mood. These participants were not paid and were an opportunistic sample (i.e. friends and relatives of the researcher).

2.1.3.2 Recruitment

Participants were initially recruited from the student population of the University of East Anglia (UEA), a higher education institution based in Norwich. UEA has a population of over 15,000 students including undergraduate and postgraduate students, 3,000 of whom are resident on campus.

Recruitment to this study was achieved by a number of methods. Each academic school at UEA was contacted via email addressed to either the Head of School, or the e-mail list 'gatekeeper' where one was known, to request permission to send an email to the students within that school. Permission from 20 schools was granted and an email was sent to these students (Appendix B). Participants who had signed up to a psychology research volunteer panel, managed by the School of Medicine, Health Policy and Practice and the School of Social Work and Psychology, were also contacted to invite them to participate. Posters and flyers were distributed around the university campus and an advertisement was placed on the university's employment website. Finally, participants who attended for the experiment were given flyers to pass to their friends and peers. Due to difficulties in recruiting sufficient numbers of high anxious participants from the student population, recruitment was widened in the final month of data collection to include staff members of the university. Permission to contact staff members was requested from each departmental manager, and where permission was granted, staff members were contacted by the most appropriate means, i.e. email for administrative staff or by letter for those staff without email access, such as the cleaning and catering staff.

2.1.3.3 Inclusion Criteria

All participants were recruited from the student and staff populations at UEA. Due to the nature and age certificates of the films that participants were exposed to, only participants over the age of 18 years were included; no upper age limit was imposed. Participants were required to be native English speakers or had spoken English in an English speaking country since the age of 10 years. This latter criterion was imposed due to an observed response biases among non-native English speaking, but reportedly fluent, participants in a related study, (personal communication, B. Mackintosh, October 2008). Therefore, a more stringent inclusion criterion was imposed, to ensure that participants were native or as-if native, English speakers, having spoken it since childhood. Participants were also included if they reported either low or high trait anxiety (defined further in section 2.1.5.4).

2.1.3.4 Exclusion Criteria

Participants were excluded from the study if they were under the age of 18 years. In order to rule out the confounding effects of reading ability and memory, all participants who reported any learning difficulties or memory impairments were excluded. Previous research has also shown that individuals with a repressive coping style potentially could lead to very skewed results, as one might expect given the behavioural and emotional profile of repressors, as discussed in Chapter 1 (see also Mackintosh et al., 2006). Therefore, participants identified as potentially having a repressive coping style were also excluded.

Research within this area is frequently carried out at UEA, therefore those that had previously participated in research using similar methods were excluded. Participants that reported experiencing any mental health difficulties either currently or within the last five

years, whether diagnosed or not, were excluded in order to avoid exposing them to potentially distressing material. Participants were screened for trait anxiety and depression during the experiment and all those that were scoring in the severe range for depression and more than 3 standard deviations above the mean on the trait anxiety scale were also excluded.

2.1.4 Ethical Considerations

Through the screening of participants for trait anxiety, there was a small possibility of the identification of clinical levels of anxiety in participants. This was unlikely given that the measure of anxiety used in this study is only a measure of trait anxiety and thus measures the vulnerability to becoming anxious, not current distress (Creamer, Foran, & Bell, 1995). However, in order to reduce the possibility of clinically anxious participants being exposed to distressing material, participants who were identified as having scores more than three standard deviations above the mean for their population at the screening stage were excluded from the study. Participants who were identified as scoring above this cut-off were allowed to continue with the experiment, although their data was excluded from the analyses. Similarly, in screening for depressive symptoms, participants' whose scores were within the severe range were also allowed to complete the experiment, although their data was removed from the final analyses. Where concerns were raised regarding responses given on the questionnaires, the researcher discussed these with the participant and suggested appropriate sources of support. The researcher conducting this experiment is experienced in dealing with high levels of distress and had the requisite skills to manage such a situation. The researcher was also supervised by an experienced Clinical Psychologist from whom further advice and supervision was available should it have been needed regarding the most appropriate course of action for at risk participants.

All participants were screened for repressive coping styles and were excluded from the study if this was believed to be present. It was not deemed appropriate or ethical to

inform participants if this was identified. A repressive coping style is one of many different defence mechanisms that an individual develops to defend against intolerable anxiety (Taylor, Bagby, & Parker, 1997). Defence mechanisms are developed in response to an individual's environment and social interactions (e.g.Vaillant, 1992) and for the most part are adaptive for that individual. It would therefore only be appropriate to inform and discuss with an individual their defence mechanisms in the process of individual therapy, where help for a particular problem has been sought. To inform normal, healthy participants of a repressive coping style would at best be meaningless to them and at worst could lead to unnecessary distress. Therefore in order to avoid creating distress in otherwise healthy individuals, participants were not informed of their exclusion due to a repressive coping style.

The procedure involved a minimal amount of deception with regards the aims of the experiment and some details of the tasks participants were to undertake. Participants were not told that there was a recognition task following the reading of the scenarios, nor were they informed that the aim was to investigate interpretation biases. To inform participants of this would have rendered the procedure ineffective. It was not anticipated that this deception would have caused any distress to the participants. However had any participants been observed to be experiencing any distress, the researcher would have halted the procedure and debriefed participants, although this was not necessary on any occasion. All participants were given full details of all other aspects of the study and asked to sign a consent form. They were informed of their rights to withdraw from the study at any point and were fully debriefed at the end of the procedure.

Participants were assured that all the data collected was in anonymised form and kept completely confidential. At the point of their returning the screening questionnaires, they were assigned a participant number. A record of each participant's name and number was stored by the primary researcher in a locked filing cabinet and kept separately to the data.

All completed questionnaires and data were only identifiable by the participant number and contained no identifying information. All questionnaires and hard copies of participants' responses were stored by the primary researcher in a locked cabinet for the duration of the study. At the end of the research study, the original data was stored in a locked archive room at UEA.

Participants were offered £5 and an information leaflet about mental health resources available to students in the area and on-line (Appendix C) as recompense for their time. This was offered to all participants who attended for the testing session, regardless of whether they completed the experiment or not.

This study received ethical approval from the University of East Anglia, Faculty of Health Ethics Committee on the 4th July 2008, with approved amendments made on 22nd October 2008 and 26th March 2009 (see Appendices D, E and F respectively).

2.1.4.1 Information Sheet and Consent Form

Participants were provided with a detailed information sheet at the initial screening stage (see Appendix G). Participants identified as appropriate for inclusion in this study, were again given this information to read before signing the consent form (Appendix H) prior to the experimental procedure and had the opportunity to ask questions before giving their consent.

2.1.5 Measures

2.1.5.1 Demographic Variables

Prior to inclusion in this study, participants were screened to ensure they met the inclusion and exclusion criteria. In order to collect information regarding demographic variables, all potential participants were asked to complete a brief demographic questionnaire (Appendix I).

2.1.5.2 Brief Measure of Anxiety

Only participants who were either high or low in trait anxiety were to be included in this study, therefore a very brief questionnaire that was a good predictor of trait anxiety scores was required. One such measure, the Mackintosh and Mathews Anxiety Questionnaire (MMANX ; Mackintosh & Mathews, 2006), was devised specifically for this purpose by researchers in this field (see Appendix J). In pilot studies involving 270 participants, the MMANX was shown to have a high correlation of .87 with the Spielberger Trait Anxiety Inventory (STAI; Spielberger, 1983), allowing for prediction of participants' scores on the STAI questionnaire with reasonable accuracy and was reported to have good internal consistency (Cronbach's α .83). The MMANX consists of 10 items referring to different emotional and physical states, for which participants were required to indicate how much they generally experienced each state on a Likert scale of one to five. Only six of the items were target items, the remaining four were distracter items.

The MMANX scores were converted to estimated STAI scores using a standard formula: (MANX x 2.3) + 8.8 = STAI (Mackintosh & Mathews, 2006). It has been common practice in previous studies to categorise participants into high, low and mid-range trait anxiety levels using tertile splits based on all the scores for the whole sample. However, in this study this was not deemed appropriate as this would have required all participant recruitment and screening to have taken place before the experiment was undertaken, which would have led to high levels of participant attrition and the increased probability that participants' anxiety scores would have changed during that time. Therefore, cut-off scores were obtained from a previous study that had screened a large number of undergraduate students using the STAI and had categorised them using tertile splits (Lambie & Baker, 2003). Based on their findings, for this study low trait anxiety was defined as an estimated

score of 38 or below on the STAI which equated to an actual score of 12 or below on the MMANX using the above formula. High anxiety was defined as an estimated score of 48 or above on the STAI, which equated to an actual score of 17 or above on the MMANX

2.1.5.3 Measure of Repressive Coping Style

A short-form of the Marlowe-Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960) was used as an adjunct to the MMANX to screen for repressive coping styles. The operational definition of repression is a low, self-reported level of anxiety and a high level of defensiveness or social desirability. Previous research has extensively relied on the STAI as a measure of anxiety and the MCSDS as a measure of defensiveness. The full MCSDS consists of 33 items, which was considered too long for an initial screening measure. A short form of the MCSDS was identified from the literature, which comprised just 13 questions. This short form has good psychometric properties (internal validity .73) and has a correlation of .93 with the original scale (Reynolds, 1982; Appendix K). Zook and Sipps (1985) also recommended the 13-item scale over other forms, as it was found to be as reliable as the original scale and has been the most extensively researched. The score on the short-form can be multiplied by 2.54 to provide a reasonably accurate estimation of the scores on the full-scale. The short-form MCSDS consists of 13 statements which participants were required to indicate whether they were true or false as they applied to them personally.

As there are no pre-determined cut-offs for repressive scores, identification of repressors in a sample in previous studies has been via tertile splits of the whole sample's data. In this study, the categorisation of repressors was based on the results of the Lambie and Baker (2003) study. The results from this study reported that repressors were those that scored below 27 on the STAI and above 15 on the full MCSDS. To apply this to our study, repressive copers were defined as those scoring 7 or below on the MMANX and 6 or above on the short-form MCSDS.

2.1.5.4 Measure of Trait Anxiety

Participants' trait anxiety levels were assessed prior to their participation in the experiment in order to confirm their estimated trait anxiety from the MMANX, using the STAI (Spielberger, 1983). The STAI is the most commonly used measure in previous research allowing for more direct comparison of our results with previous findings (Piotrowski, 1999). The STAI is a sensitive enough measure to allow for the detection of differences in levels of trait anxiety within the normal range, as opposed to other commonly used measures such as the Beck Anxiety Inventory (Beck & Steer, 1990), which measure clinical levels of anxiety. The STAI has adequate psychometric properties. The test-retest reliability ranges from .73 to .86 and the internal consistency is .90.

2.1.5.5 Measure of Depression

Levels of depression were measured primarily to screen out participants with severe depression. The Beck Depression Inventory-II (BDI-II) is a widely used measure of depressive symptoms with excellent psychometric properties (reliability .92; Beck, Steer, & Brown, 1996). The BDI-II consists of 21-items related to symptoms of depression, which participants must rate on a scale of 0-3 as to how frequently they experience them. Scores are categorised into 'normal', 'mild', 'moderate' and 'severe' ranges.

2.1.5.6 Measure of Current Mood

A brief measure of current mood was required to assess participants' mood at three points in the procedure. A Visual Analogue Scale (VAS; Appendix L) was used in this study, as in Hunter et al.'s (2006) study, which was based on Mayer and Gaschke's (1988) Brief Mood Introspection Scale (BMIS). The BMIS was derived from Watson and Tellegen's (1985) circumplex model of affective states. Eight scales selected were chosen to equate to Watson and Tellegen's (1985) high PA (happy, carefree), low PA (sad, low) to measure

positive mood in experiment one and high NA (tense, worried) and low NA (calm, content) to measure anxious mood in experiment two. Whilst the VAS used in Hunter et al's study is not a standardised measure, it does provide an indication of high and low positive and negative affective states, as is required for this study. The brevity of the measure was also vital, as time taken completing measures, could have seen induced moods decay or interfered with during that time. Additional benefits of using the VAS included the replication of the measures used by Hunter et al. (2006) and Vinnicombe et al. (2006) in order to increase the likelihood of replicating their results with a different population. The VASs in this study consisted of one practice item and eight test items.

2.1.6 Mood Induction Procedure

In the studies by Vinnicombe et al. (2006) and Hunter et al. (2006), positive and negative moods were induced by exposure to short film clips with mood congruent music played over the top of the films. As discussed in Chapter 1, it was not felt that the chosen methods of selecting the films were sufficiently rigorous nor was there adequate evidence that these films reliably induced the desired mood.

Exposing participants to film clips to induce a particular mood is a commonly used method in the literature and there are a number of studies that have examined the efficacy of particular clips at inducing mood. Hewig et al. (2005) undertook a study using 20 film clips, which were shown to 38 participants without the soundtracks and measured the induction of a range of self-reported moods. The authors reported that the two most effective clips for inducing a positive mood were clips from When Harry Met Sally (Reiner & Scheinman, 1989) and An Officer and a Gentleman (Elfand & Hackford, 1982). Please refer to Table 2.1 for details of the clips and editing guidelines. As the clips were relatively short (1-3 minutes long) and it was likely that there would be some individual differences in how participants

responded to each clip, it was decided that both clips for the positive mood would be shown to participants consecutively.

Table 2.1

Details of the Positive Film Clips and Editing Guideline, Adapted from Hewig et al. (2005)

Film	**When Harry Met Sally**
	Editing instructions from Philippot (1993)
Clip description	Sally (Meg Ryan) is faking an orgasm at the table of a restaurant.
Editing guidelines[1]	Start: Camera pans across restaurant to Sally and Harry sat at a table discussing Harry's previous relationships. End: Woman at next table places her order "I'll have what she's having".
Clip length	2'45"
Target emotion	Amusement
Film	**An Officer and a Gentleman**
	Editing instructions from Tomarken, Davidson, and Henriques (1990)
Clip description	Paula is working in a factory. Zack comes in, kisses her and carries her out of the factory
Editing guidelines[1]	Start: Final scene of film set in the factory. Camera shot of machine and Zak (officer) is seen to appear from behind the machine entering the factory. End: Zak carries Paula out of the factory. End before credits appear.
Clip length:	2'08"
Target emotion	Amusement

[1] A description of the scenes has been provided rather than specific times, as these were found to be inaccurate depending on the medium of the original film (i.e. VHS, DVD or digital download).

The decision was made not to play mood congruent music over the film clips and instead to leave the original soundtrack on the film clips. In a review of the literature on the effectiveness of music in inducing mood, there was considerable evidence that music is effective at inducing moods (Bruner, 1990). However which particular piece of music for which mood can also be a very personal and individual phenomenon that is also current mood and context specific based on the individual's own music tastes and associations with that piece of music (Konečni, 1982; see also Crozier, 1997). It was not therefore thought possible

to select with any confidence a piece of music that would reinforce the moods induced by the films and was more likely to interfere with it.

The two selected films clips with the original soundtracks were piloted on a small opportunistic sample of six participants to ensure that they were effective at inducing the desired mood. The results of the pilot are reported in Appendix M and suggested that they were effective in inducing a positive mood.

2.1.7 Measuring Interpretation Biases

Within the literature, there are three commonly used methods to measure participants' interpretation biases. An overview of each is provided in section 1.6.2.1. Due to the control over numbers of items and those that pertain to social and physical threat within the test, the ambiguous scenario method was deemed to be the most reliable measure of interpretation biases, as used by Mathews and Mackintosh (2000). To briefly recap on the test procedure, participants were first presented with an ambiguous scenario, with the final word presented as a fragment, which participants were required to complete in order to make sense of the scenario. Participants were then asked to answer a comprehension question about the scenario in order to ensure the active encoding and processing of the scenario in memory. After a number of scenarios had been presented, participants were asked to complete a recognition task, where they were shown four different sentences and were asked to rate how similar in meaning the sentences were to the original scenarios. These four sentences include positively negatively valenced foil sentences that were unrelated to the original meaning and positively and negatively valenced target sentences that were similar to the original in meaning.

2.1.8 Procedure

Participants contacted the researcher to express an interest in this study, and were then sent a brief email outlining the study (see Appendix N), the participant information sheet (see Appendix G), the MMANX questionnaire, the short-form MCSDS and a demographics questionnaire, to complete and return, to assess their eligibility.

Participants that did not meet the criteria were emailed, thanking them for their interest and informing them that they were not to be invited to participate in the study. All ineligible participants were however invited to join the Psychology Volunteer Panel and were given details of how to register (see Appendix O).

Participants that were eligible were emailed inviting them to sign up to an online scheduler (see Appendix P). The on-line scheduler allowed participants to view details of the experiment and available times to attend and select a suitable time-slot. Once a participant had signed up, an email was automatically generated to the researcher informing them of the participant's name, email address and the time they had signed up for.

2.1.8.1 Randomisation to Experiments

Participants who were deemed appropriate for this study were allocated to either this experiment (experiment 1), a subsequent experiment which ran concurrently (experiment 2) and a related, collaborative study, run by a fellow doctoral student at UEA (see Appendix Q for details of this study). Whilst it would have been ideal to randomly allocate participants to each experiment, this was impracticable given that participants were tested as and when they signed up, rather than having an initial pool of participants to randomly allocate to experiments. For these reasons, a quasi-randomised procedure for allocation to experiment was used. Testing sessions were alternately designated as either experiment 1 or experiment

2, with the addition of the collaborative experiment in the early stages of recruitment. Participants then signed up to the session according to whether the time suited them, without the knowledge of which experiment they were allocated to and with no influence from the researcher.

2.1.8.2 Testing Conditions

All participants were tested in the same room in a teaching building on the university campus. The room contained 20 computer stations around the outside walls, with privacy screens around each station.

Participants were tested individually or in groups of up to five, depending on the attendance to each session.

2.1.8.3 Apparatus

Each participant was seated at an individual workstation with a desktop computer, which was operated by use of a keyboard and a mouse. Participants were also given headphones to wear during the mood induction procedure.

The STAI, VASs and the interpretation bias test were presented on a desktop computer using the computer programme E-Prime (Schneider, Eschmann, & Zuccolotto, 2002), which recorded the responses. The BDI-II was given to participants on paper. The mood induction film clips had been edited using Wondershare Video Converter Suite (Wondershare Software Co., Ltd, 2008) and were presented on the desktop computer using the computer software Windows Media Player (Microsoft, 2004).

2.1.8.4 Procedure

Participants were seated at their workstation and were first asked to read through the participant information sheet and were given the opportunity to ask questions before signing

the consent form. All participants then completed the STAI on E-Prime after reading the instructions below.

> A number of statements, which people have used to describe themselves, will be displayed on the screen.
>
> Please read each statement and then tick the appropriate box to the right of the statement to indicate how you GENERALLY feel.
>
> There are no right or wrong answers but you will be unable to go back to the previous question if you make a mistake.
>
> Do not spend too much time on any one statement, but give the answer that best describes how you usually feel.
>
> Please use the mouse to tick the boxes. Call us in when the screen says 'thank-you'.
>
> Press any key to go on.

Each statement on the STAI was displayed sequentially on the screen, with the proceeding statement appearing only after the participant had made a response. On completion, their score was displayed, embedded in a random code on the screen for the researcher's information.

Participants were then asked to complete the BDI-II using paper and pen. During this time the researcher compared the STAI scores against the initial MMANX scores to ensure participants had been correctly categorised as high or low anxious and that they were not above the cut-off for clinical anxiety. The completed BDI-II was scored by hand to ensure participants were not in the severe range.

The following instructions were then presented on the computer screen before participants went on to complete the first series of mood VASs on E-Prime.

In this task you are asked to indicate how you are feeling at the moment, compared with how you generally feel.

Indicate your rating by clicking on the scale bar.

A practice trial will be shown to illustrate how to do the rating.

Each time, please read the labels on the scale very carefully before you start.

Press any key to go on.

Participants were given one practice trial on the VAS using the neutral state of 'tiredness' before completing the eight test trials. Each statement was displayed on the screen, one at a time, with the proceeding statement appearing on a new screen only after the participant had given a response.

On completing the VASs, participants were given the following instructions before watching the film clips. The instructions were presented on white A4 paper, left-aligned and in black, Times New Roman typeface, font size 16. The instructions were left by the computer for the participant to refer back to as needed.

We would now like you to watch two short film clips.

Please put on the headphones provided so that you can hear the audio track.

There are two film clips, each of which is 2-3 minutes long. The clips are taken from commercially available and well-known films.

Please watch the films closely and pay attention to what feelings the film evokes in you, as you will be asked about this afterwards.

The films may contain material that some people might find distressing.

If at any point you decide that you don't want to continue, you can stop the film at anytime by pressing the ESCAPE button in the top left hand corner of the keyboard, or you can ask one of the researchers to stop it for you.

When you are ready to watch the films, using the mouse, please click on the play button.

The second series of mood VASs were then presented before proceeding to the test for interpretation biases. All materials for the interpretation bias test were adapted from Mathews and Mackintosh (2000). Participants were given the following instructions on the computer screen before being asked to complete two practice trials, to ensure they understood the task.

You are about to read 20 short stories, each story will be displayed line by line.

Please press the ARROW DOWN key to start the story and to read each line. The last word of each story will appear in an incomplete form.

Your task is to work out what the word is.

AS SOON AS YOU HAVE IDENTIFIED THE WORD, PRESS THE 'ARROW DOWN' KEY.

Then find and press the LETTER KEY corresponding to the FIRST missing letter of the word.

You will then be asked a simple question about the text and given feedback about your response.

The first two stories are for practice.

Press the 'arrow down' key to go on.

The story was presented line by line, with participants pressing the 'arrow down' key to proceed to the next line of the story. At the end of the story a new page appeared with the word fragment. Participants were instructed to press the 'arrow down' key as soon as they knew what the word was, and then press the key corresponding to the first missing letter. A new page then appeared on the screen with the word fragment completed, for one second. A new page then appeared with the comprehension question, which required a yes or no response. Participants were instructed to press the 'left arrow' key to answer 'no' and the 'right arrow' key to answer 'yes'. After participants had given a response, feedback appeared in the centre of a new screen, informing them if they were 'Correct!' or 'Incorrect'. After two practice trials the following screen appeared before participants went on to the 20 test trials.

Now you have completed the practice task.

Please ask the experimenter if you have any questions at this point.

If you are clear, press the 'arrow down' key to go on.

All participants were then presented with ten social-threat scenarios and ten physical threat scenarios, which were displayed in random order by the programme E-Prime in the same format as the above practice trials. Please refer to Appendix R for the 20 scenarios used in this study. After all 20 scenarios had been read, the programme automatically proceeded to the test phase and participants were given the following instructions.

Thank you. That is the end of the first part of the task.

Press the “arrow down” key to start the second part.

[new page]

Remember back to the stories you read before.

Now you will be shown the title and a brief description as a reminder for each story along with 4 different endings.

Please rate the endings in the following way:

Press one of the number keys 1,2,3,4 to indicate how similar the ending is to how you remember it.

1= very different in meaning

2= fairly different in meaning

3= fairly similar in meaning

4= very similar in meaning

Read each ending carefully.

Respond as quickly as possible.

You will begin with the two practice items.

Please press the ‘arrow down’ key to start.

Participants were given two practice trials to ensure they understood the instructions before proceeding to the test trials. For each scenario, participants were asked to rate on a scale of one to four how similar in meaning four different sentences were to the original

meaning. The four sentences comprised a positive target, a negative target, a positive foil and a negative foil. On completion of the practice items, the four endings for the 20 target scenarios were presented one at a time, using a block-randomisation sequence generated by the E-prime programme.

On completion of the test for interpretation biases, all participants were asked to complete a third series of mood VASs. This then completed the experiment and participants were thanked for their time, debriefed, given the mental health information leaflet and paid five pounds.

2.1.9 Planned Analysis

The plan for analysis was to firstly explore the effect of induced mood and trait anxiety on ratings of high positive affect (PA) items and secondly on low PA items using mixed-model ANOVAs. A separate mixed-model ANOVA was also planned to explore the effects on interpretation biases. For the analyses of both high and low PA ratings, the dependent variable will be mood ratings, the between-subject independent variable being trait anxiety (high or low) and the within subjects variable being time (pre-, post-mood induction and post-interpretation bias test), resulting in 2x3 mixed-model analyses. For the analysis of interpretation biases, the dependent variable is recognition rating, the between-subjects independent variable is anxiety (high or low) and the within-subjects variables will be test half (first and second half of the test), target/foil items and item valence (positive or negative), resulting in a 2x2x2x2 mixed-model analysis.

CHAPTER 3: EXPERIMENT ONE

3.1 Results

3.1.1 Overview of Chapter

A summary is provided in 3.1.2 of the demographic variables for participants recruited to both experiment one and two, along with reasons for exclusion from the study. A rationale is also presented for modifications to the inclusion criteria. Section 3.1.3 details the analysis of the data for experiment one. In sections 3.1.3.2 to 3.1.3.4 the results of two mixed-model ANOVAs are presented, demonstrating the effects on high and low positive affect (PA). Section 3.1.3.5 describes the analysis of the interpretation bias data, using a mixed-model ANOVA. A summary of the results of experiment one is provided in section 3.1.3.7.

3.1.2 Overall Recruitment and Participant Demographics for Experiments One and Two

A total of 253 participants returned the screening questionnaires. Table 3.1 below summarises the demographics of the sample.

Table 3.1

Demographic Information from Whole Sample

		N	%	Mean	*SD*
Gender:	Male	63	24.9	-	-
	Female	184	72.7	-	-
	Not Specified	6	2.4	-	-
	Age	-	-	26.8	9.1
	MMANX	-	-	14.0	3.8
	MCSDS	-	-	6.8	2.8

Key: *MCSDS – Marlowe-Crowne Social Desirability Scale Short Form*
MMANX - Mackintosh and Mathews Anxiety Scale

Of the 253 screening questionnaires received, 131 met the inclusion criteria for this study. Of those eligible participants, 18 participants were quasi-randomly diverted to a similar study, as described in the previous chapter and 35 did not attend for the experiment. A total of 78 participants therefore completed the experiments one and two. There were 122 participants who were not eligible to participate; due to mid-range anxiety scores (62.6%), repressive scores on the MCSDS (4.6%), non-native English speakers (19.8%), learning, language or memory difficulties (9.2%), recent mental health problems (9.2%), having participated in a similar study previously (16.8%) or other reasons such as not completing the demographics or mood questionnaires (4.3%). Some participants met more than one exclusion criteria and these have been included in both categories. The reasons for exclusion are summarised in Table 3.2 below.

Table 3.2.

Reasons for Exclusion from the Study

	Total	Mid-range anxiety	Repressive Scores on MCSDS	Non-native English speaker	Learning difficulties	Mental Health Problems	Participation in similar study	Other
N	131	82	6	26	12	12	22	7
%	100	62.6	4.6	19.8	9.2	9.2	16.8	4.3

A total of 78 participants were initially split into high and low trait anxious groups. The MMANX scores were used to predict STAI scores using the formula STAI=8.8+(MMANX x 2.3), (Mackintosh & Mathews, 2006). Using the STAI cut-off scores from Lambie and Baker (2003), participants were allocated to the high anxious group if their MMANX score was 17 or above (predicted STAI score ≥48) and to the low anxious group if their MMANX score was 12 or below (predicted STAI score ≤38). Participants were then quasi-randomly allocated to experiment one (positive mood induction) or experiment two

(anxious mood induction) which ran concurrently. As described in Chapter 2, each of the experimental sessions were alternately allocated as experiment one or two, participants selected which session they wished to attend, without prior knowledge of the pre-determined experiment.

After collecting 253 screening questionnaires, it was apparent that there were difficulties in recruiting sufficient numbers of high anxious participants, using the predetermined cut-offs. Additional difficulties were experienced with the MMANX not serving as a suitably accurate predictor of the STAI scores, perhaps in part due to the time between completing each questionnaire and the change in context. It was observed that a number of participants deemed high or low trait anxious at the screening stage, were scoring in the mid range on the STAI at the time of the experiment. Although previous investigations had reported a correlation of .87 between the MMANX and the STAI, pooling data from experiments one and two, a correlation of .78 was observed. Table 3.3 below summarises the numbers of participants per condition based on the predetermined cut-offs.

Table 3.3

Number of High and Low Anxious Participants per Experiment using Predetermined Actual-STAI Cut-Off Scores

	High Anxious	Mid-Anxious (excluded)	Low Anxious
Expt 1 - Positive Mood	14	8	19
Expt 2 - Negative Mood	7	12	18

For pragmatic reasons therefore, it was deemed most appropriate to reallocate those eligible participants to the high and low anxious groups based on a median split of all the 253 received MMANX scores. Using this new criterion, a median score of 14 on the MMANX

was obtained from the 253 screening questionnaires, which equates to a predicted STAI score of 41. Therefore, all participants with an actual STAI score of ≤40 obtained immediately prior to the experiment were allocated to the low anxious group and those with STAI scores of ≥41 were allocated to the high anxious group. Table 3.4 below summarises the number of participants according to experiment and anxiety group using this new criterion. The data for five participants are not included in the table below, as they were excluded from the study for the following reasons. There was a software failure for one participant and so all of their data were lost, two participants had BDI-II scores within the severe range and two had STAI scores more than 3 SDs above the mean. All participants within the clinical ranges for the BDI-II and STAI were exposed to the positive mood induction and their data excluded from the analyses.

Table 3.4

Number of High and Low Trait Anxious Participants in each Experiment Using Revised Actual-STAI Cut-Off Scores

	High Anxious	Mid-Anxious (excluded)	Low Anxious
Expt 1 - Positive Mood	17	0	21
Expt 2 - Anxious Mood	15	0	20

3.1.3 Experiment One

3.1.3.1 Participant Demographics

A total of 38 participants were included in experiment one, of which 21 were allocated to the low trait anxious group and 17 to the high trait anxious group. The descriptive statistics for participants' demographic information and screening questionnaires are presented below in Table 3.5.

Table 3.5

Demographic Information for Included Participants

	All		Low Anxious		High Anxious	
	N	%	*N*	%	*N*	%
Total	38	100	21	55.3	17	44.7
Male	10	26.3	6	25	4	23.5
Female	28	73.7	15	71.4	13	76.5
	Mean	*SD*	Mean	*SD*	Mean	*SD*
Age	23.62	5.52	23.12	4.48	24.23	6.68
MMANX	13.45	4.22	10.38	2.09	17.24	2.86
MCSDS	7.11	2.72	7.90	2.70	6.12	2.47
STAI	39.47	10.60	31.33	4.36	49.53	6.43
BDI-II	7.42	6.79	3.48	3.37	12.29	6.84

Key: MCSDS – Marlowe-Crowne Social Desirability Scale Short Form
MMANX - Mackintosh and Mathews Anxiety Scale
BDI-II – Beck Depression Inventory – Second Edition
STAI – Spielberger Trait Anxiety Scale

In order to ensure the high and low anxious groups were equivalent, a series of analyses was carried out. Gender differences between the high and low anxious groups was examined using the Chi Square statistic and there was no significant difference found in the gender distribution of the two groups, $\chi^2(1) = .123$, $p=.510$. Further analyses were required in order to ensure the groups were equivalent on the BDI-II, MCSDS and age and were significantly different on measures of anxiety, using the MMANX and STAI scores. The data were not normally distributed and were significantly skewed, therefore parametric tests were not appropriate. The Mann-Whitney U test was used to compare high and low anxious

groups on these variables. A summary of the results of this analysis is provided below in Table 3.6.

Table 3.6.

Mann-Whitney U Tests for Group Equivalence Comparing Participants in the High and Low Anxious Groups

	U	*z*-score	Exact Sig. (2-tailed)
Age	174.0	-.13	.895
MCSDS	102.5	-2.25	.025
BDI-II	32.5	-4.30	.000
MMANX	8.5	-5.04	.000
STAI	0.0	-5.25	.000

Key: MCSDS – Marlowe-Crowne Social Desirability Scale Short Form
MMANX - Mackintosh and Mathews Anxiety Scale
BDI-II – Beck Depression Inventory – Second Edition
STAI – Spielberger Trait Anxiety Scale

The two groups were found to be significantly different in anxiety levels, as measured by the MMANX and the STAI, confirming that the participants had been appropriately allocated to the high and low anxious groups. Although the two groups were not significantly different in age, there were significant differences for MCSDS scores and BDI-II scores.

Consideration was given to including the MCSDS and BDI-II scores as covariates in the main analyses, however this was not deemed necessary. Theoretically, we would expect to see several differences between two groups which are related to anxiety levels, such as a general increase in negative affect with increased anxiety and decreased levels of social desirability. Additionally, including these covariates would only provide information as to how much the BDI-II and MCSDS scores covaried with the between-subjects variable of

anxiety, whereas the main variables of interest are the within-subjects variables, therefore inclusion of the covariate would unlikely increase the power and would risk loss of degrees of freedom (Tabachnik & Fidell, 2007).

3.1.3.2 Mood Data

3.1.3.2.1 Selection of mood scales.

All participants rated their mood using the eight visual analogue scales at three points during the procedure: prior to the mood induction; immediately following the mood induction and immediately following the test for interpretation biases. Theoretically, it was predicted that following the positive mood induction, there would be an increase in ratings on high PA items (happy and carefree) and a decrease in ratings on low PA items (low and sad), therefore only these items were included in the analyses for experiment one.

3.1.3.2.2 Correlations between mood scales.

An initial inspection of the correlations between these items was carried out to ensure that they were correlated, as would be predicted. The raw data was not normally distributed and showed significant skew and kurtsosis (see Appendix S). A visual inspection of the data revealed a number of outliers, which were converted to the mean plus or minus 2 standard deviations, as recommended by Field (2005). Following this, although the normality tests were still significant, the data was shown to have no evidence of significant skew or kurtosis as is the more reliable method for establishing normality (Appendix S). It was therefore deemed appropriate to use parametric tests to examine the correlations (i.e. Pearson's correlation coefficient), the results of which are shown in Table 3.7 for the four items at times one, two and three.

Table 3.7

Pearson's Correlation Coefficients for High and Low PA Items at Times One, Two and Three

		Happy	Carefree	Low	Sad
Time One	Happy	1	.439**	-.791**	-.635**
	Carefree	.439**	1	-.528**	-.287*
	Low	-.791**	-.528**	1	.609**
	Sad	-.635**	-.287*	.609**	1
Time Two	Happy	1	.636**	-.440**	-.605**
	Carefree	.636**	1	-.376**	-.289*
	Low	-.440**	-.376**	1	.543**
	Sad	-.605**	-.289*	.543**	1
Time Three	Happy	1	.280*	-.499**	.568**
	Carefree	.280*	1	-.283*	-.513**
	Low	-.499**	-.283*	1	.588**
	Sad	-.568**	-.513**	.588**	1

** Correlation is significant at the .05 level (one-tailed)*
*** Correlation is significant at the .01 level (one-tailed)*

As shown in Table 3.7, high PA items (happy and carefree) were significantly correlated at all three times, therefore it was appropriate to average the two items to provide a single measure of high PA. The low PA items (sad and low) were also significantly correlated at all three times, therefore these items were also averaged, to provide a single measure of low PA. Separate analyses were carried out for low and high PA scales, which are addressed in turn below.

3.1.3.3 Main Analysis of High PA Data

3.1.3.3.1 Missing data and accuracy.

The data were checked for accuracy of data input using methods recommended by Tabachnik and Fidell (2007). There were no cases of missing data.

The ANOVA model assumes normality of the distribution and homogeneity of variance, both of which are addressed in turn, below.

3.1.3.3.2 Assumption of normality.

The raw mood data were screened for normality using both the Kolmogorov-Smirnov and Shapiro-Wilk tests. This analysis demonstrated that for low anxious participants, the data were not normally distributed at time three. The data were also screened for skewness and kurtosis, which also highlighted significant skew and kurtosis for the low anxious group at time 3, which was defined using the Wald criterion for scores which were greater than twice the standard error (see Appendix T for a summary of these analyses).

It was not possible to transform the data due to grouped data being skewed in different directions, as this would have biased the final analyses. Three outliers were identified from the raw data and were changed to the mean score plus 2 standard deviations as recommended by Field (2005), as summarised in Appendix T. Following the removal of three outliers, the analyses were re-run, which showed no evidence of non-normality, skewness or kurtosis.

3.1.3.3.3 Assumption of homogeneity of variance.

The data did meet the assumption for homogeneity of variance of the dependent variable as assessed using the Levene statistic which is summarised in Table 3.8.

Table 3.8

Summary of the Results of the Levene Statistic for Homogeneity of Variance

	Levene Statistic	*df*1	*df*2	Sig
Time 1	.005	1	36	.945
Time 2	.011	1	36	.917
Time 3	.849	1	36	.363

3.1.3.3.4 Mixed-model ANOVA for high PA data.

In order to examine the hypotheses that both high and low anxious participants would show an increase in high PA from time one to time two and with high PA at time three remaining significantly higher than at time one, a 2x3 mixed-model ANOVA was carried out. The dependent variable was high PA score, the between-subjects variable was trait anxiety (high or low) and the within-subjects variable was time (three time points).

The descriptive statistics for high PA scores across the three time points are presented in Table 3.9

Table 3.9

Descriptive Statistics for High PA Ratings in High and Low Trait Anxious Participants at Times One, Two and Three

	Low Trait Anxious			High Trait Anxious		
	Mean	*SD*	*N*	Mean	*SD*	*N*
Time 1	.53	.134	21	.48	.134	17
Time 2	.63	.131	21	.61	.139	17
Time 3	.49	.051	21	.46	.077	17

The Mauchley's test for sphericity was not significant $W(2)=.97$, $p=.604$, therefore sphericity could be assumed and the results reported as such, which are summarised in Table 3.10.

As shown in Table 3.10, there was a main effect of time. As predicted, there was no significant interaction between anxiety and time. Figure 3.1 demonstrates the main effect of time on high PA ratings, which was further explored in a series of apriori planned comparisons. As predicted, high PA scores were significantly higher at time two (mean .62) than at time one (mean .51), $t(37)=5.88$, $p<.001$. Contrary to the hypothesis that a positive mood would be maintained, with high PA scores being significantly higher at time three than at time one, no significant differences were observed between high PA at time one (mean .51) and time three (mean .48), $t(37)=1.29$, $p=.102$.

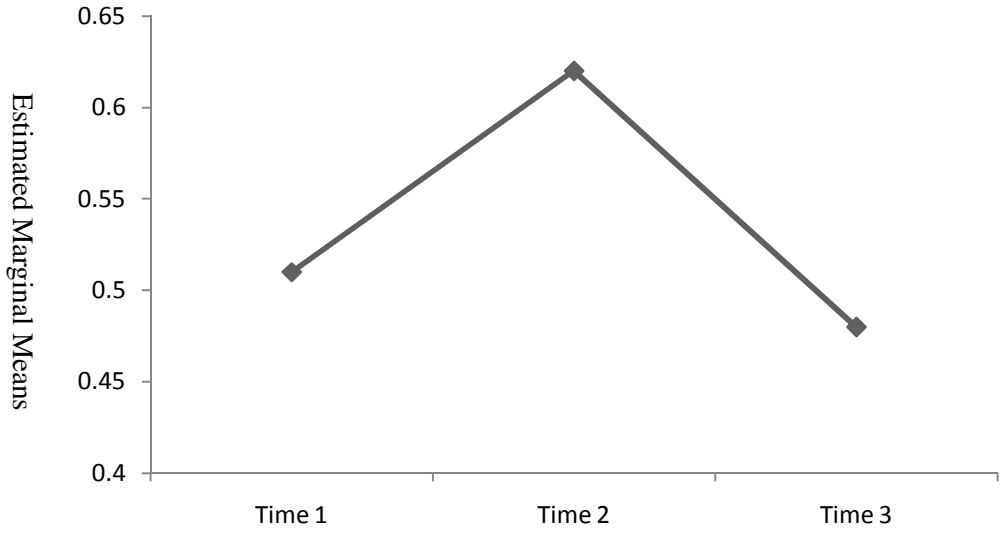
Table 3.10

Results of Mixed-Model ANOVA (Sphericity Assumed)

Within-Subjects Effects						
Effect	Sum of Squares	*df*	Mean Square	*F*	Sig.	Effect Size
Time	.453	1	.226	25.109	.000	.98
Time x Anxiety	.005	2	.003	.305	.738	.48
Error (Time)	.649	72	.009	-	-	-
Between-Subject Effects						
Anxiety	.031	1	.031	1.394	.246	.76
Error	.798	36	.022	-	-	-

Figure 3.1

Mean High PA Item Ratings at Time One (Pre-Mood Induction), Two (Post-Mood Induction) and Three (Post-Interpretation Bias Test)



3.1.3.4 Main Analysis of Low PA Data

3.1.3.4.1 Missing data and accuracy.

The data were checked for accuracy of data input using methods recommended by Tabachnik and Fidell (2007). There were no cases of missing data.

The ANOVA model assumes normality of the distribution and homogeneity of variance, both of which are addressed in turn, below.

3.1.3.4.2 Assumption of normality.

The raw mood data were screened for normality using both the Kolmogorov-Smirnov and Shapiro-Wilk tests. This analysis demonstrated that for low anxious participants at times one and three and high anxious participants at time three, the data were not normally distributed. The data were also screened for skewness and kurtosis, which also

highlighted significant skew and kurtosis for these groups, which was defined using the Wald criterion for scores which were greater than twice the standard error (see Appendix U for a summary of these analyses).

It was not possible to transform the data due to grouped data being skewed in different directions. Three outliers were identified from the raw data and were changed to the mean score plus 2 standard deviations as recommended by Field (2005), as summarised in Appendix U. Following the change to three outliers, the analyses were re-run, which showed no evidence of non-normality, skewness or kurtosis, as summarised in Appendix U.

3.1.3.4.3 Assumption of homogeneity of variance.

The data did not meet the assumption for homogeneity of variance of the dependent variable as assessed using the Levene statistic which is summarised below in Table 3.11. As recommended by Tabachnik and Fidell (2007) the more conservative alpha level of .025 for significance was therefore imposed.

Table 3.11

Summary of the Results of the Levene Statistic for Homogeneity of Variance

	Levene Statistic	*df*1	*df*2	Sig
Time 1	2.55	1	36	.119
Time 2	.23	1	36	.638
Time 3	6.09	1	36	.018

3.1.3.4.4 Mixed-model ANOVA for low PA data.

In order to examine the hypotheses that both high and low anxious participants would show a decrease in low PA from time one to time two, with low PA at time three remaining significantly lower than at time one, a 2x3 mixed-model ANOVA was carried out.

The dependent variable was low PA score, the between-subjects variable was anxiety (high or low) and the within-subjects variable was time (three time points).

The descriptive statistics for low PA scores in high and low trait anxious participants, across the three time points are presented in Table 3.12.

Table 3.12

Descriptive Statistics for Low PA Scores in High and Low Trait Anxious Participants, at Times One, Two and Three

	Low Anxious			High Anxious		
	Mean	*SD*	*N*	Mean	*SD*	*N*
Time 1	.45	.110	21	.54	.154	17
Time 2	.36	.124	21	.37	.118	17
Time 3	.49	.033	21	.51	.075	17

The Mauchley's test for sphericity was not significant $W(2)=.99$, $p=.948$, therefore sphericity could be assumed and the results reported as such, which are summarised in Table 3.13.

Table 3.13

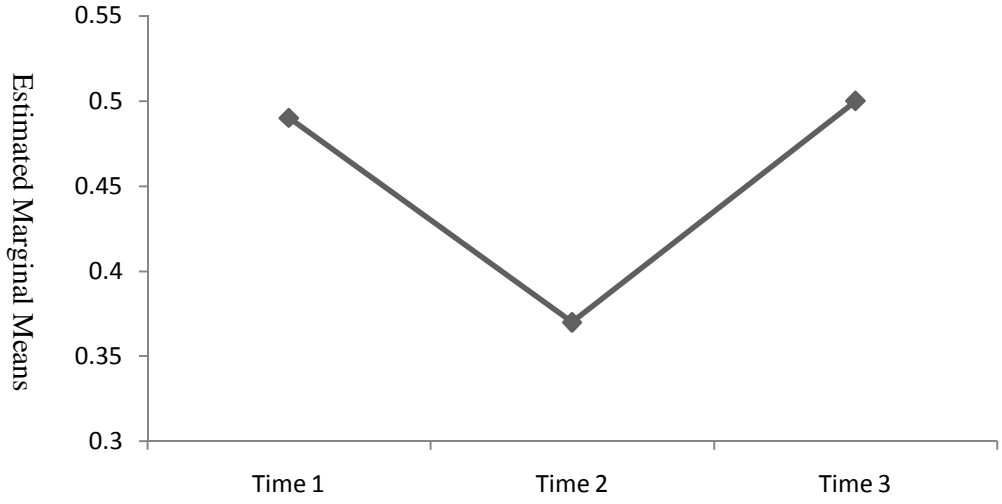
Results of Mixed-Model ANOVA (Sphericity Assumed)

Within-Subjects Effects						
Effect	Sum of Squares	*df*	Mean Square	*F*	Sig.	Effect Size
Time	.417	2	.209	26.320	.000	.98
Time x Anxiety	.033	2	.016	2.079	.133	.82
Error (Time)	.571	72	.008	-	-	-
Between-Subject Effects						
Anxiety	.044	1	.044	2.299	.138	.83
Error	.696	36	.019	-	-	-

As shown in Table 3.13, there was a main effect of time. As predicted, there was no significant interaction between anxiety and time. Figure 3.2 below demonstrates the main effect of time on low PA ratings, which was further explored in a series of apriori planned comparisons. As predicted, low PA scores significantly reduced from time one (mean .49) to time two (mean .37), $t(37)=5.54$, $p<.001$. Contrary to the hypothesis that this reduction in low PA would be maintained at time three, no significant differences were observed between low PA at time one (mean .49) and time three (mean .50), $t(37)=.615$, $p=.271$.

Figure 3.2

Mean Low PA Item Ratings at Time One (Pre-Mood Induction), Two (Post-Mood Induction) and Three (Post-Interpretation Bias Test)



3.1.3.5 Summary of Results for Mood Data

Both high and low anxious participants showed an increase in high PA and a decrease in low PA, following the positive mood induction. Both high and low PA items showed a tendency to return to baseline levels following the test for interpretation biases suggesting that a positive mood was not maintained over time.

3.1.3.6 Main Analyses of Interpretation Bias Test

3.1.3.6.1 Missing data and accuracy.

The data was checked for accuracy of data input using methods recommended by Tabachnik and Fidell (2007). There were no cases of missing data.

3.1.3.6.2 Assumption of normality.

The raw recognition data was screened for normality using both Kolmogorov-Smirnov and Shapiro-Wilk tests. This analysis demonstrated that the grouped data was not normally distributed. The data was also screened for skewness and kurtosis, which also highlighted significant skew and kurtosis, which was defined using the Wald criterion of scores which were greater than twice the standard error (see Appendix V for a summary of these analyses).

It was not possible to transform the data due to grouped data being skewed in different directions. Therefore, the raw data was screened for outliers, via visual screening of the raw data. Four outliers were identified within the skewed groups and were replaced with the mean score plus 2 standard deviations, as recommended by Field (2005). As this did not correct the non-normality, this process was repeated until the outliers no longer affected the normality of distributions, as recommended by Tabachnik and Fidell (2007); please refer to Appendix V for details of this process.

The analysis was re-run following this process and although tests for normality still showed significant non-normality in the high anxious group, for positive foil items in the second half of the test, inspection of skewness and kurtosis, showed no evidence of significant skewness or kurtosis for these, or any other grouped data, therefore the assumption of normality was assumed to have been met (see Appendix V for a summary of these analyses).

3.1.3.6.3 Assumption of homogeneity of variance.

Homogeneity of variance was investigated through further analysis of the data using the Levene statistic. As Table 3.14 shows, the data did meet the criterion for homogeneity of variance.

Table 3.14

Summary of Levene Statistic for Homogeneity of Variance

Item	Test Half	Levene Statistic	*df*1	*df*2	Sig
Positive Target	1	2.63	1	36	.114
	2	.27	1	36	.606
Positive Foil	1	.59	1	36	.447
	2	2.03	1	36	.163
Negative Target	1	.92	1	36	.344
	2	1.86	1	36	.182
Negative Foil	1	.03	1	36	.859
	2	.39	1	36	.536

3.1.3.6.4 Mixed-model ANOVA for interpretation bias data.

In order to test the hypothesis that both high and low anxious participants would show a mood congruent interpretation bias in both the first and second half of the test, a 2x2x2x2 mixed-model ANOVA was carried out, with recognition rating as the dependent variable, anxiety group as the between-subject variable (high or low) and test half (first and second), item valence (positive/negative) and target/foil as the within-subject variables.

The descriptive statistics for the recognition scores of positive items at times one and two are shown in Table 3.15. The data shown in Table 3.15 has not been split by target/foils, as the ANOVA revealed no significant interaction for target/foils, as summarised in Table 3.16.

Table 3.15

Descriptive Statistics for Recognition Scores on Interpretation Bias Test

		Low Anxious			High Anxious		
Item Valence	Test Half	Mean	*SD*	*N*	Mean	*SD*	*N*
Positive	1	2.61	.424	21	2.02	.337	17
	2	2.42	.436	21	2.04	.386	17
Negative	1	2.08	.394	21	2.10	.348	17
	2	2.02	.370	21	2.12	.3733	17

As shown in Table 3.16, there was a main effect for item valence, and target/foils, as illustrated in Figures 3.3 and 3.4 respectively. Overall, there was a higher recognition of positive items than negative items (mean recognition scores of 2.22 and 2.08, respectively) and higher recognition of target items than foil items (mean recognitions scores of 2.66 and 1.64, respectively).

There was also a significant interaction between item valence and anxiety, which is illustrated in Figure 3.5. This interaction was explored in a series of post-hoc t-tests, using the Bonferonni correction for multiple tests, requiring an alpha level of .025 for significance. Low anxious participants showed significantly higher recognition of positive than negative items, $t(20)=3.3$, $p<.025$, with mean recognition scores of 2.37 and 2.05, respectively. High anxious participants, showed no significant difference in recognition of positive and negative items, $t(16)=.42$, $p=.681$, with mean recognition scores of 2.08 and 2.11, respectively.

Table 3.16

Results of Mixed-Model ANOVA for Recognition Scores (Sphericity Assumed)

Within-Subjects Effects						
Effect	Sum of Squares	*df*	Mean Square	*F*	Sig.	Effect Size
Valence	1.52	1	1.52	4.90	.033	.911
Valence x Anxiety	2.31	1	2.31	7.46	.010	.94
Error (Valence)	11.16	36	.31	-	-	-
Target/Foil	79.59	1	79.59	327.51	.000	1.0
Target/Foil x Anxiety	.16	1	.16	.67	.419	.63
Error (Target/Foil)	8.75	36	.24	-	-	-
Test Half	.18	1	.18	2.49	.123	.84
Test Half x Anxiety	.03	1	.03	.37	.55	.52
Error (Test Half)	2.61	36	.07	-	-	-
Valence x Target/Foil	.16	1	.16	2.58	.117	.85
Valence x Target/Foil x Anxiety	.00	1	.00	.00	.951	.00
Error (Valence x Target/Foil)	2.24	36	.06	-	-	-
Valence x Test Half	.38	1	.38	5.39	.026	.92
Valence x Test Half x Anxiety	.02	1	.02	.29	.594	.47
Error (Valence x Test Half)	2.52	36	.07	-	-	-
Target/Foil x Test Half	.01	1	.01	.06	.802	.24
Target/Foil x Test Half x Anxiety	.05	1	.05	.57	.456	.60
Error (Target Foil x Test Half)	3.25	36	.09	-	-	-
Valence x Target/Foil x Test Half	.01	1	.01	.26	.614	.45
Valence x Target/Foil x Test Half x Anxiety	.00	1	.00	.04	.836	.20
Error (Valence x Target/Foil x Test Half)	1.92	36	.05	-	-	-
Between Subjects Effects						
Anxiety	.97	1	.97	1.3	.264	.75
Error	26.95	36	.75	-	-	

Figure 3.3

Mean Recognition Scores for Positively and Negatively Valenced Items

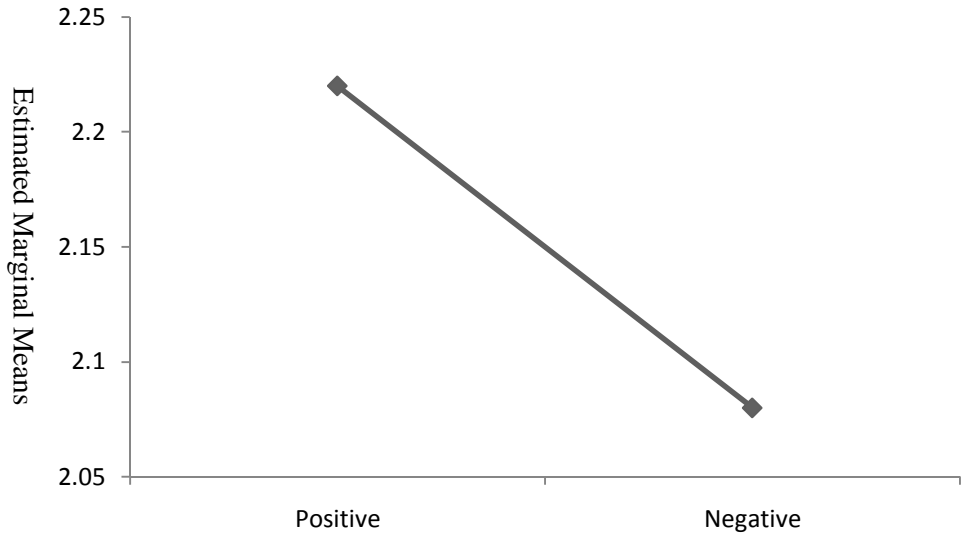


Figure 3.4

Mean Recognition Scores for Target and Foil Items

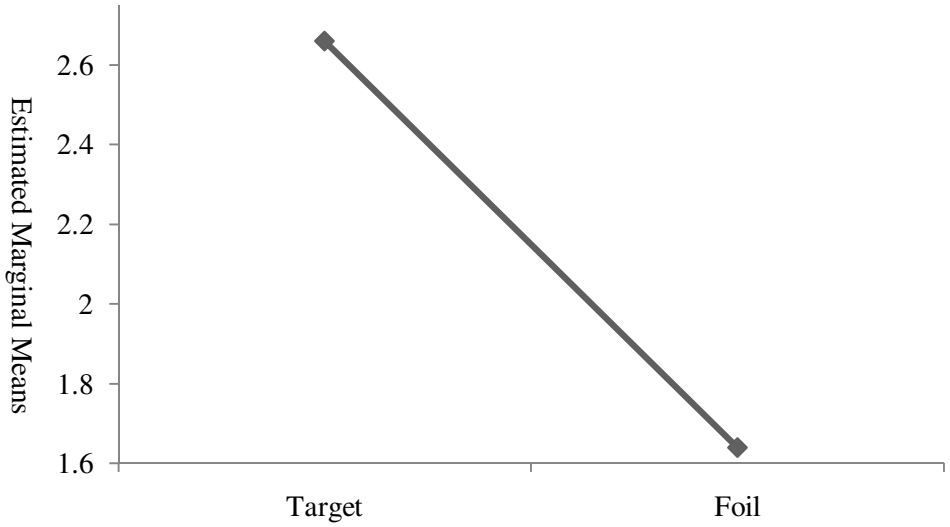
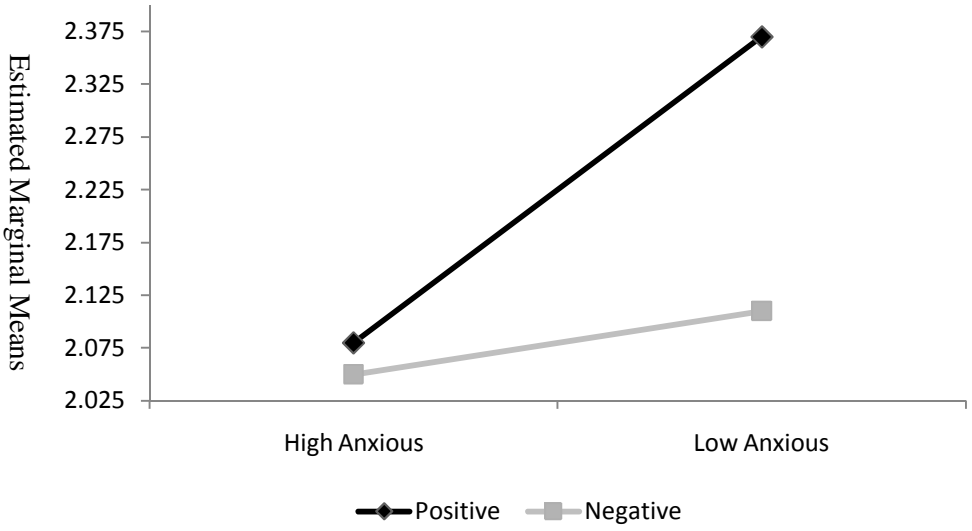


Figure 3.5

Mean Recognition Scores for High and Low Anxious Participants on Positively and Negatively Valenced Items

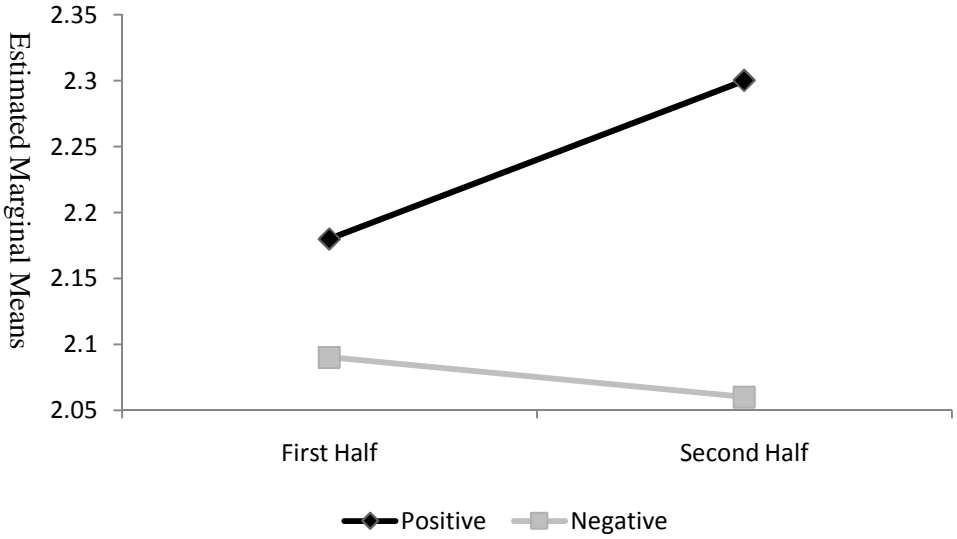


A significant interaction was also observed for item valence and test half, which is illustrated in Figure 3.6. This interaction was also explored in a series of post-hoc t-tests, using the Bonferonni correction for multiple tests, requiring an alpha level of .025 for significance. There was a significant increase in recognition of positive items from the first to the second half of the test, $t(37)=2.9$, $p<.01$, with mean recognition scores of 2.18 and 2.30, respectively. There was however, no difference in recognition of negative items between the first and second half of the test, $t(37)=.57$, $p=.570$, with mean recognitions scores of 2.09 and 2.06, respectively.

The predicted two-way interaction between item valence and target/foils was not significant, therefore the hypothesis of a consistently positive interpretation bias, was not supported. In a posthoc power calculation, achieved power was estimated to be 1.0, suggesting that this lack of an interaction was not due to a lack of power.

Figure 3.6

Mean Recognition Scores for Positive and Negatively Valenced Items in the First and Second Half of the Test



3.1.3.6.5 Summary of findings from analysis of interpretation bias data.

The above analysis suggests that following an induced positive mood, participants do not show an interpretation bias. Overall, all participants showed a generally congruent, positive, response bias, which became increasingly congruent over time. A significant interaction between item valence and anxiety, demonstrated that low trait anxious participants displayed a higher recognition of positive than negative items, i.e. a congruent response bias, whereas high trait anxious participants did not.

3.1.3.7 Summary of Experiment One

The results of experiment one demonstrated that both high and low trait anxious participants reported a more positive mood following the mood induction procedure as measured by both high and low PA measures, and that following the test for interpretation biases, both high and low PA returned to baseline levels. Given this finding, it might be expected that mood regulation had occurred, and would be apparent through mood

incongruent responses on the test for interpretation biases, however this was not the case. Participants overall, showed a mood congruent, positive response bias, which actually became increasingly positive throughout the test. Low trait anxious participants showed a significantly higher recognition of positive than negative items, suggesting a mood congruent bias, whereas high trait anxious participants did not. However this does not seem to have had any affect on subsequent mood, with a positive mood not being maintained at time three. There was no evidence of an interpretation bias, which might suggest that a positive mood only leads to a more positive response bias, but does not lead to an interpretation bias.

CHAPTER 4: EXPERIMENT ONE

4.1 Discussion

4.1.1 Overview of Chapter

In this chapter, a brief discussion of the reported findings is presented. A summary of the hypotheses to be tested is given in section 4.1.2, followed the by results found in relation to these in section 4.1.3. The reported results are then discussed in relation to previous findings and the theoretical basis to this study in section 4.1.4, with concluding remarks provided in section 4.1.5.

4.1.2 Summary of Main Hypotheses

Based on previous findings in relation to the dual process model, it was hypothesised that both high and low anxious participants would show congruent changes in mood following a positive mood induction procedure, as evidenced by an increase in high PA and a decrease in low PA. As a result of substantive processes, mood congruent (i.e. positive) interpretation biases were expected following the mood induction, that would not change between the first and second half of the test, which would have resulted in the increased high PA and decreased, low PA ratings being maintained at the end of the experiment.

4.1.3 Summary of Results

As expected, both high and low trait anxious participants showed congruent changes in mood following the mood induction procedure on both high and low PA scales. However, the hypothesised congruent interpretation bias was not observed in the results of this experiment. It was found however, that all participants showed a generally positive response bias, with higher recognition ratings of both positive target and foil items, which became increasingly positive over time. Low trait anxious participants showed a higher recognition of positive than negative items, whereas the high anxious participants did not. Despite the

observation of an increasingly positive response bias, which it is hypothesised would have maintained the positive mood, both high PA and low PA ratings returned to baseline levels following the interpretation bias test.

4.1.4 Discussion of Results

The results found here are in contrast to those reported by Hunter et al. (2006) and Vinnicombe et al. (2006) who found a relatively neutral response bias following a positive mood induction. It is suggested that this is likely to be due to the additional comparisons in this study of high and low anxious participants' results and with the variable of test half being included. It was observed that the low trait anxious participants had significantly higher recognition of positive than negative items, which the high trait anxious did not, suggesting a more positive response bias in the low trait anxious participants. For both groups of participants, there was an increasingly congruent, positive response bias over time.

With observations in this experiment only of response biases following a positive mood, does not in itself, provide evidence for or against the dual process model of mood regulation, as the results could be interpreted either way. Evidence of a mood congruent response bias, following a positive mood induction, could be predicted from the dual process model, hedonistic model or even the contextual model.

The findings reported here are in line with network activation models of mood (e.g. Bower, 1981), where it is reported that mood will lead to activation of similarly valenced cognitions. The results may also be considered to be in line with the hedonistic model of mood regulation, where there is a drive to maintain a positive mood, through positively valenced cognitions. Although contrary to Larsen's (2000) suggestion that difficulties with mood regulation are as a result of being unable to focus on the positive, it was shown here that the high trait anxious participants were as able as the low trait anxious participants to

demonstrate an increasingly positive response bias. It cannot be ruled out however, as suggested within contextual models of mood regulation (e.g. Erber & Erber, 2000), that it was due to an absence of social or contextual demands, that participants made no attempt to regulate their mood.

In considering why, despite increasingly positive response biases, participants' mood returned to baseline levels, a number of hypotheses can be considered. The most likely explanation would be that due a relatively mild positive mood being induced, there was simply a natural decay in mood over time. The test for interpretation biases, took up to 30 minutes for some participants to complete, therefore it may have been very difficult for the mood to be maintained over this length of time. The test itself, being quite long and repetitive, may also have been rather dull and boring for the participants, which may in turn have also affected their mood over time. If this was the case, then it is also possible that the increasingly positive response bias was an attempt to regulate a more negative mood induced by the test itself, with biases becoming increasingly positive in order to maintain the initially positive mood.

No evidence was found of interpretation biases, either positive or negative, which could suggest that in a positive mood, biased interpretations are not activated. In exploring whether there is a causal relationship between interpretation biases and mood, or whether there is an interaction, it could be suggested no evidence was observed for the latter hypothesis, inasmuch as positive moods were not observed to have an effect on interpretation biases. However trained positive interpretation biases in previous studies, have been found to have congruent effects on mood (e.g., Mathews & Mackintosh, 2000). This would therefore, strengthen the argument of Mathews and colleagues, that interpretation bias training directly affects interpretation biases of novel stimuli, which in turn influences mood. Were the effects observed in these previous studies, due to the training directly affecting mood, which in turn

changed interpretation biases, then it should have been observed in this study, that this change in mood affected interpretation biases. This was not the case.

There are a number of possible explanations for the effects observed in this study, which could be explored further in a separate experiment, examining the effects of an anxious mood on interpretation biases. As discussed, it is possible that participants in this study did not regulate their mood due to the contextual demands of the situation, which if the same was observed in the anxious mood induction, could indeed be inferred. However, if as hypothesised, participants will regulate a negative mood, this would provide evidence against the contextual demands hypothesis. Although no evidence was found for the effect of a positive mood on interpretation biases, before anything more than a tentative suggestion can be made as to the causal relationship between interpretation biases and mood, the effects of an anxious mood on interpretation biases, would need to be investigated further.

4.1.5 Conclusions

This experiment explored the effects of an induced positive mood on the interpretation biases of high and low anxious individuals, within a dual process model of mood regulation framework. Evidence of an increasingly positive response bias was found, for which several explanations could be inferred. In order to further explore some of these observations, a second experiment was conducted to investigate the effects of an anxious mood on interpretation biases in both high and low anxious participants. This is reported on in Chapters 5 to 7.

CHAPTER 5: EXPERIMENT TWO

5.1 Method

5.1.1 Overview of Chapter

The methodology for experiment two was identical to that described in experiment one, except that participants were exposed to an anxious mood induction procedure, as opposed to a positive mood induction, details of which are discussed further below. In regards to measures of mood, it was hypothesised that the anxious mood induction would lead to an increase in high NA and a decrease in low NA items. The items on the mood VAS which correspond to these constructs were 'tense' and 'worried' for high NA and 'calm' and 'content' for low NA (Mayer & Gashke, 1988).

5.1.2 Participant Recruitment and Allocation to Experiment Two

As described in section 2.1.8.1 of experiment one, participants who were invited to attend for the experiment, were quasi-randomly allocated to each experiment, as the two experiments were run concurrently.

5.1.3 Mood Induction Procedure

As in experiment one, mood inducing film clips were selected according to the reported results of Hewig et al.'s (2005) study. This study demonstrated that the two most effective clips for inducing an anxious mood were those taken from Halloween (Hill & Carpenter, 1978) and The Silence of the Lambs (Saxon, Utt, Bozman, & Demme, 1991). Please refer to Table 5.1 below for details of the clips and editing guidelines. As in experiment one, due to the clips being relatively short (1-3 minutes) both clips were shown to participants consecutively. The clips were edited using Wondershare Video Converter Suite (Wondershare Software Co., Ltd, 2008) and were presented on the desktop computer using the computer software Windows Media Player (Microsoft, 2004).

Table 5.1

Summary of Anxious Film Clips and Editing Instructions, Adapted from Hewig et al. (2005)

Film	**Silence of the Lambs**
	Editing instructions from Gross and Levenson (1995)
Clip description	Clarice is on the hunt for a serial killer and goes to interview James. She follows him into the basement and is faced with a gruesome sight.
Editing guidelines:	Start: Camera shot of woodland, with a green caravan in the left of scene. Camera pans across to left over rail tracks to a house with grey car parked outside. End: Clarice enters the basement, metal wire is hanging down and appears to touch her nose. Re-start: A hand holding a gun moves rapidly across the screen with yellow wallpaper in the background. End: After the gruesome sight in the bath, the lights go out and she gasps.
Clip length:	2'15"
Target emotion	Fear

Film	**Halloween**
	Editing instructions from Philippot (1993
Clip description	Laurie arrives to babysit but finds no one home. She explores the house and finds a corpse, whilst pursued by the killer.
Editing guidelines:	Start: Laurie is in the house in the dark where she has arrived to babysit but no one is home. End: Having seen the corpse in the wardrobe, she moves away and the murderer raises the knife behind her, end just before he lowers the knife.
Clip length:	0'58"
Target emotion	Fear

[1] A description of the scenes has been provided rather than specific times, as these were found to be inaccurate depending on the medium of the original film (i.e. VHS, DVD or digital download).

5.1.3.1 Piloting of Anxious Mood Inductions

Six participants were recruited to the piloting procedure in order to ensure the selected films evoked the desired mood. These participants were not paid and were an opportunistic sample (i.e. friends and relatives of the researcher). The results of the pilot study confirmed that the film clips induced an anxious mood (see Appendix M).

5.1.4 Ethical Considerations

Previous research has suggested that participants were not unduly distressed by the anxious mood procedure (Segal, et al., 2006). However, all participants in the anxious mood condition were given the opportunity to watch the positive film clips from experiment one to ensure their mood returned to baseline level before leaving.

Participants found to be scoring within the clinical range for anxiety on the STAI, defined as more than 3 standard deviations above the mean score for their population and the severe range for the BDI-II, were not shown the anxious films and were instead shown the positive films clips from experiment one, before continuing with the experiment. However their data were excluded from the analyses.

5.1.5 Planned Analysis

As in experiment one, the results will be analysed using three separate ANOVAs to firstly explore the effects of trait anxiety and induced mood on ratings of high NA items, low NA items and then the effects on interpretation biases. For the analyses of both high and low NA ratings, the dependent variable will be average mood ratings on the relevant scales, the between-subject independent variable being trait anxiety (high or low) and the within subjects variable being time (pre-,post-mood induction and post-interpretation bias test), resulting in a 2x3 mixed model analysis. For the analysis of interpretation biases, the dependent variable is recognition rating, the between-subjects independent variable is anxiety (high or low) and the within-subjects variables will be test half (first and second half of the test), target/foil items and item valence (positive or negative), resulting in a 2x2x2x2 mixed model analysis.

CHAPTER 6: EXPERIMENT TWO

6.1 Results

6.1.1 Overview of Chapter

Section 6.1.2 summarises the demographic variables for participants included in experiment two. The results of two mixed-model ANOVAs to explore the effects on mood are presented in section 6.1.3. Section 6.1.4 presents the results of a mixed-model ANOVA exploring the effects on interpretations biases. A summary of the results of the chapter, are presented in section 6.1.5.

6.1.2 Participant Demographics

A total of 35 participants were included in experiment two, of which 20 were allocated to the low anxious group and 15 to the high anxious group. The descriptive statistics for participants' demographic information and screening questionnaires are presented in Table 6.1.

Gender differences between the high and low anxious groups were examined using the Chi Square statistic and there was no significant difference found in the gender distribution of the two groups, χ^2 (1) = .276, p=.721. Further analyses were required in order to ensure the groups were equivalent on the variables of age, MCSDS and BDI-II scores and that there were significant differences between the groups in anxiety, as measured by the MMANX and STAI. The data was not normally distributed and was significantly skewed, therefore parametric tests were not appropriate, and so a series of Mann-Whitney U tests were carried out. A summary of these analyses is provided in Table 6.2.

Table 6.1

Demographic Information for Included Participants

	All		Low Anxious		High Anxious	
	N	%	*N*	%	*N*	%
Total	35	100	20	57.1	15	42.9
Gender						
Male	11	31.4	7	35.0	4	26.7
Female	24	68.4	13	65.0	11	73.3
	Mean	*SD*	Mean	*SD*	Mean	*SD*
Age	25.3	8.5	21.9	2.8	29.7	11.3
MMANX	14.0	4.2	12.2	3.4	16.5	3.9
MCSDS	6.0	2.7	6.2	2.4	5.6	3.2
STAI	38.6	9.5	32.3	5.7	46.9	6.4
BDI-II	6.2	5.4	3.7	2.7	9.7	3.2

Table 6.2

Mann-Whitney U-tests for Group Equivalence, Comparing Participants in the Positive and Negative Mood Induction Conditions

	U	*z*-score	Exact Sig. (2-tailed)
Age	86.00	-2.13	.033
MCSDS	124.50	-.55	.592
BDI-II	49.5	-3.36	.000
MMANX	29.00	-5.01	.002
STAI	.00	-5.01	.000

The two groups were found to be significantly different on measures of anxiety, on both the MMANX and the STAI. There was no significant difference between the two

groups on the MCSDS, however significant differences were observed for age and BDI-II scores. As discussed in relation to experiment one, differences on a number of variables might be expected when the groups have been selected on the basis of difference on other variables. The difference in age between the groups is likely to be as a result of the recruitment procedure, whereby after being unable to recruit sufficient numbers of high anxious students, the criterion was widened to include university staff, hence the higher age group in the high anxious group. Whilst anxiety between age groups may differ, this is likely to be due to other variables which correlate with age, such as work and family stresses, rather than age being a predictor of anxiety per se. For these reasons, the variables of age and BDI-II scores were not included in the main analyses as covariates.

6.1.3 Selection of Mood Variables

It was predicted that that negative affective scales on the VAS would be most influenced by the negative mood induction procedure, i.e. an increase in high NA and a decrease in low NA ratings. The corresponding items were worried and tense for high NA and calm and content for low NA.

The correlation between the four high and low NA items at times one, two and three were examined to ensure that these items were related as predicted. The raw data was not normally distributed and showed significant skew and kurtsosis (see Appendix W). A visual inspection of the data revealed a number of outliers, which were converted to the mean plus or minus 2 standard deviations, as recommended by Field (2005). Following this, although the normality tests were still significant, the data was shown to have no evidence of significant skew or kurtosis as is the more reliable method for establishing normality. It was therefore deemed appropriate to use parametric tests to examine the correlations (i.e.

Pearson's correlation coefficient), the results of which are shown in Table 6.3 below for the four items at times one, two and three.

Table 6.3

Pearson's Correlation Coefficients for Low and High NA Items at Times One, Two and Three

		Tense	Worried	Calm	Content
Time One	Tense	1	.156	-.587**	-.461**
	Worried	.156	1	-.227	-.352*
	Calm	-.587**	-.227	1	.319*
	Content	-.461**	-.352*	.319*	1
Time Two	Tense	1	.503**	-.492**	-.284*
	Worried	.503**	1	-.515**	-.131
	Calm	-.492**	-.515**	1	.421**
	Content	-.284*	-.131	.421**	1
Time Three	Tense	1	.584**	-.757**	-.595**
	Worried	.584**	1	-.372*	-.279
	Calm	-.757**	-.372*	1	.562**
	Content	-.595**	-.279	.562**	1

** Correlation is significant at the .05 level (one-tailed)*
*** Correlation is significant at the .01 level (one tailed)*

As predicted the low NA items, calm and content, were significantly correlated at all three times, suggesting it was appropriate to use the average of these two scores to provide a single measure of low NA. The high NA items, tense and worried, were significantly correlated at times two and three, but not at time one. Initial exploration of the descriptive statistics revealed that a greater effect of the anxious mood induction was seen for the tense scale, as shown in Table 6.4. Although the worried scale showed the same pattern it was to a much lesser extent. In order to reduce the possibility of the reduced effect on the worried

scale leading to a Type II error, it was deemed most appropriate to use only the tense scale to measure high NA.

Table 6.4

Descriptive Statistics for the High NA Scale, Tense and Worried

	Tense			Worried		
Time	1	2	3	1	2	3
n	35	35	35	35	35	35
Mean	.48	.64	.51	.47	.55	.49
SD	.140	.156	.144	.167	.118	.119

6.1.3.1 Main Analysis of High NA Data

6.1.3.1.1 Missing data and accuracy.

The data were checked for accuracy of data input using methods recommended by Tabachnik and Fidell (2007). There were no missing cases identified.

6.1.3.1.2 Assumptions of normality.

Initial analyses of the data were carried out to ensure that the raw data were normally distributed and there was no significant skewness or kurtosis. Using the Kolmogorov-Smirnov and Shapiro-Wilk tests for normality, there was evidence that the data were not normally distributed for the low anxious group at time one. In addition, significant skewness and kurtosis was also observed (Appendix X). Due to the data being skewed in different directions, it was not appropriate to use transformation to correct the non-normality. One outlier was therefore identified and replaced with the mean score plus two standard deviations (Field, 2007). As shown in Appendix X, following this process, although the normality tests were still significant, the data were not significantly skewed or kurtosed, as

evidenced by all scores being less than double the standard error scores, with this being the preferred method for testing normality.

6.1.3.1.3 Assumption of homogeneity of variance.

The data did meet the assumption for homogeneity of variance of the dependent variable as assessed using the Levene statistic which is summarised below in Table 6.5.

Table 6.5

Summary of the Results of the Levene Statistic for Homogeneity of Variance

	Levene Statistic	*df*1	*df*2	Sig
Time 1	1.005	1	33	.323
Time 2	2.833	1	33	.102
Time 3	1.830	1	33	.185

6.1.3.1.4 Mixed-model ANOVA for high NA data.

In order to examine the hypotheses that both high and low anxious participants would show an increase in high NA from time one to time two, with high anxious participants maintaining high NA at time three and low anxious participants showing high NA returning to baselines levels, a 2x3 mixed-model ANOVA was carried out. The dependent variable was high NA score, the between-subjects variable was trait anxiety (high or low) and the within-subjects variable was time (three time points).

The descriptive statistics for high NA scores across the three time points are presented in Table 6.6.

The Mauchley's test for sphericity was not significant $W(2)=.91$, $p=.203$, therefore sphericity could be assumed and the results reported as such, which are summarised in Table 6.7.

Table 6.6

Descriptive Statistics for High NA, in High and Low Trait Anxious Participants, at Times One, Two and Three

	Low Anxious			High Anxious		
	Mean	*SD*	*N*	Mean	*SD*	*N*
Time 1	.50	.128	20	.46	.157	15
Time 2	.64	.187	20	.64	.107	15
Time 3	.51	.121	20	.51	.157	15

Table 6.7

Results of Mixed-Model ANOVA (Sphericity Assumed)

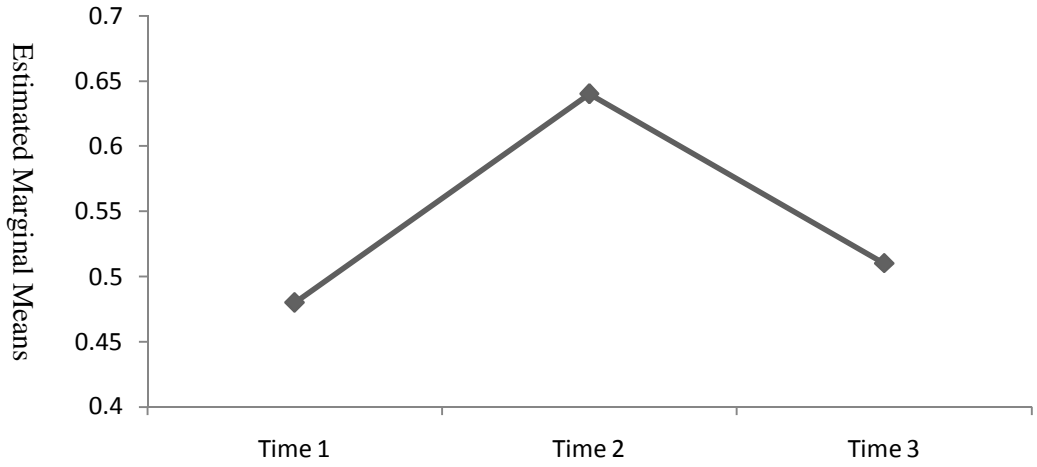
Within-Subjects Effects						
Effect	Sum of Squares	*df*	Mean Square	*F*	Sig.	Effect Size
Time	.519	2	.260	13.499	.000	.96
Time x Anxiety	.006	2	.003	.164	.849	.38
Error (Time)	1.269	66	.019	-	-	-
Between-Subject Effects						
Anxiety	.005	1	.005	.344	.561	.17
Error	.480	33	.015	-	-	-

As shown in Table 6.7, there was a main effect of time. The predicted interaction between time and trait anxiety was not significant. In a posthoc power calculation, achieved power was estimated to be .99, suggesting that this lack of an interaction was not due to a lack of power. Figure 6.1 below demonstrates the main effect of time on high NA ratings, which was further explored in a series of apriori planned comparisons. As predicted, high NA significantly increased from time one (mean .48) to time two (mean .64), $t(34)=4.99$,

p<.001. Levels of high NA were also shown to significantly reduce following the test for interpretation biases, from time two (mean .64) to time three (mean .51), $t(34)=3.65$, p<.01.

Figure 6.1

Mean High NA Item Ratings at Time One (Pre-Mood Induction), Two (Post-Mood Induction) and Three (Post-Interpretation Bias Test)



6.1.3.2 Main Analysis of Low NA Items

6.1.3.2.1 Missing data and accuracy.

The data were checked for accuracy of data input using methods recommended by Tabachnik and Fidell (2007). There were no missing cases identified.

6.1.3.2.2 Assumptions of normality.

Initial analyses of the data were carried out to ensure that the raw data were normally distributed and there was no significant skewness or kurtosis. Using the Kolmogorov-Smirnov and Shapiro-Wilk tests for normality, there was evidence that the data were not normally distributed for the low anxious group at time one and the high anxious group at times one and two. Significant skewness and kurtosis was also observed (see Appendix Y). Due to the data being skewed in different directions, it was not appropriate to

use transformation to correct the non-normality. Three outliers were therefore identified and replaced with the mean score plus or minus two standard deviations (Field, 2007). As this did not correct the non-normality, this process was repeated a second time (please refer to Appendix Y for a summary of this process). As shown in Appendix Y, following this process, although the normality tests were still significant, the data were not significantly skewed or kurtosed, as evidenced by all scores being less than double the standard error scores, with this being the more reliable method for testing normality.

6.1.3.2.3 Assumption of homogeneity of variance.

The data did meet the assumption for homogeneity of variance of the dependent variable as assessed using the Levene statistic which is summarised below in Table 6.8.

Table 6.8

Summary of the Results of the Levene Statistic for Homogeneity of Variance

	Levene Statistic	*df*1	*df*2	Sig
Time 1	2.654	1	33	.113
Time 2	1.362	1	33	.252
Time 3	1.745	1	33	.196

6.1.3.2.4 Mixed-model ANOVA for low NA data.

In order to examine the hypotheses that both high and low anxious participants would show a decrease in low NA from time one to time two, with high anxious participants maintaining reduced levels of low NA at time three and low anxious participants showing low NA returning to baselines levels, a 2x3 mixed-model ANOVA was carried out. The dependent variable was low NA score, the between-subjects variable was trait anxiety (high or low) and the within-subjects variable was time (three time points).

The descriptive statistics for low NA scores across the three time points are presented in Table 6.9.

Table 6.9

Descriptive Statistics for Low NA Scores in High and Low Anxious Participants

	Low Anxious			High Anxious		
	Mean	*SD*	*N*	Mean	*SD*	*N*
Time 1	.52	.084	20	.56	.137	15
Time 2	.38	.094	20	.40	.067	15
Time 3	.51	.082	20	.49	.117	15

The Mauchley's test for sphericity was not significant $W(2)=.95$, $p=.439$, therefore sphericity could be assumed and the results reported as such, which are summarised in Table 6.10.

Table 6.10

Results of Mixed-Model ANOVA (Sphericity Assumed)

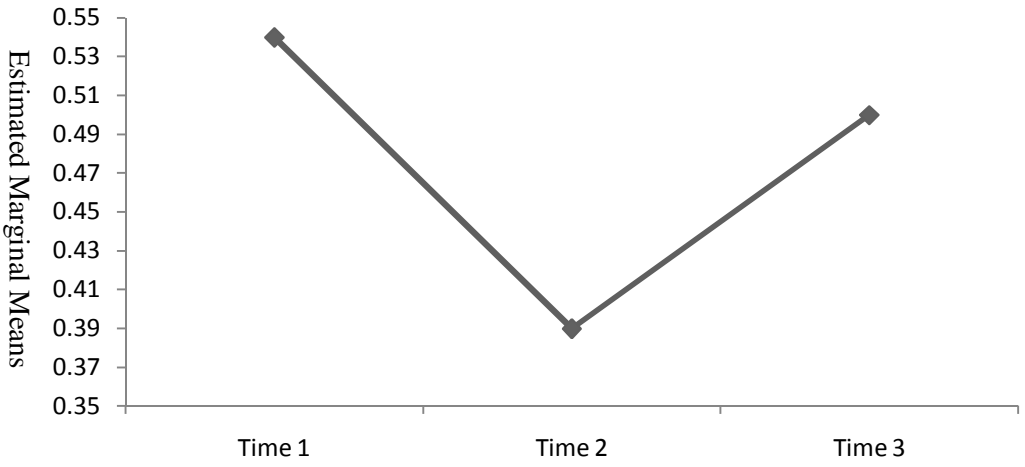
Within-Subjects Effects						
Effect	Sum of Squares	*df*	Mean Square	*F*	Sig.	Effect Size
Time	.409	2	.204	27.214	.000	.98
Time x Anxiety	.011	2	.006	.764	.470	.66
Error (Time)	.496	66	.008	-	-	-
Between-Subject Effects						
Anxiety	.005	1	.005	.383	.540	.53
Error	.455	33	.014	-	-	-

As shown in Table 6.10, there was a main effect of time. The predicted interaction between time and trait anxiety was not significant. In a posthoc power calculation, achieved

power was estimated to be 1.0, suggesting that this lack of an interaction was not due to a lack of power. Figure 6.2 below demonstrates the main effect of time on low NA ratings, which was further explored in a series of apriori planned comparisons. As predicted, low NA significantly decreased from time one (mean .54) to time two (mean .39), $t(34)=6.68$, $p<.001$. Levels of low NA were also shown to significantly increase following the test for interpretation biases, from time two (mean .39) to time three (mean .50), $t(34)=5.21$, $p<.001$.

Figure 6.2

Mean Low NA Item Ratings at Time One (Pre-Mood Induction), Two (Post-Mood Induction) and Three (Post-Interpretation Bias Test)



6.1.3.3 Summary of Results of Mood Data

Both high and low trait anxious participants showed a significant reduction in low NA following the negative mood induction procedure. In both high and low anxious participants, low NA ratings significantly increased following the test for interpretation biases. The hypothesis that high trait anxious participants would maintain their mood at time three was not supported.

6.1.4 Main Analyses of Interpretation Bias Test

6.1.4.1 Missing Data

The data were checked for accuracy of entry using methods recommended by Tabachnik and Fidell (2007). There were no cases of missing data.

6.1.4.2 Assumptions of Normality

The raw recognition data were screened for normality using both Kolmogorov-Smirnov and Shapiro-Wilk tests. This analysis demonstrated that some of the grouped data were non-normally distributed. However, inspection of the skewness and kurtosis demonstrated no evidence of significant skewness or kurtosis, therefore it could be assumed that the grouped data were normally distributed. A summary of these analyses is provided in Appendix Z.

6.1.4.3 Assumption of Homogeneity of Variance

Homogeneity of variance was investigated through further analysis of the data using the Levene statistic. As Table 6.11 below shows, the data met the criterion for homogeneity of variance.

6.1.4.4 Main Analyses

In order to test the hypotheses that high anxious participants would show a mood congruent interpretation bias in both the first and second half of the test, and that low anxious participants would show a significantly more positive interpretation bias in the second half than the first, a 2x2x2x2 mixed model ANOVA was carried out. The dependent variable measured was recognition rating, the between subjects variable was anxiety group (high or low) and the within subjects variables were item valence (positive/negative), target/foil item and test half (first and second). The relevant descriptive statistics are presented in Table 6.12 and a summary of the results of the ANOVA are presented in Table 6.13.

There was a main effect for target/foil items, which as illustrated, in Figure 6.3, shows that there were significantly higher recognition scores for target than foil items, with mean recognition scores of 2.6 and 1.5, respectively.

A main effect was also observed for anxiety group. As illustrated in Figure 6.4 low anxious participants reported higher recognition scores in general than the high anxious participants, with mean recognition scores of 2.16 and 1.96, respectively.

Table 6.11

Summary of Levene Statistic for Homogeneity of Variance

Item	Test Half	Levene Statistic	*df*1	*df*2	Sig
Positive Target	1	.469	1	33	.498
	2	.166	1	33	.687
Positive Foil	1	.331	1	33	.568
	2	.003	1	33	.956
Negative Target	1	.127	1	33	.724
	2	1.148	1	33	.292
Negative Foil	1	1.119	1	33	.298
	2	.178	1	33	.676

A significant interaction was also observed for anxiety, test half and target/foil items, as illustrated in Figure 6.5, where there appear to be differences between the high and low anxious groups in recognition of target items between the first and second half of the test. This interaction was explored further in a series of post-hoc t-tests, with a Bonferonni correction for multiple tests applied, requiring an alpha level of .025. It was observed that for the low anxious group, there was a significant increase in recognition of target items from the first to the second half of the test, $t(19)=2.48$, $p<.025$, with mean recognition scores of 2.62 and 2.77, respectively. However, for the high anxious group, there was no change in

recognition of target items between the two halves of the test, $t(14)=1.31$, $p=.213$, with mean recognition scores of 2.52 and 2.41, respectively.

Table 6.12

Descriptive Statistics for Recognition Scores on Interpretation Bias

Item Type	Test Half	Low Anxious			High Anxious		
		Mean	*SD*	*N*	Mean	*SD*	*N*
Positive Target	1	2.60	.201	20	2.44	.466	15
	2	2.85	.429	20	2.56	.510	15
Positive Foil	1	1.70	.320	20	1.44	.280	15
	2	1.63	.342	20	1.53	.367	15
Negative Target	1	2.65	.523	20	2.61	.443	15
	2	2.69	.609	20	2.67	.478	15
Negative Foil	1	1.54	.375	20	1.39	.308	15
	2	1.64	.383	20	1.47	.381	15

Table 6.13

Results of Mixed-Model ANOVA for Recognition Scores (Sphericity Assumed)

Within-Subjects Effects						
Effect	Sum of Squares	*df*	Mean Square	*F*	Sig.	Effect Size
Valence	.24	1	.24	.77	.387	.66
Valence x Anxiety	.00	1	.00	.00	.966	.00
Error (Valence)	10.44	33	.32	-	-	-
Target/Foil	73.99	1	73.99	467.54	.000	1.00
Target/Foil x Anxiety	.06	1	.06	.36	.554	.51
Error (Target/Foil)	5.22	33	.16	-	-	-
Test Half	.08	1	.08	.71	.405	.64
Test Half x Anxiety	.16	1	.16	1.36	.251	.76
Error (Test Half)	3.81	33	.12	-	-	-
Valence x Target/Foil	.00	1	.00	.00	.961	.00
Valence x Target/Foil x Anxiety	.00	1	.01	.06	.809	.24
Error (Valence x Target/Foil)	2.64	33	.08	-	-	-
Valence x Test Half	.28	1	.28	2.59	.117	.85
Valence x Test Half x Anxiety	.20	1	.20	1.84	.184	.80
Error (Valence x Test Half)	3.50	33	.11	-	-	-
Target/Foil x Test Half	.02	1	.02	.27	.604	.46
Target/Foil x Test Half x Anxiety	.45	1	.45	7.13	.012	.94
Error (Target/Foil x Test Half)	2.01	33	.06	-	-	-
Valence x Target/Foil x Test Half	.73	1	.73	7.44	.010	.94
Valence x Target/Foil x Test Half x Anxiety	.01	1	.01	.08	.784	.27
Error (Valence x Target/Foil x Test Half)	3.22	33	.10	-	-	-
Between Subjects Effects						
Anxiety	2.652	1	2.652	4.810	.035	.91
Error	18.20	33	.55	-	-	

Figure 6.3

Mean Recognition Scores for Target and Foil Items

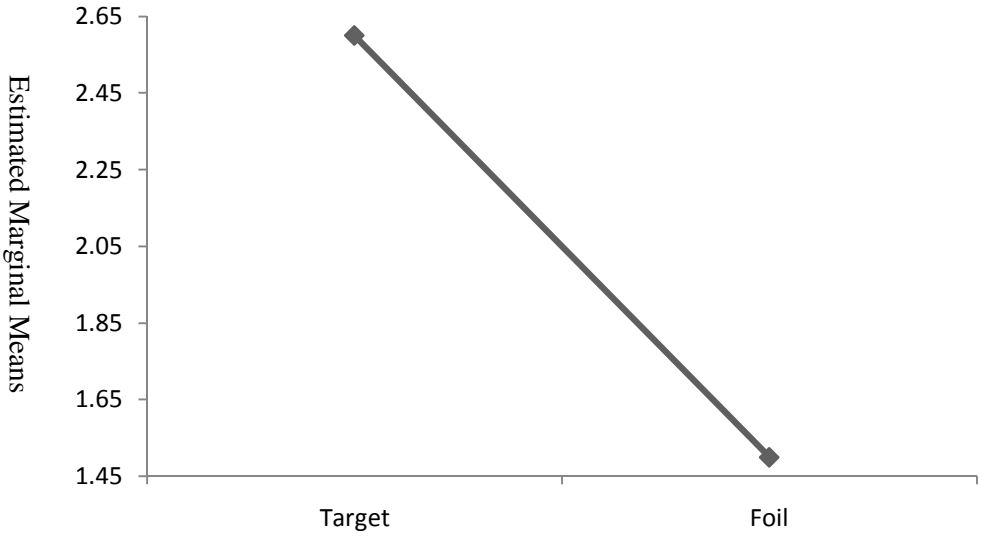


Figure 6.4

Mean Recognition Scores across All Items for High and Low Anxious Participants

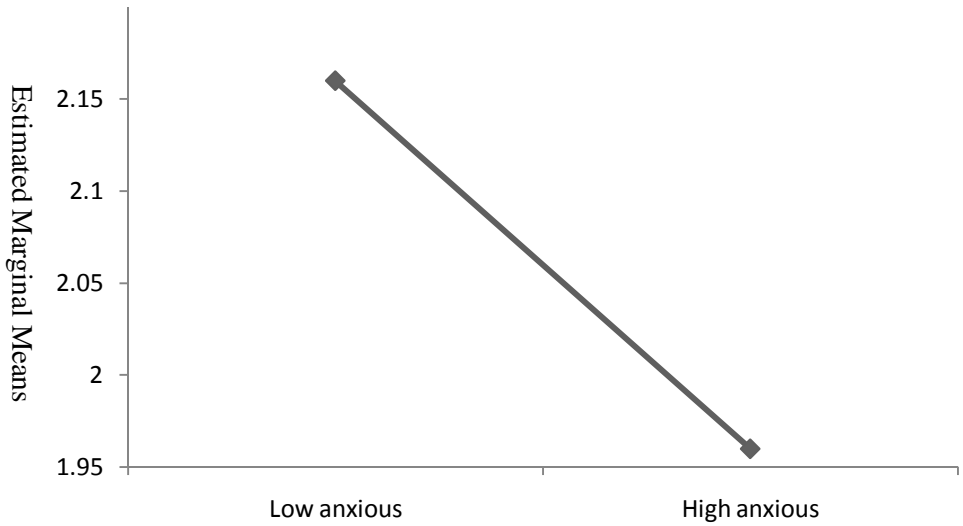
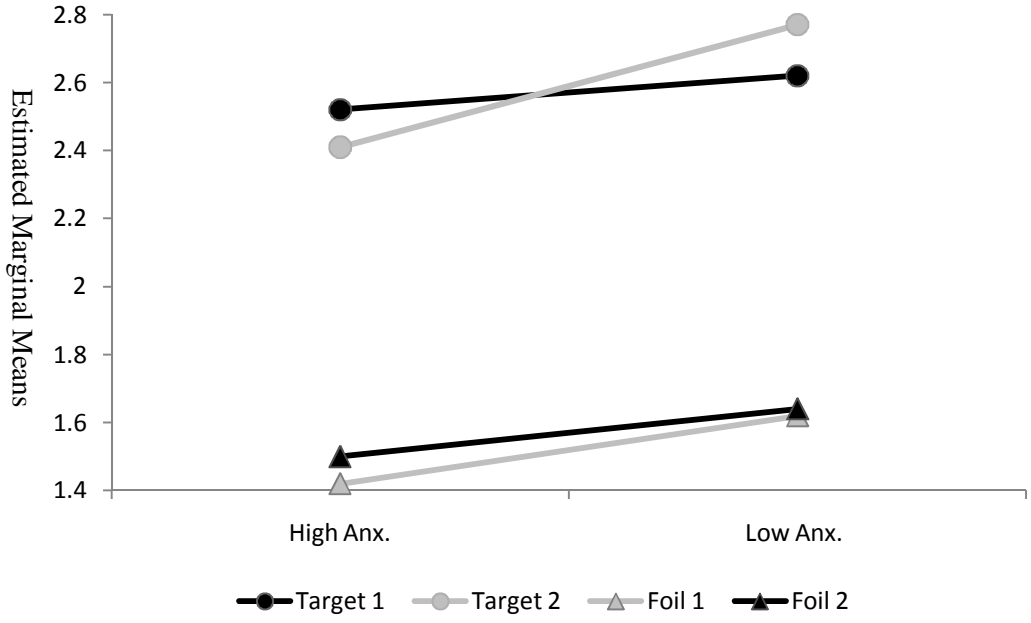


Figure 6.5

Mean Recognition Scores for High and Low Anxious Participants, at Times One and Two, for Target and Foil Items



A further interaction was observed for item valence, target/foils and test half, as illustrated in Figure 6.6. In order to decompose this three-way interaction further, two separate 2x2 repeated measures ANOVAs were carried out, firstly for target items with item valence (positive/negative) and test half (first or second). As summarised in Table 6.14, for target items there was a significant interaction between item valence and test half. The interaction between item valence and test half for target items was further explored in a series of posthoc t-tests, using the Bonferonni correction for multiple tests, with an applied alpha level of .025 for significance. A significance increase was observed for positive target items from the first to the second half of the test, $t(34)=2.7$, $p<.025$, with mean recognition scores of 2.5 and 2.7, respectively. There was however, no significant difference in recognition of negative target items between the first and second half, $t(34)=1.2$, $p=.223$, with mean recognition scores of 2.6 and 2.5, respectively.

Figure 6.6

Mean Recognition Scores for Positively and Negatively Valenced, Target and Foil Items, Across Times One and Two

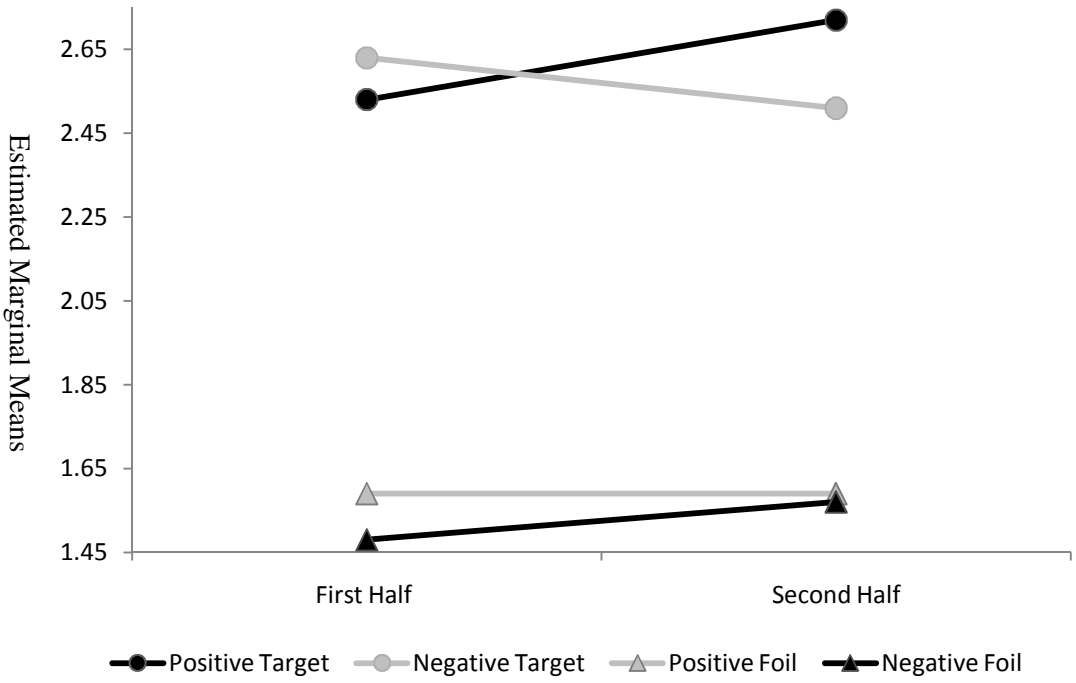


Table 6.14

Summary of Within-Subjects ANOVA for Target Items

Effect	Sum of Squares	*df*	Mean Square	*F*	Sig.	Effect Size
Valence	.11	1	.11	.40	.533	.53
Error (Valence)	9.81	34	.29	-	-	-
Test Half	.05	1	.05	.48	.492	.57
Error (Test Half)	3.40	34	.10	-	-	-
Valence x Test Half	.86	1	.86	5.47	.025	.92
Error (Valence x Test Half)	5.38	34	.16	-	-	-

In the second 2x2 within subjects ANOVA for foil items, with test half (first and second) and item valence (positive/negative) as within-subjects variables, this interaction was

not significant. No main effects for test half or item valence were observed either, as summarised in Table 6.15.

Table 6.15

Summary of Within-Subjects ANOVA for Foil Items

Effect	Sum of Squares	*df*	Mean Square	*F*	Sig.	Effect Size
Valence	.14	1	.14	1.44	.239	.77
Error (Valence)	3.27	34	.10	-	-	-
Test Half	.07	1	.07	.81	.376	.67
Error (Test Half)	3.09	34	.09	-	-	-
Valence x Test Half	.07	1	.07	1.61	.213	.79
Error (Valence x Test Half)	1.55	34	.05	-	-	-

The predicted four-way interaction for anxiety, item valence, target/foils and test half, was not found to be significant. Therefore, the hypothesis that there would be an increasingly positive interpretation bias for low anxious participants, and a consistently negative interpretation bias for the high anxious group, was not supported. A posthoc power calculation revealed that the achieved power was .97, suggesting that the lack of a significant effect was not due to a lack of power.

6.1.4.5 Summary of Results of Interpretation Bias Test Analysis

The results discussed above, demonstrate that, as expected, participants showed significantly higher recognition ratings of target than foil items. Recognition of target items, increased from the first to the second half of the test for the low anxious participants, but not for the high anxious participants. A further three-way interaction was observed, between item valence, target/foils and test half, with the observation that recognition of positive target items significantly increased from the first to the second half. This suggests that all the

participants showed an increasingly incongruent, positive interpretation bias from the first to the second half of the test. There was no difference in the interpretation biases of high and low anxious participants, suggesting that both groups, in this experiment, were equally able to employ mood incongruent, positive interpretation biases when in an anxious mood.

6.1.5 Summary of Results of Experiment Two

After an induced anxious mood, all participants showed an incongruent interpretation bias, which became increasingly positive over time and as would be predicted, participants then showed an increase in low NA and a decrease in high NA, i.e. a reduction in anxious mood. Contrary to the initial hypotheses, there were no interactions observed for the high and low anxious groups, except for the low anxious participants showing an increase in recognition of target items, for which there may be several explanations, which are discussed further in the following chapter.

CHAPTER 7: EXPERIMENT TWO

7.1 Discussion

7.1.1 Overview of Chapter

In this chapter, a brief discussion of the reported findings is presented. A summary of the hypotheses to be tested is given in section 7.1.2, followed the by results found in relation to these in section 7.1.3. The reported results are then discussed in relation to previous findings and the theoretical basis to this study in section 7.1.4, with concluding remarks provided in section 7.1.5.

7.1.2 Summary of Main Hypotheses

Based on previous findings in relation to the dual process model, it was hypothesised that both high and low anxious participants would show congruent changes in mood following an anxious mood induction procedure. Low trait anxious participants, as a result of substantive processing would show negative interpretation biases in the first half of the test, which through motivated processing strategies, would become increasingly positive in the second half. High trait anxious participants however were expected to engage in substantive processing throughout, with mood congruent interpretation biases observed, which due to a consequential drain on cognitive resources, would have prevented them from engaging in motivated processing strategies at any time. As a result of motivated, incongruent interpretation biases, low trait anxious participants' mood was expected to return to baseline, whereas due to a failure to engage in motivated processing, high trait anxious participants would maintain an anxious mood at the end of the procedure.

7.1.3 Summary of Results

The predicted increase in high NA and reduction in low NA following the anxious mood induction procedure was observed for both the high and low trait anxious participants.

Although it was hypothesised that as a result of the mood induction there would be differences between the high and low anxious participants' responses on the test for interpretation biases, this was not found to be the case. It was found however, that both the high and low anxious participants demonstrated an increasingly positive (i.e. mood incongruent) interpretation bias over time. This was evidenced by an increase in recognition of positive target items, and a slight but non-significant decrease in the recognition of negative target items. As would be predicted therefore, high NA decreased and low NA increased, at the end of the procedure, for both high and low trait anxious participants. This result, while in line with the idea of a causal effect for interpretation biases, did not support the hypothesis that high trait anxious participants would be unable to devote sufficient cognitive resources to engage in motivated processing. An unexpected observation for the main effect of anxiety was also observed, with higher recognition ratings overall for low anxious participants.

7.1.4 Discussion of Results

The results reported from experiment two, would appear to support a dual process model of mood regulation, with the observation of increasingly positive responses over time and with a reduction in anxious mood. This study also provided evidence for the hypothesised interaction between anxious mood and interpretation biases, with an induced anxious mood leading to more incongruent interpretation biases. The observation that anxious mood ratings became less anxious at end of the procedure however should be interpreted with caution. As discussed in the earlier chapter in relation to experiment one, this change in mood may not be as a result of mood regulation, but rather the result of natural mood decay, during a rather long and repetitive test. The apparent effect of mood on interpretation biases therefore should also be interpreted with caution, as any changes in bias over time, may also be as a result of other influences on mood during the procedure.

Drawing on evidence from dual process models of depression, it was hypothesised that high anxious participants would engage in substantive processing, which would maintain an anxious mood, leading to depletion of cognitive resources meaning that they would be unable to engage in substantive, incongruent processing. However, in this study high anxious participants did demonstrate incongruent processing, with no differences in the processing styles to the low anxious group. A possible explanation for this finding may be that in completing a task placing relatively little demand on cognitive resources, high anxious participants have sufficient cognitive resources still available in order to engage in effortful regulation of a mildly anxious mood. Further studies could explore this question, with the addition of a cognitive load during the interpretation bias test. With the reduction of available cognitive resources, it would be expected that high anxious participants would then be unable to engage in such an effortful and demanding process of mood regulation, whereas low anxious participants should still be able to.

In this study, it was observed that high anxious participants reported generally lower recall for all items, than the low anxious participants. This main effect was not predicted, nor is there any theoretical basis for why this might have occurred. However, some tentative suggestions might be made as to why this occurred. As discussed above, it is hypothesised that the process of mood regulation is more effortful for the high anxious participants; it may therefore be the case that high anxious participants were generally less able to attend to the task due to the cognitive effects of the anxious mood. This may give further cause for future research examining the effect of a cognitive load on high anxious participants' ability to regulate an anxious mood.

In terms of the theoretical implications of these findings, these are discussed further in Chapter 8, drawing on the findings from both experiments one and two.

7.1.5 Summary

In this second experiment, high and low anxious participants were exposed to an anxious mood induction procedure, with congruent effects observed for high and low NA ratings. Both high and low anxious participants demonstrated an increasingly positive interpretation bias, with an anxious mood reducing at the end of the procedure. Further research is suggested to explore the effects of an increased cognitive load on high anxious participants' ability to regulate mood under similar conditions.

CHAPTER 8: GENERAL DISCUSSION

8.1 Overview of Chapter

A brief overview of the stated hypotheses is provided in section 8.2, followed by a summary of the findings in experiments one and two in section 8.3. The results are then discussed in relation to the observed differences between high and low anxious participants, along with the limitations, with suggestions for future research in section 8.4. In section 8.5 the results are discussed in relation to the dual process model of mood regulation and in section 8.6, how these results might be explained by hedonistic or contextual motivators. The implications of these findings for the causal effects of interpretation biases on anxiety are discussed in section 8.7. A summary of the validity of the measures and design is provided in section 8.8, followed by discussion of the clinical implication of this and future studies in section 8.9. The general strengths and limitations of this study are discussed in section 8.10, following which an overall summary of the study and conclusions are presented in section 8.11.

8.2 Summary of Hypotheses

The dual process model would predict that an induced mood would have an effect on subsequent cognitive processes, which would be initially congruent with mood as a result of substantive processing, becoming increasingly incongruent over time, with effortful, motivated processing. Participants high in trait anxiety, were hypothesised to be unable to engage in motivated processing during an anxious mood, thereby maintaining a congruent bias throughout, without evidence of mood regulation.

8.3 Summary of Findings

In two experiments, high and low trait anxious participants were exposed to a positive and an anxious mood induction procedure and effects on interpretation biases were

measured as evidence of mood regulatory strategies. Following a positive mood induction, both high and low anxious participants showed a general, positive response bias, which became increasingly positive over time. However following an anxious mood induction procedure, both high and low anxious participants showed an increasingly positive interpretation bias, which may be interpreted as evidence of a change from substantive processing, to a more effortful style of processing in order to regulate mood, as proposed by the dual process model.

8.4 Effects of Trait Anxiety on Mood Regulation

It was not predicted that any differences would be observed between high and low anxious participants, when in a positive mood, as theoretically high trait anxiety should only affect the regulation of negative affect, not positive affect. In this study, it was observed that neither high nor low anxious participants attempted to regulate a positive mood, with evidence only of a positive response bias. Low anxious participants did however, report significantly higher recognition of positive than negative items, whereas the low anxious participants did not. This suggests that there is some evidence of low anxious participants having a slightly more positive bias than high anxious participants.

In an induced anxious mood, there was a significant difference in the overall recognition of items, with low anxious participants reporting higher recognition of items than the high anxious participants. As discussed in the previous chapter, this may be due to high anxious participants applying more cognitive resources to the effortful process of mood regulation than their low anxious counterparts, therefore being less able to attend to the task in general and being less confident in their responses.

To test whether the above hypothesis may be correct, it is proposed that future research could explore the effects of an additional cognitive load to tests of interpretation

biases following both a positive and anxious mood induction. Such research would help to determine whether in an anxious mood, high trait anxious participants still have the cognitive resources available to regulate mood through incongruent interpretation biases and if this differs to low trait anxious participants' responses under the same conditions. Also, as no evidence of mood regulation was observed in a positive mood condition, the question of whether participants would be more motivated to repair a positive mood, due to the increasing demands on cognitive resources, and whether high and low trait anxious participants would be equally able to do so, could be further investigated. Such studies may have more ecological validity inasmuch as in most people's daily lives, there are constant demands placed on cognitive resources, which may compete with the demands of mood regulation. Therefore when other demands take precedence, mood regulation may not be achievable, particularly for high trait anxious participants if, as is hypothesised, being so overwhelmed by the anxious affect, they have even less cognitive resources available.

As discussed in Chapter 3, due to the difficulties in recruiting sufficient numbers of high anxious participants, plans to exclude participants in the mid-range for trait anxiety had to be abandoned, in favour of a median split. This is likely to have been one reason for few differences being observed between the high and low anxious groups. In future studies wishing to explore differences in high and low anxious participants, participants should be allocated according to tertile or even quartile splits on trait anxiety measures to ensure that any true differences between the groups can be observed. In overcoming the difficulties with recruitment, the population recruited from may be widened to include community samples for example, or a more direct approach to recruitment, by attending classes for example, rather than by email and posters alone.

8.5 Implications for a Dual Process Model of Mood Regulation

The evidence reported here from both experiments would appear to lend support to a dual process model of mood regulation, although there are limitations as to what conclusions may be drawn. As predicted by this model, in an anxious mood, participants demonstrated an increasingly incongruent positive, interpretation bias over time. As may also be predicted from this model, a positive mood led to congruent positive response biases. However, the effects of these cognitive biases, should lead to congruent effects on subsequent mood. Although there was evidence for congruent effects on mood in experiment two, incongruent effects were observed in experiment one. This is likely to be due to methodological issues, whereby changes in mood were likely to be as a result of natural mood decay, with both positive and anxious moods returning to baseline levels, irrespective of observed cognitive biases. In the methods used here, there are difficulties in differentiating any changes in mood from those due to cognitive processes and those due to mood decay. As the moods induced were relatively mild, they could be expected to decay relatively quickly, which combined with a fairly lengthy test for interpretation biases, would see any moods dissipated by the end of the task. This may also have implications for the observed effects on cognitive biases over time. Although interpretation biases are said to occur at the time of encoding, rather than at recall (Mathews & MacLeod, 2002), induced moods may already have begun to decay during the initial reading and encoding of the ambiguous sentences. This may suggest that observed changes in cognitive biases were actually mood congruent throughout, rather than evidence of a motivated mood regulating strategy. However, the observation of an increasingly positive response bias in the positive mood condition, would suggest otherwise, as if cognitive biases were changing congruently with mood, a less positive bias would have been observed.

This may be an issue that is difficult to overcome within an experimental paradigm. An important flaw in the design of the study was that there was no baseline measure of how long mood was naturally maintained in the absence of a test for interpretation biases. With this as a consideration for future studies, different mood induction procedures could also be piloted to examine which method induces the most persistent mood.

In the test for interpretation biases, the biases are said to occur at the encoding stage, whilst reading the ambiguous scenarios, therefore by the time participants get to the sentence recognition stage, any mood regulation or mood maintenance has already taken place. In the time taken to complete the subsequent recognition task, any effects on mood may be lost due to decay or indeed boredom. It may therefore be beneficial in future studies in trying to capture any relevant mood changes, to measure mood after reading the ambiguous scenarios but before completing the sentence recognition task.

8.6 Hedonistic or Contextual Motivations for Mood Regulation?

According to the contextual model of mood regulation, it would be expected that mood would be regulated or maintained according to the demands of the situation. Were this the case in this study, then it would be hypothesised that, given that the contextual demands were equivalent across the two experiments, participants would have been equally motivated to either regulate or maintain their mood. This was not observed in this study, therefore suggesting, that at least for this procedure, contextual demands were not the main motivation for mood regulation.

Consistent with the hedonistic model, however, it was observed that a positive mood led to congruent cognitive biases, whereas as an anxious mood led to incongruent biases. This may suggest therefore, that in the absence of other demands, hedonistic concerns would drive mood regulation, in order to maintain a positive mood and reduce an anxious mood,

which in this study was observed for both high and low trait anxious participants. As discussed in section 8.4, further research with the addition of cognitive load, could also determine whether hedonistic concerns are still evident when competing demands are placed on cognitive resources, or if contextual demands would then take precedence over the desire or ability to regulate mood.

8.7 Causal Effects of Interpretation Biases on Mood

Despite some of the limitations of this study, there are some important conclusions that can be drawn in regards to the direction of influence between mood and interpretation biases. Previous research within the area has asserted that interpretation biases have a direct and causal effect on mood, with a wealth of evidence to support these claims (e.g. Mathews & Mackintosh, 2000; Mathews & MacLeod, 2002). Although few conclusions can be drawn from this study as to the effects interpretation biases have on mood, there is however evidence for the effects of an induced mood on interpretation biases. The evidence reported here would suggest that there is likely to be an interaction between interpretation biases and induced mood, as proposed by the dual process model, rather than a uni-directional causal relationship. It was also shown that these interpretation biases were only activated in a anxious and not a positive mood, which may suggest that either interpretation biases are only activated in response to an anxious mood, or that they are only activated during attempts to regulate a mood, be it positive or anxious. Given that in this study, participants appeared to attempt to maintain a positive mood, rather than regulate it, no further conclusions regarding this can be drawn from this study but could be addressed in further studies where a cognitive load is employed, which may motivate the regulation of a positive mood, as discussed above.

8.8 Measures and Design

8.8.1 Measures of Anxiety

As discussed in Chapter 2, there were some difficulties experienced in using the MMANX to predict anxiety levels on the STAI. Although previous studies had observed correlations of .87, only .78 was achieved in this study. However, it is suggested that this is not necessarily due to the MMANX being an inappropriate measure. It may be expected that a number of factors could have contributed to the discrepancies observed. Firstly, there was often a delay of up to two weeks between the screening questionnaires being completed and attendance at the experiment, which could see anxiety levels change, particularly around exam time, as was reported by several participants. Also, there was a change in context, from completing the MMANX anonymously to completing the STAI in the presence of the researcher, which could have affected how some people responded.

However, as the MMANX is a relatively new measure of anxiety, further research may be required in establishing how reliable it is as a measure of trait anxiety, with scores being compared over time and whether it is more susceptible to changes in state anxiety than more conventional measures such as the STAI.

8.8.2 Measures of Mood

A brief, visual analogue scale to indicate mood was employed in this study, with particular items related to high and low NA and high and low PA, which were selected according to each experiment and mood induction procedure. These items were able to detect significant changes in mood over time in both experiments, therefore it is thought to have been an appropriate measure of mood in this study. However, if mood were to be measured more frequently as is suggested for future research, fewer items might be used. However, one of the strengths of this measure with all eight items, is that it may be less

susceptible to response biases, if for example only levels of anxiety or happiness were enquired about. Additionally, using the same items in both experiments, eliminated this as an extraneous variable between experiments.

8.8.3 Measures of Interpretation Biases

As discussed in section 8.5, the ambiguous scenario method was effective in demonstrating an interpretation bias in experiment two. One of the strengths of this measure is that it is able to detect true interpretation biases, as opposed to response biases. Given the number of items, it was also able to show changes in interpretation biases over time and contained a balance of social and physical threat items, which other measures do not.

As discussed by Salemink et al. (2007a), some participants may have been aware of the aims of this experiment, thus biasing their responses. This was not explicitly measured in this study, although most participants were asked at the end, what they understood of the experiment and what they thought was being measured. Save for a few, most participants were unaware of the aims of the experiment. Some had noticed that the recognition items were different to the original scenarios and a few reported not being able to really remember. Only a few reported that they had become aware during the experiment that they had made either positive or negative interpretations immediately following the mood inductions and two reported having made a conscious effort to change from a negative bias to a positive bias, although mood regulation was not cited as a reason for doing so.

Although these subjective and casual observations may not provide evidence against the fact that participants may have been aware of the study's aims, it does imply that these results cannot be completely explained by participants being aware of their cognitive biases being measured and affected by mood. However, there is certainly room for future studies to take more systematic measures of how aware participants are of being tested for their

interpretations and also that the purpose of the mood induction was to change their interpretations in order to estimate whether this mediated any effects observed.

8.8.4 Threats to Social and Physical Self

In addition to some of the difficulties in detecting changes in mood discussed in section 8.5, one limitation of this study was the lack of control over the type of threat pertained to in the mood induction and subsequently measured in the tests. The positive mood induction could be said to relate to positive, social events whereas the anxious mood induction was related more to threats to the physical self. As was reported by Beard and Amir (2009) there may be differences in the interpretation biases observed, dependent on the type of threat experienced in the mood induction, although this has not always been found to be the case (Hunter et al., 2006; Vinnocombe et al., 2006). However, a strength of this study was that interpretations of both physical and social threats were measured, therefore this should control for any possible bias as a result.

8.8.5 Randomisation

There is a small possibility that some bias may have been introduced through a lack of randomisation of participants to each experiment. Although completely random allocation was not appropriate for pragmatic reasons as discussed in Chapter 2, it could be argued that block randomisation could have been a viable alternative. This may however, have reduced the flexibility for participants to choose from a range of session times. It would also have been difficult to implement using the online scheduler system, as it is not possible to determine which participants can sign up to which sessions. As this is a new system for the university and modifications are still being made in how it is used, this may be a consideration for future experiments, if such a facility could be built in.

8.8.6 Analyses

It is acknowledged that to strengthen the argument for the differential effects of positive and anxious moods on interpretation biases, rather than conducting two separate experiments and analysing the data separately, ideally induced mood would have been included as a second between-subjects variable and incorporated into a single analysis. However, in this study, due to the small number of high anxious participants in particular, this would have reduced the power of the analysis and some important effects would have been lost. It is hoped however, that given that all other variables were kept constant between the two experiments, such as by running the experiments alongside each other to rule out effects of time of year and exam times for example, this may increase the likelihood that differences between the two experiments were true differences due to induced mood. Theoretically, it is also appropriate to conduct two separate experiments, given that positive and anxious moods are not necessarily correlated, therefore it is important to examine the two theoretically different constructs separately.

8.9 Overall Strengths and Limitations of Study

As discussed in previous sections, there are a number of limitations of this study, in terms of the methodology and the recruitment and allocation of high and low anxious participants. There may also be some question as to whether it is appropriate to generalise from experimental studies to real world phenomena. It is acknowledged that the effects observed in this study are unlikely to reflect how mood is actually regulated outside of the experimental situation. In reality, the moods that are experienced are likely to be of greater intensity and personal relevance, the demands placed upon an individual may compete with the demands of mood regulation and individuals may employ a greater range of strategies to maintain or regulate a mood, such as memory recall (e.g. Josephson, Singer, & Salovey, 1996), attentional biases (e.g. MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002)

and behavioural strategies (e.g. Morris & Reilly, 1987). However, it is also argued that given the complexity of the mood regulatory process, controlled experimental designs such as this, can enable researchers and indeed clinicians, to begin to unpick and expand upon some of the processes involved, in order to begin to make sense of the complex regulatory system and begin to understand at which point these processes may break down in those individuals unable to adequately regulate mood.

8.10 Clinical Implications

It was particularly interesting to note that interpretation biases were activated in both high and low trait anxious participants and that both groups showed evidence of a mood incongruent interpretation bias when in an anxious mood. This is in contrast to previous findings, where high anxious participants are generally reported to have more negative interpretation biases than low anxious participants. However, due to the possibility that there may have been insufficient differences in trait anxiety levels between the high and low anxious groups, it may only be concluded that non-clinically anxious participants, show evidence of mood incongruent interpretation biases when in an anxious mood, which may serve to regulate anxious moods. It would however be very interesting to explore this further with groups at the extreme ends of trait anxiety, to see whether similar effects are still observed. This may have implications for the clinical application of cognitive bias modification (CBM) if it is demonstrated that high anxious participants are anxious due to a failure to employ motivated processing when under stress, rather than having just a generally negative cognitive bias. For example, if high anxious participants only show negative interpretation biases when under stress, then training of neutral biases without stress, may limit the generalisability of the training, if it is not conducted within the situations that most require it. Equally if the converse were found and high trait anxious participants were still able to show motivated processing with a cognitive load, then this might lead to further

research exploring at what other point during the process of mood regulation does it breakdown for high anxious individuals, for example if motivated strategies are simply ineffective at reducing anxiety for those individuals due to other variables not examined here, such as attentional biases.

There are also important implications for the understanding of anxiety, through a novel use of the dual-process model, which until now has only been applied to 'normal' mood processes and depression. As was seen in experiment two, untrained interpretation biases did change over time, as the model would predict, although only following an anxious mood induction. Whilst further research is required to explore whether clinical anxiety can be understood as a failure to initiate motivate processing, it does highlight the importance of including time as a variable in future studies. As discussed in Chapter One, without time as a variable (or test half in this study), important effects may be missed and indeed, potentially important differences between high and low anxious participants, overlooked. If, as is predicted by this model, both low and high anxious participants both start with strategic (congruent) processing and over time, only low anxious participants will change to a motivated strategy, then interventions could also be developed with a greater focus on encouraging this change, as opposed to looking to develop motivated processing from the outset. It may also conversely be that the differences lie at the substantive processing stage, with for example, high anxious individuals being more prone to having initially more negative interpretations thereby having to employ greater cognitive resources by having to constantly try to switch to a motivated processing, meaning they are less likely to have the cognitive resources available when under stressful conditions. Such research using the dual process model framework would serve an important function in further developing our understanding of the development of anxiety disorders and subsequently further refine clinical interventions.

8.11 Conclusions

This study has attempted to explore the mood regulatory effects of interpretation biases on positive and anxious moods, within a dual process model framework. Whilst there are some acknowledged limitations, this study does provide preliminary evidence of the interaction between anxiety and interpretation biases for an anxious mood which can be understood within a dual process model framework. In the absence of other contextual demands, it was observed that hedonistic concerns motivated mood regulatory processes, although the subsequent effects on mood could not be established. Further research is needed in order to explore how these processes may differ in a truly high anxious population and if increasing the demands on cognitive resources would serve to accentuate differences in high and low anxious participants' ability to employ cognitive biases as a mood regulatory strategy. There are suggested implications for the clinical application of cognitive bias modification, although further research is required to establish under what conditions anxiety regulation fails for high anxious individuals.

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Appendix A

Power Calculation

Segal et al. (2006) reported an effect size of .50, for a three-way interaction between item valence, mood induction and prime type, using the homograph measure of interpretation biases.

Hunter et al. (2006) did not report on the predicted three-way interaction (mood induction, item valence and target/foils), however an effect size of .89 was reported for an interaction between item valence and mood induction, using the ambiguous scenario measure of interpretation biases.

Segal et al. (2006), measuring mood at three time points, following both positive and negative mood inductions, reported an effect size of .98.

The following calculation, was entered into G*Power (Faul, Erdfelder, Lang, & Buchner, 2007)[1], based on the most conservative reported effect size of .50.

Level of significance (α) was set at .05.

Power was set at .90.

For each experiment using two groups and three within-subjects measures, the sample size required was estimated to be 12 per group.

[1] Faul, F., Erdfelder, E., Lang, A-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39,* 175-191.

Appendix B

Initial Participant Recruitment Email

Dear

RE: Psychological study – The effects on comprehension of viewing emotional films

I am a trainee Clinical Psychologist, undertaking my doctoral studies at the Faculty of Health at UEA. I am contacting you to invite you to participate in the above study which will form part of my thesis.

This is an exciting project looking at the effect of emotions on the way people think and behave. It is hoped that the results of this study will help inform future treatments and interventions for people with emotional disorders.

The study will take up to an hour of your time and will take place on the UEA campus. We hope that taking part in the study will be an interesting experience and an opportunity for you to find out more about psychological research. As compensation for your time, we would also like to offer a £5 payment and some information about where to access support for mental health problems at UEA and in the surrounding area.

If you would like to know more about this or other studies that are happening at UEA, please contact me at l.teape@uea.ac.uk directly (please do not reply to the sender).

Best wishes
Lynda Teape
Trainee Clinical Psychologist

Supervised by
Dr Bundy Mackintosh, Senior Lecturer in Abnormal Psychology Dr Helen Buxton, Clinical Psychologist and Senior Clinical Tutor

Appendix C

Mental Health Information Leaflet

Information for Students

Being a student can be a very exciting time, but it can also bring with it a number of different stresses. You may be away from home, all your friends and family for the first time, in a new city and trying to make new friends. You may be experiencing financial difficulties or struggling with the academic pressures of the course. Many people at some point in their lives have found that they would benefit from some support or advice to help them through a difficult period.

There are a number of places that you can access support and advice at these times. Many of the organisations we have listed below have a range of services available, including on-line information, telephone help lines and face-to-face counselling.

If you are concerned…

If you are concerned about your own emotional well-being or mental health, or that of someone close to you, please do talk to your GP who will be able to help.

Norwich Mind

www.norwichmind.org.uk
Norwich Mind is a highly regarded provider of mental health services in the City of Norwich and in the Central area of Norfolk. The services are easy to access and many can be delivered to people in a place of their choosing.
If you need assistance and you reside in Norfolk, you can contact their Advice Service, Mind Body & Soul, on 01603 432457 or by email at mbs@norwichmind.org.uk

If you are caring for someone with a mental health problem you can contact their Carer Support Service on 01603 432457.

rethink

www.rethink.org
rethink is an organisation that provides information and a range of services to individuals nationwide. Their website provides information for people experiencing mental health problems, their carers and those working and volunteering in mental health services. They also provide information and links to services available in your area.

Contact details:

Rethink general enquiries
Telephone: 0845 456 0455 or email:info@rethink.org

National advice service
Telephone: 0207 840 3188 (open 10am to 3pm Monday, Wednesday & Friday; 10am to 1pm Tuesday & Thursday) or e-mail: advice@rethink.org

University of East Anglia Counselling Services

http://www1.uea.ac.uk/cm/home/services/students/ucs
The University Counselling Service is part of Student Services and their aim is to enable students to achieve their academic and personal goals by providing confidential counselling and support for any difficulties encountered while at UEA. In addition to providing one-to-one counselling, the Counselling Service also offers group work and workshops to both students and staff. They work closely with other support services to provide an integrated service.
The Counselling Service website contains information, including links to online cognitive behavioural courses and guides to managing commonly experienced difficulties such as stress and perfectionism.

Samaritans

www.samaritans.org.uk
The Samaritans provides confidential non-judgemental emotional support, 24 hours a day for people who are experiencing feelings of distress or despair, including those which could lead to suicide.
They offer their service by telephone**,** email**,** letter and face to face in most of their branches.
08457 90 90 90
jo@samaritans.org
19 St. Stephen's Square, Norwich, Norfolk
NR1 3SS
United Kingdom
Phone: (08457) 90 90 90

Mental Health Care

www.mentalhealthcare.org.uk
A useful web-based resource containing mental health information for friends, family and carers. It contains information about mental health and mental illness, research findings from the Institute of Psychiatry and South London and Maudsley NHS Foundation Trust and personal stories written by carers. There are also links to other organisations and local services in your area.

Bridge
BRIDGES is a drop-in centre for people with mental health issues. The Centre is open to anyone over 16 years old without referral. The Centre offers companionship and mutual support, a choice of activities and gives members a full say in how the centre operates with the opportunity to be involved in the everyday running of the centre.
52 Magdalen Road
Norwich
NR3 4AQ
01603 403411
bridges@rethink.org

Appendix D

Letter of Approval from UEA, Faculty of Health Ethics Committee, 4th July 2008

Miss Lynda Teape
Doctorate in Clinical Psychology
Room 2.01
Elizabeth Fry Building
UEA
Norwich
NR4 7TJ

4th July 2008

Dear Lynda,

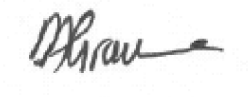
The effects of induced anxiety on interpretation biases in high and low anxious participants – 2008030

The resubmission of your above proposal has now been considered by the Chair of the FOH Ethics Committee. We can now confirm that your proposal has now been approved.

Please could you ensure that any amendments to either the protocol or documents submitted are notified to us in advance and also that any adverse events which occur during your project are reported to the committee. Please could you also arrange to send us a report once your project is complete.

The committee would like to wish you good luck with your project.

Yours sincerely



Debbie Graver
Notetaker
Faculty of Health Ethics Committee
Tel: 01603 591023
Email: Deborah.Graver@uea.ac.uk

Appendix E

Letter of Approval from UEA, Faculty of Health Ethics Committee for Amendments, 22nd October 2008

Institute of Health
Finance and Research Offices

UEA NORWICH

University of East Anglia
Norwich NR4 7TJ England

Finance Telephone
01603 593028
Research Telephone
01603 591720
Fax
01603 591132

Miss Lynda Teape
Doctorate in Clinical Psychology
Room 2.01
Elizabeth Fry Building
UEA
Norwich
NR4 7TJ

22nd October 2008

Dear Lynda,

The effects of induced anxiety on interpretation biases in high and low anxious participants – 2008030

The amendments to your above proposal has now been considered by the Chair of the FOH Ethics Committee. We can now confirm that your proposal has now been approved.

Please could you ensure that any amendments to either the protocol or documents submitted are notified to us in advance and also that any adverse events which occur during your project are reported to the committee. Please could you also arrange to send us a report once your project is complete.

The committee would like to wish you good luck with your project.

Yours sincerely

Debbie Graver
Notetaker
Faculty of Health Ethics Committee
Tel: 01603 591023
Email: Deborah.Graver@uea.ac.uk

Appendix F

Letter of Approval from UEA, Faculty of Health Ethics Committee for Amendments, 26th March 2009

Lynda Teape
Trainee Clinical Psychologists
Doctoral Programme in Clinical Psychology Room 2.01,
Elizabeth Fry Building
UEA Norwich
NR4 7TJ

Faculty of Health
Research Office

University of East Anglia
Norwich NR4 7TJ
United Kingdom

Email: Jane.Carter@uea.ac.uk
Tel: +44 (0) 1603 591023
Fax: +44 (0) 1603 591132

Web:www.uea.ac.uk

26 March 2009

Dear Lynda Teape

Re: Amendments to research protocol
The effects of induced anxiety on interpretation biases in high and low anxious participants – 2008030

The amendments to of your above proposal have now been considered by the Chair of the FOH Ethics Committee and we can confirm that your proposal has been approved.

Please could you ensure that any amendments to either the protocol or documents submitted are notified to us in advance and also that any adverse events which occur during your project are reported to the committee. Please could you also arrange to send us a report once your project is completed.

The committee would like to wish you good luck with your project.

Yours sincerely,

Jane Carter

Dr. Jane Carter

+44 (0) 1603 591023
Jane.Carter@uea.ac.uk

Appendix G

Participant Information Sheet

Please reply to
Lynda Teape
Doctoral Programme in Clinical Psychology
Elizabeth Fry Building
University of East Anglia
Norwich NR4 7TJ
04th March 2008 E-mail: l.teape@uea.ac.uk

Participant Information Sheet

Cognition and Emotion Research Project

Title of Project: The Effects on Comprehension of Viewing Emotional Films

In order to improve understanding of the way our emotions work, new research projects regularly take place with the eventual aim of developing improved treatments and services for those individuals that suffer from emotional disorders or other mental health problems. I would therefore like to invite you to take part in a current research project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Talk to others about the study if you wish. If you are agreeable I will go over the details when we meet to make sure you understand what is involved and you will be asked to sign a form to give your consent to taking part. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the study?
Psychologists have realised for some time that when people experience emotions there are changes in the way they think and behave and these changes can perpetuate those emotions. We are interested in your experience of emotions and how that affects the way you think and behave.

Why have I been chosen?
You have been chosen because you are a student or member of staff at the University of East Anglia.

Do I have to take part?
No. It is up to you whether or not to take part. If you do, you will be given the opportunity to discuss the project further when we meet when you will be asked to sign a consent form if you are willing to go ahead. You will remain free to withdraw at any time and without giving a reason. A decision not to take part, or to later withdraw, will in no way affect your studies or employment at the University and no-one except the research team will be aware of any aspects of your participation.

What will happen to me if I take part?
The first thing that will happen is that you will be asked to complete a number of questionnaires asking you about your thoughts, feelings and behaviour. This will help us decide whether this study is suitable for you and to ensure we select equivalent individuals for the different parts of the study. Then some people will be asked to attend a session, lasting approximately an hour, when you will complete a number of further questionnaires, watch a short video clip, and answer some questions about what you saw on the video. Not everyone who completes the questionnaires will be asked to attend this session. For instance, you would not be suitable for the study if English is not your first language or you have not spoken English in an English-speaking country since the age of 10 years or have any significant reading problems. Also, as this is a study of usual emotional responses in volunteers we will not ask people to participate if they have a history of depression, anxiety or other mental illness in the past 5 years. Finally, people who have completed a similar psychology study in the past may not be suitable as this could affect the reliability of the results of the study, we will need to ask about any previous studies in which you have participated. The study is not aimed at investigating the quality of your memory of the video clip; we are more interested in your perception of it.

What do I have to do?
All you will have to do is complete the initial questionnaires and come to a session at a time agreed between you and the researcher to complete the further questionnaires, watch the video clip and answer the questions about it, and complete a brief comprehension task. These activities are not at all difficult.

Will I be paid?
Individuals who attend the testing session will be paid £5 and will also be given a booklet on how to improve mental wellbeing as a thank you for taking part.

What are the possible benefits of taking part?
We hope that this will be an interesting and informative experience of psychological research for you. Although there are no direct benefits for participants it will help our understanding of emotions, which will be helpful in developing further psychological treatments.

Are there any disadvantages of taking part?
The video clips contain scenes taken from popular movies, some pleasant and some less pleasant which could invoke negative emotions and there is a possibility that some may find these distressing. If this is the case you can ask the researcher to stop at any time and withdraw yourself from the study. However, as the clips have all been taken from movies available to the public on general release, and have been used in previous research where they have caused no problems to other participants this is highly unlikely. Most find that the negative emotions invoked dissipate after a short period of time. The only other disadvantage is the possible inconvenience of coming to the session. Some people have also said that the activities can seem a bit dull! However, others have also said they have found them quite interesting to do and find out about, so this might not be too much of a problem for you.

Will my taking part in the study be kept confidential?
Yes. All information which is collected about you during the course of the research will be kept strictly confidential to the research team. You will be allocated an anonymous code number, which will be used to identify your personal contribution. The information that matches this code to your name will be held in a special encrypted computer file, separate from the other information about the study. Once we have completed collecting information about you for the study we will ensure that only the anonymous code remains so that the results remain completely confidential. Storage and use of information in this study will be fully compliant with the Data Protection Act.

What will happen to the results of the research study?
We hope to publish the results in journals reporting research in psychology. You will not be identified in any way in the reports of the research. We will be happy to send you a summary of our findings.

Who is organising and funding the research?
The research has been organised by Lynda Teape as part of her research on the Doctoral Programme in Clinical Psychology. She is supervised by Dr Bundy Mackintosh, an academic research psychologist and Dr Helen Buxton, a clinical psychologist. None of the research team is being paid additionally to their normal salaries. Please contact Lynda Teape on the email address above if you would like any further information.

Who has reviewed the study?
The study has been reviewed by the University of East Anglia Research Ethics Committee and given a favourable ethical opinion for conduct at the University.

If there is a problem:
If you have a concern about any aspect of the study you should contact Lynda Teape Trainee Clinical Psychologist on the contact details above, who will do her best to answer your concerns, or direct you to further sources of help and advice. If you remain unhappy and wish to make a more formal complaint, then you should contact Dr Helen Buxton, Clinical Tutor for the Doctoral Programme in Clinical Psychology on 01603 593 310 who will help you to take the complaint forward.
Although we are not able to make any clinical diagnoses or offer treatment, and this is not the aim of this study, it may become apparent that you are currently experiencing distress. If this is the case, we will provide you with some information and suggest where to seek help.

With many thanks for considering taking part and taking time to read this sheet.

Appendix H

Participant Consent Form

Participant identification number for this trial: _____

CONSENT FORM

Title of Project: ***Clinical Psychology Research Project***

Chief Investigator: Lynda Teape

Please initial box:

1. I confirm that I have read and understand the information sheet dated 4th March 2008 for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my studies or employment at the University of East Anglia being affected. ☐

3. I agree to take part in the above study. ☐

_____	_____	_____
Name of participant	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Appendix I

Demographic Questionnaire

	Candidate questionnaire	**Participant number (OFFICE USE ONLY)**
	Please answer all of the information below.	
1	Name	
2	Date of birth (i.e.01/01/1980)	
3	Gender	
4	School and town of study (students) Department employed (staff)	
5	Year of study (students) Job title (staff)	
6	Is English your first language? Or have you spoken English in an English speaking country since the age of 10 years?	
7	Are you aware that you have any learning or language difficulties (e.g. dyslexia, dysphasia, memory impairments)?	
8	Do you currently have or have you experienced in the last 5 years, any form of mental illness, whether treated or untreated?	
9	Have you ever participated in a psychological study at UEA before?	
	If you have answered **YES** to question **9**, please give as much detail as you can including who ran the experiment, when it was and what the study was about?	

Appendix J

MMANX Brief Anxiety Questionnaire

MMANX

Instructions:
Below are a number of words that describe different feelings or emotions. Please read each item and then tick the box to the right of the word which best indicates how you **GENERALLY** feel**.** Please do not dwell long on each answer as we are interested in the first response that comes to mind. Just give the answer that best describes your feelings generally. There are no right or wrong answers.

		Almost never	Occasionally	Sometimes	Often	Almost always
1	interested	☐	☐	☐	☐	☐
2	satisfied	☐	☐	☐	☐	☐
3	inadequate	☐	☐	☐	☐	☐
4	sleepy	☐	☐	☐	☐	☐
5	calm	☐	☐	☐	☐	☐
6	worried	☐	☐	☐	☐	☐
7	energetic	☐	☐	☐	☐	☐
8	useful	☐	☐	☐	☐	☐
9	optimistic	☐	☐	☐	☐	☐
10	a failure	☐	☐	☐	☐	☐

Appendix K

Short-Form Marlowe-Crowne Social Desirability Scale

Listed below are a number of statements concerning personal attitudes. Read each item and circle whether the statement is TRUE or FALSE as it pertains to you personally.

	TRUE	FALSE
1. It is sometimes hard for me to go on with my work if I am not encouraged.	T	F
2. I sometimes feel resentful when I don't get my way.	T	F
3. On a few occasions, I have given up doing something because I thought too little of my ability.	T	F
4. There have been times when I felt like rebelling against people in authority even though I knew they were right.	T	F
5. No matter whom I'm talking to, I'm always a good listener.	T	F
6. There have been occasions when I took advantage of someone.	T	F
7. I'm always willing to admit it when I make a mistake.	T	F
8. I sometimes try to get even rather than to forgive and forget.	T	F
9. I am always courteous, even to people who are disagreeable.	T	F
10. I have never been irked when people expressed ideas very different from my own.	T	F
11. There have been times when I was quite jealous of the good fortune of others.	T	F
12. I am sometimes irritated by people who ask favors of me.	T	F
13. I have never deliberately said something that hurt someone's feelings.	T	F

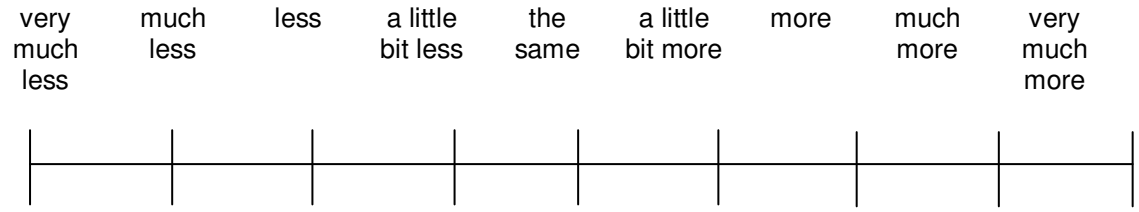
Appendix L

Visual Analogue Scales – Mood Valence

1. Practice Item

Compared with how you feel generally, how tired are you feeling right now?

← less tired than usual more tired than usual →



Please use the mouse to move to a point on the scale and click to record your choice.

----------new page----------

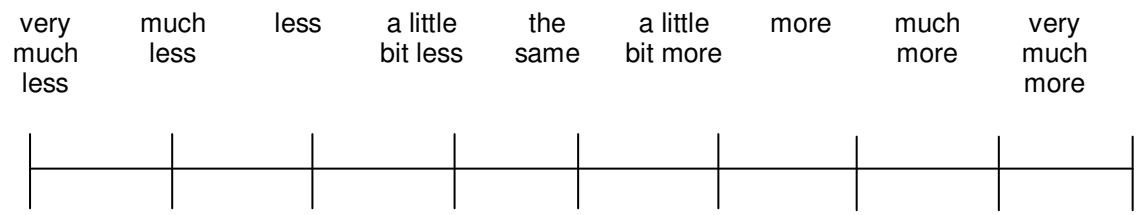
Thank you, this was the practice example.

Please press any key to go on.

----------new page----------

2. Test Item

Compared with how you feel generally, how low/depressed are you feeling right now?



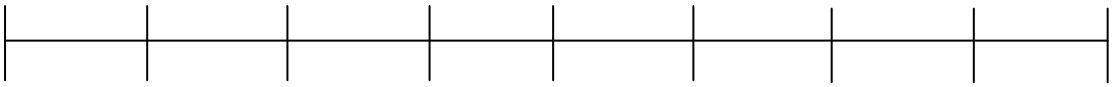
Please use the mouse to move to a point on the scale and click to record your choice.

----------new page----------

3. Test Item

Compared with how you feel generally, how sad are you feeling right now?

very much less	much less	less	a little bit less	the same	a little bit more	more	much more	very much more



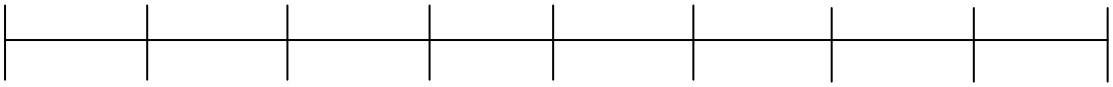
Please use the mouse to move to a point on the scale and click to record your choice.

----------new page----------

4. Test Item

Compared with how you feel generally, how tense are you feeling right now?

very much less	much less	less	a little bit less	the same	a little bit more	more	much more	very much more



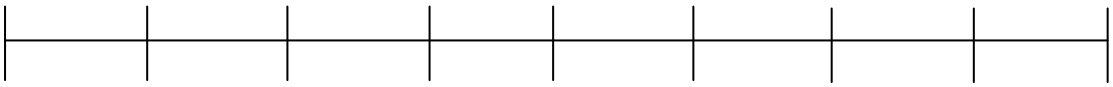
Please use the mouse to move to a point on the scale and click to record your choice.

----------new page----------

5. Test Item

Compared with how you feel generally, how worried are you feeling right now?

very much less	much less	less	a little bit less	the same	a little bit more	more	much more	very much more



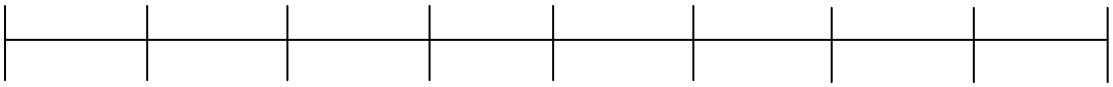
Please use the mouse to move to a point on the scale and click to record your choice.

----------*new page*----------

6. Test Item

Compared with how you feel generally, how carefree are you feeling right now?

very much less	much less	less	a little bit less	the same	a little bit more	more	much more	very much more



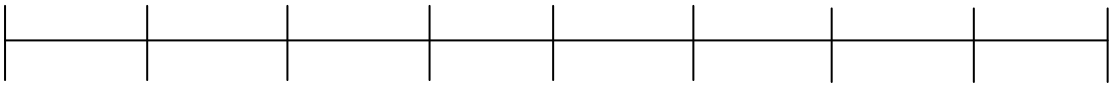
Please use the mouse to move to a point on the scale and click to record your choice.

----------*new page*----------

7. Test Item

Compared with how you feel generally, how content are you feeling right now?

very much less	much less	less	a little bit less	the same	a little bit more	more	much more	very much more



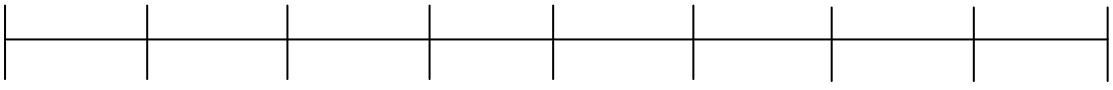
Please use the mouse to move to a point on the scale and click to record your choice.

----------*new page*----------

8. Test Item

Compared with how you feel generally, how calm are you feeling right now?

very much less	much less	less	a little bit less	the same	a little bit more	more	much more	very much more

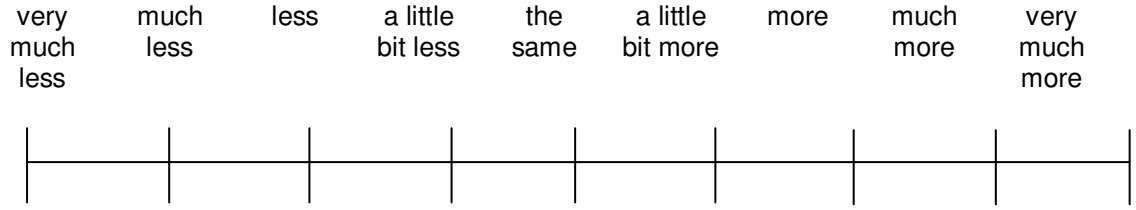


Please use the mouse to move to a point on the scale and click to record your choice.

----------new page----------

9. Test Item

Compared with how you feel generally, how happy are you feeling right now?



Please use the mouse to move to a point on the scale and click to record your choice.

----------new page----------

Thank you.

---------end of questionnaire--------

Appendix M

Results of Pilot Study for Mood Induction Procedures

An opportunistic sample of six participants were exposed to two positive and two negative film clips. After each of the four films, participants were asked to indicate first how it had affected their mood valence from, 1 being very negative, to 9, being very positive and then on a questionnaire regarding discrete affective states, to indicate on a scale of 0-9, how much fear, disgust, happiness and pleasure the films had evoked. Scores for both positive films were combined, as were scores for both negative films. For the second questionnaire, items fear and disgust were then reversed and the mean of happiness, pleasure, fear and disgust was calculated to give an average affect score. The descriptive statistics are presented in Table A.

Table A.

Descriptive Statistics for Induced Mood Following Positive and Negative Films.

	Positive Films		Negative Films	
	Mean	*SD*	Mean	*SD*
Mood valence	7.00	1.91	3.50	1.98
Happiness	6.25	2.22	0.92	1.88
Pleasure	5.67	2.64	0.83	1.80
Fear	0.67	1.61	3.58	2.47
Disgust	0.92	1.62	2.58	2.57
Average affect	7.08	1.47	3.40	1.65

Responses following the positive and negative films were then compared using both the mood valence questionnaire and average affect score from the second questionnaire using a Mann-Whitney U test.

A significantly more negative mood was evoked following the negative films clips, than the positive films as measured by both the mood valence questionnaire, U=16.0, p<.001 and the average discrete affect score U=6.0, p<.001, therefore these films were considered appropriate for use in inducing a positive and an anxious mood.

Appendix N

Brief Information about Study for Participants

Dear [participant]

Thank you for your interest in the above study.

This is an exciting project looking at the effect of emotions on the way people think and behave. It is hoped that the results of this study will help inform future treatments and interventions for people with emotional disorders.

The study will take up to an hour of your time and will take place on the UEA campus. We hope that taking part in the study will be an interesting experience and an opportunity for you to find out more about psychological research. As compensation for your time, we would also like to offer a £5 payment and some information about where to access support for mental health problems at UEA and in the surrounding area.

Please find attached a detailed information sheet about the study along with some screening questionnaires. If you would like to participate after reading the information sheet then please open each of the questionnaires (clicking 'enable macros' if asked).

On the file called 'Brief Screening Questionnaire', make sure you complete all the questions and then click 'Next' at the bottom of the page, this will take you onto a second page, which you need to complete and click 'click here to save' again.

For the file called 'Candidate Questionnaire' you only need to complete the questions on the first page and then click 'click here to save'.

Both files will automatically save with your name in the title.

Make sure you save the questionnaires somewhere convenient on your computer, then attach the new versions of both files in an email back to me.

If you are eligible to participate after completing the questionnaires I will email you with details about how to sign-up for the study session.

Any questions, please don't hesitate to ask.

Best wishes
Lynda Teape
Trainee Clinical Psychologist

Supervised by
Dr Bundy Mackintosh, Senior Lecturer in Abnormal Psychology
Dr Helen Buxton, Clinical Psychologist and Senior Clinical Tutor

Att. Participant Information Sheet
Demographic Questionnaire
Brief Screening Questionnaire

Appendix O

Email to Participants Ineligible for Study

Dear [participant]

Thank you for your interest in the above study and for taking the time to complete the initial questionnaires.

Unfortunately, we will not be inviting you to attend for the testing session as we now have enough participants for this section of the study.

However, the cognition and emotion research group are running a number of studies at present, which you may be eligible for. If you would be interested in participating in other studies then please go to www.uea.ac.uk/med-swp-research where you can find out more.

We would like to store the information from your screening questionnaires, along with your contact details in order that we may invite you to participate in further studies being conducted by the cognition and emotion group over the next year.

Please do let us know if you would prefer not to be invited for future studies.

Best wishes

Lynda Teape
Trainee Clinical Psychologist

Supervised by
Dr Bundy Mackintosh, Senior Lecturer in Abnormal Psychology
Dr Helen Buxton, Clinical Psychologist and Senior Clinical Tutor

Appendix P

Email Inviting Eligible Participants to Sign Up for the Study

Dear [participant],

Thank you for your interest, and for completing the screening questionnaires.

I'm pleased to tell you that you are eligible to participate in the study.

All you need to do now is go to the following website: http://uea-uk.sona-systems.com/ and sign up for an account (if you don't already have one) by clicking the link on the left hand side of the page.

When you have your login and password, login to the website and click on the tab that says 'studies' at the top of the page. Click on the link that says 'timeslots available' for our study (look for the study title "the effects on comprehension of viewing emotional films").

At the bottom of the page click 'view timeslots for this study'. Choose a timeslot that is convenient for you. You will need a code to be able to sign up for a time slot.

Please enter the code **kas4892y**

Then click 'sign up'.

If you cannot find a suitable time or experience any difficulties with using the online system, then please feel free to contact me.

Best wishes
Lynda Teape

Appendix Q

Notes on Collaborative Project

The planning and early implementation stages of this study were conducted in collaboration with fellow UEA, DClinPsy student, Lorna Shelfer. The aim was that our two, separate but complementary studies would run alongside each other, with participants drawn from the same sample and the results of both studies informing our own respective studies. Due to a change in circumstance, Lorna was unable to continue recruiting to her own study beyond December 2008. Therefore, it may be noted that a small number of participants were diverted from the recruited sample in this study, to the collaborative study, yet no further information has been provided. This will be due this study as yet being uncompleted.

Appendix R

Materials for the Test of Interpretation Biases

	Practice Item 1
Title	Walking in the Park
Line 1	You are walking through the park early on a Sunday morning.
Line 2	The sun is shining and as you look around you see children playing
Line 3	on the grass. You begin to tire, so you decide to rest for
Line 4	a few minutes while sitting on a
Word fragment	b - n c -
Completed word	bench
Comprehension Question	Did you see children in the park?
Negative Foil	You were walking through the park when a thunderstorm started
Negative Target	You had a picnic in the park one afternoon
Positive Foil	You rode your bike through the park on your way home
Positive Target	You were walking through the park and sat down to rest

	Practice Item 2
Title	Getting off the Bus
Line 1	You are on the bus going to work
Line 2	when you see your stop approaching.
Line 3	You press the bell and
Line 4	get ready to stand up when the bus
Word fragment	s t o - s
Completed word	stops
Comprehension Question	Were you going to work on the bus?
Negative Foil	As you stand, the bus accelerates past your stop
Negative Target	As you stand, the bus screeches to a halt
Positive Foil	As you stand, the bus drives straight past your stop.
Positive Target	As you stand, the bus comes to a slow halt

	Social threat 1
Title	The local club
Line 1	You are invited for a night out at a local club, although you don't know
Line 2	any of the members very well. As you approach the door
Line 3	you can hear loud music and noisy conversation,
Line 4	but as you enter the room it is quiet for a
Word fragment	m - m - n t
Completed word	moment
Comprehension Question	Do you know most of the club members?
Negative Foil	As you enter the room someone asks you why you are there.
Negative Target	As you enter the room everyone stops and stares at you.
Positive Foil	As you enter the room someone greets you warmly.
Positive Target	As you enter the room the music stops for a moment.

	Social threat 2
Title	The first aid refresher
Line 1	You participate on a first aid refresher course at work.
Line 2	The instructor asks a question and no one in the group
Line 3	volunteers an answer, so he looks directly at you. You offer a reply,
Line 4	thinking about how your answer must be sounding to the

Word fragment	o t h - - s
Completed word	others
Comprehension Question	Was the refresher course organized by a local charity?
Negative Foil	You answer the question, realising you are irritated by this teaching style.
Negative Target	You answer the question, thinking how ignorant you may seem.
Positive Foil	You answer the question, pleased that you have such an interesting teacher.
Positive Target	You answer the question, thinking that the others may be quite impressed.

Social threat 3

Title	The private view
Line 1	Your neighbour invites you to a private exhibition of his art.
Line 2	You arrive to find many other guests whom you do not know.
Line 3	You try talking to some of them, and can see
Line 4	how interested they are in your
Word fragment	c - - v e r - - t i - n
Completed word	conversation
Comprehension Question	Was the private view at a relative's house?
Negative Foil	You don't know anyone there and everyone ignores you completely.
Negative Target	You talk to some guests but they think what you say is boring.
Positive Foil	You meet many guests whom you know and enjoy talking to them.
Positive Target	You talk to some guests and can tell that they find you interesting.

Social threat 4

Title	The joke
Line 1	You are with a group of new friends, on your way to an open air concert.
Line 2	You decide to tell a joke you heard recently. Everyone looks at you
Line 3	as you start telling the joke, and you see
Line 4	their expressions change when you get to the punch
Word fragment	l - n e
Completed word	line
Comprehension Question	Did you hear the joke you told quite recently?
Negative Foil	When you start telling your joke someone interrupts you.
Negative Target	When you get to the punch line everyone looks confused.
Positive Foil	When you get to the end you receive several compliments.
Positive Target	When you get to the end you see everyone starting to laugh.

Social threat 5

Title	The wedding reception
Line 1	Your friend asks you to give a speech at her wedding reception.
Line 2	You prepare some remarks and when the time comes,
Line 3	get to your feet. As you speak, you notice
Line 4	some people in the audience start to
Word fragment	l - - g h
Completed word	laugh
Comprehension Question	Did you stand up to speak?
Negative Foil	As you speak, some people in the audience start to yawn in boredom
Negative Target	As you speak, people in the audience find your efforts laughable
Positive Foil	As you speak, people in the audience applaud your comments
Positive Target	As you speak, people in the audience laugh appreciatively

Social threat 6

Title	The job interview

Line 1	You applied for a job in a company you'd really like to work in.
Line 2	You are invited to an interview, where you answer
Line 3	the questions as well as you can. Reflecting later,
Line 4	you think that the quality of your answers decided the
Word fragment	o u - c o m -
Completed word	outcome
Comprehension Question	Did you think about your answers later?
Negative Foil	You think your poor reference must have made a bad impression.
Negative Target	You think that your poor answers lost you the job.
Positive Foil	You think it was a good thing you did not take the job.
Positive Target	You think that your astute answers led to you being offered the job.

Social threat 7

Title	The bus ride
Line 1	You get on a bus and find an empty seat next to one
Line 2	that has a rip in it. At the next stop several people get on
Line 3	that you vaguely recognise, but they sit together
Line 4	and the seat next to you remains
Word fragment	v - c a - t
Completed word	vacant
Comprehension Question	Were the people who got on strangers to you?
Negative Foil	The person in the seat next to you makes a rip in the fabric.
Negative Target	The seat next to you is empty because no one wants to sit with you.
Positive Foil	The person in the seat next to you talks to you in a friendly way.
Positive Target	The seat next to you remains empty because it looks damaged.

Social threat 8

Title	Your birthday
Line 1	It is your birthday and you wake up looking forward to your day.
Line 2	You wonder how many friends will send you a birthday card.
Line 3	However, you have to go to work as usual,
Line 4	and by the time you leave, no cards have
Word fragment	a r r - v - d
Completed word	arrived
Comprehension Question	Did you have to go to work on your birthday?
Negative Foil	You leave for work knowing that it is going to be a stressful day.
Negative Target	You leave for work realising that no one has sent you a card.
Positive Foil	You leave for work feeling pleased with the cards you have received.
Positive Target	You have to leave for work before the postman brings your mail.

Social threat 9

Title	Meeting a friend
Line 1	In the street, you bump into an old friend you haven't seen for a long time.
Line 2	She is too busy to stop, so you arrange to meet later in a bar.
Line 3	You arrive a little late but the bar is empty
Line 4	and a few minutes later she is still not
Word fragment	t h - - e
Completed word	
Comprehension Question	there
Negative Foil	Your friend tells you that she does not want to meet you.
Negative Target	You arrange to meet in a bar but your friend stands you up.
Positive Foil	You are busy but your friend insists on meeting you in a bar.

Positive Target	You arrange to meet a friend in a bar but your friend is late.

Social threat 10

Title	Your first painting
Line 1	You've taken up painting as a hobby, and have just finished
Line 2	your first picture. You hang it on the wall
Line 3	when a group of friends visit. Later you overhear your friends
Line 4	making remarks that make clear their opinion of your
Word fragment	a b - l - t y
Completed word	ability
Comprehension Question	Did you leave the painting on an easel?
Negative Foil	You overhear some friends making fun of something you just said.
Negative Target	You overhear some friends making critical remarks about your picture.
Positive Foil	You overhear some complimentary remarks about your good taste.
Positive Target	You overhear some friends saying how much they liked your painting.

Physical threat 1

Title	The car park
Line 1	It is late at night and you are in a multi-storey car park
Line 2	trying to find your car. You have been looking for about ten minutes
Line 3	and still cannot find it. You hear a noise behind you
Line 4	and see a shadow of
Word fragment	s o - e t h - - g
Completed word	something
Comprehension Question	Did you find your car right away?
Negative Foil	You see that you have forgotten your ticket and will have to pay a fine.
Negative Target	You see someone coming towards you looking threatening.
Positive Foil	You see some money on the floor and pick it up.
Positive Target	You see a security person approaching to help you.

Physical threat 2

Title	The evening stroll
Line 1	You are taking a stroll on a quiet street near where you live.
Line 2	As you round the corner you see someone coming towards you
Line 3	on the same side of the road. As you meet, he stares straight at you
Line 4	and moves closer while raising his
Word fragment	h - - d
Completed word	hand
Comprehension Question	Was the person on the opposite side of the street?
Negative Foil	As you meet he mutters obscenities and staggers away drunkenly
Negative Target	As you meet he moves closer and raises his fist menacingly
Positive Foil	As you meet he tells you how much he and his wife love your house
Positive Target	As you meet he waves in recognition and gives you a friendly greeting

Physical threat 3

Title	The exercise regime
Line 1	You decide that you must start to exercise more.
Line 2	For the next week you take a little more exercise each day.
Line 3	After several weeks, you are running further and decide to see
Line 4	how far you can push yourself, when you notice your breathing is
Word fragment	l a - o u r - -
Completed word	laboured

Comprehension Question	Have you been exercising for several weeks?
Negative Foil	You push yourself so hard you strain a muscle and hurt yourself
Negative Target	Pushing yourself too hard you cannot get enough air and feel dizzy
Positive Foil	Pushing yourself more than usual you feel your running is much easier
Positive Target	Running further than usual you have to breath harder and deeper

Physical threat 4

Title	A flight abroad
Line 1	You are on your way on holiday abroad. You have been in the air
Line 2	for an hour when you hear a change in the sound of the engine
Line 3	next to you. The fasten seat-belt sign flashes,
Line 4	and you hear the captain begin to make an
Word fragment	a n n - - n c - - e n t
Completed word	announcement
Comprehension Question	Did the engine sound different than before?
Negative Foil	The seat belt light comes on, the cabin crew say you are diverted due to fog
Negative Target	The seat belt light comes on and the captain tells you one engine is failing
Positive Foil	The seat belt light comes on and the cabin crew say lunch will be served now
Positive Target	The seat belt light comes on and the captain says there will be turbulence

Physical threat 5

Title	At home one night
Line 1	You are at home alone late one night. You have just
Line 2	finished reading and turn out the light to go to sleep.
Line 3	While lying in the dark you hear a soft rustling sound
Line 4	coming from just outside your
Word fragment	w - - d - w
Completed word	window
Comprehension Question	Were you listening to the radio before turning out the light?
Negative Foil	Lying in bed you hear a car accident in the street outside your window
Negative Target	Lying in bed you hear the sound of someone trying to get in at your window
Positive Foil	Lying in bed you hear the sound of birds singing outside your window
Positive Target	Lying in bed you hear the sound of a small animal outside your window

Physical threat 6

Title	Late return home
Line 1	Your partner is working late this evening but now it is well past the time
Line 2	you were expecting them home. You are thinking about a crash you saw on
Line 3	the route your partner drives, when the phone rings. You pick it up and
Line 4	find out what had
Word fragment	h a - - e n - d
Completed word	happened
Comprehension Question	Did you expect your partner to be late?
Negative Foil	The phone rings and a friend tells you about gossip being spread about you.
Negative Target	The phone rings and you are informed your partner is hurt in the accident.
Positive Foil	The phone rings and a friend invites you and your partner round for a meal.
Positive Target	The phone rings and it is your partner telling you they are nearly home.

Physical threat 7

Title	Walking home
Line 1	You have been visiting some friends in the centre of town, when you

Line 2	realise it is getting late. They offer you a lift but you set off on foot.
Line 3	Walking through a street that you don't know at all well, you can hear
Line 4	someone running up from
Word fragment	b e - - n d
Completed word	behind
Comprehension Question	Did your friends offer you a lift?
Negative Foil	In the unfamiliar street you think about how bored you were that evening
Negative Target	In the unfamiliar street a mugger runs up from behind and threatens you
Positive Foil	In the unfamiliar street you think about how much you enjoyed your visit
Positive Target	In the unfamiliar street your friend runs up from behind to walk with you

Physical threat 8

Title	Visiting the doctor
Line 1	You have been feeling dizzy occasionally, and decide to get a check-up.
Line 2	You make an appointment right away.
Line 3	Your doctor takes your blood pressure and listens to your chest,
Line 4	and then tells you to relax while giving you his
Word fragment	o p - n - o n
Completed word	opinion
Comprehension Question	Did you delay before going to the doctor?
Negative Foil	The doctor tells you that you will have to pay extra on your health plan.
Negative Target	The doctor tells you he has bad news about your health.
Positive Foil	The doctor tells you that you have free dental care on your health plan.
Positive Target	The doctor tells you all is normal and you are in good health.

Physical threat 9

Title	The screening clinic
Line 1	You have been offered a routine cancer screening appointment
Line 2	at your local health centre. You have an X-ray and some samples
Line 3	are taken for tests. While waiting you see the doctor point out something
Line 4	on the X-ray plate to the
Word fragment	n - r s e
Completed word	nurse
Comprehension Question	Were you being screened for cancer?
Negative Foil	You notice the Doctor pointing out that you are very unfit.
Negative Target	You notice the Doctor pointing out a tumour on your X-ray to the nurse.
Positive Foil	You notice the Doctor pointing out your impressive fitness score.
Positive Target	You notice the Doctor pointing out to the nurse that your X-ray is normal.

Physical threat 10

Title	Your eye operation
Line 1	You're finding that your sight is worse than it was and despite the risks
Line 2	you decide to try an experimental laser surgery you've read about.
Line 3	Afterwards as the bandages are taken off your eyes, you realise your life
Line 4	will be affected radically by the
Word fragment	r - s u - t
Completed word	result
Comprehension Question	Did you read about the laser surgery?
Negative Foil	You realise the operation cost far more than you can afford
Negative Target	You realise that the operation has made your vision much worse
Positive Foil	You realise that you are surrounded by gifts from your friends
Positive Target	You realise that this operation has made your vision perfect

Appendix S

Descriptive Statistics for Experiment One, Exploring Correlations in High and Low PA Items

Table S1

Summary of Initial Analyses of Normality of Separate Scales for High and Low PA at Times One, Two and Three

		Kolmogorov-Smirnov			Shapiro-Wilk		
Scale	Time	Statistic	*df*	*Sig.*	Statistic	*df*	Sig.
Happy	1	.165	38	.011	.954	38	.122
	2	.170	38	.007	.961	38	.203
	3	.253	38	.000	.842	38	.000
Carefree	1	.148	38	.034	.965	38	.268
	2	.142	38	.052	.960	38	.190
	3	.172	38	.006	.907	38	.004
Low	1	.200	38	.001	.945	38	.060
	2	.159	38	.016	.940	38	.041
	3	.191	38	.001	.891	38	.001
Sad	1	.193	38	.001	.931	38	.022
	2	.166	38	.009	.967	38	.327
	3	.252	38	.000	.791	38	.000

Table S2

Summary of Initial Analyses of Skew and Kurtosis for High and Low PA Scales at Times One, Two and Three

					Skewness		Kurtosis	
Scale	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Happy	1	.53	.023	.144	.059	.383	.155	.750
	2	.65	.023	.141	.254	.383	.055	.750
	3	.50	.016	.098	1.157*	.383	5.688*	.750
Carefree	1	.48	.028	.172	-.463	.383	-.108	.750
	2	.59	.025	.153	.101	.383	1.047	.750
	3	.47	.020	.123	1.029*	.383	1.780*	.750
Low	1	.49	.022	.137	-.236	.383	.566	.750
	2	.37	.022	.138	-.072	.383	.584	.750
	3	.50	.012	.076	-.413	.383	3.036*	.750
Sad	1	.48	.030	.187	-.453	.383	1.367*	.750
	2	.37	.022	.135	-.415	.383	.344	.750
	3	.50	.011	.068	-.879*	.383	4.715*	.750

**Scores more than twice the standard error indicating significant skew or kurtosis*

Table S3

Summary of Identified Outliers in Raw, High and Low PA Data and Process of Reducing Effects on Normality

Scale	Time	Outlier – case no.	Case score	Mean score	*SD*	Mean +/- 2 *SD*
Happy	3	54	.88	.50	.098	.70
	3	7	.25	.50	.098	.31
Carefree	3	54	.88	.47	.123	.72
Low	3	59	.69	.50	.076	.65
		78	.25	.50	.076	.35
Sad	1	9	.88	.48	.187	.86
	1	26	.87	.48	.187	.86
	1	54	.00	.48	.187	.11
	1	35	.00	.48	.187	.11
	3	78	.25	.50	.068	.37
	3	73	.38	.50	.068	.37

Table S4

Summary of Analyses of Normality of Separate Scales for High and Low PA at Times One, Two and Three following Removal of Outliers

		Kolmogorov-Smirnov			Shapiro-Wilk		
Scale	Time	Statistic	*df*	*Sig.*	Statistic	*df*	Sig.
Happy	1	.165	38	.011	.954	38	.122
	2	.170	38	.007	.961	38	.203
	3	.185	38	.002	.932	38	.023
Carefree	1	.148	38	.034	.965	38	.268
	2	.142	38	.052	.960	38	.190
	3	.241	38	.000	.917	38	.008
Low	1	.200	38	.001	.945	38	.060
	2	.159	38	.016	.940	38	.041
	3	.198	38	.001	.913	38	.006
Sad	1	.184	38	.002	.949	38	.083
	2	.166	38	.009	.967	38	.327
	3	.274	38	.000	.827	38	.000

Table S5

Summary of Analyses of Skew and Kurtosis for High and Low PA Scales at Times One, Two and Three Following Removal of Outliers

					Skewness		Kurtosis	
Scale	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Happy	1	.53	.023	.144	.059	.383	.155	.750
	2	.65	.023	.141	.254	.383	.055	.750
	3	.50	.013	.078	.234	.383	.907	.750
Carefree	1	.48	.028	.172	-.463	.383	-.108	.750
	2	.59	.025	.153	.101	.383	1.047	.750
	3	.47	.018	.110	.419	.383	-.597	.750
Low	1	.49	.022	.137	-.236	.383	.566	.750
	2	.37	.022	.138	-.072	.383	.584	.750
	3	.50	.011	.065	.118	.383	.902	.750
Sad	1	.49	.028	.171	-.069	.383	.510	750
	2	.37	.022	.135	-.415	.383	.344	.750
	3	.51	.010	.059	.321	.383	1.383	.750

**Scores more than twice the standard error indicating significant skew or kurtosis*

Appendix T

Descriptive Statistics for Experiment One, High PA Data

Table T1

Summary of Initial Analyses of Normality of High PA Data

		Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Time	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	1	.135	21	.200	.949	21	.328
	2	.182	21	.068	.945	21	.277
	3	.203	21	.024	.761	21	.000
High Anxious	1	.151	17	.200	.917	17	.132
	2	.179	17	.151	.948	17	.427
	3	.201	17	.065	.920	17	.148

Table T2

Summary of Initial Analyses of Skew and Kurtosis of High PA Data

					Skewness		Kurtosis	
Group	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	1	.53	.029	.134	.575	.501	1.391	.972
	2	.63	.029	.131	.739	.501	.143	.972
	3	.51	.022	.101	2.506*	.501	8.435*	.972
High Anxious	1	.48	.033	.134	-.598	.550	-.356	1.063
	2	.61	.034	.139	.010	.550	-.340	1.063
	3	.46	.019	.077	.693	.550	1.049	1.063

**Scores more than twice the standard error indicating significant skew or kurtosis*

Table T3

Summary of Conversion of Outliers in High PA Data

Group	Time	Outlier – case no.	Case score	Mean score	*SD*	Mean +/- 2 *SD*
Low Anxious	3	54	.88	.5126	.02215	.5569
	3	73	.62	.5126	.02215	.5569
	3	56	.58	.5126	.02215	.5569

Table T4

Summary of Analyses of Normality of High PA Data Following Conversion of Outliers

		Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Time	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	1	.135	21	.200	.949	21	.328
	2	.182	21	.068	.945	21	.277
	3	.145	21	.200	.932	21	.148
High Anxious	1	.151	17	.200	.917	17	.132
	2	.179	17	.151	.948	17	.427
	3	.201	17	.065	.920	17	.148

Table T5

Summary of Analyses of Skew and Kurtosis of High PA Data Following Change of Outliers

					Skewness		Kurtosis	
Group	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	1	.53	.029	.134	.575	.501	1.391	.972
	2	.63	.029	.131	.739	.501	.143	.972
	3	.49	.011	.0561	-.154	.501	-1.290	.972
High Anxious	1	.48	.033	.134	-.598	.550	-.356	1.063
	2	.61	.034	.139	.010	.550	-.340	1.063
	3	.46	.019	.077	.693	.550	1.049	1.063

* Scores more than twice the *SE*, indicating significant skewness or kurtosis

Appendix U

Descriptive Statistics for Experiment One, Low PA Data

Table U1

Summary of Initial Analyses of Normality of Low PA Data

		Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Time	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	1	.190	21	.047	.875	21	.012
	2	.170	21	.117	.936	21	.180
	3	.230	21	.005	.867	21	.008
High Anxious	1	.106	17	.200	.974	17	.888
	2	.122	17	.200	.964	17	.706
	3	.227	17	.020	.868	17	.020

Table U2

Summary of Initial Analyses of Skew and Kurtosis of Low PA Data

					Skewness		Kurtosis	
Group	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	1	.44	.028	.127	-1.397*	.501	3.134*	.972
	2	.36	.027	.124	-.647	.501	.113	.972
	3	.49	.009	.039	1.342*	.501	3.472*	.972
High Anxious	1	.54	.037	.154	.027	.550	-.630	1.063
	2	.37	.029	.118	-.271	.550	.273	1.063
	3	.51	.022	.089	-1.363*	.550	3.692*	1.063

**Scores more than twice the standard error indicating significant skew or kurtosis*

Table U3

Summary of Conversion of Outliers in Low PA Data

Table 1.

Group	Time	Outlier – case no.	Case score	Mean score	*SD*	Mean +/- 2 *SD*
Low Anxious	1	54	.06	.44	.127	.186
	3	59	.61	.49	.039	.568
High Anxious	3	78	.25	.51	.089	.332

Table U4

Summary of Analyses of Normality of Low PA Data Following Conversion of Outliers

		Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Time	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	1	.179	21	.079	.924	21	.106
	2	.170	21	.117	.936	21	.180
	3	.194	21	.039	.917	21	.077
High Anxious	1	.106	17	.200	.974	17	.888
	2	.122	17	.200	.964	17	.706
	3	.195	17	.087	.932	17	.237

Table U5

Summary of Analyses of Skew and Kurtosis of Low PA Data Following Conversion of Outliers

					Skewness		Kurtosis	
Group	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	1	.45	.024	.110	-.721	.501	.665	.972
	2	.34	.027	.124	-.647	.501	.113	.972
	3	.49	.007	.033	.570	.501	1.048	.972
High Anxious	1	.54	.037	.154	.027	.550	-.630	1.063
	2	.37	.029	.118	-.271	.550	.273	1.063
	3	.51	.018	.075	-.525	.550	.987	1.063

**Scores more than twice the standard error indicating significant skew or kurtosis*

Appendix V

Descriptive Statistics for Experiment One, Recognition Data

Table V1

Summary of Initial Analysis of Normality of Grouped Recognition Data

Group	Item	Test Half	Kolmogorov-Smirnov			Shapiro-Wilk		
			Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	Positive Target	1	.114	21	.200	.942	21	.233
		2	.145	21	.200	.943	21	.248
	Positive Foil	1	.246	21	.002	.805	21	.001
		2	.102	21	.200	.956	21	.444
	Negative Target	1	.097	21	.200	.969	21	.700
		2	.097	21	.200	.961	21	.541
	Negative Foil	1	.153	21	.200	.925	21	.109
		2	.121	21	.200	.960	21	.507
High Anxious	Positive Target	1	.197	17	.080	.893	17	.052
		2	.202	17	.064	.903	17	.078
	Positive Foil	1	.195	17	.086	.896	17	.057
		2	.225	17	.022	.829	17	.005
	Negative Target	1	.106	17	.200	.974	17	.890
		2	.094	17	.200	.981	17	.966
	Negative Foil	1	.175	17	.178	.944	17	.366
		2	.424	17	.009	.806	17	.002

Table V2

Summary of Initial Analysis of Skew and Kurtosis of Grouped Recognition Data

Group	Item	Test Half	Mean	*SE*	*SD*	Skewness		Kurtosis	
						Statistic	*SE*	Statistic	*SE*
Low Anxious	Positive Target	1	2.83	.118	.540	-.713	.501	.912	.972
		2	2.92	.085	.391	-.120	.501	1.293	.972
	Positive Foil	1	1.82	.136	.622	2.132*	.501	7.145*	.972
		2	1.92	.134	.616	.709	.501	.689	.972
	Negative Target	1	2.57	.113	.517	-.033	.501	-.749	.972
		2	2.47	.132	.604	-.556	.501	-.187	.972
	Negative Foil	1	1.59	.089	.408	.862	.501	.747	.972
		2	1.57	.064	.292	.206	.501	-1.002	.972
High Anxious	Positive Target	1	2.56	.089	.368	.929	.550	1.436	1.063
		2	2.72	.099	.408	.957	.550	.394	1.063
	Positive Foil	1	1.49	.101	.418	1.268*	.550	1.907	1.063
		2	1.60	.123	.509	1.518*	.550	1.920	1.063
	Negative Target	1	2.62	.103	.425	.372	.550	.491	1.063
		2	2.63	.106	.437	-.113	.550	.141	1.063
	Negative Foil	1	1.59	.098	.404	.823	.550	.414	1.063
		2	1.65	.125	.514	1.943*	.550	4.694*	1.063

*Scores more than twice the *SE*, indicating significant skewness or kurtosis

Table V3
Summary of Initial Conversion of Outliers in Grouped Recognition Data

Group	Item/Test Half	Outliers – case no.	Case score	Mean score	*SD*	Mean plus 2 *SD*
Low Anxious	Positive foil 1	1	4.00	1.82	.622	3.07
High Anxious	Positive foil 1	45	2.60	1.49	.418	2.32
	Positive foil 2	45	2.90	1.60	.509	2.62
	Negative foil 2	54	3.20	1.65	.514	2.67

Table V4
Summary of Second Conversion of Outliers in Grouped Recognition Data

Group	Item/Test Half	Outliers – case no.	Case score	Mean score	*SD*	Mean plus 2 *SD*
High Anxious	Positive foil 2	45	2.62	1.58	.466	2.52
		54	2.60	1.58	.466	2.52
	Negative foil 2	54	2.67	1.62	.422	2.46

Table V5
Summary of Third Conversion of Outliers in Grouped Recognition Data

Group	Item/Test Half	Outliers – case no.	Case score	Mean score	*SD*	Mean plus 2 *SD*
High Anxious	Positive foil 2	45	2.52	1.57	.441	2.46
		54	2.52	1.57	.441	2.46

Table V6
Summary of Fourth Conversion of Outliers in Grouped Recognition Data

Group	Item/Test Half	Outliers – case no.	Case score	Mean score	*SD*	Mean plus 2 *SD*
High Anxious	Positive foil 2	45	2.46	1.57	.425	2.42
		54	2.46	1.57	.425	2.42

Table V7
Summary of Fifth Conversion of Outliers in Grouped Recognition Data

Group	Item/Test Half	Outliers – case no.	Case score	Mean score	*SD*	Mean plus 2 *SD*
High	Positive foil 2	45	2.42	1.56	.415	2.39
Anxious		54	2.42	1.56	.415	2.39

Following the above process the effect of the outliers was reduced and the distribution of the data was observed to meet the criterion for normality, as demonstrated in the text.

Table V8

Summary of Analyses of Skew and Kurtosis of Grouped Recognition Data Following Conversion of Outliers

		Test	Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Item Type	Half	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	Positive Target	1	.114	21	.200	.942	21	.233
		2	.145	21	.200	.943	21	.248
	Positive Foil	1	.178	21	.079	.942	21	.244
		2	.102	21	.200	.956	21	.444
	Negative Target	1	.097	21	.200	.969	21	.700
		2	.097	21	.200	.961	21	.541
	Negative Foil	1	.153	21	.200	.925	21	.109
		2	.121	21	.200	.960	21	.507
High Anxious	Positive Target	1	.197	17	.080	.193	17	.052
		2	.202	17	.064	.903	17	.078
	Positive Foil	1	.176	17	.170	.927	17	.194
		2	.203	17	.060	.877	17	.029
	Negative Target	1	.106	17	.200	.974	17	.890
		2	.094	17	.200	.981	17	.966
	Negative Foil	1	.175	17	.178	.944	17	.366
		2	.210	17	.046	.895	17	.056

Table V9

Summary of Analyses of Skew and Kurtosis of Grouped Recognition Data Following Conversion of Outliers

Group	Item	Test Half	Mean	*SE*	*SD*	Skewness		Kurtosis	
						Statistic	*SE*	Statistic	*SE*
Low Anxious	Positive Target	1	2.83	.118	.540	-.713	.501	.912	.972
		2	2.92	.085	.391	-.120	.501	1.293	.972
	Positive Foil	1	1.78	.104	.475	.782	.501	1.545	.972
		2	1.92	.134	.616	.709	.501	.689	.972
	Negative Target	1	2.57	.113	.517	-.033	.501	-.749	.972
		2	2.47	.132	.604	-.556	.501	-.187	.972
	Negative Foil	1	1.59	.089	.408	.862	.501	.747	.972
		2	1.57	.064	.292	.206	.501	-1.002	.972
High Anxious	Positive Target	1	2.56	.089	.368	.929	.550	1.436	1.063
		2	2.72	.099	.408	.957	.550	.394	1.063
	Positive Foil	1	1.47	.091	.375	.835	.550	.290	1.063
		2	1.56	.099	.408	.988	.550	.128	1.063
	Negative Target	1	2.62	.103	.425	.372	.550	.491	1.063
		2	2.63	.106	.437	-.113	.550	.141	1.063
	Negative Foil	1	1.59	.098	.404	.823	.550	.414	1.063
		2	1.60	.095	.390	.988	.550	.745	1.063

*Scores more than twice the *SE*, indicating significant skewness or kurtosis

Appendix W

Descriptive Statistics for Experiment Two, Exploring Correlations in High and Low NA Items

Table W1

Summary of Initial Analyses of Normality of Separate Scales for High and Low NA at Times One, Two and Three

		Kolmogorov-Smirnov			Shapiro-Wilk		
Scale	Time	Statistic	*df*	*Sig.*	Statistic	*df*	Sig.
Calm	1	.278	35	.000	.871	35	.001
	2	.214	35	.000	.915	35	.011
	3	.178	35	.007	.920	35	.014
Content	1	.151	35	.042	.948	35	.098
	2	.203	35	.001	.832	35	.000
	3	.204	35	.001	.897	35	.003
Tense	1	.249	35	.000	.904	35	.005
	2	.160	35	.024	.940	35	.054
	3	.172	35	.010	.916	35	.011
Worried	1	.164	35	.018	.938	35	.049
	2	.237	35	.000	.925	35	.021
	3	.168	35	.014	.922	35	.016

Table W2

Summary of Initial Analyses of Skew and Kurtosis for High and Low NA Scales at Times One, Two and Three

					Skewness		Kurtosis	
Scale	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Calm	1	.51	.022	.131	.647	.398	1.287	.778
	2	.34	.019	.110	-.570	.398	-.391	.778
	3	.50	.022	.129	-.071	.398	2.693*	.778
Content	1	.57	.024	.140	-.221	.398	.712	.778
	2	.43	.020	.119	-.714	.398	5.504*	.778
	3	.50	.020	.118	.903*	.398	2.571*	.778
Tense	1	.48	.026	.155	-1.000*	.398	1.963*	.778
	2	.64	.026	.156	-.285	.398	1.167	.778
	3	.51	.024	.144	-.489	.398	1.358	.778
Worried	1	.47	.028	.167	.197	.398	1.109	.778
	2	.55	.020	.118	.760	.398	.410	.778
	3	.49	.020	.119	-.749	.398	1.162	.778

**Scores more than twice the standard error indicating significant skew or kurtosis*

Table W3

Summary of Conversion of Outliers in Raw High and Low NA Data

Scale	Time	Outlier – case no.	Case score	Mean score	*SD*	Mean plus 2 *SD*
Calm	3	13	.87	.50	.129	.76
	3	49	.13	.50	.129	.24
Content	2	46	.79	.43	.119	.67
	2	21	.01	.43	.119	.19
	3	13	.88	.50	.118	.74
	3	48	.75	.50	.118	.74
Tense	1	21	.00	.48	.155	.16
	1	23	.12	.48	.155	.16

Table W4

Summary of Analyses of Normality of Separate Scales for High and Low NA at Times One, Two and Three Following Removal of Outliers

		Kolmogorov-Smirnov			Shapiro-Wilk		
Scale	Time	Statistic	*df*	*Sig.*	Statistic	*df*	Sig.
Calm	1	.278	35	.000	.871	35	.001
	2	.214	35	.000	.915	35	.011
	3	177	35	.007	.942	35	.064
Content	1	.151	35	.042	.948	35	.098
	2	.186	35	.003	.909	35	.007
	3	.202	35	.001	.925	35	.019
Tense	1	.239	35	.000	.928	35	.025
	2	.160	35	.024	.940	35	.054
	3	.172	35	.010	.916	35	.011
Worried	1	.164	35	.018	.938	35	.049
	2	.237	35	.000	.925	35	.021
	3	.168	35	.014	.922	35	.016

Table W5

Summary of Analyses of Skew and Kurtosis for High and Low NA Scales at Times One, Two and Three Following Removal of Outliers

					Skewness		Kurtosis	
Scale	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Calm	1	.51	.022	.131	.647	.398	1.287	.778
	2	.34	.019	.110	-.570	.398	-.391	.778
	3	.50	.019	.112	-.085	.398	.896	.778
Content	1	.57	.024	.140	-.221	.398	.712	.778
	2	.44	.016	.093	-.430	.398	1.062	.778
	3	.50	.018	.105	.243	.398	.669	.778
Tense	1	.48	.024	.140	-.479	.398	.441	.778
	2	.64	.026	.156	-.285	.398	1.167	.778
	3	.51	.024	.144	-.489	.398	1.358	.778
Worried	1	.47	.028	.167	.197	.398	1.109	.778
	2	.55	.020	.118	.760	.398	.410	.778
	3	.49	.020	.119	-.749	.398	1.162	.778

**Scores more than twice the standard error indicating significant skew or kurtosis*

Appendix X

Descriptive Statistics for Experiment Two, High NA Data

Table X1

Summary of Initial Analyses of Normality of High NA Data

		Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Time	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	1	.211	20	.020	.937	20	.214
	2	.110	20	.200	.948	20	.343
	3	.154	20	.200	.907	20	.056
High Anxious	1	.266	15	.005	.928	15	.257
	2	.268	15	.005	.918	15	.176
	3	.260	15	.008	.799	15	.004

Table X2

Summary of Initial Analyses of Skew and Kurtosis of High NA Data

					Skewness		Kurtosis	
Group	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	1	.50	.029	.128	-.581	.512	1.535	.992
	2	.64	.042	.187	-.380	.512	.559	.992
	3	.51	.030	.136	.360	.512	2.473*	.992
High Anxious	1	.16	.040	.157	-.311	.580	.000	1.121
	2	.64	.028	.107	.383	.580	1.001	1.121
	3	.51	.041	.157	-1.285	.580	.898	1.121

*Scores more than twice the *SE*, indicating significant skewness or kurtosis

Table X3

Summary of Initial Conversion of Outliers in High NA Data

Group	Time	Outlier – case no.	Case score	Mean score	*SD*	Mean +/- 2 *SD*
Low Anxious	3	49	.88	.51	.136	.76

Table X4

Summary of Analyses of Skew and Kurtosis of High NA Data Following Conversion of Outliers

		Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Time	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	1	.211	20	.020	.937	20	.214
	2	.110	20	.200	.948	20	.343
	3	.162	20	.181	.930	20	.156
High Anxious	1	.266	15	.005	.928	15	.257
	2	.268	15	.005	.918	15	.176
	3	.260	15	.008	.799	15	.004

Table X5

Summary of Analyses of Normality of High NA Data Following Conversion of Outliers

					Skewness		Kurtosis	
Group	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	1	.50	.029	.128	-.581	.512	1.535	.992
	2	.64	.042	.187	-.380	.512	.559	.992
	3	.51	.027	.121	-.455	.512	1.130	.992
High Anxious	1	.16	.040	.157	-.311	.580	.000	1.121
	2	.64	.028	.107	.383	.580	1.001	1.121
	3	.51	.041	.157	-1.285	.580	.898	1.121

**Scores more than twice the standard error indicating significant skew or kurtosis*

Appendix Y

Descriptive Statistics for Experiment Two, Low NA Data

Table Y1

Summary of Initial Analyses of Normality of Low NA Data

		Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Time	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	1	.200	20	.035	.947	20	.327
	2	.159	20	.200	.959	20	.526
	3	.177	20	.101	.941	20	.250
High Anxious	1	.224	15	.042	.930	15	.273
	2	.253	15	.010	.750	15	.001
	3	.199	15	.115	.893	15	.075

Table Y2

Summary of Initial Analyses of Skew and Kurtosis of Low NA Data

					Skewness		Kurtosis	
Group	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	1	.52	.019	.084	.452	.512	1.434	.992
	2	.38	.021	.094	-.165	.512	-.476	.992
	3	.50	.020	.090	-.684	.512	2.239*	.992
High Anxious	1	.56	.035	.137	.866	.580	.471	1.121
	2	.39	.027	.103	-2.395*	.580	7.134*	1.121
	3	.50	.035	.136	1.421*	.580	3.254*	1.121

**Scores more than twice the standard error indicating significant skew or kurtosis*

Table Y3

Summary of Initial Conversion of Outliers in Low NA Data

Group	Time	Outlier – case no.	Case score	Mean score	*SD*	Mean +/- 2 *SD*
Low Anxious	3	49	.26	.50	.090	.32
High Anxious	2	21	.06	.39	.103	.18
	3	13	.88	.50	.136	.77

Table Y4

Summary of Second Conversion of Outliers in Low NA Data

Group	Time	Outlier – case no.	Case score	Mean score	*SD*	Mean +/- 2 *SD*
High Anxious	2	21	.18	.39	.078	.24

Table Y5
Summary of Analyses of Normality Following Conversion of Outliers for Low NA Data

		Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Time	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	1	.200	20	.035	.947	20	.327
	2	.159	20	.200	.959	20	.526
	3	.154	20	.200	.970	20	.745
High Anxious	1	.224	15	.042	.930	15	.273
	2	.172	15	.200	.927	15	.246
	3	.152	15	.200	.955	15	.600

Table Y6
Summary of Analyses of Skew and Kurtosis Following Conversion of Outliers for Low NA Data

					Skewness		Kurtosis	
Group	Time	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	1	.52	.019	.084	.452	.512	1.434	.992
	2	.38	.021	.094	-.165	.512	-.476	.992
	3	.51	.018	.082	-.108	.512	.937	.992
High Anxious	1	.56	.035	.137	.866	.580	.471	1.121
	2	.40	.017	.067	-.949	.580	.868	1.121
	3	.49	.030	.117	.764	.580	.972	1.121

Appendix Z

Descriptive Statistics for Experiment Two, Recognition Data

Table Z1

Summary of Analyses of Normality of Grouped Recognition Data

		Test	Kolmogorov-Smirnov			Shapiro-Wilk		
Group	Item Type	Half	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Low Anxious	Positive Target	1	.172	20	.123	.959	20	.521
		2	.118	20	.200	.986	20	.985
	Positive Foil	1	.178	20	.095	.896	20	.035
		2	.135	20	.200	.974	20	.933
	Negative Target	1	.116	20	.200.	.978	20	.899
		2	.185	20	072	.892	20	.029
	Negative Foil	1	.146	20	.200	.948	20	.334
		2	.185	20	.073	.959	20	.530
High Anxious	Positive Target	1	.151	15	.200	.953	15	.570
		2	.202	15	.101	.926	15	.241
	Positive Foil	1	.158	15	.200	.946	15	.459
		2	.154	15	.200	.945	15	.447
	Negative Target	1	.146	15	.200	.947	15	.479
		2	.112	15	.200	.959	15	.681
	Negative Foil	1	.225	15	.040	.928	15	.251
		2	.170	15	.200	.925	15	.233

Table Z2

Summary of Analysis of Skew and Kurtosis of Grouped Recognition Data

		Test				Skewness		Kurtosis	
Group	Item	Half	Mean	*SE*	*SD*	Statistic	*SE*	Statistic	*SE*
Low Anxious	Positive Target	1	2.60	.112	.201	-.034	.512	-.912	.992
		2	2.85	.096	.429	.110	.512	.310	.992
	Positive Foil	1	1.70	.072	.320	.520	.512	.338	.992
		2	1.63	.076	.342	.207	.512	-.494	.992
	Negative Target	1	2.65	.117	.523	-.409	.512	.586	.992
		2	2.69	.136	.609	-.684	.512	-.777	.992
	Negative Foil	1	1.54	.084	.375	.645	.512	-.072	.992
		2	1.64	.086	.383	.514	.512	-.237	.992
High Anxious	Positive Target	1	2.44	.120	.466	-.445	.580	-.402	1.121
		2	2.56	.132	.510	.276	.580	-.175	1.121
	Positive Foil	1	1.44	.072	.280	.292	.580	-.825	1.121
		2	1.53	.095	.367	.822	.580	.996	1.121
	Negative Target	1	2.61	.114	.443	.614	.580	-.354	1.121
		2	2.27	.123	.478	-.043	.580	-.990	1.121
	Negative Foil	1	1.39	.080	.308	.782	.580	.516	1.121
		2	1.47	.098	.381	.748	.580	.368	1.121

*Scores more than twice the *SE*, indicating significant skewness or kurtosis