Cognitive Bias Modification in the Context of Depression: Interpretation Bias and Mental Imagery

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Abstract

The aim of this thesis was to develop a positive Cognitive Bias Modification (CBM) technique using imagery in the context of depressed mood. CBM targets biases associated with emotional disorders. CBM modifying interpretation bias (CBM-I) has been investigated for anxiety, but not depression. Whilst many cognitive processes contribute to depression, the current focus was on mental imagery and interpretation bias. In a series of six studies a positive, imagery-oriented CBM-I was developed, culminating in a final test in a clinically depressed population.

Prior research had demonstrated that for positive CBM-I, a verbal rather than imagery condition was not only less effective at promoting positive mood, but led to mood deterioration. Experiment 1 investigated what aspect of verbal processing might be responsible for the paradoxical increase in negative emotion. Results suggested that unfavourable comparisons between the self and the positive CBM-I material was driving the increased negativity. Experiment 2 investigated whether making such comparisons in an imagery mode would yield similar effects and whether field perspective imagery instructions would enhance positive CBM-I. Results indicated that optimal instructions for CBM-I should include field perspective imagery whilst discouraging comparative processing.

Studies 3a and 3b investigated the relationship between interpretation bias, mental imagery and depressive symptoms in a large sample. Interpretation bias discriminated between low and high dysphoric participants, who had a greater frequency of negative intrusive images. To target negative intrusive images, a new CBM-I technique was developed in Study 4 and Experiment 5 – "CBM of appraisals". Compared to negative CBM of appraisals training, positive training led to fewer intrusive memories and less intrusive symptomatology concerning a depressive film after one week.

Finally in Experiment 6, a multi-component CBM-I package (including auditory CBM-I from Experiments 1 and 2; CBM of appraisals from Study 4 and Experiment 5; plus a picture-word technique) was tested in 24 participants with clinical depression. Positive compared to neutral multi-component CBM-I led to improvements in interpretation bias, appraisal bias, depressive and intrusive symptoms. This suggests the potential clinical benefit of a multi-component positive imagery-oriented CBM-I package.

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List of Abbreviations

AST	Ambiguous Scenarios Test
AST-R	Ambiguous Scenarios Test - Revised
BDI – II	Beck Depression Inventory – 2nd Edition
BHS	Beck Hopelessness Scale
CBM	Cognitive Bias Modification
CBM – I	Cognitive Bias Modification for interpretation bias
CBM – A	Cognitive Bias Modification for attentional bias
CBQ	Cognitive Bias Questionnaire
CBT	Cognitive Behaviour Therapy
CCBT	Computerised Cognitive Behaviour Therapy
CIQ	Cognitive Intrusions Questionnaire
CNT	Concreteness Training
DSM - IV	Diagnostic Statistics Manual 4th Edition
GAD	Generalised Anxiety Disorder
HRSD	Hamilton's Rating Scale for Depression
IES	Impact of Event Scale
IES – A	Avoidance subscale of the Impact of Event Scale
IES – I	Intrusion subscale of the Impact of Event Scale
III	Interpretation of Intrusions Inventory
MBCT	Mindfulness-based Cognitive Therapy
MEST	Memory Specificity Training
NICE	National Institute for Health and Clinical Excellence
PANAS	Positive and Negative Affect Schedule
PTSD	Posttraumatic Stress Disorder
RAT	Remote Associates Test
RCI	Reliable Change Index
RIQ	Response to Intrusions Questionnaire
SCID-1	Structured Clinical Interview for DSM-IV Axis 1 disorders
SST	Scrambled Sentences Test
STAI - S	State version of the Spielberger State – Trait Anxiety Inventory
STAI - T	Trait version of the Spielberger State – Trait Anxiety Inventory
SUIS	Spontaneous Use of Imagery Scale

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CHAPTER 1

Literature Review: Cognitive Bias Modification in the Context of Depression: Imagery and Interpretation Bias

Aim

Information processing biases have been implicated in the development and maintenance of emotional disorders (Mathews & Macleod, 2005; J. M. G. Williams, Watts, MacLeod, & Mathews, 1997). Newly developed computerised techniques based on psychological theory, namely cognitive bias modification (CBM) provide a novel way of modifying such biases. CBM is a rapidly expanding field of research (MacLeod, Koster, & Fox, 2009) with CBM techniques shown to modify biases of interpretation (CBM-I), attention (CBM-A) and memory (e.g., memory specificity training [MEST]). At the time of beginning the current thesis, CBM-I research (investigating techniques that systematically modify interpretation bias) had focussed predominantly on anxiety disorders, and the implications of CBM-I research for depression had not yet been explored. The high co-morbidity between depression and anxiety (Moffitt et al., 2007), suggest that these advances in the anxiety literature may have exciting applications in depression.

Whilst there are many processes that make significant contributions to depression, the current thesis will focus on just two processes discussed by Holmes, Lang and Deeprose (2009), namely interpretation bias and mental imagery. The aim of the research presented in the current thesis was thus to develop a positive imagery-oriented CBM-I technique in the context of depressed mood. Overall the aim was to explore how best to employ imagery in the CBM-I and make preliminary steps towards translating the psychological theory driven lab findings to the treatment of depression in the real world potentially.

Depression

Major depressive disorder is a widespread problem posing considerable strain on society and individuals. It has been estimated that 151.2 million people world-wide suffer from depression and it is predicted that depression will become the second most burdensome illness in the world by the year 2020 (World Health Organisation, 2004). Only approximately 50% of patients receiving an evidence based therapeutic treatment for depression are estimated to fully recover (Hollon, Thase, & Markowitz, 2002). It is thus essential to further understand and improve remediation techniques for depression (Hollon et al., 2002). Figure 1.1 presents the diagnostic criteria for a major depressive episode.

Figure 1.1. Diagnostic criteria for a major depressive episode from the Diagnostic and Statistical Manual of Mental Disorders-IV-TR (DSM-1V, American Psychiatric Association, 2000).

To be diagnosed as having a depressive episode one must have five or more of the following symptoms. These need to have been present for the same 2 week period and be different from usual functioning.

One of these symptoms must be either (1) or (2)

(1) depressed mood most of the day almost every day

(2) reduced interest or pleasure in things usually enjoyed most of the day nearly every day

(3) Significant change in weight when not dieting whether an increase or decrease e.g. a change of more than 5% in body weight or an increase or decrease in appetite nearly every day.

(4) Insomnia or hypersomnia nearly every day

(5) Psychomotor agitation or retardation almost every day

(6) Loss of energy or fatigue nearly every day

(7) Feelings of worthlessness or excessive or inappropriate guilt nearly every day

(8) Reduced ability to concentrate, think or make decisions nearly every day

(9) Recurrent thoughts of death nearly every day

B. The symptoms cannot meet criteria for a mixed episode.

C. The symptoms cause significant distress or interfere with social, occupational or important areas of functioning

D. The symptoms are not a direct result of physiological effects of a substance or medical condition.

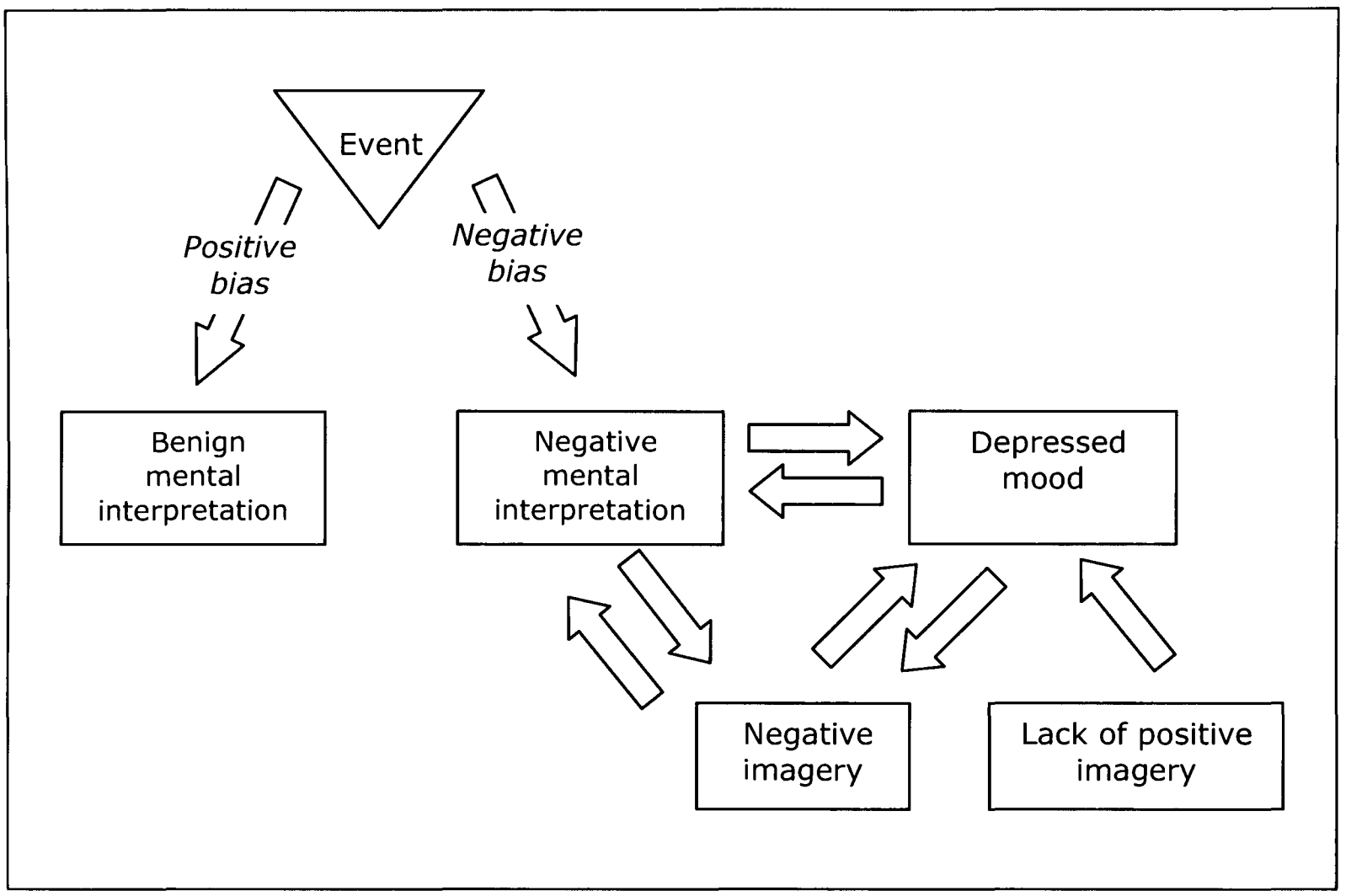
E. Symptoms can not better be accounted for by bereavement

Depression is associated with emotional, cognitive and behavioural symptoms. The diagnostic criteria, as outlined in Figure 1.1, include either depressed mood for most of the day or reduced interest or pleasure in things usually enjoyed. In addition, depression is typically accompanied by symptoms such as change in appetite, sleep disturbances, loss of energy, loss of concentration as well as many others.

A Guiding Framework for Examining Mental Imagery and Interpretation Bias in Depression

Depression is a widely studied disorder with many well established cognitive variables which are known to make substantial contributions to the development and maintenance of the disorder, such as overgeneral autobiographical memory (J. M. G. Williams et al., 2007) or rumination (Nolen-Hoeksema, 1991). Holmes, Lang and Deeprose (2009) discuss a subset of specific cognitive psychopathological processes worthy of further investigation. These include negative interpretation bias (a tendency to negatively interpret ambiguous information), a preponderance of negative imagery and a lack of positive imagery. Figure 1.2 presents the experimental psychopathology sub-components model of depression (Holmes, Lang, & Deeprose, 2009). The term sub-components is emphasised, as clearly the model does not address all clinical features of depression and simply highlights specific aspects of depression worthy of further investigation. This model is used as a guiding framework for the current thesis and is raised at the beginning of each chapter to illustrate the processes that will be addressed within each.

Figure 1.2. An experimental psychopathology sub-components model of depression focussing on mental imagery and interpretation bias presented in Holmes, Lang and Deeprose (2009).



The model begins firstly with *interpretation bias* (Figure 1.2, top left hand side): when faced with an event, such as the metaphorical "half filled glass", if adopting a positive bias, a benign interpretation would follow such as seeing the glass as "half full". This is in contrast to a negative bias, which would lead to a negative mental interpretation such as perceiving the glass as "half empty", thus promoting depressed mood. Importantly, if the outcome of the negative interpretation takes the form of a mental image (rather than a verbal thought), the powerful effect of imagery on emotion (Holmes & Mathews, 2005) means that depressed mood is likely to be further exacerbated.

The second process key to this model (Figure 1.2, bottom left) is the preponderance of *negative intrusive imagery* of the past and future. Again, due to the

powerful effect of imagery on emotion, this also further lowers depressed mood. For example, individuals with depression frequently report uncontrollable intrusive images which are associated with feelings of distress (Wheatley et al., 2007). As illustrated in the model, (Figure 1.2, centre) the interpretation of negative intrusive imagery (e.g., "this means that I am crazy") also serves to maintain depressed mood (Starr & Moulds, 2006). Finally, a lack of positive imagery in depression (Figure 1.2, bottom right) contributes to the continuation of depressed mood and absence of healthy optimism that things can become better in the future. For example, a study by Holmes, Lang, Moulds and Steele (2008) indicated that depression may be associated with a lack of positive prospective imagery (vivid imagery of the future).

As outlined above, the graphical representation presented in Figure 1.2 will be used across the following thesis chapters to illustrate the processes that will be featured within each. The aim of the current thesis was to focus on key processes discussed in this experimental psychopathology sub-components model of depression. These processes represent neglected areas of research in the context of depression worthy of further investigation. The following review will present research to date investigating these processes focusing on their role in depression.

Mental Imagery Across Emotional Disorders

Abnormalities in mental imagery are problematic across a range of different psychological disorders. Mental imagery has been described as the experience of 'seeing with the mind's eye'; 'hearing with the mind's ear' and so on (Kosslyn, Ganis, & Thompson, 2001). A mental image can occur in any sensory modality. Such mental imagery can be of the past or future, positive or negative, and can be either voluntary (deliberately generated) or involuntary/intrusive (coming to mind

spontaneously). Imagery has a powerful effect on emotion and as such, plays a particularly important role in emotional disorders (Holmes & Mathews, 2005).

Recurrent distressing intrusive images are a hallmark diagnostic symptom of posttraumatic stress disorder (PTSD). For example, following an assault, a patient may 're-experience' the event through sensory and affective flashbacks such as "feeling like I am being stabbed in the chest" (Holmes, Grey, & Young, 2005, p.8). Not only are intrusive images problematic in PTSD but cause distress across a range of psychological disorder. These include social phobia, psychosis, body dysmorphic disorder, agoraphobia, bipolar disorder and depression (Holmes & Hackmann, 2004). Across anxiety disorders, patients are frequently faced with images of the things they are afraid of. In social phobia for example, patients frequently report images of their fears the "self-exhibiting symptoms of anxiety e.g. blushing or sweating" (Hirsch & Holmes, 2007, p. 161).

Mental Imagery in Depression

Depression has traditionally been associated with verbal rather than imagery based thinking. A key focus has been on rumination, a predominantly verbal process (Fresco, Frankel, Mennin, Turk, & Heimberg, 2002) though recent evidence does suggest that rumination involves some imagery (Pearson, Brewin, Rhodes, & McCarron, 2008). However, another clinical feature of depression is the experience of involuntary negative image-based memories. Some studies indicate that up to 90% of individuals with depression report experiencing distressing intrusive memories (Birrer, Michael, & Munsch, 2007). For example in a case study by Kandris and Moulds (2008) intrusive memories reported by an individual with depression were of "the final argument with his partner that terminated their relationship" (p.217).

Further research surrounding intrusive memories in depression will be presented in Chapter 5.

It has been proposed that overgeneral autobiographical memory (the tendency to recall categories of events in contrast to specific events) in depression may develop as a protective mechanism adopted by individuals in an attempt to prevent such distressing intrusive memories from coming to mind (J. M. G. Williams et al., 2007). When asked for a specific memory as part of the autobiographical memory test (J. M. G. Williams & Broadbent, 1986) participants with depression tended to respond by summarising categories of events, for example, "I used to walk the dog every morning" (J. M. G. Williams et al., 2007, p.123) as opposed to specific memories for example, 'when I walked my dog on Tuesday morning'. There is an abundance of evidence showing that depression is associated with overgeneral autobiographical memory (J. M. G. Williams et al., 2007; J. M. G. Williams & Scott, 1988). J. M. G. Williams, Healy and Ellis (1999) indicate that specific recall of autobiographical memories is more closely associated with mental imagery than overgeneral memories (see also, Mansell & Lam, 2004). That is, when recalling a specific memory, it is more likely to be in the form of a vivid mental image than if recalling an overgeneral memory. The finding of overgeneral memory in depression thus suggests that people with depression may experience difficulties recalling specific images.

In suicidal individuals, overgeneral autobiographical memory is thought to be associated with reductions in the ability to imagine the future (J. M. G. Williams et al., 1996). J. M. G. Williams et al. (1996) Experiment 1 asked suicidal individuals and controls to generate specific images of the future and recall specific memories from the past in response to positive, negative and neutral cues. The specificity of the memory recalled was positively correlated with the ability to generate specific images

of the future in both groups. The specificity of memories was manipulated in a non-clinical sample in Experiment 2 of J. M. G. Williams et al. (1996). When induced to recall specific memories of the past, the specificity of the images of the future was increased, with more specific images generated in response to positive or neutral compared to negative cues.

Research into future imagery associated with depression (depressed mood) has also been conducted by, Stöber (2000) and Holmes, Lang et al. (2008). In Holmes, Lang et al. (2008) participants were asked to imagine ten positive and ten negative future scenarios and rate the vividness of each of these images. Findings indicated that depressed mood was associated with reduced vividness and imagability of positive, but not negative, future events. Whilst suicidal individuals report a lack of vivid deliberately generated future imagery, they may also report vivid (i.e., spontaneous rather than deliberate) intrusive images of committing suicide termed "flashforwards" (Holmes, Crane, Fennell, & Williams, 2007).

Studies have explored the relationship between depression and performance on (non-emotional) mental imagery tasks. Cocude, Charlot and Denis (1997) found that participants with depression took longer to generate images in response to nouns than controls. However, the images that were generated were maintained for the same amount of time. Zarrinpar, Deldin & Kosslyn (2006) examined the use of imagery in patients with depression compared with a control group. They asked participants to complete a mental image generation task, a mental image rotation task and other tasks that required identifying objects from differing viewpoints. Patients with depression took a longer time to respond to the tasks (as in Cocude et al., 1997) than the non-depressed control group. Zarrinpar et al. (2006) proposed that the deficits displayed on mental imagery tasks i.e. taking longer to respond to tasks, was not a result of problems with using mental imagery

but represented problems associated with general processing and responding to the stimuli presented (taking longer to make decisions and evaluate images).

Bywaters, Andrade, and Turpin (2004) found that depressed mood was associated with increased vividness of imagery of both positively and negatively valenced pictures (taken from the International Affective Picture system) in a non-clinical sample. Further to this, higher levels of depression have been found to be associated with greater vividness of mental imagery in patients with PTSD (Karatzias, Power, Brown, & McGoldrick, 2009). Whilst the previous evidence suggests that depression is associated with a reduced ability to deliberately generate images in response to nouns, the vividness of the images generated when given a picture does not appear to be compromised. Likewise, intrusive images associated with depression are also vivid.

Summary

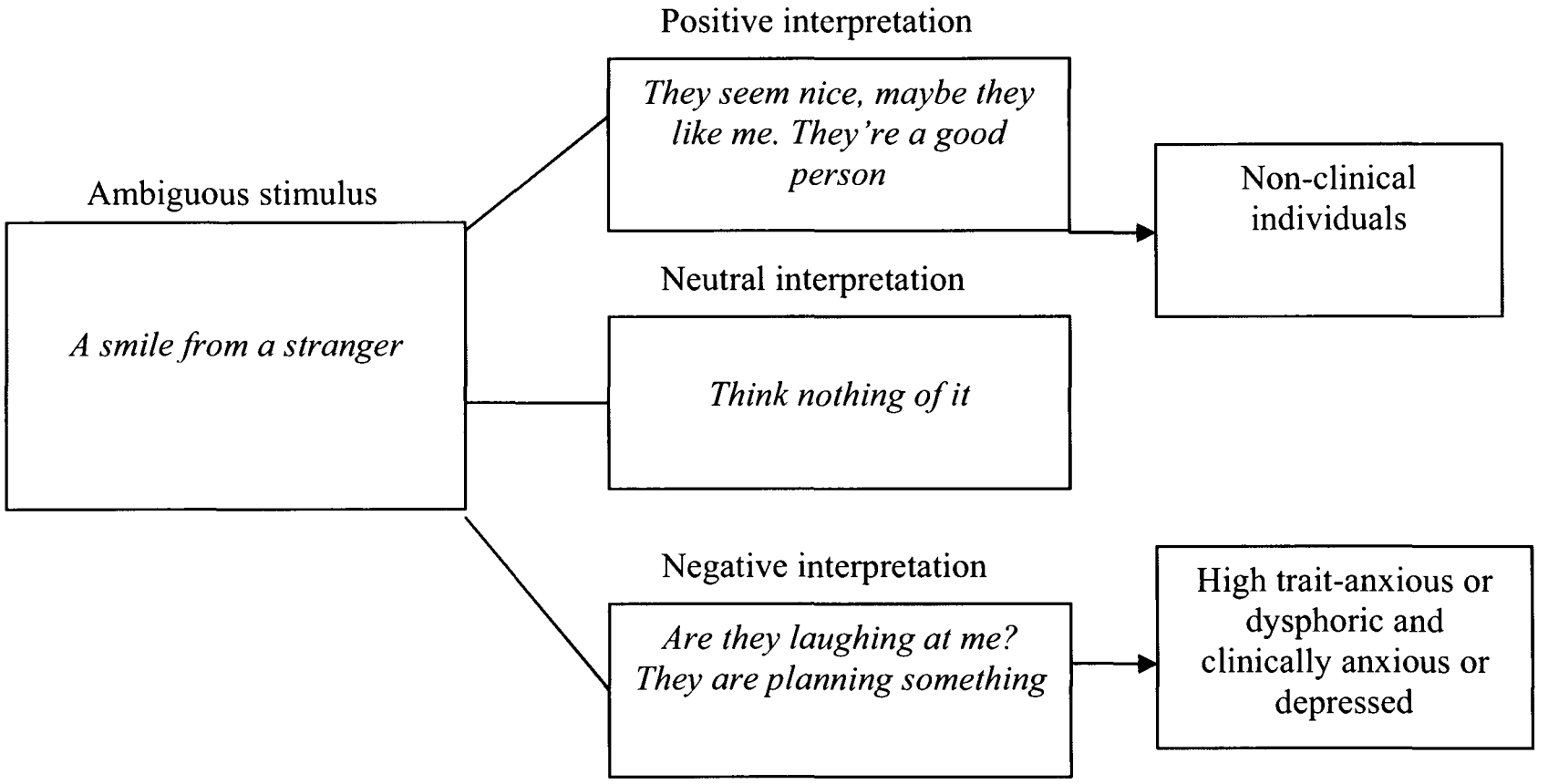
In summary, the literature reviewed above indicates mixed evidence regarding imagery in the context of depression. Depression is associated with overgeneral autobiographical memory (a lack of specific image recall of past events), negative vivid intrusive imagery, reduced vividness of positive future imagery, longer image generation latencies and a greater vividness of imagery for positive and negative pictures, compared with non-depressed controls.

Interpretation Bias Across Emotional Disorders

Extensive evidence indicates healthy people tend to make positive interpretations of ambiguous information. This has been termed the *'rose-coloured glasses effect'* (Taylor & Brown, 1988). Conversely, people with high trait anxiety or dysphoria and those clinically anxious or depressed have been found to display the opposing negative interpretation bias, when assessing, for example, the probability of future negative or

positive events or homophones (Butler & Mathews, 1983; Pury, 2002). This negative interpretation bias is true across a range of emotional disorders (for a review see Mathews & Macleod, 1994). To further illustrate the differential interpretation biases displayed by non-clinical, sub-clinical (high trait anxious, and dysphoric) and clinically anxious, or depressed individuals an example is presented in Figure 1.3. This figure indicates the types of interpretations that are likely to be endorsed by non-clinical individuals, high trait anxious or dysphoric and clinically anxious or depressed individuals.

Figure 1.3. Schematic representation of an example of interpretation bias potentially displayed by non-clinical, high trait anxious or dysphoric and clinically depressed or anxious individuals.



Interpretation Bias in Depression

Depression is characterised by negative cognitive biases and there is extensive research, that highlights the relationship between cognitive processes and depressive symptoms (Beck, Rush, Shaw, & Emery, 1979; Butler & Mathews, 1983). It is widely assumed that depression is associated with the tendency to interpret

ambiguous information negatively (Rude, Wenzlaff, Gibbs, Vane, & Whitney, 2002). This idea is evidenced in both cognitive theories of depression and experimental studies.

Cognitive models of depression have long held the view that negative thinking is a causal antecedent to clinical depression and implicated in the maintenance of the disorder (Beck, 1976). Beck et al. (1979) proposed a model of depression that includes 3 concepts, a cognitive triad, negative schemas and faulty information processing. The cognitive triad consists of, first, a negative view of self that involves making internal attributions of negative events, followed by misinterpretation of interactions, situational and environmental. Finally this includes a negative view of the future with enhanced anticipation of negative events. Negative schemas activated in situations in individuals with depression, as described in this model, involve a negative conceptualisation of a range of different situations potentially perceived as a negative interpretation bias. The third concept involves systematic errors in thinking.

Accordingly, Macleod, Campbell, Rutherford and Wilson (2004) proposed that interpretation biases produce dysfunctional emotional symptomatology, and that successful treatments should seek to attenuate such biases. Indeed, a focus of traditional cognitive therapy for depression is to ameliorate such maladaptive thinking patterns. Moreover, one of the targets believed to be important in the effectiveness of antidepressant medication is modifying cognitive bias. Harmer, Hill, Taylor, Cowen and Goodwin (2003) found antidepressant medication shifted bias before modifying mood. This effect was replicated in Harmer et al. (2009). Results across the two studies indicated an increase in positive interpretation of faces prior to an increase in mood (i.e., facilitated recognition of positive emotions in faces) following antidepressant medication.

Furthermore, cognitive theories of depression (Beck, 1976) hold that underlying cognitive biases such as negative interpretation bias, contribute not only to the development and maintenance of depression, but to an individual's vulnerability to developing depression. Teasdale (1988) proposed the differential activation hypothesis, which suggests that vulnerability to depression is determined by the extent to which these negative thinking styles are activated by negative mood – this is termed 'cognitive reactivity'. This hypothesis is supported by a number of empirical studies as reviewed by Scher, Ingram and Segal (2005). One example is Segal, Gemar & Williams (1999) who found that in formerly depressed patients, depressive relapse over a 30 month period was predicted by the degree to which dysfunctional attitudes were re-activated following a negative mood induction in formerly depressed patients.

Watkins and Moulds (2007) compared participants who were currently depressed, recovered depressed or who had never been depressed, on a measure of interpretation bias. Recovered depressed participants more closely resembled currently depressed than never-depressed controls, in their reporting of a negative interpretation bias. In line with these findings, Gupta and Kar (2008) found recovered depressed individuals reported negative thinking on the Cognitive Bias Questionnaire (CBQ) in a similar way to individuals who are currently depressed and significantly different to never depressed controls.

Empirical support for the presence of a negative interpretation bias in depression. Numerous empirical studies have provided evidence for the hypothesised negative interpretation bias in depression. Convergent evidence has been provided across self-report and behavioural measures of interpretation bias (for a review see Mathews & Macleod, 1994, 2005). Table 1.1 provides a summary of the empirical research examining the presence of a negative interpretation bias in depression (in

clinical, sub-clinical and non-clinical populations). It illustrates the different measures used to assess interpretation bias, the research publication and the results. The results indicate whether a greater negative interpretation bias was indicated in the population tested and thus associated with/present in depression.

Butler and Mathews (1983) gave participants with anxiety and depression a set of ten ambiguous scenarios e.g. "You wake with a start in the middle of the night, thinking you heard a noise, but all is quiet" and asked them to respond to an open ended question e.g. "what do you think woke you up? " The participants were then asked to provide three explanations that would likely come to mind in this situation and to arrange them in order of primacy. Responses were then assigned scores depending on the position of the most threatening explanation. Butler and Mathews (1983) found that these ambiguous social scenarios were interpreted more negatively by participants with depression and anxiety, compared to non-depressed and non-anxious controls respectively.

Krantz and Hammen (1979) similarly found the existence of a negative interpretation bias in depressed individuals as measured by the CBQ. This measure consisted of a number of scenarios in which participants must imagine themselves as the main character. After each scenario, participants select the one option from four which best represented what they would do in that situation. Response options varied across 2 dimensions, depressed versus non-depressed in tone (depressive content) and distorted versus non-distorted in terms of logical inference. Participants with depression selected distorted and depressed options significantly more than non-depressed participants. Norman, Miller and Klee (1983) similarly found participants with depression to select negatively distorted interpretations significantly more than non-depressed subjects using the CBQ.

Mogg, Bradbury and Bradley (2006) used an adaptation of the Mathews, Richards and Eysenck (1989) homophone interpretation task to measure interpretation bias. Participants wrote down homophones played over the tape recorder in so doing, they reported either threatening or non-threatening spellings e.g., *die / dye*. Negative interpretations were calculated by the percentage of negative spellings produced out of the total number completed. Participants with depression displayed enhanced negative interpretations. Mogg et al. (2006) additionally used a text comprehension task previously shown to indicate an interpretation bias in high trait anxious individuals (MacLeod & Cohen, 1993). In this task, participants read ambiguous sentences with a continuation sentence resolving the ambiguity in a positive or negative manner. Participants must respond by pressing a button in order to move forward, with the reading time of the continuation sentence indicative of the interpretation. That is, shorter reading time of positive resolutions indicated a more positive interpretation of the preceding ambiguous sentence. Participants with depression did not display the anticipated depressive bias on this measure.

Prospective designs have also been used to provide evidence for the link between depression and negative interpretation bias. Pury (2002) investigated whether existing negative interpretation bias could predict depressive or anxious response to a stressor. They tested undergraduate students, during a period of low stress, for attentional bias, interpretation bias and mood. The measure of interpretation bias used was the homophone-spelling task described above. Participants were subsequently followed up with post diagnostic mood questionnaires the week prior to exams (a period typically associated with higher levels of stress). Results showed that prior negative interpretation bias predicted dysphoric reaction to stress.

Rude et al. (2002) and Rude, Valdez, Odom and Ebrahimi (2003) also used a prospective design to investigate negative processing bias in depression. The Scrambled Sentences Test (SST) was used. This test was specifically designed to measure depressive interpretation bias. This involved participants unscrambling a set of six words into a five-word statement, selecting a positively or negatively valenced response e.g. "happy miserable I expect to be." A positive interpretation could be "I expect to be happy" and a negative could be "I expect to be miserable." Individuals with depression have been shown to have high levels of thought suppression (Wenzlaff, Meier, & Salas, 2002). To inhibit thought suppression, participants were required to hold a 6 digit number in mind whilst unscrambling the sentences thus contributing to the cognitive load. It was found that a higher percentage of negative statements (generated on this measure) predicted future depression in non clinical participants 4-6 weeks (Rude et al., 2002) and 18-28 months (Rude et al., 2003) later, even after controlling for depressive symptoms at time of testing, as well as the individual's history of depression. This measure will be used in Chapter 7.

Table 1.1 *A Summary of Empirical Research Examining the Presence of a Negative Interpretation Bias in Depression*

Interpretation bias Measure	Participant Type			Results
	Clinically depressed	Sub-clinical	Non-clinical	Negative interpretation bias
Ambiguous social scenarios	Butler & Mathews (1983) Nuun, Mathews & Trower (1997)			↑
Self assessment of performance on tasks	Cane & Gotlib (1985)		Forgas, Bower & Krantz (1984)	↑
Cognitive Bias Questionnaire (CBQ)	Norman Miller & Dow (1988) Krantz & Hammen (1979) Norman, Miller & Klee (1983) Gupta & Kar (2008) Krantz & Gallagher-Thompson (1990) Miller & Norman (1986)	Krantz & Liu (1987)		↑
Scrambled Sentences Test (SST)	Hedlund & Rude (1995) Watkins & Moulds (2007)		Rude et al. (2002) Rude et al. (2003)	↑
Semantic Priming Task		Lawson & Macleod (1999) Bisson & Sears (2007)		↓
Homophone spelling task	Mogg et al. (2006)		Pury (2002)	↑
Human Blink response		Lawson et al. (2002)		↑
Face Recognition Task	Joormann & Gotlib (2006) Suslow, Junghanns & Volker (2001) Hale (1998) Raes, Hermans &Williams (2006)			↑
Text comprehension task	Mogg et al. (2006)			=

Note: ↑ = increased response compared to control or positive association with depression; ↓ = decreased response compared to control or negative association with depression; = indicates an equal response compared to a control condition or no association

Behavioural evidence comes from Lawson, MacLeod and Hammond (2002) who measured human blink reflex in response to auditory stimuli and found dysphoric students more likely to negatively interpret information. They presented participants with ambiguous auditory stimuli and asked them to imagine a situation evoked by the stimuli. The stimuli consisted of negative and neutral words merged together, which could be interpreted as either valenced meaning (i.e., negative or neutral). For example, *gloom* (low mood) and *bloom* (flowering plant) were made into **loom* as the ambiguous stimuli, with the first phoneme distorted (*). They found blink reflex stronger in response to ambiguous targets in high dysphoric participants compared to low dysphoric participants, which indicated a tendency to interpret these stimuli negatively.

Not only do depressed and dysphoric individuals interpret verbal stimuli such as homophones, homographs and ambiguous text negatively, Raes, Hermans and Williams (2006) have found that they tend to interpret faces as more negative than controls. Joormann and Gotlib (2006) found participants with depression less easily identified happy expressions and more easily recognised negative ones.

Whilst many studies, as outlined above, have found that depressed and dysphoric participants display a negative interpretation bias, recent evidence using a semantic priming paradigm has brought into question the robustness of this effect (Bisson & Sears, 2007; Lawson & MacLeod, 1999; Mogg et al., 2006). Lawson and MacLeod (1999) experimentally examined interpretation bias in dysphoric versus non-dysphoric participants using a semantic priming paradigm. They repeatedly presented ambiguous sentences following each sentence with a target word, which participants read aloud. This target word disambiguated the sentence in a negative or neutral way. For example, the ambiguous sentence could read "The doctor examined little Emily's growth", this would be followed by either a negative prime "tumour" or

a neutral one "height." Half of the ambiguous sentences consisted of loss or failure, relating to depressive symptoms e.g. "Carol cried throughout the service", the other half were related to threat or danger e.g. "The two men discussed how to blow up the dingy." Interpretation bias was measured by the time it took to read the target word with a faster response indicating a desired interpretation. Results failed to confirm a negative interpretation bias in dysphoric participants. This finding could be explained by the lack of self-reference in the material. It has been argued that if processing was conducted in a self-referent way, it is likely that participants would have displayed the replicated interpretation bias commonly found in these individuals (Lawson & MacLeod, 1999). Bisson and Sears (2007) using this semantic priming paradigm, also failed to find a negative interpretation bias in dysphoric compared to non-dysphoric participants.

Bisson and Sears (2007) argue that previous findings of interpretation bias in depression may be accounted for by demand effects and problems with self report. However, they omitted to include in their review two relevant studies (outlined above), whose methods are less susceptible to these concerns - the scrambled sentences test under a cognitive load (Rude et al., 2002) and an eye blink response to ambiguous words (Lawson et al., 2002). Further to this, the aforementioned studies that have failed to find interpretation bias in depression have relied on latency measures (Bisson & Sears, 2007; Lawson & MacLeod, 1999). Lawson et al. (2002) suggest that using reaction time measures with individuals with depression can be problematic, as responses tend to be variable and thus not sensitive enough in this population. In line with this assertion, Moretti et al. (1996) found that patients with clinical depression were generally slow in responding and as such, reaction times were not a sensitive measure in this population. Furthermore, the variability of reaction time responding is demonstrated in Bryne (1976) who found reaction time

responses were influenced in depressive samples by levels of depression and in some samples age. Given the ineffective measurement of bias using latency measures on samples with depression, convergent evidence does support the presence of a negative interpretation bias in depression (Mathews & Macleod, 2005).

Support for the presence of a negative appraisal bias in depression.

As highlighted by the framework offered by Holmes, Lang and Deeprose (2009), not only is the interpretation of external events implicated in the maintenance of depression but also the interpretation of internal events such as intrusive memories. The tendency to negatively interpret intrusive memories is referred to in the current thesis as a negative "appraisal bias". Starr and Moulds (2006) interviewed 84 undergraduate students for the presence of intrusive memories, and assessed cognitive and affective responses to the memory including an assessment of the negative appraisals of intrusive memories (as measured by the negative subscale of the Response to Intrusions Questionnaire). Findings indicated that the negative appraisals of the intrusive memories were the strongest predictor of depressive symptoms over and above the frequency and the negativity of the content of the intrusions. This was subsequently replicated by A. D. Williams and Moulds (2008).

Summary

Overwhelmingly, the empirical evidence outlined above indicates that depression is associated with a negative interpretation bias as hypothesised by Beck and colleagues' (1979) model of depression. The research indicates that this interpretation bias is not limited to external stimuli but also applies to the interpretation of internal events such as the appraisal of intrusive memories.

Modifying Interpretation Bias Using CBM-I

One of the basic aims of cognitive therapy is to strategically modify interpretation bias (Beck et al., 1979). Further to this, there has been an emerging body of literature that has begun to assess CBM techniques that experimentally manipulate information processing biases such as interpretation bias (CBM-I). This technique is often referred to as 'interpretation training' so called to reflect the intention to 'train' or induce a particular interpretation bias for example, train a positive interpretation bias.

In the context of anxiety, these novel experimental techniques have been proven to induce positive/benign and negative interpretation bias effectively in laboratory situations, and, as a result, decrease or increase levels of state anxiety (Grey & Mathews, 2000; Holmes, Mathews, Dalgleish, & Mackintosh, 2006; Mathews & Mackintosh, 2000). Moreover, such techniques have been found to transfer to different processing tasks and exaggerate reactivity to stress. See Table 1.2 for an overview of the available research on modification techniques at the time of beginning the current thesis.

An updated literature review can be found in Chapter 7. The research outlined below and included in Table 1.2 that was published after beginning the thesis, was included here as manuscripts of these findings were available when this thesis was begun.

Table 1.2 A *Summary of the Available Research Surrounding CBM-I Techniques When Beginning this Thesis* [1]

	Participants		Results			
CBM-I Technique	High-trait anxious	Non-clinical	Bias Change	Mood Change	Transfer to subsequent task	Vulnerability to stress
Repeated presentation of homographs		Grey & Mathews (2000)	+		+	
		Hertel et al. (2003)	+	-	+	
		Wilson et al. (2006)	+	+	+	+
Repeated presentation of ambiguous scenarios		Mathews & Mackintosh (2000)	+	+/ -		
		Yiend et al. (2005)	+	+ / -		
		Holmes & Mathews (2005)	+	+		
		Holmes et al. (2006)	+	+ / -		
	Salemink *et al.* (2009)		+	+ / -		
		Salemink et al. (2007a)	+	-	-	
		Salemink et al. (2007b)	+	+	-	
		Holmes, Lang & Shah (2009) Experiment I	+ / -	+	+	+
		Mackintosh et al. (2006)	+	-		

Note: + = positive findings, - = negative findings , +/- = mixed findings , blank space = not examined in the stu

[1] An update of both CBM-I research will be presented in Chapter 7.

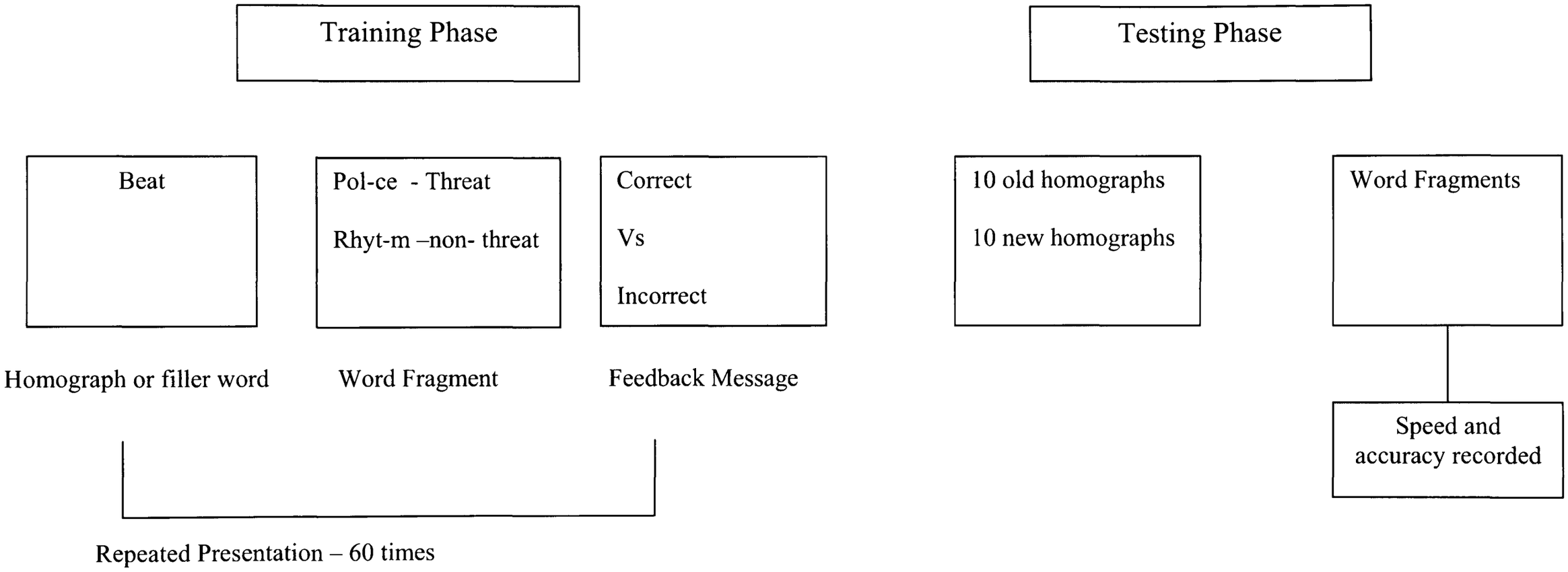
Grey and Mathews (2000) were first to manipulate interpretation bias. They repeatedly presented participants with emotionally ambiguous homographs (based on Richards & French, 1992) for example, *strain, tank* and trained them to disambiguate them by selecting non-threatening or threatening meanings, for example, *pain vs. sieve* or *army vs. fish*. The aim of the experiments was to induce a negative interpretation bias analogous to that found in high anxious individuals in an unselected population. In Experiment 1 of Grey and Mathews (2000) non-clinical participants were trained to interpret emotionally ambiguous homographs. Homographs were presented followed by word fragments related to either the threatening or non-threatening meaning of the homograph. For example, *beat* followed by *police* (threat) or *rhythm* (non-threat). The word fragments have one missing letter and participants were told to use the cue to quickly complete the fragment. A feedback message was given indicating whether it was 'correct' or 'incorrect.' Participants were then tested with new fragments relating to both the valence they were trained to select and half with a non-trained valence using both old (previously seen) and new homographs as cues. See Figure 1.4 for a diagram of this method.

The interpretation bias in Grey and Mathews (2000) was measured by the time it took to respond to word fragments related to trained valence, and the accuracy of responses. A faster response to a word fragment indicated a preferred interpretation. Results showed that participants trained with threat homographs and associated fragments responded faster to subsequent threatening word fragments both old and new. However, for non-threat training the influence only translated to old homographs and did not extend to new ones. That is, participants in the neutral condition did not display the trained bias when presented with novel stimuli.

Experiment 2 of Grey and Mathews (2000) increased the number of homographs and fragment trials used during the training phase and added a lexical decision task to show the transfer to a different response measure. The original results were replicated and were extended to include a transfer to a different interpretation bias measure, a lexical decision task.

Experiment 3 of Grey and Mathews (2000) focused on whether active generation of responses was necessary to generate the induced interpretation bias. Instead of providing the word fragments following the homographs, participants were presented with the completed words and asked to make a judgement as to whether or not the words were related or not. Threat training resulted in faster responses to threat meanings after both old and new homographs. It showed that active generation was not necessary to produce the change in bias. Experiment 4 of Grey and Mathews (2000) created a baseline condition and showed that without specific valence training, there were no effects of the task. This provided stronger evidence for a change in bias as a result of CBM-I.

Figure 1.4. Schematic representation of Grey and Mathews (2000) CBM-I technique using homographs.



Mathews and Mackintosh (2000) extended the CBM-I technique to personally relevant and more naturalistic textual stimuli (more complex descriptions). Participants (community volunteers) read 64 statements taken from Hirsch and Mathews (1997), about social scenarios, which remained ambiguous until the final word. There were also 24 irrelevant fillers and 16 probe trials varying in valence to disguise the intention of the training. The participants were asked to imagine themselves in these situations. They were then required to complete a word fragment of the disambiguating word.

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 the new people you will meet will find you (boring/friendly)."*

This was presented one line at a time with the final word presented as a word fragment relating to a positive or negative interpretation e.g. bo---g or fri—y. There was only one possible response to the word fragment. Participants were told to base their response on their understanding of the paragraph. Following each sentence participants answered comprehension questions further emphasising the desired interpretation either positive or negative according, to random assignment to condition.

For example: *"Will you be disliked by your new acquaintances?"* followed by a yes/no question. *Correct answer or wrong answer* appeared, depending on response in assigned condition. For this example if the word fragment following the sentence was boring, the expected answer is "yes" and if it was friendly, "no".

Participants then completed a recognition test, which was a test of their interpretation bias. Twenty paragraphs were presented in written form with 10 as the

test of interpretation bias relating to the scenarios presented during CBM-I based around social contexts. "*Your friend asks you to give a speech at her wedding reception. You prepare some remarks and when the time comes, get to your feet. As you speak, you notice some people in the audience start to (l—gh) – laugh"*

The paragraphs required completion of a word fragment at the end of each, however, these did not resolve the ambiguity and instead maintained it. They were similarly followed by a yes/no comprehension question. All 20 paragraphs were read together and upon completion of all of them, participants were provided with a recognition test. This involved rating how similar on a scale of one to four disambiguated paragraphs were to the original (ambiguous) paragraph they had read. The disambiguated paragraphs included four examples for each original paragraph including one positive interpretation, one negative interpretation, one positive foil and one negative foil. Interpretation bias was reflected in higher recognition ratings of material in the same direction as training. That is, rating positive items as more similar to the original paragraph than negative items or foils. Examples of four possible disambiguated paragraphs from the scenario outlined above include;

(a) As you speak, people in the audience laugh appreciatively [positive]

(b) As you speak, people in the audience find your efforts laughable [negative]

(c) As you speak, some people in the audience start to yawn [negative – foil]

(d) As you speak people in the audience applaud your comments [positive – foil]

In Experiment 1 of Mathews and Mackintosh (2000), a change in interpretation bias was found following CBM-I, as measured by the recognition test, indicating that interpretations are not automatic and that such training effectively shifts bias. Positive interpretations were overall more prevalent than negative interpretations, but positive interpretations were more likely after positive CBM-I.

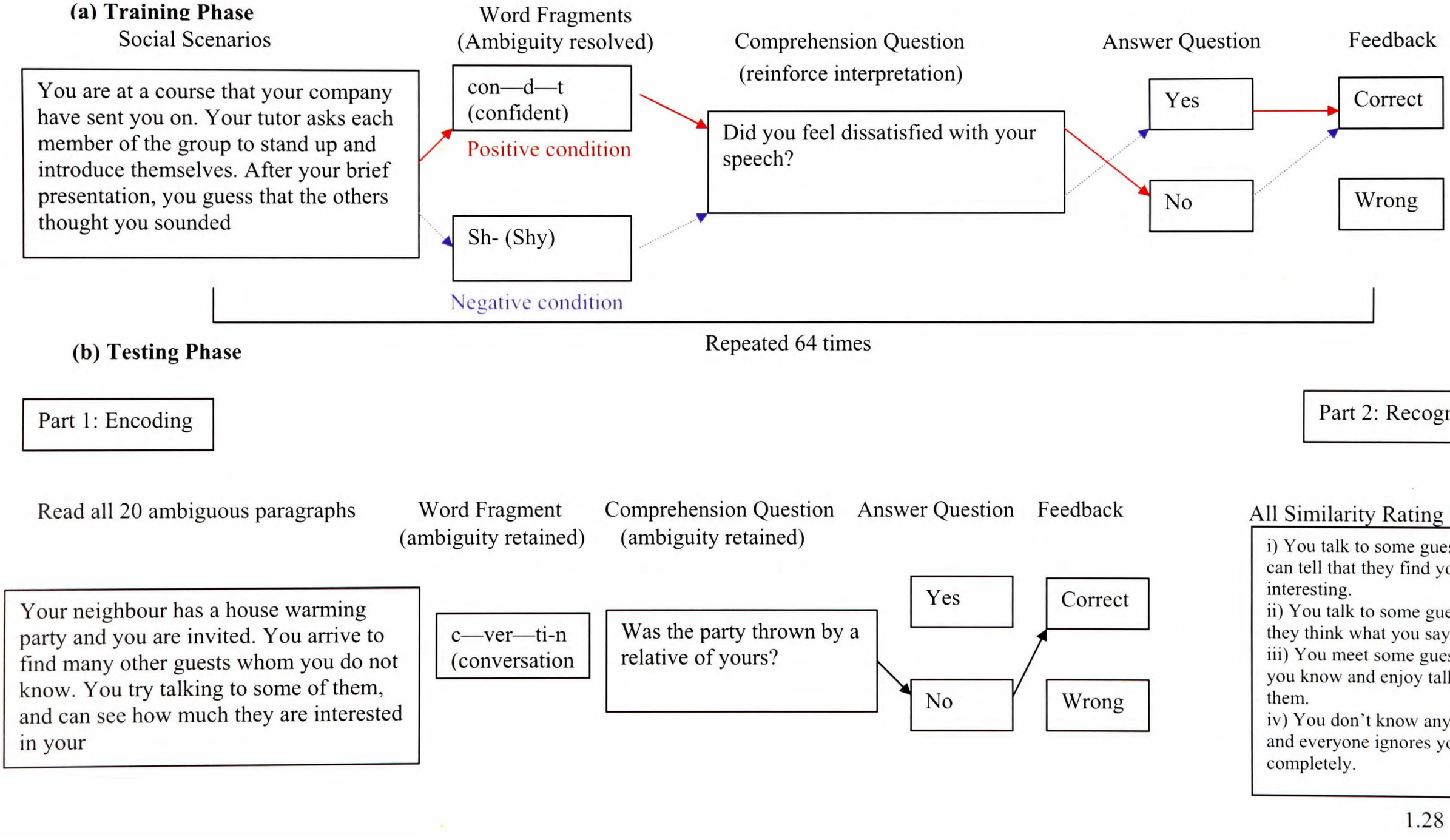
This study thus provided evidence that repeated exposure to congruent examples can modify interpretation of 'personally relevant' information. Figure 1.5 shows a diagram of this CBM-I technique.

Holmes and Mathews (2005) further adapted the Mathews and Mackintosh (2000) CBM-I technique by presenting the stimuli in auditory, as opposed to textual form (auditory CBM-I) to allow for the use of mental imagery to process the stimuli and similarly found an increase in negative interpretation bias following threat training. Holmes et al. (2006) subsequently devised new stimuli which consistently resolved positively and found this technique effectively decreased negative interpretation bias. These two experiments will be explained in greater detail below.

Impact of CBM-I on Mood

To investigate whether interpretation bias was causal to anxiety, CBM-I techniques mentioned above were used to assess their impact on mood associated with the induced interpretation bias. Along with extending the existing technique to include more naturalistic text, Mathews and Mackintosh (2000) tested whether congruent changes in anxiety accompanied the change in interpretation bias. Experiment 1 revealed an increase in anxiety following negative CBM-I and a decrease following positive CBM-1. Using the Mathews and Mackintosh (2000) text based CBM-I technique, Yiend, Mackintosh and Mathews (2005) also found that state anxiety was altered in line with the valence of the CBM-I technique completed. That is, an increase in state anxiety following negative CBM-I and a decrease of state anxiety following positive CBM-I. Conversely, Salemink, Van den Hout and Kindt (2007a) failed to find a significant change in anxiety following CBM-I, however, they found a trend in the expected direction.

Figure 1.5. Schematic representation of Mathews and Mackintosh (2000) CBM-I technique using textual stimuli.



Holmes and Mathews (2005), using an adapted version of Mathews and Mackintosh's (2000) CBM-I technique, namely auditory CBM-I, found an increase in anxiety following negative training when participants were asked to imagine themselves in the situations described, compared to participants instructed to verbally process the situations. Similarly Holmes et al. (2006) found the opposing decrease in state anxiety following imagery instructions for positive auditory CBM-I.

Transferability of CBM-I to Subsequent Tasks

Studies have explored whether the effects of CBM-I extend to alternative measures of bias and performance on alternative tasks which in many instances are "conceptually similar but methodologically different" (Yiend & Mackintosh, 2004). Extending the work of Grey and Mathews (2000) and Mathews and Mackintosh (2000), Hertel, Mathews, Peterson and Kitner (2003) investigated whether CBM-I would transfer to a different processing task measuring bias. They repeatedly presented non-anxious college students with threat homographs primed by threat or non-threat words and asked them to make semantic relatedness judgements to the primes (as in Experiment 3 Grey & Mathews, 2000). Subsequent to the CBM-I, participants were told they were to complete a separate pilot study. This involved providing them with 16 new threat/non-threat homographs such as *"blow"* or *"stalk"* and asking them firstly to make an image of the word and then to describe the image in a sentence. Participants then rated the valence of the image from one (*very positive*) to nine (*very negative*). Independent raters categorised them as threat or non-threat related. Sentences generated by participants in response to the homographs in the threat condition were rated as more threat - related then those in the non-threat trained group. This showed a transfer of interpretation bias to a different processing task.

Salemink, van den Hout and Kindt (2007b) used two additional tests of interpretation bias to see whether Mathews and Mackintosh's (2000) CBM-I technique would demonstrate a change in bias as assessed by two measures not resembling the training technique. First, an adaptation of the extrinsic affective Simon task (EAST; De Houwer, 2003) was utilised. In this adaptation, homographs relating to positive-neutral meanings and negative-neutral meanings were used as target stimuli. Interpretation was tested by speed of responding to congruent or incongruent buttons relating to a homograph presented. This means that a positive or negative button was (required to be) pressed in response to colours of stimuli. If interpretation bias does extend, positive training would result in faster response times to the positive key (congruent) compared to negative and the converse would be true for negative training. Second, the ambiguous social situations interpretation questionnaire was used (AASSIQ; Stopa & Clark, 2000). This includes items about social situations and bodily sensations. Participants were offered short descriptions such as "You join a group of colleagues for lunch at work. As you sit down, two people in the group get up to leave without saying anything." Participants were asked to provide the first thing that came to mind, which would explain what was happening in the situation. Experimenters rated whether the descriptions provided were positive negative, neutral or not classifiable. Salemink et al. (2007) failed to find congruent interpretation changes resulting from CBM-I.

Impact of CBM-I on Vulnerability to Stress

Whilst modification of mood does not necessarily indicate a change of bias following CBM-I (Standage, Ashwin, & Fox, in press), an alternate test of causation is to assess whether response to stress and thus vulnerability to the disorder, is modified in response to the change in bias. Mathews and Macleod (2002) hypothesise that anxiety

vulnerability is influenced by interpretation bias through the negative distortion of processing subsequent emotional events. In addition, Yiend and Mackintosh (2004) suggest that CBM-I potentially has latent effects on mood, which are shown only when under stress. It is thus of interest to assess whether CBM-I influences vulnerability to anxiety and depression by considering responding to stress and thus further examine the causal nature of the relationship. Wilson, MacLeod, Mathews and Rutherford (2006) examined the impact CBM-I has on anxiety reactivity in undergraduate students using the homograph training technique from Grey and Mathews (2000) to induce bias. Wilson et al. (2006) measured the levels of anxiety subsequent to watching a stressful film. Anxiety levels significantly increased following threat CBM-I compared to non-threat CBM-1 subsequent to the stressor. These results indicated CBM-I influenced anxiety reactivity to stress whereby threat training exacerbated the vulnerability to stress.

Salemink and colleagues conducted experiments to explore whether CBM-I would influence anxiety vulnerability. Salemink et al. (2007a) explored this possibility using the CBM-I technique employed in Mathews and Mackintosh (2000). To extend the findings to incorporate vulnerability to anxiety, their study included an anagram stressor task that was adapted from Macleod, Rutherford, Campbell, Ebsworthy and Holoker (2002), with measurement of emotional reactions subsequent to the task. Similar to Mathews and Mackintosh (2000), Salemink et al. (2007a) found faster response time to positive word fragments following positive CBM-I and faster response to negative word fragments in the negative condition. This provided evidence of an induced interpretation bias.

Following CBM-I, self reported anxiety increased in the negative condition compared to the positive condition, however, this effect was transient and did not

remain following the filler task. The stressor task did not differentially influence self-reported depression or anxiety as measured by visual analogue scales. This showed that this particular CBM-I under these conditions in these participants did not extend to vulnerability to anxiety.

Durability of CBM-I

When considering the potential applicability of CBM-I techniques in a clinical setting, it is important to determine the endurance of the effects. Yiend, Mackintosh and Mathews (2005) used the Mathews and Mackintosh (2000) CBM-I technique and found robust training-congruent interpretations 24 hours after training. Mackintosh, Mathews, Yiend, Ridgeway and Cook (2006) replicated this finding of 24 hour endurance and extended the durability to change of context between training and testing. The context included modality of presentation and change in valence of stimuli from social threats to physical threats. For clinical application, further investigation of the durability of these techniques is necessary.

CBM-I for Depression

The focus of the CBM-I literature thus far has been predominantly on anxiety and the implications of applying CBM-I in depression have yet to be explored. The co-morbidity between anxiety and depression is now widely accepted in clinical literature (Moffitt et al., 2007) and there is a move towards a transdiagnostic approach to research and treatment of psychological disorders (Harvey, Watkins, Mansell, & Shafran, 2004).

Given this high degree of overlap, the recent advances in the anxiety literature regarding CBM-I may have exciting implications for depression research. It is important therefore to consider whether these techniques are applicable to depressed mood. Preliminary steps have been taken by Experiment 1 of Holmes, Lang and Shah (2009)

who introduced the measurement of depressive interpretation bias and response to a depression-related stressor (negative mood induction) following CBM-I. Results indicated that positive CBM-I (using the same material as in Holmes et al., 2006) decreased depressive bias and reduced the negative impact of the stressor.

The Role of Imagery in CBM-I

Studies suggesting a privileged link between visual imagery and emotion led researchers to hypothesise that training procedures seeking to manipulate interpretive biases would be more effective if they relied on imagery, rather than semantic verbal processing of the same information. Many of the CBM-I techniques outlined previously derived from Mathews and Mackintosh (2000) script based CBM-I employed a training protocol in which participants were instructed to "imagine" themselves in the scenarios presented. Holmes and Mathews (2005) and Holmes et al. (2006) explored whether the mode of processing that is, imagery versus verbal instructions during the training phase, were thus critical to changes in mood and bias in the context of negative and positive CBM-I respectively.

In the studies by Holmes & Mathews (2005), participants were presented with negative or benign auditory descriptions over headphones (auditory CBM-I) which they were required to imagine themselves in or focus on the meaning of, and were forced to interpret them in either a negative. This study tested whether the instructions to generate self-related imagery, instead of verbally processing the descriptions, were the mechanism causing the change in emotion found by Mathews and Mackintosh (2000).

In Experiment 1 of Holmes and Mathews (2005), participants were presented with the negative descriptions used in Mathews & Mackintosh (2000), however, instead of reading them, they were given them in auditory form and were either told

to focus on imagining the scenarios or think about the meaning. Participants in the imagery condition showed increased state anxiety compared to participants in the verbal condition. Furthermore, a bigger increase in negative interpretation was found for those told to imagine compared to those who were focussing verbally on the stimuli. To examine whether the change in interpretation was a result of the change in mood, they used post-test state anxiety scores as a covariate and re-examined interpretation scores. They confirmed their previous result of an increased negative interpretation bias in imagery trained participants was independent of mood effects. Experiment 2 of Holmes and Mathews (2005) expanded the study to include benign material and attempted to replicate the negatively valenced imagery versus verbal findings from Experiment 1. Whilst the original finding regarding imagery versus verbal instructions in responding to negative CBM-1 was replicated, they failed to find an effect in response to benign CBM-I. Overall, results suggest that imagery processing negative auditory CBM-I is significantly more effective at increasing both anxiety and negative interpretive bias. Whilst this provides evidence for a stronger emotional effect of imagery rather than verbal processing, it points to a potentially protective role of verbal processing.

Holmes et al. (2006) used a positive (rather than negative) auditory CBM-I technique to investigate whether this mode of processing effect was limited to anxiety or also applied to positive mood. In the imagery condition, positive training resulted in a reduction in anxiety and also enhanced positive mood. Conversely, the opposite was true of verbal, with an increase in anxiety and decrease in positive mood. This study will be explained in further detail below. Taken together, the results of Holmes et al. (2006) show that imagery promotes more effective training

irrespective of the valence of training material and additionally in the context of positive CBM-I verbal instructions may be detrimental.

Clinically, imagery is said to have strong emotional consequences (Holmes & Hackmann, 2004), with limited empirical evidence supporting the claim. Holmes and Mathews (2005) proposed a number of hypotheses for this special relationship between imagery and emotion. First, they suggest that this is because imagery/perceptual systems evolved earlier than systems such as language that would thus lend itself to the closer link to emotion. Second, it is outlined that properties are shared between images and perceptual representations from sensory experience (Kosslyn et al., 2001) and it is as a result that imagery and emotion are so closely linked. In addition, Holmes and Mathews (2005) outline that for autobiographical memory, emotional episodes are potentially stored in the form of images (Conway, 2001). This would thus lead to the conclusion that they would elicit more emotions. This is one of the reasons imagery is a focus throughout this thesis in an attempt to bring about emotional change.

Towards a Clinical Application of CBM-I

At the time of beginning the thesis, to my knowledge, no published studies had attempted to apply the CBM-I technique in a clinical setting. Salemink, Van den Hout and Kindt (2009) had taken the first steps by attempting to apply it to a high trait anxious student population. They provided CBM-I on eight consecutive days with 832 trials in total (as opposed to the usual 50-104) for one hour per day. Bias was measured using the Ambiguous Social Situation Interpretation Questionnaire (ASSIQ) and a recognition test (as in Mathews & Mackintosh, 2000). This anagram task was used as a stressor, and visual analogue scales assessed the extent of anxious-relaxed and happy-depressed emotions.

Results showed that positively trained participants showed slower responses to negative probes than positive ones and gave more positive interpretations than controls when measured within 24 hours (as measured by the recognition test). However, training had no effect on mood. Anxiety increased in the control group but remained stable in the positively trained group. Trait anxiety decreased more after positive training. Psychopathology decreased in the training group and remained stable in the control group (as measured by the symptom checklist). The study also failed to find a difference in the vulnerability to stress between the different groups.

Overall, the study found that repeated sessions of CBM-I effectively manipulated negative interpretation bias, with faster response to positive word fragments and more positive interpretations on the recognition test but not on the ASSIQ in positive compared to negative CBM-I. Additionally, there was a decrease in psychopathology and trait anxiety at the completion of one week of CBM-I in the negative compared to positive condition. Given these mixed preliminary findings, further investigation is important to determine whether this technique and other CBM-I techniques can be developed to be a potentially effective clinical tool.

Commercially Available Computerised Therapeutic Techniques (Other Than CBM)

Studies have begun to assess the efficacy of computerised therapeutic techniques other than CBM (for a review see Kaltenthaler, Parry, Beverley, & Ferriter, 2008). Randomised control trials have been conducted investigating computerised Cognitive Behaviour Therapy (CCBT) programs such as "Beating the Blues," (Proudfoot et al., 2004) "Overcoming Depression on the Internet" (Clarke et al., 2002) and "MoodGYM" (Christensen, Griffiths, & Jorm, 2004). Proudfoot and colleagues (2004) for example, randomly allocated 274 patients with depression

and/or anxiety to receive either Beating the Blues or continue with treatment as usual (continue the recommended treatment by the individual's general practitioner [GP]). Beating the Blues involved a 15 min introductory video, followed by eight, one hour sessions per week at a GP practice, with homework in between. Results indicated that Beating the Blues led to greater improvements in depressive and anxious symptoms with improvements maintained at a six month follow up compared to treatment as usual. Beating the Blues is currently recommended by the NICE guidelines for the treatment of mild to moderate depression (National Institute for Health and Clinical Excellence, 2006).

These CCBT packages are quite general in their approach, in that they attempt to modify a range of cognitions, beliefs and schemas, as in cognitive behavioural therapy (CBT). One possible development would be to introduce a program targeted at a particular bias aimed to reduce a negative bias or even attempt to encourage the individual to adopt a positive bias.

Baccus, Baldwin and Packer (2004) developed a computer program aimed at increasing self-esteem. Self-relevant information is repeatedly paired with an image of a smiling face. This information is based on responses to questions at the beginning of the experiment. One hundred and thirty nine undergraduate students took part and results indicated increased self-esteem in those participants trained with positive emotion linked to self-relevant information compared with controls.

The CBM-I techniques present a novel innovative method of modulating bias and potentially with adjustments and repeated administration could be used in a therapeutic context. Further investigation is required to assess the efficacy of this application.

Conclusions and Next Steps

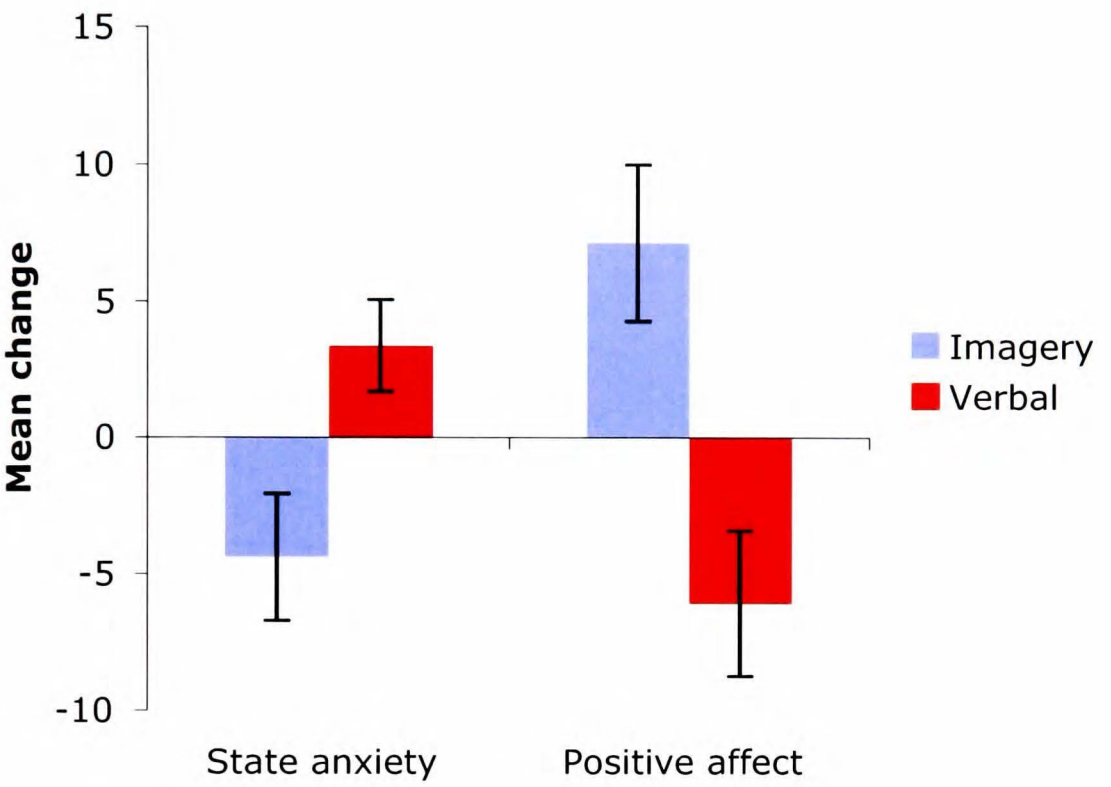
This chapter has presented a review of the literature relevant to mental imagery and interpretation bias in depression. It presents a guiding framework for examining these processes as discussed by Holmes, Lang and Deeprose (2009). A summary of the research investigating CBM-I techniques available when the current thesis was begun is also provided. This summary outlines the impact of CBM-I on mood, along with research indicating the transferability of CBM-I to subsequent tasks, the impact of CBM-I on vulnerability to stress and the durability of the effects of CBM-I. The limited research to date investigating CBM-I in depressed mood (Holmes, Lang, & Shah, 2009, Experiment 1) is also included with a summary of the preliminary steps that have been taken towards clinical applications of CBM-I.

The aim of the current thesis was to develop a positive imagery-oriented CBM-I technique for depressed mood. Specifically the focus was on interpretation bias and mental imagery as discussed by Holmes, Lang and Deeprose (2009). The thesis next presents a series of 4 experiments and 3 studies on this topic. These studies are numbered to retail numerical order, but titled 'experiment' rather than 'study' if an experimental design was used.

Positive CBM-I presents the starting point to explore the clinical potential of the CBM-I technique to improve negative bias and mood. In particular Holmes et al. (2006) developed overtly positive CBM-I material for anxiety, providing the first successful test of positive stimuli CBM-I reported in the literature. This CBM-I included auditory descriptions that were initially ambiguous and consistently resolved positively. As previously discussed, the experiment by Holmes et al. (2006) tested whether the mode of processing, that is, imagery versus verbal instructions during CBM-I, was critical to changes in mood and bias. Figure 1.6 presents the change in

anxiety and positive affect following positive CBM-I in the experiment presented in Holmes et al. (2006).

Figure 1.6. *Mean changes in state anxiety and positive affect following positive imagery and positive verbal CBM-I in Holmes et al. (2006).*



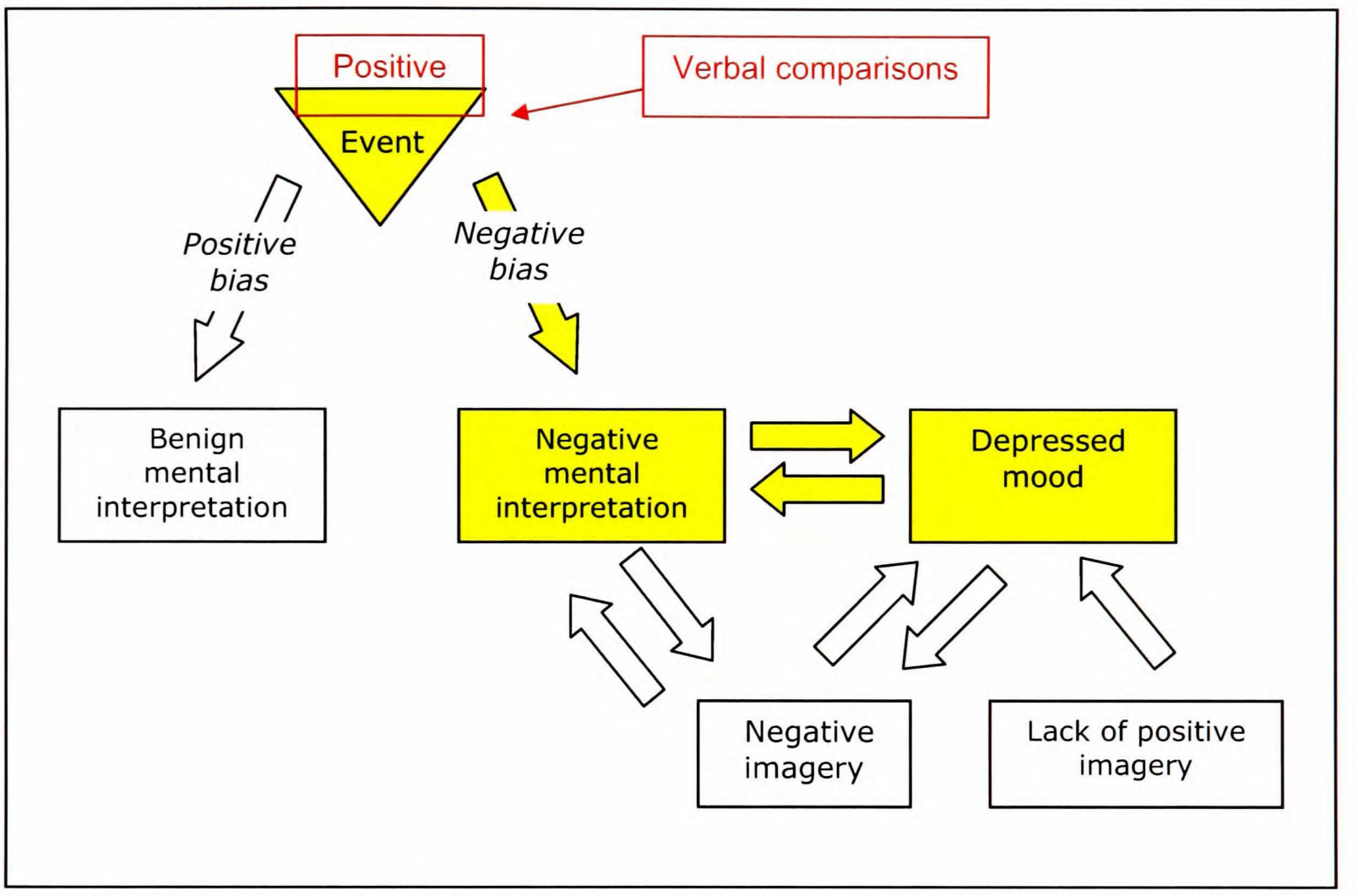
As can be seen in Figure 1.6, Holmes et al. (2006) found that imagery instructions for positive auditory CBM-I gave rise to the anticipated increase in positive emotion and decrease in anxiety. In contrast, surprisingly verbal instructions for the same positive material resulted in paradoxical negative emotional effects including an increase in anxiety and a decrease in positive affect.

This paradoxical effect (namely a negative response to positive information) on mood was subsequently replicated in Experiment 1 of Holmes, Lang and Shah (2009). This finding is particularly compelling given the potential clinical implications. That is, when offering positive information, promoting verbal processing (but not imagery) might actually be detrimental (rather than merely less effective). According to clinical anecdotes, when given positive information in

therapy patients with depression may say that this makes them feel worse. For example, therapists may ask patients to think of a holiday coming up and patients may respond by negatively by saying "I do not enjoy holidays anymore". In developing CBM-I it is not only of interest to increase positive emotional effects but also important to explore how to prevent inadvertent decreases in positive emotions. Thus the unexpected detrimental effect of the verbal positive CBM-I condition warrants further exploration and will be the focus of Experiment 1.

CHAPTER 2

Experiment 1: Thinking Verbally About Positive Events Can Make You Feel Worse - Why do Verbal Instructions in Positive CBM-I Lead to Mood Deterioration?



This model is adapted from Holmes, Lang and Deeprose (2009) and is presented at the beginning of each chapter as a guiding framework to illustrate what is being focussed on (highlighted in yellow with red annotations).

The current study is published as Experiment 2 in Holmes, E. A., Lang, T. J., & Shah, D. M. (2009). Developing interpretation bias modification as a 'cognitive vaccine' for depressed mood - Imagining positive events makes you feel better than thinking about them verbally. *Journal of Abnormal Psychology, 118*, 76-88.

Aim

The aim of Experiment 1 was to investigate what aspect of verbal processing may have caused mood and bias deterioration in the verbal instruction condition of positive auditory CBM-I in Holmes et al. (2006) and Experiment 1 of Holmes, Lang and Shah (2009). Clinically it is important to understand how to optimise the effectiveness of the CBM-I technique to promote positive mood as well as how to best prevent mood from deteriorating. Specifically, it is important to understand how presenting such material might even cause mood deterioration before applying this work to a clinical population.

Mechanisms Inhibiting Effective Positive Auditory CBM-I

What aspect of verbal processing caused the mood deterioration during the positive CBM-I training phase seen in Experiment 1 of Holmes, Lang and Shah (2009) and Holmes et al. (2006)? Experimental debriefing indicated that verbal condition participants in Experiment 1 of Holmes, Lang and Shah (2009) reported thoughts such as "things never work out like this for me". This highlighted the possibility that participants may have unfavorably compared the outcome of the overtly positive scenarios with their own, not as (extremely) positive experiences. While it was not expected that the non-clinical sample would have chronically negative experiences, neither were they expected to have unusually positive lives. For example, take the scenario "It is Saturday morning - the start of the weekend - and you have many things to do. You are feeling lively and energetic and make an enthusiastic start." Comparing to what typically happens in real life, many participants may feel they have to do chores at the weekend, or feel more lethargic and unmotivated, so that the comparison would be negative. Take another example, "It's a rainy day and you go outside with your umbrella. As the rain falls around you,

you notice your step quicken and you whistle and feel surprisingly cheerful". Again, compared to real life, many participants may dislike or only tolerate bad weather rather than enjoy it.

For clinical conditions such as anxiety and depression, verbal processing can be found to be associated with negative emotion for example in the form of rumination and worry. Clearly not all verbal processing will yield negative emotional effects. Indeed some clinical theories suggest that verbal processing may in the short term reduce negative affect. The 'reduced concreteness theory' (Stöber & Borkovec, 2002) suggests that abstract verbal thinking is associated with reduced imagery, and may thus be used to avoid distressing negative imagery. What cognitive mechanisms might account for paradoxical effects on mood of verbally processing *positive* information? The most compelling explanation is that a process of making verbal comparisons with positive information known as 'evaluation' can result in negative emotional consequences (Markman & McMullen, 2003). Evaluation is defined as "an evaluative mode of thinking characterised by the use of information about the standard as a reference point against which to evaluate one's present standing" (Markman & McMullen, 2003, p. 245). Evaluative processing is predicted to result in affective contrast i.e. if comparing with more positive information, negative affect would result, and vice versa.

Support for this comes from the social psychology literature which explains that social comparisons made between worse off (downward) and better off (upward) others often gives rise to positive and negative emotions respectively (Morse & Gergen, 1970). Further, the counterfactual thinking literature argues that while downward counterfactual thinking (considering worse alternatives) improves affect,

upward counterfactual thinking (considering better alternatives) worsens affect (Markman, Gavanski, Sherman, & McMullen, 1993).

Relatedly, thinking about discrepancies between how one actually is (actual self) with how one would ideally like to be (ideal self) or how one feels they ought to be (ought self), has been found to relate to depression and anxiety, respectively (Strauman, 1989; Strauman & Higgins, 1987; Strauman et al., 2006). Self-discrepancy theory proposes that the more accessible a discrepancy is, the more the individual will experience the negative emotion associated with the particular discrepancy that is salient (Higgins, 1987). For example, if the discrepancy between an individual's actual and ideal self becomes accessible the individual is likely to experience increases in depressed mood. Strauman and Higgins (1987) primed self-relevant attributes to activate self-discrepancies, which led to increases in sadness and anxiety. Continuing with the previous examples, making comparisons may even prompt a participant in the experiment to focus on the discrepancy between how they are (e.g. fed up with chores and the bad weather) and how they would like to be or feel they should be (e.g. excited, optimistic, energetic).

One can of course also make comparisons using imagery, but this may be less automatic and more effortful, requiring active switching between images (with deliberate imagery generation known to take seconds; Cocude, Charlot, & Denis, 1997), or switching between imagery and verbal modes. Further, imagery can be highly absorbing for example, flashbacks to trauma are difficult to dismiss from mind (Brewin & Holmes, 2003). In the positive domain, individuals can indulge in positive imaginal daydreams and fantasies (Kavanagh, Andrade, & May, 2005) without contradicting them until they come to an end (and then switch to comparative or verbal processing). Perhaps these absorbing and believable properties of imagery (at

least in the moment) enhance the ability to benefit from even unrealistic and highly positive information.

The aforementioned theories suggest ways in which being presented with positive material might make participants more negative i.e. the verbal processing instructions may provoke 'evaluative' comparisons or highlight discrepancies between actual and ideal or ought self concepts. That is, participants may have been making comparisons between themselves and the overtly positive scenarios which may be causing the increase in negativity found in the verbal condition (but be less likely in imagery) of Experiment 1 Holmes, Lang and Shah (2009) and Holmes et al. (2006). To test this proposal, two new verbal conditions were created, aimed to either increase or decrease the amount of comparisons being made. They were both based on the existing verbal condition instructions of Experiment 1 of Holmes, Lang and Shah (2009), plus either (1) additionally instructing participants to compare each scenario with how things are for them in reality (the "verbal comparisons condition") or, (2) removing the reference to 'focus on the meaning' in the instructions, as well as reducing the time available to make comparisons (the "verbal reduced-comparisons condition," so-called to reflect the intention of the manipulation). The original imagery condition of Experiment 1 was included as a control.

In the "verbal reduced-comparisons condition", the time available to make comparisons was reduced by removing the short gap after each auditory training scenario and speeding up the scenarios (while preserving comprehension). The latter was motivated by Pronin and Wegner (2006) in which participants read statements at either double or half normal reading speed. Increased speed was associated with greater increases in positive mood.

Hypotheses

The key hypotheses were that:

1. Following positive auditory CBM-I, the verbal comparisons condition compared with either the imagery or verbal reduced-comparisons condition would result in greater increases in anxiety (Spielberger State- Trait Anxiety Inventory [STAI]), with complementary decreases in positive affect (Positive and Negative Affect Schedule [PANAS]) and on bias (ambiguous test descriptions). In particular, the verbal reduced-comparisons condition was expected to lead to smaller increases in anxiety (and less decreases in positive affect) than the verbal comparisons condition.

2. Within the verbal comparisons condition alone, there would be significant deterioration in mood and bias over the training phase. Within the imagery condition, the current experiment aimed to replicate the finding of improvements in mood and bias over the training phase.

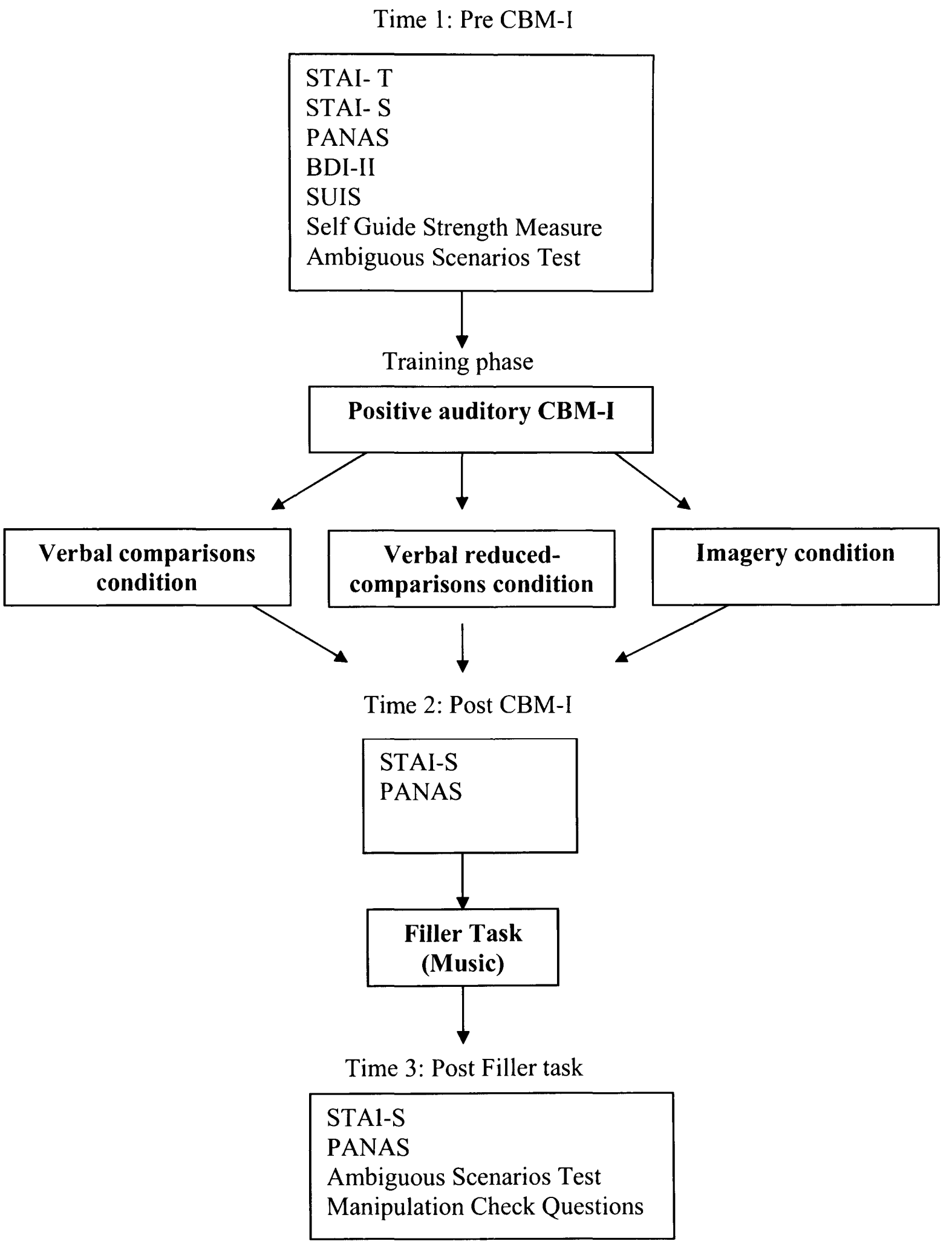
Method

Overview

A diagram of the procedure is presented in Figure 2.1. Participants were trained to positively interpret emotionally ambiguous information. They were repeatedly presented with auditory descriptions, which remain ambiguous till they were consistently resolved positively in the final word as in Holmes et al. (2006) and Holmes, Lang and Shah (2009, Experiment 1). A mixed experimental design was employed whereby, based on random allocation, participants were instructed to process the stimuli presented using mental imagery or alternatively process it verbally and either compare the information with how things are for them in reality (verbal comparisons) or focus on understanding the descriptions (verbal reduced

comparisons). Baseline measures of mood, interpretation bias and self discrepancy were taken prior to CBM-I. Mood was additionally measured after CBM-I, followed by a filler task of music to minimise the influence of any mood differences between conditions when measuring interpretation bias. Measures of mood and interpretation bias were subsequently taken. Participants were debriefed and completed questions to assess the effectiveness of the manipulation.

Figure 2.1. Schematic overview of the experimental procedure.[1]



[1] STAI-S = State version of the State–Trait Anxiety Inventory, STAI-T = Trait version of the State–Trait Anxiety Inventory BDI-Il = Beck Depression Inventory II, SUIS = Spontaneous Use of Imagery Scale.

Participants

The 60 participants comprised 20 males and 40 females, with a mean age of 24.95 years (*SD* = 7.38). Participants were recruited via e-mail advertisements and from two local universities using posters displayed around campus sites and voluntary sign-up at freshers' fairs.

Sample Size Estimation

The sample size for the current study was estimated based on experiments employing a mixed design (as in the current experiment with CBM instruction condition as the between subjects factor and time – pre-CBM-I vs. post-CBM-I as the within subject factors) examining state anxiety and positive affect changes (from pre to post CBM-I) between imagery and verbal instruction conditions of positive auditory CBM-I conditions (Holmes et al., 2009; Holmes et al., 2006). Holmes et al. (2006) reported effect sizes η_p^2 between .24 and .32 for a change of anxiety and positive affect and Holmes, Lang and Shah (2009, Experiment 1) reported an effect size of .29 and .22.

A power calculation for a mixed design based on the effect size of $\eta_p^2 = 0.22$ (the smallest previously reported effect) with 80% power to detect the effect and alpha set at 0.05 indicated a sample of approximately 18 participants would be necessary per condition. As in Experiment 1 of Holmes, Lang and Shah (2009) the current study tested 20 participants per condition.

Materials

Apparatus

E-prime software was used to programme the experiment (Versions 1.1.4.1, Pittsburgh: Psychology Software Tools Inc.). The positive auditory CBM-I training paragraphs and Ambiguous Scenarios Test (AST) were taken from Holmes et al.

(2006) and Holmes, Lang and Shah (2009, Experiment 1) and recorded digitally using Cool Edit 2000 software (Phoenix; Syntrillium Software Corporation). The descriptions were read in the same female voice lasting approximately 10-13 seconds. Questions following each sentence were presented visually using e-prime software. Participants responded using a standard computer keyboard. The descriptions were sped up using wave-pad software (Version 3.05, Canberra; NCH Swift Sound). The music for the filler task was played via the headphones using Windows Media player (Version 9.00.003349, 2002).

Positive Auditory CBM-I Materials

The 100 training descriptions with positive emotional outcomes were taken from Holmes et al. (2006) and Experiment 1 Holmes, Lang and Shah (2009). Half of these descriptions began with a negatively implied resolution that later became positive. The other half started with a neutral theme and similarly resulted in a positive emotional outcome. An example of a paragraph with a negative beginning is "you've taken an exam as part of an evening course and are worried you did not do very well. At the next class the grades are on the notice board and everyone is looking. The sight of your grade makes you feel *elated and fills you with confidence.*" (resolution in italics). An example of a paragraph with a benign theme "It's Christmas day and your family are gathered around you. You look at them with a rush of *love and pride*" (resolution in italics). For a full outline of positive auditory CBM-I sentences see Appendix 2.I. The overall aim of this CBM-I technique was to train participants to generate positive resolutions to situations that could have developed in other and less desirable ways by providing overtly positive resolutions. There was a 2 s gap after each description. The 100 descriptions were randomly presented in 5

blocks of 20 with a rest in between each block. Reminder instructions were given during the rest.

In the verbal reduced-comparisons condition, in an attempt to reduce the time in which participants could make comparisons, the scenarios were played 20% faster than normal. For the verbal reduced-comparisons condition, the mean duration of each letter was approximately 59 ms changed from 74 ms. This is slower than the 'sped up' condition using visual words presented by Pronin and Wegner (2006), that is 40 ms versus 80 ms per letter for their average readers. However, since the stimuli were presented in auditory form (not visually) slower speeds were required. I suggest that it was the relative speed that was important with a maximum speed of 59 ms determined by pilot work to preserve comprehension. In addition, the 2 s gap at the end of each description was removed in the reduced comparisons condition only; to further prevent opportunities for comparisons being made after each description.

To focus participants on the assigned task for their condition (imagery vs. verbal reduced-comparisons vs. verbal comparisons) after each training paragraph (and 2 s gap for the imagery and verbal comparisons conditions) they rated either vividness of imagery (as in Holmes et al., 2006), ability to comprehend the scenario ("how difficult was it to understand the description?"), or difference from reality ("how different was this description compared to how things really are for you in reality?"). All ratings were made on 5-point scales anchored from 1 (*not at all vivid/difficult/different*) to 5 (*extremely vivid/difficult/different*).

Filler Task

After CBM-I, participants completed a 10 minute unrelated filler task of listening to music. Participants listened to extracts of classical music (lasting 40 seconds) and rated how pleasant or unpleasant they found each section on a scale of 1

(*extremely unpleasant*) to 9 (*extremely pleasant*). The filler task was included, to reduce differences in participants' mood across conditions, minimising the influence of any mood differences across conditions on interpretation.

Interpretation Bias Measure

Ambiguous Scenarios Test (AST; Holmes et al., 2006). The AST includes ambiguous descriptions used to test for interpretation bias. These were 10 positively resolvable paragraphs used previously in the context of anxiety in Holmes et al. (2006). The sentences were ambiguous in that possible emotional outcomes were implied but not explicitly described. They were presented without specific instructions as to encoding. After each description participants were asked to rate how emotional the description was, using a 9-point scale from 1 (*extremely unpleasant*) to 9 (*extremely pleasant*). For example, "You buy a new outfit for a party. Other people's reactions show how you *look.*"; "You are watching the lottery results on TV. As the numbers are called you suddenly find out your *results.*" The ambiguous test descriptions are presented in Appendix 2.2.

Self Guide Strength Measure

The Self Guide Strength measure (Higgins, Shah, & Friedman, 1997; Shah, Higgins, & Friedman, 1998) was used to check that there were no pre-existing differences between groups in general tendency to make comparisons (between self and positive situations) that would have confounded the experimental manipulation. This measure assesses discrepancies between ideal and actual self as well as ought and actual self. This is a computer-adapted version of the Selves Questionnaire (SQ: Higgins, 1987). Participants were given detailed instructions regarding the meaning of ideal self and ought self, which is derived from the original SQ instructions. Ideal self

was defined as "the type of person they ideally would like to be, the type of person they hoped, wished, or aspired to be." Their ought self was defined as "the type of person they believed it was their duty, obligation or responsibility to be" (Higgins et al., 1997). Participants were asked to list three characteristics that they felt represented their ideal self and three characteristics which represented their ought self. They then rated the extent to which they would ideally like to, or believed they ought to, possess this characteristic (extent rating) and the extent to which they believe they actually posses this attribute (actual rating) from 1 (*slightly*) to 4 (*extremely*). Discrepancy scores were calculated by subtracting the extent rating from actual rating on both ideal and ought selves yielding one ideal discrepancy score and one ought discrepancy score.

Questionnaire Measures.

Spielberger State- Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAI was used as an index of both state (STAI-S) and trait (STAI-T) anxiety. As a trait measure, participants were asked to rate 20 anxiety related statements for how relevant they are to how they "generally feel" on a 4-point scale "*almost never*" "*sometimes*" "*often*" "*always*." As a state measure, participants rate 20 anxiety related items for how appropriate they are to how they "feel right now" similarly on a 4 point scale " *not at all*", "*somewhat*", "*moderately so*", or "*very much so*." This scale is reported to have satisfactory reliability and validity with internal validity measured by an alpha coefficient above .90 (Spielberger et al., 1983).

The Positive Affect Subscale of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS was used to measure state levels of positive affect. Participants are presented with a list of 21 emotional words

and asked to indicate the extent to which these words describe their present feelings where 1 is *"not at all"*, 2 is *" a little"*, 3 indicates*" moderately"*, 4 is *"quite a bit"* and 5 is *"extremely."* The emotional words are based on 4 different emotional scales, joviality (8 items), self-assurance (6 items), attentiveness (4 items), serenity (3 items) (Watson & Clark, 1994).The instructions given were, "this scale consists of a number of words and phrases that describe different feelings and emotions. Read each item then mark the appropriate space next to the word. Indicate to what extent you feel this way now, in the past few minutes". Good reliability is reported with Chronbach's alpha between 0.86 and 0.90 (Watson et al., 1988).

Beck Depression Inventory - Second Edition (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a self-report questionnaire used to measure depressive symptoms. Participants respond to 21 depression-related questions with respect to how they have been feeling during the past 2 weeks. The BDI-II possesses high internal consistency with an alpha level of 0.9 (Beck, Steer, Ball, & Ranieri, 1996). One week test retest reliability is also high, $r = 0.93$ (Beck, Steer, & Brown, 1996).

Spontaneous Use of Imagery Scale (SUIS; Reisberg, Pearson, & Kosslyn, 2003). The SUIS questionnaire consists of 12 items, for example "When I think about visiting a relative, I almost always have a clear mental picture of him or her". Each item is rated on a 5-point scale, anchored with the instructions "If a description is always completely appropriate, please write *5*; if it is never appropriate, write *1*; if it is appropriate about half of the time, write *3*; and use the other numbers accordingly." Reisberg et al. (2003) found that the mean score (average across all items) for 150 participants was 3.1, with a range of 1.2 to 4.7. High internal consistency was also reported with correlations of 0.98 or higher.

Manipulation Check Questions

Participants rated their experience of listening to the descriptions during the training phase. The questions given firstly assessed the extent to which participants were verbally analysing the training material ("how much did you find yourself verbally analysing the meaning of the sentences?") and then how much they compared themselves with the material ("how much did you find yourself comparing the scenarios with how things are for you in reality as you were listening to the sentences?") Participants also rated how much time they spent thinking in images ("How much did you find yourself thinking in images, i.e., in mental pictures and sensory impressions?"). Finally, to asses the extent to which participants reported concentration difficulties, participants were asked to rate "how much of the time did you find it difficult to focus on your task, i.e. your attention wandered and you found it difficult to concentrate"). Each question was rated on a 9-point scale ranging from 1 (not at all) to 9 (all the time).

Procedure

An overview of the procedure is illustrated in Figure 2.1.

Time 1: Pre CBM-I

Prior to arrival, participants were randomly assigned to condition using a random number generator. After giving informed consent to participate, participants completed the STAI-T, BDI-II and the SUIS. The participants then completed the STAI-S and PANAS. This was followed by the computerised Self Guide Strength measure. Participants then put on headphones and listened to 10 ambiguous descriptions rating the emotionality of each as described previously (ambiguous scenarios test).

Training Phase and Instructions

The experimenter then read out instructions for the assigned condition (for full instructions see Appendix 2.3). Both the verbal comparisons and verbal reduced-comparisons conditions begun with a practice exercise about cutting a lemon. This was to illustrate how to verbally process and focus on the words as they heard them. It was explained that processing text focussing on the words helps enhance processing of it.

The verbal comparisons condition was further told, that accompanying this verbal processing with a comparison with how things are for oneself could further enhance that processing. In the verbal reduced-comparisons condition, the practice exercise was followed by four sample descriptions with the instructions to "focus on the words as the description unfolds." In the verbal comparisons condition the same four examples were used, however, the instructions given were "focus on the words and meaning as the sentence unfolds ensure you make a comparison with how things really are."

In the imagery condition, participants did a practice task where they were asked to imagine cutting a lemon to clarify what is meant by "using mental imagery". The experimenter ensured that participants had generated self-images by asking questions about each image. Participants were then given the same four examples as in the verbal conditions but with the instructions to imagine the event happening to them and to focus on their image of the outcome. For a full outline of all instructions see Appendix 2.3.

Participants were then presented with an example on the computer. Following this, they were then given 100 experimental descriptions in 5 randomised blocks of 20 with a rest between each. After each auditory description, participants were asked to

make a rating ensuring adherence to condition. This consisted of a vividness rating in the imagery condition, a comparison rating in the verbal comparisons condition and a comprehension rating in the verbal-reduced comparisons condition. During the break, participants were instructed to read their reminder instructions and then to continue.

Time 2: Post CBM-I

Participants completed the manipulation check questions. They then completed the STAI-S and PANAS.

Filler Task

Participants subsequently listened to different extracts of classical music for 10 minutes, and rated how pleasant they found it on a scale of 1 (*extremely unpleasant*) to 9 (*extremely pleasant*).

Time 3: Post Filler Task

Participants were again given the PANAS and the STAI-S. Participants then completed the second administration of the ambiguous scenarios test.

Finally, participants were debriefed, reimbursed for their time and thanked for their participation.

Results

Comparison of Participants in the Verbal Comparisons, Verbal Reduced-Comparisons and Imagery Conditions at Baseline

There was no significant difference between conditions in terms of gender, $\chi^2(2, N = 60) = 1.05, p = .59$, see Table 2.1. At baseline, the conditions were comparable in terms of age, trait anxiety (STAI-T), imagery (SUIS), positive affect (PANAS), depression (BDI-II) and interpretation bias (AST), for each measure,

$F(2,57) < 1.02$, $p = .37$, see Table 2.1. Table 2.2 shows mean values for CBM-I state anxiety and positive affect scores, as well as for the ambiguous scenarios test. In addition, there were no pre-CBM-I differences on a measure potentially related to the experimental manipulation of making comparisons - the Self Guide Strength measure, $F(2,57) < 1$, see Table 2.2.

Table 2.1

Characteristics of Participants at Baseline per Condition

	Imagery (n = 20)		Verbal reduced-comparisons (n = 20)		Verbal comparisons (n = 20)	
Characteristic	*M*	*SD*	*M*	*SD*	*M*	*SD*
Age (years)	24.40	7.23	25.15	8.15	25.30	7.07
Gender (%)						
Female	60		75		65	
Male	40		25		35	
STAI Trait	33.95	8.11	35.60	12.16	31.40	7.06
BDI-II	7.20	4.95	8.50	7.56	7.25	7.18
SUIS	4.00	0.61	3.73	0.87	3.98	0.76
Ideal discrepancy	4.05	1.61	4.35	2.60	4.90	2.27
Ought discrepancy	3.45	1.96	3.90	1.89	4.05	1.57

Note: STAI = State–Trait Anxiety Inventory, BDI-II = Beck Depression Inventory II, SUIS = Spontaneous Use of Imagery Scale, the ideal and ought discrepancy ratings were taken from the Self Guide Strength measure

Mood Change From Pre CBM-I to Immediately Post CBM-I

State Anxiety

It was predicted that participants in the verbal comparisons condition would have greater increases in anxiety relative to either the verbal reduced-comparisons or imagery condition. Using a mixed model ANOVA, the grouping factor was condition (verbal comparisons vs. verbal reduced-comparisons vs. imagery) and the within subjects factor was time (pre vs. post training). There was no significant main effect of time $F(1, 57) < 1$ or condition $F(2, 57) < 1$. As predicted, there was a significant

interaction between time and condition $F(2, 57) = 6.31$, $p = .002$, $\eta_p^2 = .18$. Using independent samples *t*-tests, as expected, anxiety increased significantly more in the verbal comparisons than verbal reduced-comparisons group, $t(38) = 2.52$, $p = .016$, $d = .80$, confirming the study hypothesis. The predicted difference between the verbal comparisons and imagery group was also significant, $t(38) = 3.81$, $p < .001$, $d = 1.20$. There was no significant difference between the imagery and verbal reduced-comparisons groups ($t < 1$, $p > .56$). For mean change in anxiety scores over training, see Figure 2.2.

As predicted, paired samples *t*-tests revealed a significant increase in anxiety over training within the verbal comparisons condition, $t(19) = 2.91$, $p = .009$, $d = .49$, and a significant decrease in anxiety within the imagery condition, $t(19) = 2.46$, $p = .024$, $d = .43$. There was no significant change in anxiety within the verbal reduced-comparisons condition, ($t < 1$, $p > .36$).

Notably, the inclusion of a Bonferroni correction (a conservative protection against an inflated alpha caused by computing three between condition comparisons) in the analyses (.05 / 3 = .017) did not change the pattern of results.

Figure 2.2. Mean change in STAI scores pre to post CBM-I for each condition. Error bars show one standard error of the mean.

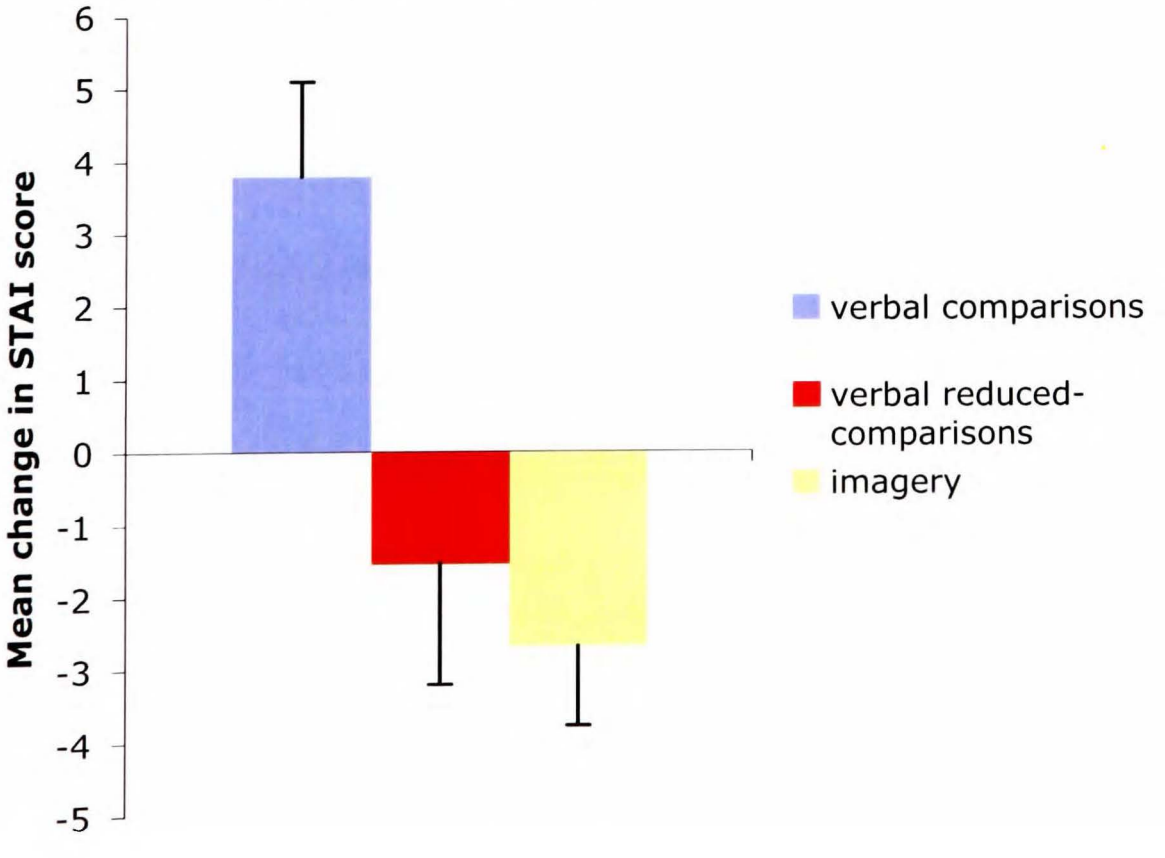


Table 2.2

Means and Standard Deviations for State Mood Measures (STAI, PANAS), Emotionality Ratings for the AST, and Manipulation Checks per Condition

	Imagery (n = 20)		Verbal reduced-comparisons (n = 20)		Verbal comparisons (n = 20)	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*
Mood measures						
State STAI, time 1	33.95	8.11	35.60	12.16	31.4	7.05
State STAI, time 2	31.25	8.16	34.05	9.60	35.20	8.45
State STAI, time 3	30.95	6.72	32.40	9.78	32.50	6.76
PANAS, time 1	69.30	16.14	65.40	15.16	71.00	12.79
PANAS, time 2	70.20	15.18	59.80	15.64	64.00	13.54
PANAS, time 3	67.75	15.35	59.10	15.81	66.45	15.23
Bias measure						
Ambiguous scenarios test, time 1	6.38	0.72	6.20	0.96	6.31	0.99
Ambiguous scenarios test, time 3	6.50	0.91	6.01	1.02	6.21	0.89
Manipulation Checks						
Use of imagery	8.00	0.73	3.25	1.74	3.53	1.21
Use of verbal	2.50	1.35	7.45	1.05	7.45	1.04
Use of comparisons	4.90	2.43	3.75	2.10	8.25	0.79

Note: Time 1 = pre-CBM-I, time 2 = immediately post-CBM-I, time 3 = after 10 min filler task post CBM-I; STAI = State–Trait Anxiety Inventory, PANAS = total positive affect score from the PANAS, the emotionality ratings for the ambiguous scenarios test are anchored 1 = *extremely unpleasant* to 9 = *extremely pleasant*, manipulation check questions are anchored 1 = *not at all* to 9 = *all the time*.

Positive Affect

The hypothesis that the verbal comparisons condition compared to both verbal reduced-comparisons and imagery conditions would result in greater decreases in positive affect was tested using a mixed model ANOVA, similar to that described above. The pattern of results for the PANAS was less clear than for the STAI. There was a main effect of time, $F(1, 57) = 10.24$, $p = .002$, $\eta_p^2 = .15$, with positive affect decreasing, and no main effect of condition, $F(2, 57) = 1.36$, $p = .27$. There was a significant interaction between time and condition, $F(2, 57) = 3.99$, $p = .03$, $\eta_p^2 = .12$.

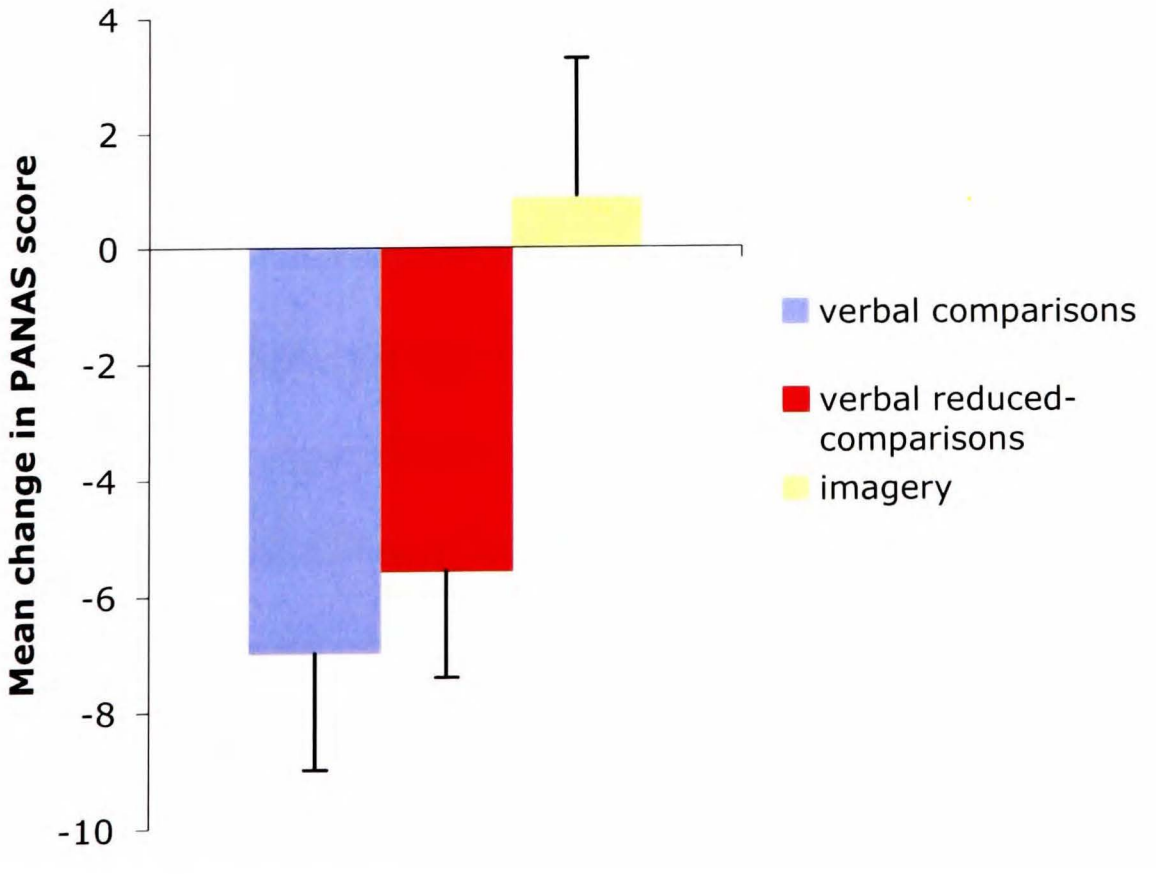
The directional hypothesis was tested by comparing changes in positive affect over time between pairs of the three groups using independent samples *t*-tests. As predicted, there was a significant difference between the verbal comparisons and

imagery groups, $t(38) = 2.50$, $p = .017$, $d = .79$. Unexpectedly, there was no significant difference between the verbal comparisons and verbal reduced-comparisons groups, $t(38) < 1$. The difference between imagery and verbal reduced-comparisons groups was significant, $t(38) = 2.13$, $p = .04$, $d = .67$. For mean change in anxiety scores over CBM-I, see Figure 2.3.

Changes within each group were examined separately using paired samples *t*-tests. As predicted, there was a significant decrease in positive affect within the verbal comparisons group, $t(19) = 3.48$, $p = .002$, $d = .53$. The difference was also significant within the verbal reduced-comparisons group $t(19) = 3.06$, $p = .006$, $d = .36$. Unexpectedly, unlike previous experiments, there was no significant increase in positive affect following imagery training, $t(19) < 1$.

Including a Bonferroni correction only affects the (non-critical) difference between the verbal reduced-comparisons and imagery condition ($p = .04$) rendering it non-significant.

Figure 2.3. Mean change in PANAS scores pre to post CBM-I for each condition. Error bars show one standard error of the mean.



State Anxiety and Positive Affect After the Filler Task

Differences between groups in mood prior to the second administration of the AST were examined using a one-way ANOVA. This confirmed that there were no significant differences between groups in either state anxiety $F(2, 57) < 1$, or positive affect, $F(2, 57) = 1.82$, $p = .17$.

Ambiguous Scenarios Test (Interpretation bias)

Using a mixed model ANOVA, there was no main effect of time, $F(1,57) < 1$ or condition, $F(2,57) < 1$. Unexpectedly, the interaction between time and CBM-I condition did not reach significance, $F(2,57) = 1.67$, $p = .20$ and it was therefore not possible to decompose further. The mean changes for each condition were in the predicted direction; see Table 2.2 (it is noted that individual comparisons between conditions showed only non-significant trends).

Manipulation Checks

Participant ratings of their subjective experience of listening to the training paragraphs were compared using one-way ANOVAs and decomposed with independent samples *t* - tests. For mean scores, see Table 2.2. Participants in the imagery condition reported using significantly more imagery than both those in the verbal comparisons and verbal reduced-comparisons conditions, $F(2, 57) = 84.89$, $p < .001$, $\eta_p^2 = .94$; imagery versus verbal comparisons, $t(38) = 14.20$, $p < .001$, $d = 4.49$; imagery versus verbal reduced-comparisons $t(38) = 11.25$, $p < .001$, $d = 3.57$; verbal comparisons versus verbal reduced-comparisons, $t(38) < 1$. Participants in the verbal comparisons condition reported making significantly more comparisons to those in the verbal reduced-comparisons or imagery conditions, $F(2, 57) = 121.87$, $p < .001$, $\eta_p^2 = .96$; verbal comparisons versus imagery, $t(38) = 12.96$, $p < .001$, $d = 4.09$, verbal

comparisons versus verbal reduced-comparisons, $t(38) = 8.98$, $p < .001$, $d = 2.83$; imagery versus verbal reduced-comparisons, $t(38) = 1.60$, $p = .06$.

Participants in the verbal comparisons and verbal reduced-comparisons conditions reported using significantly more verbal processing than those in the imagery condition, $F(2, 57) = 121.87$, $p < .001$, $\eta_p^2 = .96$; imagery versus verbal comparisons, $t(38) = 12.96$, $p < .001$, $d = 3.29$; imagery versus verbal reduced-comparisons; $t(38) = 12.90$, $p < .001$, $d = 4.09$; verbal comparisons versus verbal reduced-comparisons, $t(38) < 1$.

There was no significant difference between conditions for difficulty concentrating on the training task, $F(2, 57) < 1$. Overall, these results indicate that participants reported that they were adhering to the appropriate condition instructions during the training phase. The pattern of results did not change when a Bonferroni correction was applied.

Discussion

This study sought to examine a potential mechanism to account for the paradoxical finding in the studies of Holmes et al. (2006) and Holmes, Lang and Shah (2009, Experiment 1), where exposure to overtly positive material in a verbal instruction CBM-I condition led to mood worsening, rather than improving. It was proposed that one possibility might be that participants were unfavourably comparing the very positive CBM-I material to their personal (not so consistently positive) experiences. Such comparisons with positive information were predicted to lead to mood deterioration (Markman & McMullen, 2003; Strauman & Higgins, 1987). In the present study, two new verbal conditions were created for the purposes of either increasing or decreasing comparisons.

As predicted, the critical result was that positive auditory CBM-I in the verbal comparisons condition led to greater increases in anxiety than both the imagery and verbal reduced-comparisons conditions. In line with predictions, in the verbal comparisons condition alone there was a significant increase in anxiety; in the imagery condition there was a significant decrease in anxiety; and within the verbal reduced-comparisons condition there was no significant change in anxiety. Thus, for state anxiety, the verbal reduced-comparisons condition ameliorated the negative emotional impact of thinking verbally about positive material. The finding that thinking about positive events using imagery reduces anxiety, whereas thinking about them verbally "can make you feel worse", appears robust for a verbal condition encouraging comparisons. Thus the current findings support the prediction that a feature of this new condition - comparative verbal processing - contributed, at least in part, to previous findings of an increase in negative mood when participants were exposed to the positive training material in a verbal condition.

The analogous pattern of results for positive affect seem less clear, however, since Watson, Clark and Tellegen (1988) have demonstrated the independence of positive and negative affect this may be unsurprising. Both verbal conditions resulted in lower PANAS scores than the imagery condition. Within both verbal conditions, there was a significant reduction in positive affect, whereas this had been expected only in the verbal comparisons condition. This independence of positive and negative affect has been further supported by MacLeod and Moore (2000) who present evidence suggesting these two factors are "mediated by separate psychological systems rather than opposite ends of a single dimension" (p.1). Making comparisons may account for changes in anxiety, and future studies need to further unpack mechanisms involved in changing positive affect.

While there was a significant difference between the imagery and both verbal conditions, the positive mood increase within the imagery condition alone did not reach significance. Apart from the changes detailed to create the two new verbal conditions, only one further modification to the Holmes et al. (2006) and Holmes, Lang and Shah (2009, Experiment 1) studies was made to the current experiment. This entailed the inclusion of the Self Guide Strength measure, prior to the training phase, to ensure groups were matched at baseline for tendency to make comparisons. Unfortunately the Self Guide Strength measure may have primed participants to make comparisons by explicitly requiring them to do so, prior to beginning training. Indeed, the manipulation check ratings for the training phase showed that the mean comparison score in the imagery condition reached the mid-range (see Table 2.2). Future research could compare whether effective imagery conditions are characterised by lower ratings of comparisons.

The Self Guide Strength measure may have also encouraged participants to generate observer perspective images, in the imagery condition. That is, making participants aware of the differences between their current self-concepts and the scenarios may have resulted in the generation of images from an observer perspective. This is in line with Libby and Eibach (2002), who asked participants to recall memories relating to different aspects of self which have changed. They found that these memories were more likely to be recalled from an observer perspective. They further extended this result to the construction of images and found that participants would generate observer perspective images of themselves when the image to be generated was related to things different to what they would conceivably do. Observer versus field perspective during positive auditory CBM-I has been found to result in more negative results in terms of state anxiety, positive affect and bias (Holmes,

Coughtrey, & Connor, 2008). In the context of the current experiment therefore, it is possible that the Self Guide Strength measure, by drawing participants' attention to the differences between current and wanted selves, prompted participants to imagine some scenarios from an observer perspective, causing the imagery condition to appear less effective at promoting positive mood than previously found. The Self Guide Strength measure will thus not be included in Experiment 2.

Both the results surrounding positive affect and state anxiety provide additional evidence for the robustness of the paradoxical effect of verbal processing instructions for positive auditory CBM-I. This finding is supported by literature in social psychology that has long held that comparisons result in different affective responses dependent on the direction of the comparison. When making comparisons with better-off (upward) or worse-off (downward) others, negative and positive affect follows respectively (Buunk, Collins, Taylor, VanYperen, & Dakof, 1990). In the verbal condition of the present experiment, the highly positive nature of the material may have promoted 'upwards comparisons' as most participants' lives would be unlikely to be as extremely positive as the material shown to them. This notion could offer an explanation for the finding of increased negative affect. Future studies could test a comparison manipulation using negative rather than positive training material. In this case, given the average participant may lead more positive lives than the typical highly negative training scenarios, downward comparisons would be expected, with an associated more positive response to negative material. Indeed in Holmes and Mathews (2005), the verbal negative condition led to less negative affect than the negative imagery condition.

The current results may also be consistent with other work on depressive rumination. As previously discussed, Treynor, Gonzalez & Nolen-Hoeksema (2003)

defined brooding as "passive comparison of one's current situation with some unachieved standard." Relatedly, Watkins (2004) defines a maladaptive form of ruminative processing as "conceptual-evaluative" which involves a more analytic focus on the causes, meanings and consequences, including "thinking about the self, focusing on discrepancies between current and wanted outcomes" (p. 1039). Recent support for the distinction between brooding rumination as 'maladaptive' and reflection as 'adaptive' comes from Rude, Maestas and Neff (2007), who found significantly higher positive correlations between brooding, depression and anxiety than between reflection and these mood states. Making unfavourable comparisons with positive information, as is the case in this experiment, may tap into one aspect of maladaptive depressive rumination. Interestingly and conversely, in Holmes and Mathews (2005), a verbal negative CBM-I condition led to less negative affect than an imagery negative CBM-I condition, suggesting that verbal thinking helped reduce negative affect (cf. Stöber & Borkovec, 2002). In this experiment, the negative training scenarios were highly negative, in comparison to which the average participant, very likely, had more positive daily experiences. Therefore, downward comparisons would be expected (Markman & McMullen, 2003) with an associated more positive response to negative material.

However, rather than addressing rumination per se or responses to thinking verbally about negative information, the current research explores negative responses to *positive* material. These results are consistent with other depression research indicating a difference in affective response to positive information. Joormann and Siemer (2004) compared dysphoric and non-dysphoric participants' response to thinking about positive autobiographical memories after inducing a negative mood. While the sadness ratings of non-dysphoric participants improved, those of

dysphorics did not. It was suggested that making comparisons between the past and one's current situation prompted dysphoric participants to recall the negative aspects of the positive memories thus interfering with the mood repair seen in the non-dysphoric participants (e.g., Conway & Ross, 1984, as cited in Joormann & Siemer, 2004). Feldman, Joormann and Johnson (2008) discuss dampening responses as "engaging in thoughts that would likely shorten the duration of positive affect". Self-report of dampening was associated with both rumination and depression. It is possible that making unfavourable comparisons with positive information contributes to dampening, and the failure of dysphoric participants to benefit from positive memories.

Future research using positive material with the CBM-I technique could seek to reduce the salience of unfavourable comparisons. For example, Mathews, Ridgeway, Cook and Yiend (2007) exposed participants to positive training descriptions in a graded manner. Other methods could include instructions not to compare, or stimulus speeding as attempted in the experimental manipulation.

Verbal processing might be particularly conducive to engaging in comparative thinking due to rich semantic networks available in a verbal mode. Switching to use imagery may be useful in this regard. Future studies also need to fractionate the effects of making comparisons and imagery more precisely. For example, observer perspective imagery may facilitate comparisons (Kuyken & Howell, 2006) and reduce affect. In contrast, it would be predicted that field perspective imagery would be most beneficial for positive CBM-I. This will be explored in the next experiment.

There were no perceived differences in difficulty concentrating during the training phase between the three conditions. Manipulation check ratings were consistent with adherence to the appropriate condition instructions during the training

phase, though experimenter demand cannot be ruled out. Despite unsuccessfully seeking evidence for alternative explanations for the results, caution should still be drawn about conclusions since it is always possible an additional variable incidental to the experimental manipulation could have accounted for the pattern of results.

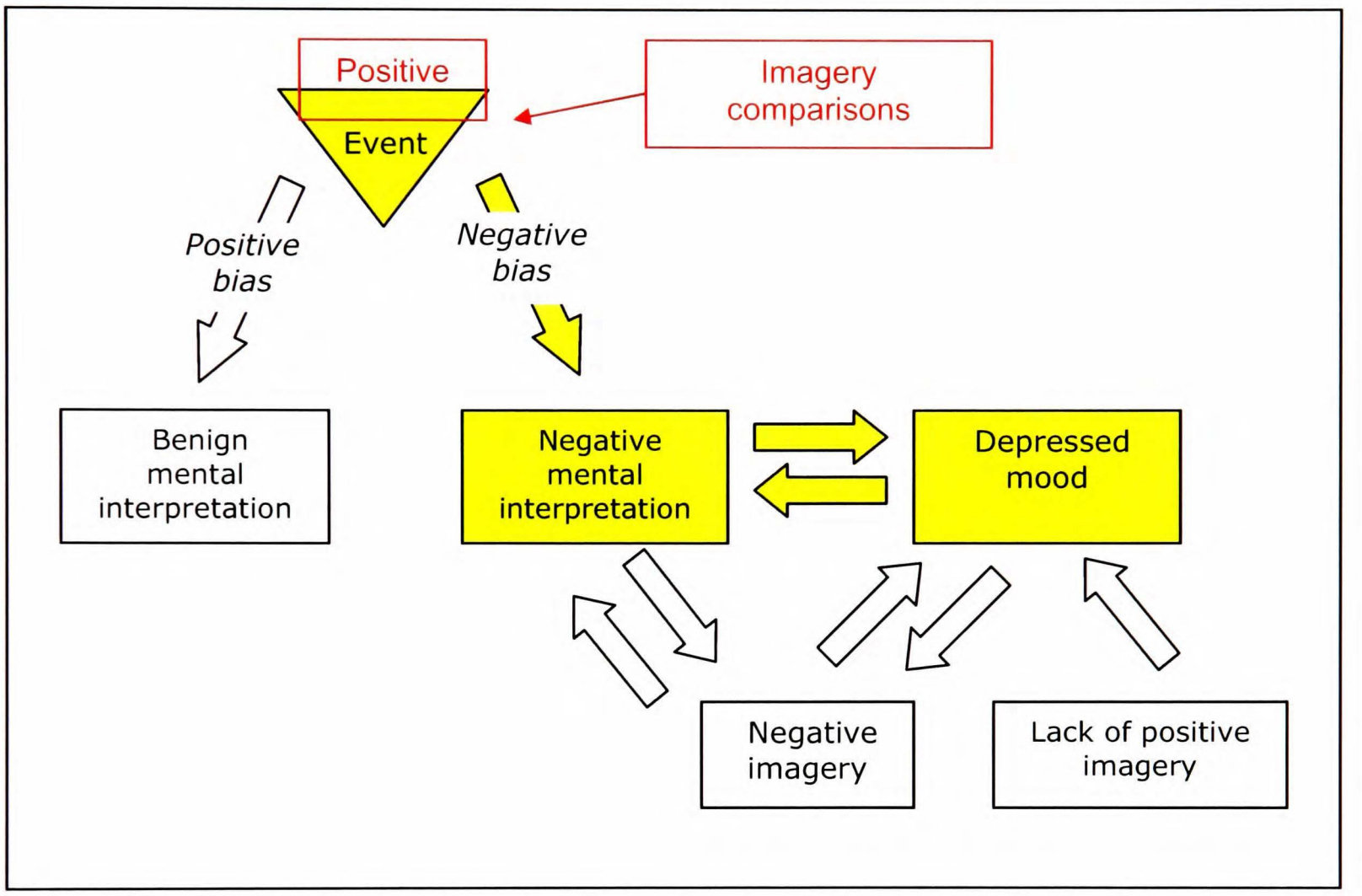
A recent study published since conducting this experiment is by Standage, Ashwin and Fox (2009). It compared the effects of a visual and an auditory presentation of CBM-I stimuli for *both* positive and negative conditions. Against hypotheses, this experiment's version of auditory CBM-I led to mood deterioration across *both positive* and negative conditions. Consideration of the method shows that a brief imagery instruction was given, but it is possible that this may have been insufficient. In contrast, the imagery instructions in the current thesis are detailed and extensive with practise examples (see Appendix 2.3). Standage et al. (2009) did not report results of any manipulation checks to determine whether participants were engaging in imagery or not. It is possible that participants may have verbally processed the material. Such verbal processing could explain their mood deterioration results in the positive condition. This remains to be tested.

A limitation of the current experiment is that only imagery versus verbal conditions were contrasted. Future research should use a third "control" condition to acquire baseline data concerning the trajectory of mood across the session in the absence of either training manipulation. Such a condition would allow the conclusion that not only the original verbal and imagery conditions differed in their emotional impact, but also whether they made a generally negative or a generally positive contribution. It would clearly be clinically beneficial to develop CBM-I techniques, which are enjoyable rather than aversive to do. A control condition without direct processing instructions will thus be explored in Experiment 2.

Overall, the results of the current experiment suggest that making unfavourable comparisons with the positive auditory CBM-I material may be at least partially responsible for the increase in negative emotion observed in response to verbal processing instructions in Holmes et al. (2006) and Holmes, Lang and Shah (2009, Experiment 1). It remains possible, however, that making comparisons with positive information regardless of whether the mode of processing is verbal will result in mood deterioration. The aim of the next experiment (Experiment 2) was thus to investigate whether making comparisons between the self and the material presented during positive auditory CBM-I in an *imagery* instruction condition, would also result in negative emotional consequences.

CHAPTER 3

Experiment 2: Do Imagery Instructions Encouraging Comparisons with Material Presented in Positive CBM-I Lead to Mood Deterioration?



Aim

Experiment 1 investigated what aspect of verbal processing was responsible for the paradoxical increases in negative emotions following positive auditory CBM-I in a verbal instruction condition found in Holmes et al. (2006) and Experiment 1 of Holmes, Lang and Shah (2009). Results suggested that making unfavourable comparisons with the positive material presented during CBM-I was driving, at least in part, the greater increases in negative emotions.

It is possible that making comparisons with positive information, regardless of processing mode (verbal or imagery), could result in negative emotional effects. The current experiment thus aimed to further investigate the role that making comparisons with positive information plays in generating these negative effects by manipulating comparisons within an *imagery* (rather than verbal) instruction CBM-I condition.

As previously outlined in Chapter 2, an imagery instruction CBM-I condition may be less conducive to participants making unfavourable comparisons than a verbal instruction CBM-I condition. This is because imagery processing can be extremely absorbing and making comparisons in an imagery mode may be less automatic and more effortful than in a verbal mode, requiring active switching between images or switching in between imagery and verbal modes. It remains possible however, to make comparisons whilst using mental imagery. Indeed, Kuyken and Howell (2006) have suggested that observer perspective imagery is more likely to encourage comparisons with the self, compared to field perspective imagery. That is, imagining as if seeing oneself (observer perspective) is more likely to allow for comparisons with the self to be made than imagining as if experiencing a situation through one's own eyes (field perspective).

Libby and Eibach (2002) have demonstrated that when there is a discrepancy between current and ideal self, observer perspective memories are more likely to be retrieved. This is particularly relevant to depression with large reported discrepancies between actual and ideal self (Strauman, 1989). Indeed, depression has been found to be associated with a greater tendency to recall autobiographical memories from an observer perspective. This phenomenon has been reported in depressed adolescents (Kuyken & Howell, 2006), depressed adults (Lemogne et al., 2006) and previously depressed individuals (Bergouignan et al., 2008). Furthermore, Kuyken and Moulds (2009) examined autobiographical memory perspective in participants with a history of recurrent depression prior to completing one of two treatments, either maintenance antidepressants or mindfulness-based cognitive therapy (MBCT). They found that participants with a greater tendency to recall observer perspective memories pre-treatment had higher post-treatment levels of depression.

As described in Chapter 2, Holmes, Coughtrey et al. (2008) manipulated imagery perspective with positive auditory CBM-I. They found that compared to field perspective imagery, observer perspective imagery instructions for positive auditory CBM-I resulted in mood deterioration. It is possible that comparisons were encouraged within the observer perspective imagery condition causing this mood deterioration. The research outlined above suggests that observer perspective imagery is more likely than field perspective imagery to encourage comparisons with the self. In attempting to test an imagery instruction condition less likely to encourage comparisons with the positive auditory CBM-I material, field perspective imagery instructions appear likely to be optimal.

In the current study, two new imagery conditions were created which aimed to either increase or reduce the amount of comparisons being made whilst imagining the

CBM-I stimuli: One condition included imagery instructions encouraging a field perspective, attempting to reduce the likelihood that comparisons would be made (imagery field condition). A second condition, matched for imagery field instructions, was included with the addition of instructions encouraging comparisons (similar to the verbal comparisons condition from Experiment 1) between the self and the positive auditory CBM-I stimuli (imagery field-comparisons condition).

Results from Experiment 1 also indicated that an imagery condition as opposed to two verbal conditions was more effective at promoting positive emotion. However, from the previous experimental design it was only possible to conclude that the imagery condition was superior, relative to the two verbal conditions, and not that imagery actually enhanced the effects of the CBM-I technique per se. The current study therefore includes a mere exposure control condition, with no direct processing instructions to determine the natural trajectory of mood resulting from positive auditory CBM-I. When comparing with such a control condition, it would be possible to examine whether imagery would give rise to greater positive emotional effects (such as decreases in anxiety and increases in positive affect).

The two main research questions were thus (i) whether comparisons between the self and the positive auditory CBM-I material would elicit negative effects even in an imagery condition (ii) whether field perspective imagery would be better at promoting positive emotional and bias effects than merely being exposed to the positive auditory CBM-I material.

To test these questions, three between-subjects instructional conditions were compared, imagery field condition, imagery field-comparisons condition and the mere exposure condition.

Hypotheses

The key hypotheses were that:

1. Following positive auditory CBM-I, participants in the imagery field-comparisons condition compared to the imagery field condition, would have greater increases in state anxiety (STAI), with complementary effects on positive affect (PANAS) and on interpretation bias (ambiguous scenarios test). In particular, the imagery field condition was expected to lead to larger decreases in anxiety and negative interpretation bias (and greater increases in positive affect) than the mere exposure condition.

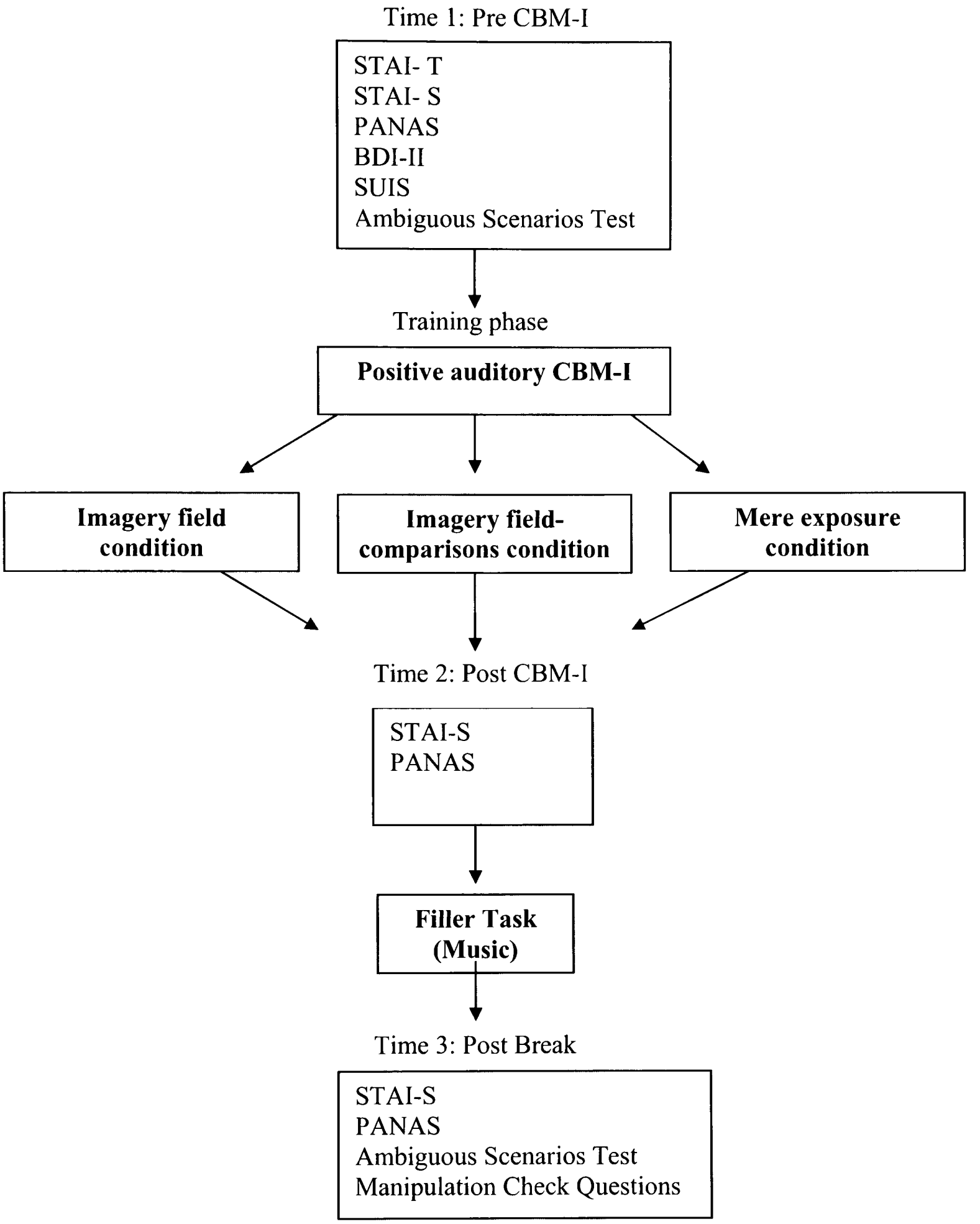
2. Within the imagery field-comparisons condition alone there would be significant deterioration in mood and bias from pre to post CBM-I. Within the imagery field condition, improvements of both mood and bias over the training phase would be anticipated.

Method

Overview

A mixed design was employed whereby participants were randomly allocated to one of three positive auditory CBM-I conditions. A diagram of the procedure is presented in Figure 3.1. Participants were either instructed to process the positive auditory CBM-I stimuli using field perspective mental imagery (imagery field condition), using field perspective mental imagery whilst comparing themselves with the material presented (imagery field-comparisons condition) or alternatively given the same stimuli with no processing instructions (mere exposure condition). Prior to the positive auditory CBM-I, participants completed measures of mood and interpretation bias. Upon completion of training, participants re-completed mood measures. To reduce the influence of state mood differences between conditions prior to measuring interpretation bias, a filler task of music was completed. Interpretation bias measures were subsequently administered. Participants then completed manipulation check questions and were debriefed about the experiment.

Figure 3.1. Schematic overview of the experimental procedure.[3]



[3] STAI-S = State version of the State–Trait Anxiety Inventory, STAI-T = Trait version of the State–Trait Anxiety Inventory, PANAS = Positive and Negative Affect Schedule, BDI-II = Beck Depression Inventory II, SUIS = Spontaneous Use of Imagery Scale.

Participants

Sixty participants took part in the experiment, of which 24 were male and 36 female with a mean age of 29.02 years (SD = 8.30). Recruitment was as in Experiment 1.

Sample Size Estimation

The sample size for the current study was estimated based on the sample size of Experiment 1 and the power calculation conducted previously. It was thus determined that 20 participants per condition (as in Experiment 1) would be necessary for the current experiment.

Materials

Apparatus

The apparatus was the same as that used in Experiment 1.

Positive Auditory CBM-I Materials

The 100 auditory training descriptions with positive emotional outcomes were the same as that used in Experiment 1 and Holmes et al. (2006), Holmes, Lang and Shah (2009, Experiment 1) and Holmes, Coughtrey et al. (2008). As in Experiment 1, after each training paragraph, participants were asked questions to ensure they were focusing on the assigned task in each condition. For the imagery field-comparisons condition, participants were asked, similar to the verbal comparisons condition in Experiment 1, "how different was this image compared to your image of how things really are for you?" For the imagery field condition, following from Holmes, Coughtrey et al. (2008), participants were asked "to what extent are you experiencing this through your own eyes (as if you are actively involved)?" In the mere exposure

condition, participants responded to the question "how much were you attending to the description presented?" Responses were given on a 5-point scale ranging from 1 (*not at all*) to 5 (*extremely*).

Filler Task

The 10 min filler task was the same as that used in Experiment 1.

Interpretation Bias Measure

Ambiguous Scenarios Test (AST; Holmes et al., 2006). The Ambiguous scenarios test was used to measure interpretation bias as in Experiment 1.

Questionnaire Measures.

Spielberger State- Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAI was used as an index of both state and trait anxiety as in Experiment 1.

Positive subscale of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS was used to measure state levels of positive affect as in Experiment 1.

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II was used to measure levels of depressive symptoms as in Experiment 1.

Spontaneous Use of Imagery Scale (SUIS; Reisberg, Pearson, & Kosslyn, 2003). The SUIS was used to measure the spontaneous use of imagery in everyday life as in Experiment 1.

Manipulation Check Questions

Participants responded to six questions to determine whether they had adhered to the instructions given in their assigned condition as in Experiment 2.

Imagery, verbal use, and concentration during CBM-I were assessed as in Experiment 2. Unique to this experiment, participants were asked: (1) " How much were you imagining the situation from a bystander's point of view (i.e. watching the situation happening to yourself) as you were listening to the sentences?"; (2) "How much were you imagining the situation from a personal point of view (i.e. imagining the situation happening to yourself) as you were listening to the sentences?"; (3) "How much did you find yourself comparing the scenarios with how you are in reality as you were listening to the sentences?" All responses were made on a 9-point scale ranging from 1 (*not at all*) to 9 (*all the time*).

Procedure

An illustration of the procedure is presented in Figure 3.1. The procedure was the same as Experiment 2 with the following exceptions;

1. The Self Guide Strength measure was not included at baseline.
2. All experimental conditions and thus instructions to process the positive auditory CBM-I stimuli were modified from Experiment 2. In the imagery field condition, participants were instructed to imagine the description through their own eyes as if they were actively involved "please imagine it happening to yourself, as if you are there and you are actively involved in the situation and seeing what is happening through your own eyes. Don't imagine from an observer's perspective, and try to imagine as vividly as possible." For the imagery field-comparisons condition, participants were instructed to imagine as in the field condition, but with the addition of instructions to "compare this image, with an image of how things really are for you in reality." In the mere exposure condition, participants were instructed to "pay close attention to the scenarios presented." Both the

imagery field and imagery field-comparisons conditions, but not the mere exposure condition, began with a practice exercise learning how to imagine to cut a lemon from a field perspective (as in the imagery conditions in Experiment 2). For a full outline of all instructions see Appendix 3.I.

Results

Comparison of Participants in the Imagery Field-comparisons, Imagery Field and Mere Exposure Conditions at Baseline

There was no significant difference between conditions in terms of gender, $\chi^2(2, N = 60) = 0.42, p = .81$, see Table 3.1. The conditions were also comparable at baseline in terms of age, trait and state anxiety (STAI-S), imagery (SUIS), positive affect (PANAS), depression (BDI-II) and interpretation bias (AST), for each measure, $F(2,57) < 1$, see Table 3.2 for the mean values.

Table 3.1

Characteristics of Participants at Baseline per Condition

Characteristic	Imagery field (n = 20)		Imagery field-comparisons (n = 20)		Mere exposure (n = 20)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Age (years)	28.90	7.34	27.95	7.42	30.20	10.11
Gender (%)						
Female	55		60		65	
Male	45		40		35	
STAI Trait	40.75	11.11	36.80	12.89	38.55	10.83
BDI-II	9.85	9.72	7.70	8.11	7.00	4.87
SUIS	3.88	0.97	3.96	0.73	4.08	0.62

Note: STAI = State–Trait Anxiety Inventory, BDI-II = Beck Depression Inventory II, SUIS = Spontaneous Use of Imagery Scale.

Mood Change From Pre CBM-I to Immediately Post CBM-I

State Anxiety

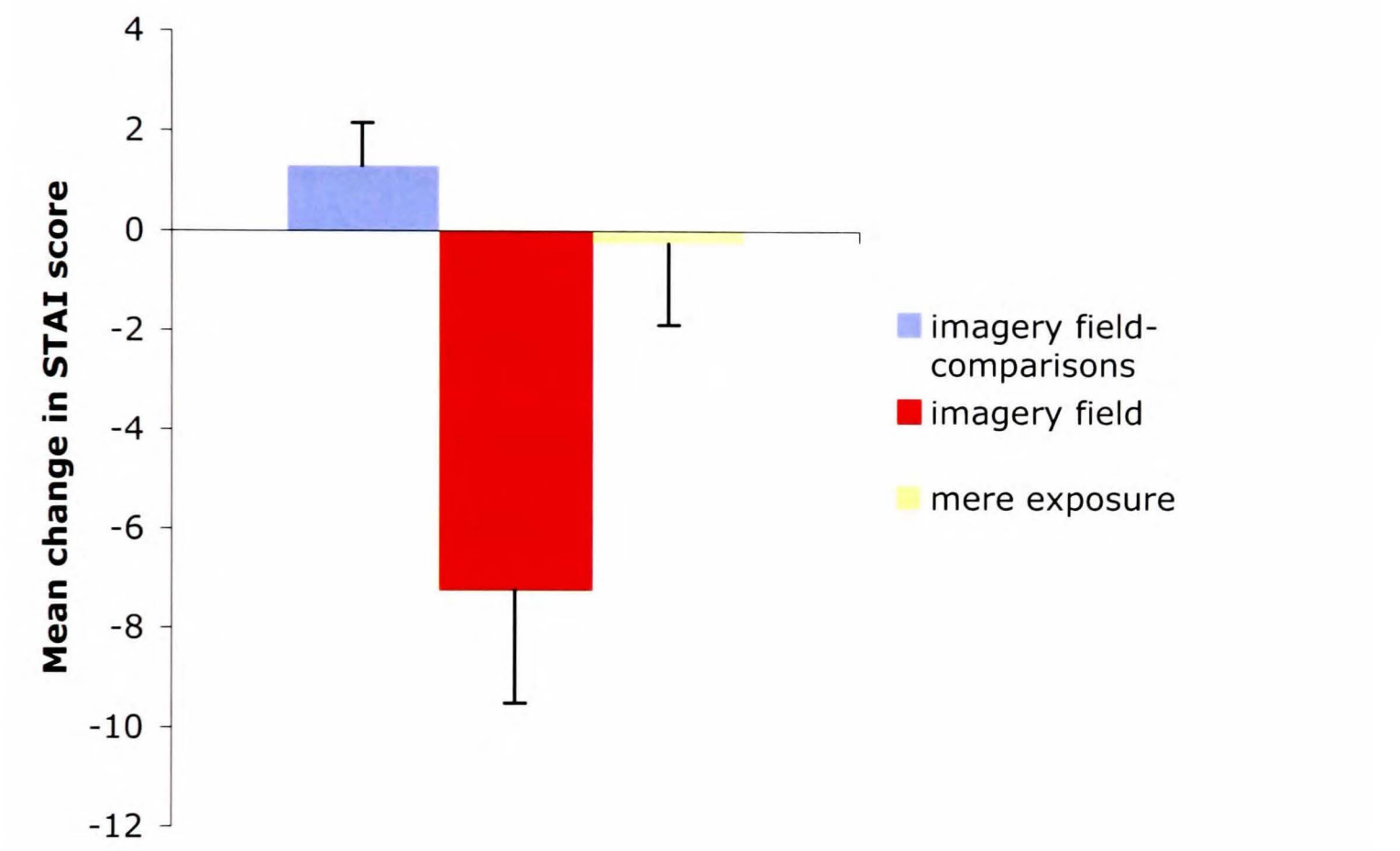
It was predicted that participants in the imagery field-comparisons condition would report greater increases in anxiety relative to the imagery field condition. In addition, it was anticipated that the imagery field condition would result in greater decreases in anxiety compared with the mere exposure condition.

A mixed model ANOVA was conducted with a between subjects factor of condition (imagery field-comparisons vs. imagery field vs. mere exposure) and a within subjects factor of time (pre vs. post CBM-I). There was a significant main effect of time, $F(1,57) = 4.48$, $p = .04$, $\eta_p^2 = 0.07$ with anxiety decreasing over time, and no main effect of condition $F(2, 57) < 1$. As predicted, there was a significant interaction between time and condition $F(2, 57) = 7.26$, $p = .002$, $\eta_p^2 = .15$. To decompose this interaction, changes in anxiety from pre to post CBM-I were compared between pairs of groups using independent samples *t*-tests. As hypothesised, the imagery field-comparisons condition reported greater increases in anxiety compared with the imagery field group, $t(38) = 3.53$, $p = .002$, $d = 1.11$, see Figure 3.2. As predicted, the imagery field condition resulted in significantly greater decreases in anxiety compared to the mere exposure condition, $t(38) = 2.50$, $p = .017$, $d = 0.79$. There was no significant difference between the imagery field-comparisons and mere exposure conditions, $t(38) < 1$.

Paired samples *t*-tests investigating changes in anxiety from pre to post CBM-I revealed, as predicted, a significant decrease in anxiety within the imagery field condition, $t(19) = 3.20$, $p = .005$, $d = 1.09$. There was no significant change in anxiety within the imagery field-comparisons condition, $t(19) = 1.50$, $p = .15$ or in the mere exposure condition, $t(19) < 1$. The inclusion of a Bonferroni correction to the analysis

of state anxiety (.05 / 3 = .017) as in Experiment 1 does not alter the pattern of results for state anxiety. See Table 3.2 for mean STAI scores at each time point.

Figure 3.2. Mean change in STAI scores from pre to post CBM-I. Error bars show one standard error of the mean.



Positive Affect

It was hypothesised that the imagery field condition would result in greater increases in positive affect compared to either the imagery field-comparisons or mere exposure conditions. This was tested using a mixed model ANOVA, similar to that described above. There was no main effect of time, $F(1, 57) = 0.34$, $p = .56$, or condition, $F(2, 57) = 0.56$, $p = .58$. There was a significant interaction between time and condition, $F(2, 57) = 9.09$, $p < .001$, $\eta_p^2 = .24$.

The directional hypothesis was tested by comparing changes in positive affect over time between pairs of the three groups using independent samples *t*-tests. As can be

seen in Figure 3.3 and as predicted, there was a significantly greater decrease in positive affect in the imagery field-comparisons condition compared to the imagery field condition, $t(38) = 4.27$, $p < .001$, $d = 1.35$. In addition, there was a significant difference between the imagery field and mere exposure condition, $t(38) = 3.43$, $p = .001$, $d = 1.09$. However, there was no significant difference between the imagery field-comparisons and mere exposure conditions, $t(38) < 1$.

Changes within each group were examined separately using paired samples *t*-tests. As predicted, there was a significant decrease in positive affect in the imagery field-comparisons condition, $t(19) = 2.70$, $p = .01$, $d = 0.10$. As expected, there was a significant increase in positive affect within the imagery field condition, $t(19) = 3.33$, $p = .004$, $d = 0.59$. There was a non-significant trend towards a decrease in positive mood in the mere exposure condition, $t(19) = 1.83$, $p = .08$, $d = 0.34$. See Table 3.2 for mean positive PANAS scores across time. As above, Bonferonni corrections do not alter the pattern of results for positive affect.

Figure 3.3. Mean change in PANAS scores from pre to post CBM-I. Error bars show one standard error of the mean.

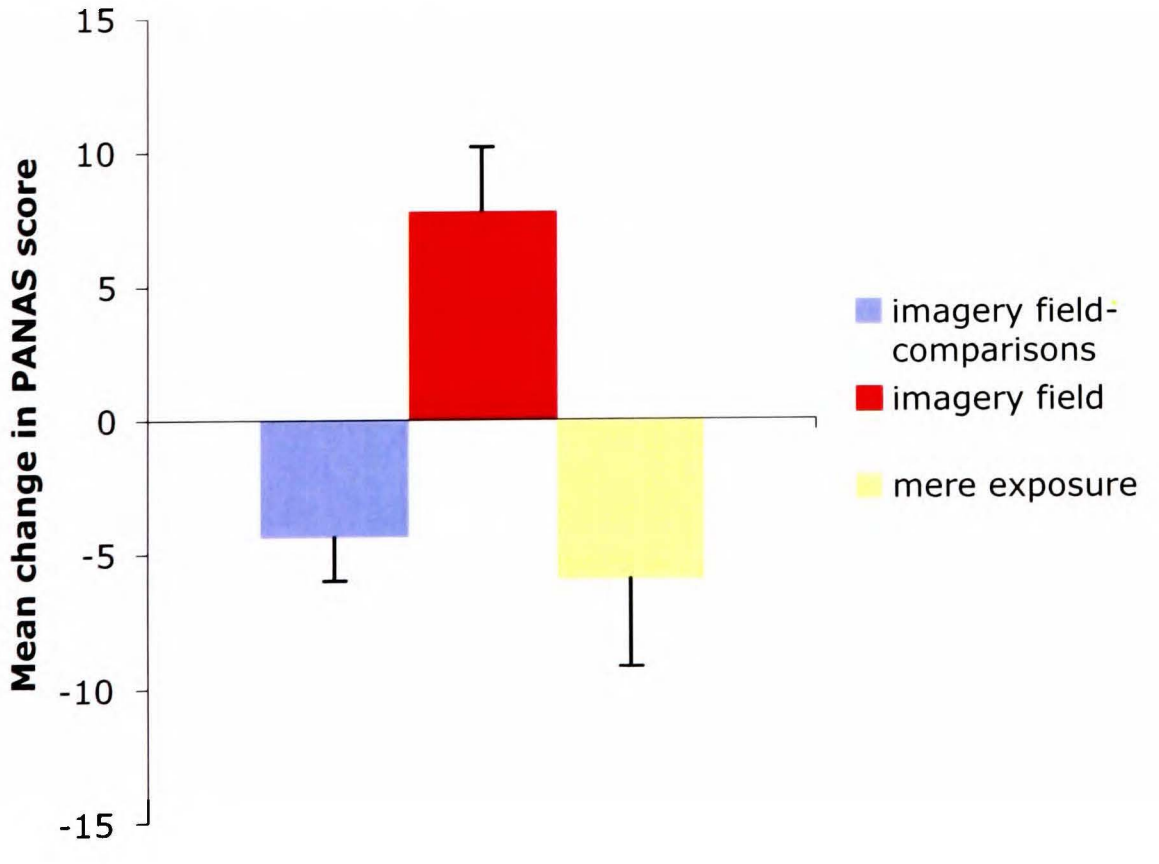


Table 3.2.

Means and Standard Deviations for State Mood Measures (STAI, PANAS), Emotionality Ratings for the AST and Manipulation Checks per Condition

Measure	Imagery field (n = 20)		Imagery field-comparisons (n = 20)		Mere exposure (n = 20)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Mood measures						
State STAI, time 1	35.45	11.55	32.65	11.07	31.55	6.51
State STA1, time 2	28.20	6.67	33.95	11.91	31.30	8.34
State STAI, time 3	30.10	5.51	33.65	13.10	29.15	5.33
PANAS positive, time 1	66.95	11.00	68.35	15.80	72.15	15.88
PANAS positive, time 2	74.80	15.46	63.95	14.27	66.15	18.84
PANAS positive, time 3	69.75	13.18	67.05	18.64	70.30	18.55
Bias measures						
AST, time 1	6.04	0.81	6.13	0.88	6.18	0.78
AST, time 3	6.42	0.82	6.12	0.92	6.19	0.95
Manipulation Checks						
Difficulty paying attention	6.85	1.93	6.50	2.06	6.90	1.62
Use of imagery	7.70	0.98	7.70	1.08	6.55	2.33
Use of verbal	2.70	1.56	3.80	2.53	6.60	1.85
Use of comparisons	4.60	2.72	7.30	1.78	6.50	2.40
Use of field perspective	7.65	1.42	7.55	1.00	5.70	2.85
Use of observer perspective	2.85	1.81	2.50	1.15	5.80	2.57

Note: Time 1 = pre-training, time 2 = immediately post-training, time 3 = after 10 min filler task post training, time 4 = after mood induction. STAI = State–Trait Anxiety Inventory, PANAS positive = total positive affect score from the PANAS, AST = ambiguous scenarios test; the emotionality ratings for the AST are anchored 1 = *extremely unpleasant* to 9 = *extremely pleasant*, manipulation check questions are anchored 1 = *not at all* to 9 = *all the time*.

State Anxiety and Positive Affect After the Filler Task

To reduce the influence of differences in mood between conditions prior to measuring interpretation bias, participants completed a 10 min filler task. A one-way ANOVA was used to examine differences in mood between conditions at time 3, prior to completing the interpretation bias measure. Analysis revealed no significant differences between conditions in terms of state anxiety, $F(2,57) = 1.47$, $p = .24$ or positive affect, $F(2,57) = 0.21$, $p = .81$.

Ambiguous Scenarios Test (Interpretation Bias)

It was hypothesised that participants completing the imagery field-comparisons condition would report greater increases in negative interpretation bias compared to the imagery field condition. Using a mixed model ANOVA to compare changes in pleasantness ratings from Time 1 to Time 3, there was a trend towards a main effect of time, $F(1,57) = 3.60$, $p = .06$, $\eta_p^2 = .06$ with negative bias decreasing over time. There was no significant main effect of condition $F(2,57) < 1$. As predicted, there was a significant interaction between time and CBM-I condition, $F(2,57) = 3.46$, $p = .04$, $\eta_p^2 = .11$. The directional hypothesis was tested by comparing changes on pleasantness ratings from the AST from pre to post CBM-I between conditions, using independent samples *t*-tests. The imagery field condition displayed greater increases in bias compared to the mere exposure condition, mean change = +.38 ($SD = 0.51$) and + .01 ($SD = 0.53$) respectively, $t(38) = 2.22$, $p = .03$, $d = 0.75$. The imagery field condition showed greater increases compared with the imagery field-comparisons condition (mean change = -.01, SD = 0.51), $t(38) = 2.35$, $p = .02$, $d = 0.70$. There was no significant difference between the imagery field-comparisons condition and mere exposure condition $t(19) < 1$.

Changes in interpretation bias in each condition were again tested separately. Paired-sample *t*-tests revealed that there was no significant change in interpretation bias over time within the imagery field-comparisons, $t(19) < 1$ or mere exposure condition, $t(19) < 1$. As predicted, there was a significant decrease in negative bias in the imagery field condition, $t(19) = 3.27$, $p = .004$, $d = 0.47$. The mean changes for each condition were in the predicted direction, see Table 3.2.

Manipulation Checks

Subjective experience ratings were made by participants regarding their experience of listening to the CBM-I training paragraphs. These ratings were compared using one-way ANOVAs and subsequently decomposed with independent samples *t* - tests. Mean scores are presented in Table 3.2. Participants in both the imagery field-comparisons and imagery field conditions reported using imagery more than participants in the mere exposure condition, $F(2, 57) = 3.51$, $p = .037$, $\eta_p^2 = .11$; imagery field versus mere exposure, $t(38) = 2.04$, $p = .049$, $d = 0.64$; imagery field-comparisons versus mere exposure, $t(38) = 2.00$, $p = .05$, $d = 0.63$; imagery field versus imagery field-comparisons, $t(38) < 1$.

In line with this, participants in the mere exposure condition, as expected, reported using verbal processing significantly more than both the imagery field condition and the imagery field-comparisons condition, $F(2, 57) = 19.85$, $p < .001$, $\eta_p^2 = .41$; mere exposure versus imagery field, $t(38) = 7.22$, $p < .001$, $d = 2.28$; mere exposure versus imagery field-comparisons, $t(38) = 4.00$, $p < .001$, $d = 1.26$; imagery field-comparisons versus imagery field, $t(38) = 1.66$, $p = 0.11$.

Use of comparisons were reported significantly more in the imagery field-comparisons condition than in the imagery field however not the mere exposure condition, $F(2, 57) = 7.07$, $p = .002$, $\eta_p^2 = .20$; imagery field-comparisons versus imagery field, $t(38) = 3.71$, $p = .001$, $d = 1.17$, imagery field-comparisons versus mere exposure, $t(38) = 1.20$, $p = .24$; imagery field versus mere exposure, $t\ (38) = 2.34$, $p = .02$, $d = 0.74$.

Use of field perspective imagery was used significantly more in both the imagery field and imagery field-comparisons compared to the mere exposure control condition, $F(2,57) = 6.49$, $p = .003$, $\eta_p^2 = .19$; imagery field versus imagery field-

comparisons, $t(38) < 1$; imagery field versus mere exposure, $t(38) = 2.74$, $p = .009$, $d = 0.87$; imagery field-comparisons versus mere exposure, $t(38) = 2.74$, $p = .009$, $d = 0.87$.

For observer perspective imagery, participants in the mere exposure condition reported significantly greater use compared with the imagery field-comparisons and imagery field condition, $F(2,57) = 17.61$, $p < .001$, $\eta_p^2 = .38$; mere exposure versus imagery field, $t(38) = 4.20$, $p < .001$, $d = 1.33$; mere exposure versus imagery field-comparisons, $t(38) = 5.25$, $p < .001$, $d = 1.66$; imagery field-comparisons versus imagery field, $t(38) < 1$.

The difficulty concentrating on the task ratings, did not differ between conditions, $F(2, 57) < 1$. This indicates that the different processing instructions for each condition did not result in any differences in how difficult they found each task. Overall, the current results indicate that participants adhered to the processing instructions given to each condition.

Discussion

The first aim of the current experiment was to investigate whether in an *imagery* instruction condition, making unfavourable comparisons with the material presented during positive auditory CBM-I would result in mood and bias deterioration. Findings from Experiment 1 indicated that making such comparisons in a verbal processing condition was responsible, at least in part, for the negative effects of verbal positive auditory CBM-I reported in early studies (Holmes et al., 2009; Holmes et al., 2006). However, the effect of 'mode' of processing (imagery vs. verbal) was unclear, that is, the question remains whether making comparisons with positive CBM-I would also have a negative effect. Therefore, in the current experiment, comparisons were manipulated within an imagery condition with two

new imagery conditions aimed to increase or decrease comparisons; the imagery field condition and imagery field-comparisons condition respectively.

The critical result was that, as predicted, participants in the imagery field-comparisons condition reported greater increases in state anxiety and greater decreases in positive affect compared to participants in the imagery field condition. As expected, manipulation checks confirm that participants in the imagery field condition reported spending significantly less time making comparisons with the CBM-I material than participants in the imagery field-comparisons condition. These results support the proposal that comparisons, as encouraged in the imagery field-comparisons condition, contributed to negative emotional responses to positive auditory CBM-I material. Making comparisons between the self and positive material appears to be 'toxic' irrespective of what mode of processing is used (i.e., imagery or verbal processing).

These findings once again (as in Experiment 1) demonstrate negative emotional effects in response to positive information. This is in line with Wood, Perunovic and Lee (2009) who found negative responses to positive self-statements. Wood et al. (2009) randomly assigned participants with high and low self esteem to either a self statement condition in which participants were asked to repeat a positive statement about the self (e.g., "I am a loveable person") or a no-statement condition (with no such instructions). Participants with low self-esteem felt worse when asked to repeat positive statements compared to those participants not instructed to repeat these statements. This is also consistent with the study conducted by Joormann and Seimer (2004) described previously (See Chapter 2).

The second aim of the current experiment was to determine whether imagery field perspective processing instructions for positive auditory CBM-I enhanced the

effects of the CBM-I technique compared to an exposure control condition. This control condition was added to ascertain the exact trajectory of mood without instructions regarding mode of processing. This therefore provided the opportunity to determine whether imagining from a field perspective was better at promoting positive affect and decreasing anxiety and negative interpretation bias, than simply being exposed to the positive auditory CBM-I material.

As hypothesised, imagery field perspective instructions for positive auditory CBM-I resulted in greater decreases in state anxiety and increases in positive affect than the mere exposure condition. Within the imagery field condition alone there was a significant increase of positive affect and decrease of state anxiety. These findings indicate that imagining positive information from a field perspective generates increases in positive affect relative to participants simply exposed to the positive auditory CBM-I material, or those instructed to make comparisons with those images. That is, imagining from a field perspective seems to enhance the effects of positive auditory CBM-I. It appears that it is not imagery processing in general that promotes the most effective positive auditory CBM-I, rather specifically imagery field perspective instructions, which seem to be critical. Of note, the imagery field condition successfully increased positive affect in this study while in Experiment 1 of this thesis imagery instructions failed to produce such increases. It was argued that the use of the self-guide strength measure may have inadvertently prompted participants to make comparisons with the CBM-I material.

It was proposed by Hoppitt, Mathews, Yiend and Mackintosh (in press) that the emotional effects of imagery based CBM-I are derived from the active generation of meaning (active processing). In the current study however, both the imagery field instructions and imagery field-comparisons instructions involve active processing and

do not similarly promote positive emotions as would be predicted by Hoppitt et al. (in press). Whilst active processing might explain in part why imagery elicits emotional effects, the current results and those of Holmes, Coughtrey et al. (2008) suggest that additional cognitive processes (such as making comparisons and imagery perspective) must be taken into consideration.

Studies suggest that observer perspective imagery compared to field perspective imagery can be protective against negative emotion (McIsaac & Eich, 2004), and is associated with reduced emotional intensity of both positive and negative emotions (Berntsen & Rubin, 2006). In the current study, the imagining of positive information from a field perspective is likely to have allowed for greater engagement with emotion (as suggested by Holmes et al., 2008), promoting the more positive emotional effects that were found.

As suggested by Blackwell and Holmes (2009), in the context of depression, harnessing field perspective imagery may be particularly relevant given that depressed mood is associated with increased use of observer perspective imagery (Williams & Moulds, 2007). Further, Williams and Moulds (2008) suggest that techniques promoting field perspective imagery and encouraging a change from observer perspective, (e.g., in recalling autobiographical memories), may help emotional processing and elicit reductions in negative affect. The use of field perspective imagery instructions with positive auditory CBM-I thus present exciting potential clinical implications and should be promoted when testing the applications of the CBM-I technique to depression for personal memories as the stimuli used here.

Field perspective imagery resulted in more positive interpretation bias compared to both the imagery field-comparisons condition and the mere exposure condition. As predicted, within the field perspective imagery condition alone, positive

interpretation bias significantly increased over time. Surprisingly, there was no significant change of interpretation bias within the mere exposure condition. In contrast both Mathews and Mackintosh (2000) and Hoppitt et al. (in press) suggest that mere exposure to CBM-I material should be sufficient to induce a bias. In Experiment 2 of Mathews and Mackintosh (2000) participants were simply exposed to the positive versus negative text based CBM-I material and not required to complete word fragments. Whilst changes in anxiety were not seen, the anticipated changes in interpretation bias were found. These findings were taken to indicate that active processing is only necessary to promote mood effects and not bias. The current findings suggest that for positive auditory CBM-I, additional instructions are necessary to modify interpretation bias. Specifically general imagery instructions (as in Holmes et al., 2009; Holmes et al., 2006) or specific imagery field perspective instructions are required.

It has been argued that observer perspective imagery encourages comparisons with the self (Kuyken & Howell, 2006). The findings in the current experiment are consistent with the contention that observer perspective imagery instructions for positive auditory CBM-I may derive its negative effects, as seen in Holmes, Coughtrey et al. (2008), by encouraging comparisons with the positive auditory CBM-I stimuli although this needs to be tested directly. In line with this assertion however, Holmes, Coughtrey et al. (2008) report mean decreases of positive affect from pre to post CBM-1 within the observer perspective condition of 4.8 (SD = 14.96) on the PANAS in line with mean reductions of 4.4 (SD = 15.04) points reported in the imagery field-comparisons condition in the current study.

However, there was no significant difference between the changes in anxiety and positive affect between the imagery field-comparisons condition and the mere

exposure condition. One potential reason for the lack of difference between these conditions could be the reportedly high levels of comparative processing undertaken during CBM-I in the mere exposure condition. In line with such an account, there was no significant difference between the two conditions on the manipulation check question for the amount of time spent making comparisons with the material during CBM-I.

Experiment 1 of the current thesis found that imagery instructions gave rise to the anticipated decreases in state anxiety but failed to show increases in positive affect. It was argued that the use of the self-guide strength may have inadvertently prompted participants to make comparisons with the CBM-1 material, reducing the effectiveness of the imagery condition. In the current study, participants were instructed to imagine from a field perspective that demonstrated the hypothesised increase in positive affect alongside the decrease in state anxiety. This difference in findings between the current study and those in Experiment 1 is not surprising, given the exclusion of the self-guide strength measure and the clinical and cognitive literature regarding the use of field perspective imagery.

It could be argued that the different processing instructions for each condition required differing levels of concentration, giving rise to the differential emotional effects of the CBM-I technique. However, participants in the three conditions did not differ in their concentration ratings during the task.

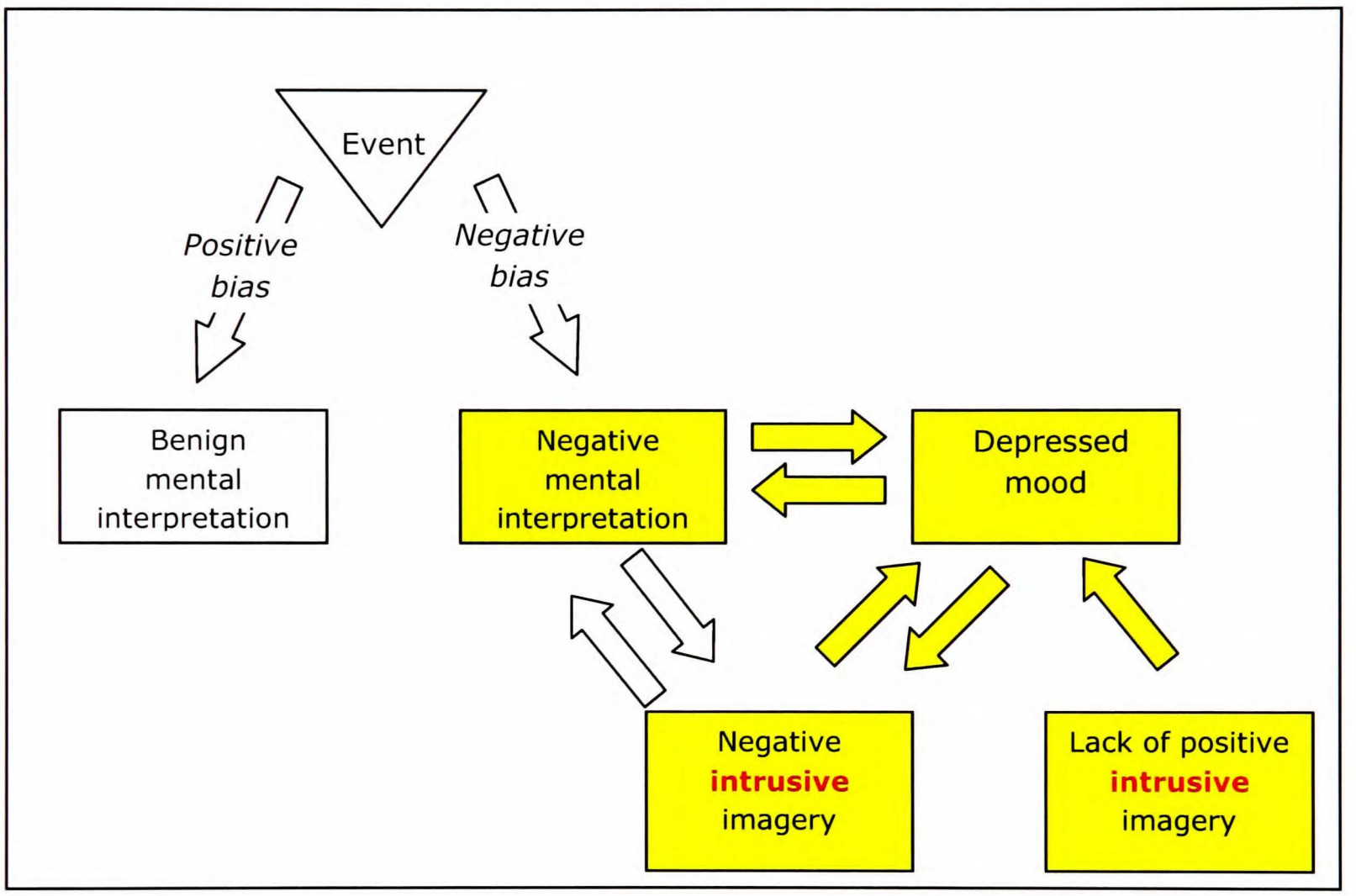
In conclusion, the results of the current study suggest that making comparisons with positive material produce negative emotional effects from positive auditory CBM-I even in an imagery mode. Thus, since a similar effect was found in a verbal condition (Experiment 1), it appears that 'comparisons' rather than mode of processing is critical. These findings indicate first, that to use positive auditory CBM-I

as a potential therapeutic technique, comparisons between the self and material presented should be discouraged. Second, compared to mere exposure, imagining from a field perspective enhances the emotional and bias effects of positive auditory CBM-I. Therefore in the clinical study presented in Experiment 6, field perspective imagery instructions will be used alongside instructions to discourage comparisons.

Variations of the current measure of interpretation bias, the AST, have been developed in the context of anxiety. However, to my knowledge no published studies have confirmed that this measure assesses a bias relevant to depressive symptoms even though it is based on a theoretical assumption that it should. Before embarking on Experiment 6, the next chapter examines the relationship between interpretation bias, as measured by the AST, and depressive symptoms alongside considering mental imagery in a large unselected sample. It can be informative to assess biases in populations of interest as part of developing CBM techniques (MacLeod, Koster, & Fox, 2009).

CHAPTER 4

Study 3a and 3b: Two Exploratory Studies Concerning the Relationship Between Depressive Symptoms, Interpretation Bias and Use of Mental Imagery in a Non-Clinical Sample



Aims and Background

Study 3a and 3b were conducted as exploratory studies to examine associations between depressed mood, interpretation bias on the AST and mental imagery in two large unselected samples. As previously outlined, there are many established cognitive predictors of depression such as overgeneral autobiographical memory (Williams et al., 2007) and rumination (Nolen-Hoeksema & Morrow, 1991). By no means did the current studies aim to examine the best predictors of depressive symptoms, instead the focus was on examining two processes discussed by Holmes et al. (2009) (mental imagery and interpretation bias) which represent a neglected area of research worthy of attention. It is important to do this as part of developing CBM techniques (MacLeod, Koster, & Fox, 2009).

The aspects of cognitive processing indicated by the framework of the experimental psychopathology sub-components model of depression (Holmes et al., 2009) are discussed earlier in this thesis (Chapter 1). The work suggests that interpretation bias along with a mental imagery bias (consisting of a preponderance of negative imagery and lack of positive imagery) may act independently and interact to contribute to depressed mood. This is in line with Hirsch, Clark and Mathews (2006) who proposed a 'combined cognitive bias hypothesis' that suggests that biases should be examined in combination instead of in isolation.

As previously reviewed (Chapter 1), negative interpretation bias has long been assumed to be associated with depression and experimental research has frequently found such a relationship. The mental imagery literature reviewed in Chapter 1 indicates a mixed pattern in depression. Depression is associated with decreased specificity of autobiographical memory (Williams et al., 2007), reduced vividness of

positive future imagery (Holmes, Lang, Moulds, & Steele, 2008; Williams et al., 1996) and longer image generation latencies (Cocude, Charlot, & Denis, 1997) compared to non depressed controls or individuals low in dysphoria. On the other hand, depression has also been associated with negative intrusive imagery and a greater vividness of imagery of both positively and negatively valenced International Affective Picture System pictures (Bywaters, Andrade, & Turpin, 2004). To my knowledge, no studies have examined a trait tendency to use mental imagery in depression. I suggest the Spontaneous Use of Imagery Scale (SUIS; Reisberg, Pearson, & Kosslyn, 2003) which measures a general tendency to spontaneously use mental imagery in everyday life assess such a trait tendency. Participants respond to statements such as "before I get dressed to go out, I first visualise what I will look like if I wear different combinations of clothes" and rate how appropriate these were.

The current chapter includes two exploratory studies investigating imagery and interpretation bias in the context of depressed mood. The first study (Study 3a) examined whether negative interpretation bias as measured by the AST and differences in the use of imagery would be revealed between high and low dysphoric individuals. The second study (Study 3b) further explored the nature of the relationship between imagery and depressive symptoms and assessed the relative contribution of positive and negative imagery in the explanation of the variance in depressive symptoms.

Study 3a

Aim

The aim of Study 3a was to assess the association between interpretation bias, tendency to use mental imagery and depressive symptoms. In so doing, the current study examined the following:

1. Whether high dysphoric participants (BDI-II score $\geq$ 14) would demonstrate a greater negative interpretation bias (as measured by lower scores on the AST) compared to low dysphoric participants (participants with a BDI-II score $\leq$ 6).

2. Whether any relationship would be indicated between a trait tendency to use mental imagery and depressive symptoms. No specific hypotheses were formulated given that, as reviewed above, research regarding mental imagery performance in depression is mixed.

3. Whether interpretation bias and the tendency to spontaneously use imagery would explain any proportion of the variance in depressive symptoms (BDI-II scores) collectively and/or independently.

Method

Participants

The 289 participants with a mean age of 26.67 (*SD* = 8.9) comprised 115 males and 174 females. On the basis of BDI-II scores, a subgroup of participants were categorised as high dysphoric (BDI-II $\geq$ 14, N = 53) or low dysphoric (BDI $\leq$ 6, N = 153) as in Mould and Kandris (2006) and Holmes, Lang et al. (2008). Participants were recruited through online advertisements, posters displayed around Oxford city, and voluntary sign-up during orientation week at two Oxford universities. Participants were reimbursed a nominal amount for their time.

Measures

Questionnaire Measures

Beck Depression Inventory - Second Edition (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a self-report questionnaire used to measure depressive symptoms as in Experiment 1 and 2.

Spontaneous Use of Imagery Scale (SUIS; Reisberg et al., 2003). The SUIS questionnaire was used to measure the tendency to spontaneously use mental imagery as in Experiment 1 and 2. It is considered a trait measure of imagery and is highly correlated with the VVIQ but is much briefer to administer.

Interpretation Bias Measure

Ambiguous Scenarios Test (AST; Holmes, Mathews, Dalgleish, & Mackintosh, 2006). The AST was used to measure interpretation bias as in Experiments 1 and 2.

Procedure

Participants came to the laboratory and provided their written informed consent. Participants subsequently completed the BDI-II and the SUIS in random order. Participants then completed the AST which involved listening to the ambiguous test descriptions over headphones and completing pleasantness ratings. Measures were collected in a testing battery prior to any experimental manipulation in studies conducted between September 2005 and November 2008 in the Experimental Psychopathology and Cognitive Therapy team.

Results

Comparison of High Dysphoric Versus Low Dysphoric Participants

Mean scores on the self-report measures of depressive symptoms, state mood, use of imagery and interpretation bias for the high and low dysphoric groups are presented in Table 4.1. For the combined high and low dysphoric groups the sample size was 206. The two groups did not significantly differ in age $t(204) = .05$, $p = .96$ or gender, $\chi^2(1, N = 206) = 2.01$, $p = .16$. Compared to the low dysphoric group, the high dysphoric group had higher BDI-II scores, $t(204) = 29.73$, $p < .001$.

Independent samples t – tests revealed high dysphoric participants reported lower pleasantness ratings on the AST, $t(204) = 4.58$, $p < .001$, $d = 0.85$ compared to low dysphoric participants. This indicates as expected, a greater negative interpretation bias in the high dysphoric compared to low dysphoric participants. In addition, high dysphoric participants reported a greater tendency to spontaneously use imagery (SUIS scores) compared to low dysphoric participants, $t(204) = 2.34$, $p = .02$, $d = 0.37$.

Table 4.1

Means and Standard Deviations for Self-Report Measures for Both High and Low Dysphoric Groups

	High dysphoric ($n = 53$)		Low dysphoric ($n = 153$)	
	M	*SD*	*M*	*SD*
BDI-II	20.74	6.41	3.07	2.15
SUIS	4.04	0.92	3.73	0.81
AST	5.73	1.03	6.44	0.76

Note. BDI-II = Beck Depression Inventory-II; SUIS = Spontaneous Use of Imagery Scale and AST = Ambiguous Scenarios Test.

Regression Analysis

To investigate whether interpretation bias and the use of imagery explained a significant proportion of the variance in depression collectively and/or independently, a stepwise multiple regression analysis was conducted. Together imagery and interpretation bias were able to predict 13.8 % of depressive symptoms on the BDI-II, (adjusted $R^2 = 0.14$, $F(2,286) = 22.96$, $p < .001$). As can be seen in Table 4.2, the AST uniquely predicted 11.0% of depressive symptoms. The SUIS scores contributed an additional 2.8% to the prediction of the variance. This indicated that the SUIS

significantly contributed to the prediction of depressive symptoms over and above the predictive power of the AST.

Table 4.2

Summary of Stepwise Regression Analyses Predicting Depressive Symptoms (BDI-II)

Step	R^2	Change in R^2	*t*	*p*	*Beta*
1 Interpretation bias: AST	*.11*	*.11*	*5.96*	*<.001*	*-.33*
2 SUIS	.14	.03	3.07	.002	.15

Note. BDI-II = Beck Depression Inventory-II; SUIS = Spontaneous Use of Imagery Scale and AST = Ambiguous Scenarios Test.

Discussion

The current study aimed to examine any relationships between depressive symptoms, interpretation bias and the tendency to spontaneously use mental imagery. Three main findings emerged. First, as predicted, high dysphoric participants displayed a greater negative interpretation bias than low dysphoric participants on the AST. This indicated that the AST, discriminates between high and low dysphoric participants. This suggests that the AST is a measure of bias relevant to depressive symptoms. This is important in the context of the CBM-I research as it is important to demonstrate that the bias targeted by such techniques is a bias relevant to the population of interest (MacLeod et al., 2009).

The relationship between negative interpretation bias and depressive symptoms using the AST is consistent with theory and other studies using different measures of interpretation bias. For example, the scrambled sentences test (SST), face recognition test and the human blink reflex response (Joormann & Gotlib, 2006; Lawson, Macleod, & Hammond, 2002; Rude, Valdez, Odom, & Ebrahimi, 2003; Rude,

Wenzlaff, Gibbs, Vane, & Whitney, 2002). Whilst variations of the AST have been used in a number of CBM-I studies (e.g., Holmes & Mathews, 2005; Holmes et al., 2006; Mathews & Mackintosh, 2000), to my knowledge no published research has tested the AST independent of the CBM-I technique. The current study thus presents the first independent test of the AST.

The second main finding was that high dysphoric individuals reported higher SUIS scores compared to low dysphorics indicating that individuals higher in depressive symptoms reported a greater tendency to use imagery in their everyday life than individuals lower in depressive symptoms. In contrast Holmes et al. (2008) found that high versus low dysphoric individuals did not differ in their tendency to spontaneously use mental imagery, though means were in the same direction. In Holmes et al. (2008) however, a smaller sample size was tested and the comparison between high and low dysphoric participants indicated a small effect size (with high dysphorics higher on the SUIS). This suggests that there was potentially insufficient power to detect the effect. The finding thus requires a test of replication and will be investigated in the next study (Study 3b).

It could be argued that the finding of a greater tendency to use mental imagery in high dysphoric individuals is in contrast to some of the previous findings reporting problems with mental imagery in depression. For example, studies that have found that patients with depression report overgeneral autobiographical memory indicating problems recalling specific images of the past (Williams, 1996; Williams et al., 2007; Williams, Healy, & Ellis, 1999), take longer to generate images (Cocude et al., 1997), have problems with mental image rotation tasks (Zarrinpar, Deldin, & Kosslyn, 2006) and lack vivid positive prospective imagery (Holmes et al., 2008; Stöber, 2000). However, these findings relate to 'deliberately generated' as opposed to 'spontaneously

occurring' images (Mace, 2007). I suggest that the SUIS is a measure consistent with assessing spontaneously occurring images. The findings reported here thus do not contradict those previously found and suggest that the difficulties with imagery in depression may be particular to deliberately generated imagery.

The third main finding is that mental imagery and interpretation bias were collectively able to explain a small but significant proportion of the variance (13.8%) in depressive symptoms, with a medium effect size found for the regression equation according to Cohen (1988). Independently they each also made a significant contribution. The individual contributions, however, appeared smaller than the overall contribution of the two variables together.

In comparison to other cognitive variables that make important and substantial contributions to depression for example, overgeneral autobiographcial memory (Williams et al., 2007) and rumination (Nolen-Hoeksema, 1991) the interpretation bias and tendency to use mental imagery does explain a smaller proportion of the variance in depressive symptoms. For example, overgeneral autobiographical memory independently explained 33% of the variance in depressive symptoms in Brittlebank, Scott, Williams and Ferrier (1993) and rumination independently explained from 44% (Raes et al., 2006) to 19% (Nolen-Hoeksema & Morrow, 1991) of the variance in depressive symptoms. The current study did explain 13.8% of the variance which is in line with other studies exploring interpretation bias such as Rude et al. (2002) who found that interpretation bias as measured by the Scrambled Sentences Test (SST) in males, accounted for 14% of the variance in predicting BDI-II scores.

Limitations of the Current Study

It is important to acknowledge some limitations of the current study. As discussed, the finding of a greater tendency to use mental imagery in high dysphoric compared to low dysphoric individuals requires a test of replication. This will be tested in the next study (Study 3b). In addition, the SUIS was used to measure the general tendency to spontaneously use mental imagery but it does not distinguish between positive and negative mental imagery. The next study (Study 3b) will thus examine whether the finding of greater spontaneous use of imagery can be attributed to positive and/or negative images.

Study 3b

Aim

The aim of the current study was to attempt to test a replication of the finding from Study 3a that the tendency to spontaneously use imagery was elevated in high dysphoric participants compared to low dysphoric participants. In addition to the SUIS, a measure of the frequency of positive and negative intrusive images in the past week was included. The current study further aimed to examine whether a simple measure of positive and/or negative imagery would contribute more to the prediction/explanation of the variance in depressive symptoms.

A newly revised version of the AST was included in the current study, the Ambiguous Scenarios Test – Revised (AST-R). Recent pilot work by Berna (2009) tested newly developed ambiguous test descriptions along with the previously used descriptions from Holmes et al. (2006), for their ability to discriminate between individuals, high and low, in depressive symptoms (as determined by a quartile split). It appears a number of the descriptions tested had enhanced relevance to depression.

The current study was conducted over the internet. Evidence for the utility of web-based surveys to examine mental imagery generation is provided by Libby, Shaeffer, Eibach, and Slemmer (2007). In a web-based study, these investigators successfully manipulated participants' visual perspective of an imagined future event and observed changes in subsequent behaviour.

Hypotheses

It was predicted that:

1) As in Study 3a, high dysphoric individuals would report a greater tendency to spontaneously use imagery, as measured by the SUIS, than low dysphoric individuals.

2) Compared to low dysphoric participants, high dysphoric participants would report a greater frequency of negative intrusive images, and fewer positive images over the week.

3) As in Study 3a, the variance of depressive symptoms would be significantly predicted by both positive and negative imagery as well as interpretation bias independently and collectively.

Method

Participants

The 208 participants were 72 males and 136 females, with a mean age of 22.49 years (SD = 5.02). Participants were recruited via e-mail within the University of Oxford with a link to the web-based survey. An incentive was offered to complete the survey – entering a cash prize draw of approximately £100. On the basis of BDI-II scores as in Study 3a, a subgroup of participants were categorised as high (BDI-II $\geq$14; N = 70) or low (BDI-II $\leq$ 6; N = 74) dysphoric.

Measures and Procedure

The Bristol Online Surveys (BOS; 2007) software was used to create the web-based survey. This online survey was posted online in collaboration with another DPhil student Chantal Berna. Participants gave their informed consent on-line, and then completed the questionnaires in the following order:

Beck Depression Inventory-II (BDI-II; Beck et al., 1996) was used to measure levels of depressive symptoms. This was used as in Experiments 1 and 2 and Study 3a.

Spontaneous Use of Imagery Scale (SUIS; Reisberg et al., 2003). The SUIS was used to measure the tendency to spontaneously use imagery in everyday life as in Experiments 1, 2 and Study 3a.

Ambiguous Scenarios Test Revised (AST-R). A revised set of ten ambiguous test descriptions were selected for the AST-R used in the current study (including only 2 of the original items). Eight items were different from those used in Study 3a. These were chosen in the following way: Pilot work by Berna (2009) tested an additional 35 newly developed descriptions that aimed to have enhanced relevance to depression compared to those used in the AST (Holmes et al., 2006) applied in Experiments 1 and 2, and Study 3a. Twenty of the descriptions tested in this pilot work were used by Blackwell (2009) to assess interpretation bias in a clinical case series testing positive auditory CBM-I in individuals with depression. From these 20 descriptions, ten were selected for the current study (to follow using ten descriptions in Experiment 1, 2 and Study 3a). This was based on how well they were able to distinguish between high and low levels of depressive symptoms (based on a quartile split of the pilot data from Berna, 2009 taking the top quartile as high depressive vs. the bottom quartile as low depressive). The top ten items best able to discriminate between these groups were selected which included 2 of the original AST items from Holmes et al. (2006; and used in experiment 1 and 2 and Study 3a). The current version of the AST-R was included in the online survey with the same instructions as those used in Berna (2009) taken from imagery instructions used in a task by Holmes, Lang et al. (2008) "Please quickly form a mental image of each of the following

scenarios. Imagine each scenario happening to you personally. Follow the first image that comes to mind, don't think too much. Then rate how pleasant your image is".

Frequency of positive and negative spontaneous mental images (Steele, 2007). This measure consists of two questions with instructions to "please answer the following questions for the period of the last week." These questions include; "how often have positive images popped into your mind" and "how often have negative images popped into your mind." Responses were made on a seven point scale from 1 (*never*) to 7 (*always*).

Results

Comparison of High Dysphoric Versus Low Dysphoric Participants

Means and standard deviations are presented in Table 4.3. The high and low dysphoric groups did not differ in age, $t(142) = 1.29, p = .20$ or gender, $\chi^2(1, N = 144) = 2.52, p = .15$. Compared to the high dysphoric group, the low dysphoric group had lower BDI-II scores, $t(142) = 18.45, p < .001$. An independent samples *t*-test indicated that compared to the low dysphoric group, the high dysphoric group reported a significantly greater tendency to spontaneously use mental imagery as measured by the SUIS, $t(142) = 2.83$, $p = .005$, $d = 0.48$ and a greater negative interpretation bias as measured by the AST-R, $t(142) = 4.68$, $p < .001$, $d = 0.77$. Examining the influence of valence, the high dysphoric compared to low dysphoric participants reported significantly more negative spontaneous images over the past week compared to low dysphoric participants, $t(142) = 4.6, p < .001, d = 0.78$. However there was with no difference in the number of positive spontaneous images reported, $t(142) = 1.38, p = .17, d = 0.23$.

Table 4.3

Characteristics of High and Low Dysphoric Participants

	High Dysphoric (BDI ≥ 14) $n = 70$		Low Dysphoric (BDI ≤ 6) $n = 74$	
	M	*SD*	*M*	*SD*
BDI-II	22.19	8.49	3.55	1.79
SUIS	3.56	0.57	3.31	0.52
AST-R	5.24	0.91	5.94	0.90
Frequency of spontaneous images in the past week				
Positive images	4.61	1.39	4.92	1.27
Negative images	4.34	1.31	3.32	1.33

Note: BDI-II = Beck Depression Inventory II, SUIS = Spontaneous Use of Imagery Scale and AST-R = Ambiguous Scenarios Test Revised.

Regression Analysis

Similar to Study 3a, to investigate whether interpretation bias, spontaneous use of imagery, and the frequency of positive and negative intrusive images explained any of the variance in depressive symptoms, a stepwise multiple regression analysis was conducted. As can be seen in Table 4.4, together interpretation bias, tendency to spontaneously use mental imagery and frequency of positive and negative intrusive images were able to predict 27.1 % of depressive symptoms, (adjusted $R^2 = 0.27$, $F(4,203) = 20.25$, $p < .001$). The frequency of negative image intrusions was able to independently predict 15.2% of the variance in depressive symptoms. The AST was able to contribute an additional 9.9% to the prediction with positive image intrusion frequency contributing an additional 1.6%. The SUIS also contributed an additional 1.9% to the prediction of depressive symptoms.

Table 4.4

Summary of Stepwise Regression Analyses Predicting Depressive Symptoms (BDI-II)

Step		R^2	Change in R^2	*t*	*p*	*Beta*
1	Negative intrusion frequency	.15	.15	6.08	<.001	.39
2	Interpretation bias: AST-R	.25	.10	5.19	<.001	-.32
3	Positive intrusion frequency	.27	.02	2.08	.04	-.14
4	SUIS	.29	.02	2.32	.02	.14

Note. BDI-II = Beck Depression Inventory-II; AST-R = Ambiguous Scenarios Test Revised (Interpretation bias) and SUIS = Spontaneous Use of Imagery Scale.

Discussion

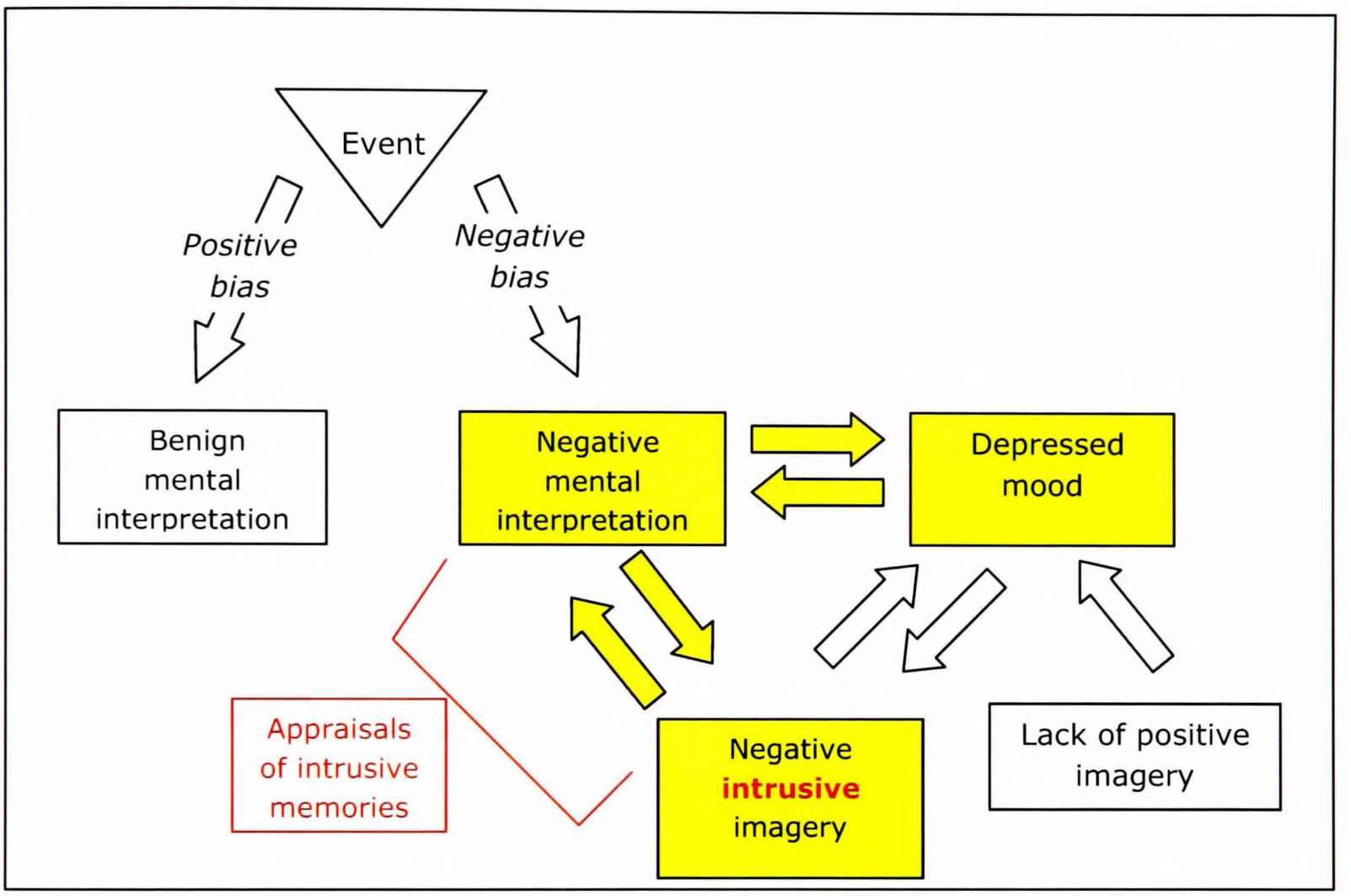
Replicating the findings of Study 3a, high dysphoric individuals reported a greater tendency to spontaneously use mental imagery compared to low dysphoric individuals. In an extension of Study 3a, high dysphoric individuals reported a greater frequency of negative intrusive images than their low dysphoric counterparts with no such difference in the frequency of positive images. This suggests that the finding of a greater tendency to use imagery in high dysphoric participants might, at least in part, be accounted for by the greater frequency of negative images. Whilst the frequency of positive images was not significantly different between high and low dysphoric individuals, it was inversely able to predict a small but significant proportion of the variance in depressive symptoms.

The regression analysis revealed that collectively, interpretation bias, tendency to spontaneously use mental imagery and the frequency of positive and negative images predicted 27.2% of the variance of depressive symptoms. This is almost twice as much of the variance that was predicted in Study 3a. This may be due to negative intrusive images predicting independently 15.2% of the variance in depressive symptoms, underscoring their potential role in depression. Independent of the

contribution of negative intrusive images, interpretation bias explained 9.9% of the variance in depressive symptoms. Together, interpretation bias and mental imagery explain 25% of the variance, indicating that collectively these biases play a significant role in depression. It is important to note that one limitation of the current study was that a simple 2 item (unpublished) question was used to assess for positive and negative intrusion frequency. There is however, no known measure to otherwise discriminate between positive and negative spontaneous imagery used. The findings of the current study suggest that it would it would potentially be beneficial to target negative intrusive images. A CBM-I technique to modify negative intrusive images has not yet been developed, and will be the focus of the next study (Study 4).

CHAPTER 5

Study 4: A Pilot Study to Develop a CBM-I Technique Targeting Depressive Appraisals of Intrusive Memories.



Aim

The two experimental studies in the current thesis thus far have focused on using CBM-I to modify the interpretation of ambiguous situations. The situations referred to here are ambiguous *external* events. Further, as highlighted by Study 3b another problematic process in depression regards *internal* events – negative intrusive images. Intrusive memories in depression are an example of such imagery (Patel et al., 2007). The misinterpretation or negative bias concerning intrusive memories has also been implicated in depression (Starr & Moulds, 2006) and represents a treatment target. The aim of the current pilot study therefore was to develop a new CBM-I technique to target depressive appraisals of intrusive memories.

Intrusive Memories and Depression

Whilst intrusive negative memories do not form part of the diagnostic criteria for depression (American Psychiatric Association, 2000), or traditional formulations of cognitive therapy, growing evidence has demonstrated that these types of memories are commonly experienced by depressed patients (Birrer, Michael, & Munsch, 2007; Carlier, Voerman, & Gersons, 2000; Kuyken & Brewin, 1994). Up to 90% of depressed patients report negative intrusive memories (Birrer et al., 2007; Brewin, Hunter, Carroll, & Tata, 1996). Not only are such intrusive memories i.e. images common across a range of psychopathologies (Holmes, Arntz, & Smucker, 2007; Holmes & Hackmann, 2004) in depression, they also appear to be as frequently experienced as in PTSD, and to prompt the same degree of cognitive avoidance. For example, Brewin, Watson, McCarthy, Hyman and Dayson (1998) reported that depressed cancer patients endorsed levels of intrusion and avoidance of their intrusive memories (measured by the Impact of Event Scale) that were equivalent to patients with PTSD. Birrer et al. (2007) reported that "the intrusive images were associated with as much distress in PTSD patients as in depressed

patients with or without trauma" (p. 2060). They further commented that it is "surprising that intrusive images have received more attention in PTSD than in depression" (p. 2062). Patel et al. (2007) suggested that intrusive memories play a key role in maintaining depressed mood. This suggestion accords with evidence that levels of intrusion frequency and avoidance are associated with depression severity (Kuyken & Brewin, 1994) and are predictive of depression over six months (Brewin, Reynolds, & Tata, 1999).

Recent clinical studies have examined the potential benefits of targeting intrusive memories in the treatment of depression. Kandris and Moulds (2008) completed a clinical case study that suggested the utility of imaginal exposure in reducing intrusive memories and depression symptoms. At post treatment and six month follow-up, the patient no longer met diagnostic criteria for depression. Wheatley, Brewin, Patel, Hackmann, Fisher and Myers (2007) conducted two case studies in which they employed imagery rescripting techniques to reduce intrusive memories in patients with depression. Their findings were promising: they reported significant reductions in depressive symptoms that were maintained at 12-month follow-up. Furthermore, Brewin, et al. (2009) completed imagery rescripting treatment of intrusive memories with ten patients with depression. Reliable improvement in depressive symptoms was shown by seven of the ten patients with large treatment effects maintained at one year follow up.

Negative Appraisals of Intrusive Memories in Depression

Negative, maladaptive appraisals of intrusive memories (e.g., *having intrusive memories means I'm crazy*) have been studied more extensively in PTSD than in depression. The cognitive model of PTSD by Ehlers and Clark (2000) proposes that when an individual assigns maladaptive appraisals to intrusive memories, the experience of these memories results in more distress, and secondarily, prompts the use of avoidant

strategies such as thought suppression. These strategies paradoxically result in the increase in the frequency of intrusions (Ehlers & Clark, 2000; Ehlers & Steil, 1995). From this perspective, maladaptive appraisals are thus a major driver in the maintenance of PTSD symptoms (Brewin & Holmes, 2003; Ehlers & Clark, 2000; Ehlers & Steil, 1995). Evidence for the role of appraisals has been provided by retrospective studies showing significant associations between negative interpretations of intrusive memories and PTSD severity (Clohessy & Ehlers, 1999; Dunmore, Clark, & Ehlers, 1999; Steil & Ehlers, 2000). Further evidence is provided by longitudinal prospective studies in which maladaptive appraisals predicted PTSD severity over time, beyond initial symptom levels (Bryant & Guthrie, 2007; Dunmore, Clark, & Ehlers, 2001). Critical support for the importance of maladaptive appraisals was provided by Bryant and Guthrie's (2007) prospective study of trainee firefighters. They demonstrated that maladaptive appraisals, such as "there is something wrong with me as a person" (specifically the self subscale of the Post traumatic Cognitions Inventory [Foa, Ehlers, Clark, Tolin, & Orsillo, 1999]), endorsed *prior to* trauma exposure (i.e., fire fighting), predicted PTSD severity at a four year follow-up.

This tendency to negatively or maladaptively interpret internal cognitions, specifically intrusive memories, is a negative appraisal bias that has been studied more recently in the context of depression. Maladaptive appraisals (e.g., *having this memory means that I am weak*) have been proposed to maintain intrusive memories, and in turn, depressive symptoms (Starr & Moulds, 2006; Williams & Moulds, 2008). Starr and Moulds (2006) and subsequently Williams and Moulds (2008) showed that maladaptive appraisals of intrusions were associated with levels of depressive symptoms in a non-clinical population. Further, these associations held after controlling for the severity of the memory content and intrusion frequency. The strongest predictor of depression in

these studies was the negative appraisals of the intrusions. Given their proposed role in intrusion persistence (i.e. maintaining the presence of negative intrusive memories), such maladaptive appraisals present a potential target for intervention.

CBM-I and the Appraisals of Intrusive Memories

An experimental tool with which to manipulate cognitive biases is the CBM-I technique. The previous experiments in the current thesis have predominantly been used to modify interpretations of external ambiguous situations. Recently, Mackintosh et al. (2008) extended the application of the CBM-I technique beyond ambiguous external information, and targeted the interpretation of internal cognitions; specifically, appraisals of intrusive trauma memories in a non-clinical sample. This work was inspired by the findings of Bryant and Guthrie (2007) which had demonstrated that maladaptive appraisals of intrusive memories (as measured by the self subscale of the PTCI) predicted the development of PTSD. The negative training of Mackintosh et al. (2008) incorporated those maladaptive appraisals associated with PTSD (Foa et al., 1999) as listed in the self subscale of the PTCI. The positive training condition consisted of the opposite, adaptive counterpart to each of the negative items. The impact of the CBM-I was tested on a standardised analogue traumatic event known to generate intrusions – a traumatic film. Participants who completed positive CBM-I rated their intrusive memories of the traumatic film (over one week) as less distressing (in Experiment 1) and less frequent (in Experiment 2) than those who completed negative CBM-I.

Similar to Mackintosh et al. (2008), for the current study, a new CBM-I technique was developed specifically to target maladaptive appraisals of intrusive memories that are associated with depression following findings by Starr and Moulds (2006) indicating such appraisals predictive of depressive symptoms. The precise maladaptive appraisals

endorsed by people with depressive symptoms were identified by examining correlations between measures of appraisals of intrusive memories and BDI-II scores. The CBM-I items were thus derived from a range of maladaptive cognitions from the Response to Intrusions Questionnaire (RIQ; Clohessy & Ehlers, 1999); e.g., *"Intrusive memories mean that something is wrong with me*", Interpretation of Intrusions Inventory (III; Obsessive Compulsive Cognitions Working Group, 2001); e.g., *"Intrusive memories mean that I cannot cope"* and the Cognitive Intrusions Questionnaire (CIQ; Freeston, Ladouceur, Gagnon, & Thibodeau, 1991); e.g., *"how much do you disapprove of having this thought or image enter your mind"*.

Method

Part 1: Developing the CBM of Appraisals Technique

(1) Identifying the Specific Maladaptive Appraisals of Intrusive Memories to Target for CBM of Appraisals

Raw data taken from Michelle Moulds' Laboratory in Sydney, Australia from the published study Williams and Moulds (2008) was used to calculate correlations between dysphoria as measured by the BDI-II and items on the RIQ (Clohessy & Ehlers, 1999) and the control subscale of the III (Obsessive Compulsive Cognitions Working Group, 2001). Participants included 147 undergraduate students with a mean age of 19.71 (*SD* = 4.18). Correlations between the BDI and individual items on the RIQ and control subscale of the III are presented in Table 5.1. Both Williams and Moulds (2008) and Starr and Moulds (2006) found that in examining intrusive memories in depression, negative appraisals of intrusive memories as measured by these questionnaires were the strongest predictors of depressive symptoms in a non-clinical sample.

Table 5.1

Correlations Between BDI-II Scores and Individual Questionnaire Items of the RIQ and the Control Subscale of the III Using Raw Data from the Williams and Moulds (2008) Study. Significant Correlations are Indicated in Bold

Questionnaire Measure	Correlation with the BDI-II
Response to Intrusions Questionnaire (RIQ; Clohessy & Ehlers, 1999) Think back to times when you have had intrusive memories of distressing situations	
(i) Negative interpretation of intrusions subscale **"rate what intrusive memories mean to you on a scale of 1 (totally disagree) to 7 (totally agree)"**	***r* (146) = 0.20, *p* = .02**
Something is wrong with me	**r (146) = 0.20, *p* = .02**
Someday I will go out of my mind	**r (146) = 0.17, *p* = .046**
I am inadequate	**r (146) = 0.25, *p* = .003**
I have a psychological problem	**r (146) = 0.18, *p* = .03**
I cannot cope	**r (146) = 0.20, *p* = .02**
I will not achieve future goals that are important to me	r (146) = 0.02, *p* = .80
(ii) 'NORMAL appraisal SUBSCALE' - "rate what intrusive memories mean to you on a scale of 1 (totally disagree) to 7 (totally agree)"	r (146) = -0.02, p = .98
Nothing- it is a normal reaction	*r* (146) = -0.07, *p* = .40
I care about other people	*r* (146) = 0.08, *p* = .36
I am a responsible person	*r* (146) = -0.12, *p* = .16
I take my relationships/family/career seriously	*r* (146) = 0.1, *p* = .22
(iii) Ruminative response subscale – how often engaging in these strategies	***r* (146) = 0.31, *p* < .001**
I dwell on them	***r* (146) = 0.28, *p* = .001**
I worry that something like that could happen to me again	***r* (146) = 0.30, *p* <.001**
I think about what I could have done differently	*r* (146) = 0.06, *p* = .50
(iv) Efforts to suppress subscale – how often engaging in these strategies	***r* (146) = 0.16, *p* = .05**

Table 5.1 (continued)

Questionnaire Measure	Correlation with the BDI-II
I try to push them out of my mind	***r* (146) = 0.23, *p* = .004**
I think about something else	*r* (146) = 0.09, *p* = .28
I watch TV, listen to music, or read	*r* (146) = 0.059, *p* = .48
I drink alcohol or smoke	Not included in Williams & Moulds (2008)
(v) Dissociation subscale – feeling during intrusions	**r (146) = 0.22, p = .009**
Detached	*r* (146) = 0.16, *p* = .05 approaching significance
Numb	***r* (146) = 0.19, *p* = .03**
Need to Control Subscale of Interpretation of Intrusions Inventory (III; Obsessive Compulsive Cognitions Working Group, 2001) when you were bothered by intrusive thoughts, rate how much you believe the ideas listed below	
I must regain control of this thought	r (146) = 0.1, *p* = .24 – approaching significance
I should be able to rid my mind of this thought	r (146) = -0.06, *p* = .49
Because I've had this intrusive thought, what I'm doing will be ruined	**r (146) = 0.25, *p* = .002**
Because I can't control this thought, I am a weak person.	**r (146) = 0.32, *p* < .001**
Having this intrusive thought means that I could lose control of my mind	**r (146) = 0.32, *p* < .001**
I would be a better person if I gained more control over this thought	**r (146) = 0.28, *p* = .001**
Having this intrusive thought means I'm out of control	**r (146) = 0.32, *p* < .001**
If I don't control this unwanted thought something bad is bound to happen	**r (146) = 0.20, *p* = .02**
I must have control over this thought	**r (146) =0.24, *p* = .003**
I should not be thinking this kind of thing	**r (146) =0.26, *p* = .002**
If I don't control this thought, I'll be punished.	**r (146) = 0.19, *p* = .02**

For additional maladaptive cognitions to target in the CBM-I technique, correlations with the BDI-II and the remaining subscales of the III and the CIQ (Freeston et al., 1991) were examined from two publications (raw data was not examined in this case); Freeston, Ladouceur, Thibodeau and Gagnon (1992) and Obsessive Compulsive Cognitions Working Group (2001). The CIQ (Freeston et al., 1992) evaluates cognitive intrusions on 13 dimensions broken down into five factors. These include factor 1- frequency, anticipatory fear, anticipated difficulty of removal and emotional reactions (worry, sadness); factor 2 – evaluation of valence judgments, guilt, disapproval and responsibility; factor 3 – related to the ability to remove the thought and decrease discomfort; factor 4 – number of thoughts, strategies and forms and; factor 5 – attentive thinking. Freeston et al. (1992) examined correlations in 125 undergraduate university students between the BDI-II and these factors on the CIQ. Significant correlations were found with factor 1, $r(121) = 0.46, p < .001$ and factor 2, $r(121) = 0.42, p < .001$. There was no significant correlation between the BDI-II and factor 3, $r(121) = 0.14, p > .05$, factor 4, $r(121) = 0.36, p > .05$ or factor 5, $r(121) = 0.01, p > .05$. In addition, Obsessive Compulsive Cognitions Working Group (2001) in a sample of 365 participants report significant correlations between the remaining subscales of the III not examined in Williams and Moulds (2008); importance of thoughts, $r(364) = 0.37, p < .05$ and responsibility $r(364) = 0.32, p < .05$ subscales and the BDI-II.

(2) Developing the CBM of Appraisals Stimuli

A script-based CBM-I technique was developed to target maladaptive appraisals of depressive intrusive memories, and was programmed using E-prime software (Version 1.1.4.1, Pittsburgh: Psychology Software Tools Inc.). The structure of the current technique, including eight blocks of initially ambiguous descriptions followed by a

recognition test of induced bias was based around Mathews and Mackintosh (2000) script-based CBM-I technique.

The scripts in the current study were developed in a similar way to the CBM technique designed by Mackintosh et al. (2008) to target PTSD related cognitions. Instead of targeting those PTSD related cognitions, the CBM-I items in the current study were derived from the maladaptive cognitions identified above as significantly correlated with dysphoria. As in Mackintosh et al. (2008) the scripts comprised 72 either positively or negatively valenced paragraphs (depending on the assigned CBM-I condition), in addition to 8 neutral fillers (e.g., "Intrusive memories pop into mind *spontaneously*").

Further, similar to Mathews and Mackintosh (2000) and Mackintosh et al. (2008) the CBM task descriptions remained ambiguous until the final few words that were presented as to-be completed word fragments that resolved the valence/ambiguity of the paragraph. Word fragments were created such that only one solution could fit and complete the sentence. The items of the RIQ, III and CIQ were thus adapted in this way. An example of an item adapted from the RIQ is as follows: *"having an intrusive memory means something is wrong with me"* was changed to "having an intrusive memory means *nothing* is wrong with me" for the positive condition, and remained "having an intrusive memory means *something* is wrong with me" for the negative condition. To generate a sufficient number of CBM descriptions, more than one CBM description was often created from the individual items of the questionnaires. For example, taking the RIQ item outlined above "*having an intrusive memory means something is wrong with me*" this was also modified to create the item *"when I am sitting around and a sad memory pops into my mind this means that I am quite normal"* for the positive condition, and *"when I am sitting around and a sad memory pops into my mind this means that I am quite abnormal"* for the negative condition. Table 5.2 presents some examples of RIQ items

modified to suit the CBM-I technique. For a full outline of all CBM of appraisals items for both the positive and negative conditions, including original questionnaire items, see Appendix 5.1.

The CBM-I technique was programmed such that the description always appeared on the screen in two parts. The first half appeared on the screen for 2 s, followed by presentation of the remainder of the statement (in the form of a word fragment). Participants would be asked to press the advance key when they knew what the first missing letter was and then to type it in. The correct word would then appear on the screen.

As in Mackintosh et al. (2008), to help participants focus on their task, following randomly selected statements (a total of four in each block of eight), participants would be required to answer a comprehension question indicating 'yes' or 'no' as a response. For example, the CBM script item above would be followed by the question *"Do you believe intrusive memories mean something is wrong with you?"* The 32 questions were worded such that 50 percent of the time "yes" was the correct answer. The program would then indicate whether participants were right or wrong by displaying "correct response" and "incorrect response", respectively. These questions are included alongside the scripts developed and are presented in Appendix 5.1.

Table 5.2

Examples of CBM of Appraisals Items Alongside the Original Response to Intrusions Questionnaire (RIQ; Clohessy & Ehlers, 1999) items. Italics Indicate the Positive and Negative Resolutions of Each of the Descriptions

Response to Intrusions Questionnaire item	Positive CBM of appraisals item	Negative CBM of appraisals item
Intrusive memories mean that something is wrong with me	Intrusive memories mean that *nothing* is wrong with me	Intrusive memories mean that *something* is wrong with me
Intrusive memories mean that someday I will go out of my mind	Having an intrusive memory *does not mean* that I will go out of my mind	Having an intrusive memory *does mean* that I will go out of my mind
Intrusive memories mean that I am inadequate	Intrusive memories mean that I am more than *adequate*	Intrusive memories mean that I am *inadequate*
Intrusive memories mean that I have a psychological problem	Intrusive memories mean that I *don't have a psychological problem*	Intrusive memories mean that I *have a psychological problem*
Intrusive memories mean that I cannot cope	Intrusive memories mean that I *can cope*	Intrusive memories mean that I *cannot cope*
After having intrusive memories I dwell on them	After having intrusive memories I *don't dwell* on them	After having intrusive memories *I dwell* on them

(3) Developing the Recognition Test of Appraisal Bias

To determine whether the appraisal bias induction was effective, a recognition test similar to that used by Mackintosh et al. (2008) was developed. This test involved two phases. In the first phase (encoding), participants would be presented with 10 ambiguous descriptions and asked to "please imagine yourself as vividly as you can in each of the descriptions". They would then rate how vivid their image was on a 5-point scale from 1 (*not at all vivid)* to 5 (*extremely vivid*). The descriptions were developed using similar items of the RIQ, CIQ and III as those used in the CBM scripts. Each description began with a title; e.g., "*Responding to intrusive memories*". After participants consider the title,

the description would be shown e.g., *"After having spontaneous memories I try to get myself to react in a certain way that I feel is appropriate."*

After each of the 10 descriptions, participants would complete the second phase of the task (recognition). New instructions would explain that new descriptions would be presented along with the original titles. Participants would be asked to indicate how similar or different this new description was to the original one that they read. They would rate from 1 (*very different in meaning*) to 4 (*very similar in meaning*). For each of the original ambiguous descriptions, four sentences were developed, namely: a positive interpretation (positive target), negative interpretation (negative target), a positive and a negative foil. For example:

1. When I have spontaneous memories pop into my head, I always try to think about and work through them (positive target)
2. When I have spontaneous memories pop into my head, I always try to push them out of my mind (negative target)
3. When I have spontaneous memories pop into my head, I feel myself feeling more positive (positive foil)
4. When I have spontaneous memories pop into my head, I feel myself feeling more negative (negative foil)

Following Mackintosh et al. (2008), appraisal bias scores would be calculated by subtracting the mean similarity rating of negative targets from the mean similarity rating of positive targets. Scores ranged from -3 to 3, where negative scores indicated a negative appraisal bias. For a full outline of the recognition test items, see Appendix 5.2.

Part 2: Pilot Testing the Newly Developed CBM of Appraisals Technique

Participants

The 12 non-clinical participants had a mean age of 25.17 years (SD = 7.80). There were 7 females and 5 males. Participants were recruited through multiple sources: via online advertisements, posters displayed around Oxford city, and voluntary sign-up at freshers' fairs at two Oxford universities. Participants were paid a nominal amount to reimburse them for their time.

Materials

Beck Depression Inventory - Second Edition (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II was used to measure depressed mood symptoms as in Study 2 and 4 and Experiment 3.

Positive subscale of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Carey, 1988). The positive subscale of the PANAS was used in the current study to measure state positive affect as in Experiment 1 and 2.

Negative subscale of the PANAS (Watson, Clark, & Tellegen, 1988). The negative subscale of the PANAS was included in the current study to measure state levels of negative affect. Participants were presented with a list of 10 negative words mixed in with the 21 words from the positive subscale and asked to indicate the extent to which these words describe their present feelings where 1 is *"not at all"*, 2 is *" a little"* 3 indicates *" moderately"*, 4 is *"quite a bit"* and 5 is *"extremely."* The negative subscale shows high internal consistency in both a patient (.84) and undergraduate (.94) sample (Watson, Clark, & Tellegen, 1988).

CBM of appraisals task. The CBM of appraisals task was used as described above and presented in Appendix 5.1

Recognition Test. The recognition test was used to test for the induced appraisal bias. It was used as described above and presented in Appendix 5.2.

Procedure

After giving informed consent, participants were randomly assigned to either the positive or negative CBM condition. Participants completed the BDI-II and were then given instructions for how to complete the CBM task. Specifically, participants were instructed; *"You will have to read a series of statements which relate to thoughts and feelings that people might have if they have had intrusive memories. While reading these statements we want you to think back to when you may have experienced an intrusive memory in the past, and try to imagine what it was like. Imagine yourself in the situation when reading the statements. The last line of the statement always misses the final section. When you press the advance button, the missing word will appear in an incomplete version. It is then your job to complete the line correctly, by selecting the first missing letter of the incomplete word. When you have found it the correct word will appear. After a number of such statements you will be asked a question about a randomly selected statement to see if you have understood it. For your answer, which will be just 'yes' or 'no' you will be using the arrow keys as indicated on the screen."*

Participants were then given instructions for the recognition test as outlined previously. Following the recognition test, participants again completed the PANAS. Finally, participants were debriefed and thanked for their time.

Results

Comparison of Participants in Positive and Negative Conditions at Baseline

There were no significant differences between conditions in terms of age, $U = 16.5$, $z = -.24$, $p = .81$ or gender, χ^2 $(1, N = 12) = 0.34$, $p = .56$. In addition, participants

did not differ in depression, $U = 16$, $z = -0.32$, $p = .75$ or pre CBM levels of positive, $U = 17.5$, $z = -0.08$, $p = .94$, and negative affect, $U = 15.5$, $z = -0.41$, $p = .68$, see Table 5.3.

Table 5.3

Characteristics of Participants at Baseline per Condition

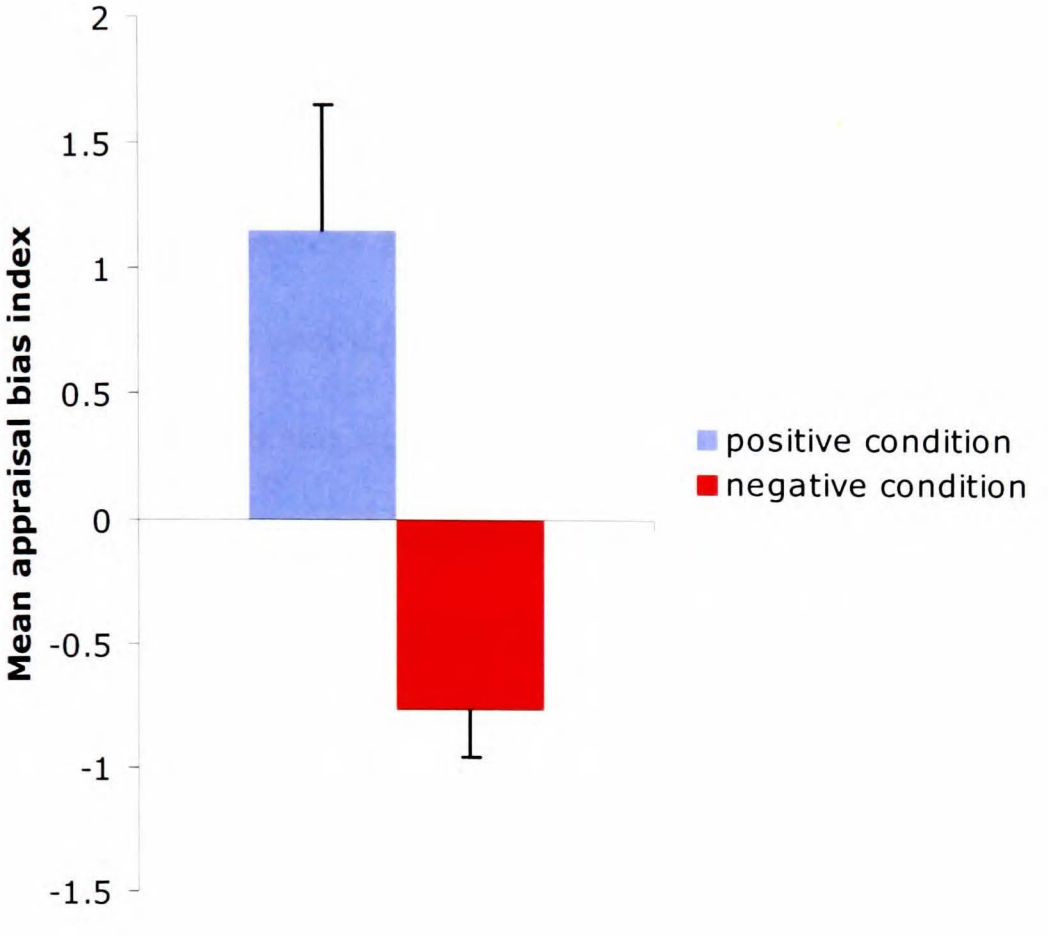
	Positive Condition ($n = 24$)		Negative Condition ($n = 24$)	
Characteristic	*M*	*SD*	*M*	*SD*
Age (years)	26.00	10.33	24.33	5.05
Gender (%)				
Female	33.3		50	
Male	66.7		50	
BDI-II	5.00	4.47	4.83	2.79
PANAS positive	66.17	19.47	64.83	9.50
PANAS negative	26.67	4.32	26.67	1.97

Note. BDI-II = Beck Depression Inventory II, PANAS positive = Positive subscale of the Positive and Negative Affect Schedule and PANAS negative = Negative subscale of the Positive and Negative Affect Schedule

Recognition Test (Test of Induced Appraisal Bias)

Participants' interpretation of novel ambiguous scripts was indexed by the recognition test. The conditions were compared using the Mann Whitney U test. As expected, the positive group endorsed more positive interpretations than the negative group, $U = 2.5$, $z = -2.49$, $p = .01$, $r = .72$, see Figure 5.1.

Figure 5.1. Mean scores on the recognition test of appraisal bias for the positive and negative CBM conditions. Error bars show one standard error of the mean.



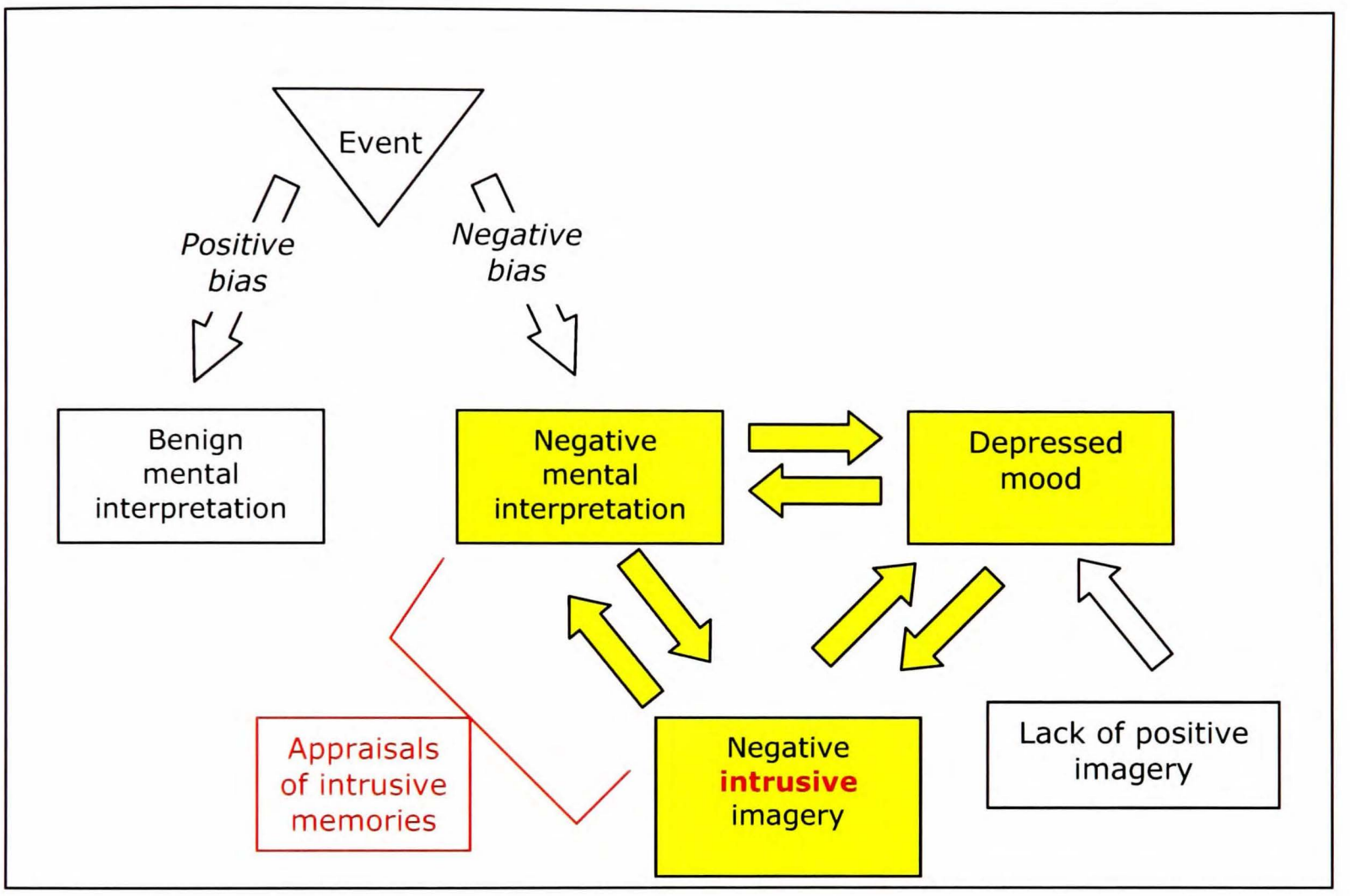
Discussion

The current pilot study sought to examine whether maladaptive appraisals about intrusive memories associated with depression could be altered by a newly developed CBM-I technique targeting the appraisals of intrusive memories. Appraisals were identified by examining correlations between measures of appraisal bias and BDI-II scores from a database held by Michelle Moulds and reported correlations by Freeston et al. (1992) and Obsessive Compulsive Cognitions Working Group (2001). The critical finding was that scores on the test of appraisal bias were, as predicted, significantly different between the positive and negative CBM conditions. This is consistent with the claim that it may be possible to modify depression-related appraisals of intrusive memories, at least in a small sample. It also demonstrated compliance with this new form of CBM-I.

The small sample size ($N = 12$) tested in the current pilot study provides only limited evidence for the potential use of the CBM of appraisals technique. Even with a large effect size on bias found between conditions (as defined by Cohen, 1988), the results require replication in a larger sample. Whilst the current study shows it is possible to manipulate depressive appraisals of intrusions, it does not demonstrate any effects of such changes on actual intrusive phenomena. To explore the clinical potential of the CBM of appraisals technique, it is important to determine the predicted downstream effects of manipulating the appraisals of intrusions e.g., on their frequency and related symptomatology. A standardised task to induce intrusions would allow examination of the impact of this technique on intrusions. This is the subject of the next experiment.

CHAPTER 6

Experiment 5: Reducing the Frequency of Depressive Intrusions of a Depressive Film via a CBM of Appraisals Task



The current study is published in Lang, T. J., Moulds, M. L., & Holmes, E. A. (2009). Reducing depressive intrusions via a computerised cognitive bias modification of appraisals task: Developing a cognitive vaccine. *Behaviour Research and Therapy, 47*, 139-145.

Aim

The aim of the current experiment was to test the CBM of appraisals technique derived in Study 4, in a larger, appropriately powered sample and also examine any impact on intrusions. Negative appraisals of intrusive memories remain a treatment target given their association with symptom persistence in depression (Williams & Moulds, 2008). To date, research investigating the relationship between negative appraisals of intrusive memories and depression has been largely correlational. This means the causal impact of these appraisals on the development of intrusions is unclear. In contrast, the current experiment aimed to test the impact of positive versus negative conditions of the newly developed CBM of appraisals task on depressive intrusion frequency for a standardised event (a depressive film).

Using a between-subjects experimental design, positive and negative CBM of appraisals conditions were compared. A standardised task to generate intrusions, a depressing film, was introduced and the frequency of depressive intrusions related to the film were monitored in a diary for one week. Additional measures given at a one week follow up included a measure of intrusive symptomatology (the Impact of Event Scale [IES]) and a congruent measure of intrusions (an intrusion provocation task).

Hypotheses

The key hypotheses were that:

1. Compared to the negative condition, participants who underwent positive CBM of appraisals would show a more positive appraisal bias, as indexed by the recognition test (as developed in Study 4).

2. Following positive compared to negative CBM of appraisals, participants would report reduced levels of intrusions of a depressing film, as indexed by three

convergent measures: (i) a one week intrusion diary, (ii) the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979), and (iii) an intrusion provocation task.

Method

Participants

The 48 participants comprised 24 males and 24 females, with a mean age of 29.52 years (SD = 10.89). Participants were recruited in the same way as Study 4. For ethical reasons, the material that was used for recruitment included information that warned participants that the experiment involved viewing distressing film clips. Participants were paid a nominal amount to reimburse them for their time.

Sample Size Estimation

The sample size for the current study was estimated for a between subjects design (different from the previous experiments which were employing a mixed between by within subjects design). The estimate was based on the finding of a large between group effect size (which according to Cohen, 1988 is $d = 0.8$ and $r = 0.6$) between positive and negative CBM of appraisals conditions on appraisal bias (as measured by the recognition test) in the pilot study (Study 4), $r = 0.72$ and pilot data testing a similar CBM technique from an unpublished study by Mackintosh et al. (2008) reporting $d = .88$. A power calculation based on the large effect size of $d = 0.8$ indicated a sample of approximately 24 participants would be necessary per condition for 80% power to detect the effect with an alpha level of 0.05.

Materials

Questionnaire Measures

Trait version of the Spielberger State-Trait Anxiety Inventory (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAI-T was used to measure trait anxiety as in Experiment 1 and 2.

Spontaneous Use of Imagery Scale (SUIS; Reisberg, Pearson, & Kosslyn, 2003). The SUIS was used to measure the spontaneous use of imagery in everyday life as in Experiment 1 and 2.

Beck Depression Inventory- Second Edition (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II was used to measure levels of depressive symptoms as in Experiment 1 and 2 and Study 4.

Beck Hopelessness Scale (BHS; Beck & Steer, 1993). The BHS was used to measure degree of hopelessness about the future. Participants answered 20 true or false items such as *"I look forward to the future with hope and enthusiasm."* They were instructed to give a response of "true" if the statement described their attitude in the past week. Satisfactory reliability has been reported with Chronbach's alpha of .88 (Steed, 2001).

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Carey, 1988). The positive and negative subscales of the PANAS were used in the current study to measure state positive and negative affect as in Study 4.

Impact of Event Scale (IES; Horowitz et al., 1979). The IES is a 15-item clinical measure used to assess the subjective experience of a specific life event. It includes both an intrusion and avoidance subscale. Horowitz et al. (1979) reported satisfactory internal reliability, with alpha coefficients of .86 for the total score, .78 for the intrusion subscale and .82 for the avoidance subscale. For the current study,

each item was adapted and anchored to the subjective experience of the film e.g., the original item "*any reminder brought back feelings about it*" was changed to *"any reminder brought back feelings about the film."* This use of the IES is consistent with previous studies in which this instrument has been adapted to measure responses to stressful films (Holmes, James, Coode-Bate, & Deeprose, 2009; Laposa & Alden, 2006; Mackintosh et al., 2008; Wessel, Overwijk, Verwoerd, & de Vrieze, 2008). Furthermore, Laposa and Alden (2006) conducted correlations between IES intrusion scores and the frequency of intrusions reported in an intrusion diary. These indices were highly correlated (i.e., $r = .69$), indicating that the IES is a useful measure of response to analogue stressors. This measure is presented in Appendix 6.1.

CBM of Appraisals Materials

The CBM of appraisals technique was the same as that developed in Study 4.

Recognition Test (Test of Induced Appraisal Bias)

The Recognition test was the same as that as that developed in Study 4.

Depressive Film

A 13 min 35 s depressing film that included commercial and public information films was played using Windows Media player (Version 9.00.003349, 2002) and projected onto a 1.4 m x 0.8 m screen using a data Canon projector (approximately 2m from the participant). The film consisted of five scenes of depressing content, namely: suicide, hopelessness, bereavement, social rejection and loss. The film included clips that showed the suicide of an old man released from prison unable to reintegrate into society, a traffic accident in which people faced the loss of a friend, the suicide of a young boy, children trying to communicate that they are being bullied, and the unexpected suicide of a woman. These clips were taken

from films used in previous studies (Schaefer, Nils, Sanchez, & Philippot, 2008; Williams & Moulds, 2007). For a full list of the films included in the current study, see Appendix 6.2.

Film Ratings

Participants responded to the question *"how much attention did you pay to the film being shown?"* on a visual analogue scale marking a 10cm line from *not at all* to *a lot* as in Bourne, Frasquihlo, Roth and Holmes (2008). Participants also rated how relevant the film clips were, and how familiar they were with them, on an 11-point scale, from 0 (*not at all relevant/familiar)* to 10 (*extremely relevant/familiar*).

Intrusion Diary

Participants kept a daily diary over the 7 days following the film in which they recorded the occurrence of any intrusions of the film (as in Davies & Clark, 1998; Holmes, Brewin, & Hennessy, 2004). See Appendix 6.3 for a copy of the intrusion diary. Participants recorded the content of their intrusions and the level of distress associated with them on an 11-point scale from 0 (*not at all distressing*) to 10 (*extremely distressing*). Participants also indicated whether their intrusion was an image, a thought or a combination of the two. Intrusive images and thoughts were distinguished for participants by the following instructions: *"What goes through our minds can either take the form of words and phrases ('verbal thoughts'), or it can be like mental images. Although mental images often take the form of pictures they can actually include any of the five senses, so you can imagine sounds or smells too."* Participants were given clear instructions about what was meant by unwanted intrusions (i.e., spontaneously occurring, not deliberately recalled), as well as how to complete the diary. Participants were asked to carry the diary with them to enable

them to record each occurrence of an intrusion and to check at least once a day whether their diary had been completed. Participants were also instructed to make a diary entry even if they did not experience any intrusions that day. At follow-up the experimenter asked questions about the intrusions that had been reported in the diary, to ensure that they were about the film and that they occurred spontaneously.

Diary Compliance

Compliance in completing the diary was measured with participants asked to; "please indicate how accurate you think the diary you completed is" from 1 (*not at all accurate*) to 10 (*extremely accurate*) as in Bourne et al. (2008).

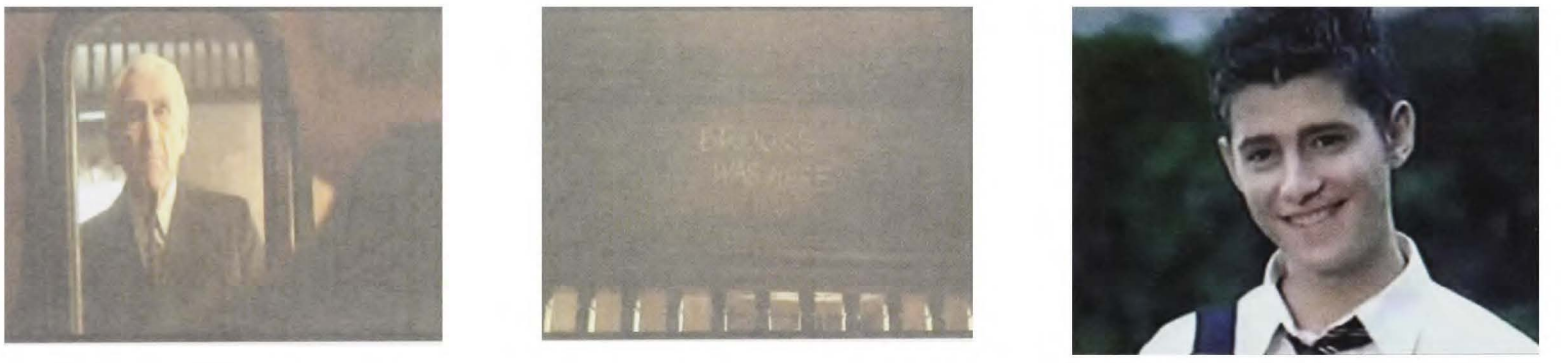
Intrusion Provocation Task

Participants viewed 10 still pictures taken of scenes from the depressing film. The images depicted the scenes shown just *prior* to the most distressing parts of the film clips (i.e., the scenes known to induce intrusions). See Figure 6.1 for the stimuli used in the image provocation task. Pilot work was used to test how emotional these pictures were. Ten individuals (9 female and 1 male) from the Department of Psychiatry voluntarily (mean age = 30.7 *SD* = 11.88) rated the valence of the images. Ratings were made on a 9-point scale, with anchors 1 (*extremely negative*), 5 (*neutral*) and 9 (*extremely positive*). The ratings confirmed that the images selected for this task were indeed neutral, with mean ratings of 4.77 (*SD* = 0.31) and scores ranging from 4.2 to 5.3.

Using Microsoft PowerPoint (2003), the pictures were presented sequentially for 2 s at a time, with the aim of providing an analogue trigger. Participants were instructed to pay close attention to the pictures. Following viewing, participants were told to close their eyes let their mind wander and note what comes to mind for two

minutes. Participants rested their fingers on a keyboard and recorded the occurrence of any intrusive images or thoughts about the film by pressing the '1' key for images and the '2' key for thoughts. Following this 2 min period, participants were asked to describe the contents of each of their intrusions in an open-ended question (i.e., *"what were the thoughts and images you just recorded?"*). In addition, participants were asked to rate the distress associated with each intrusion on an 11-point scale (where 0 = *not at all distressing* and 10 = *extremely distressing*.

Figure 6.1. The ten picture stimuli used in the intrusion provocation task.

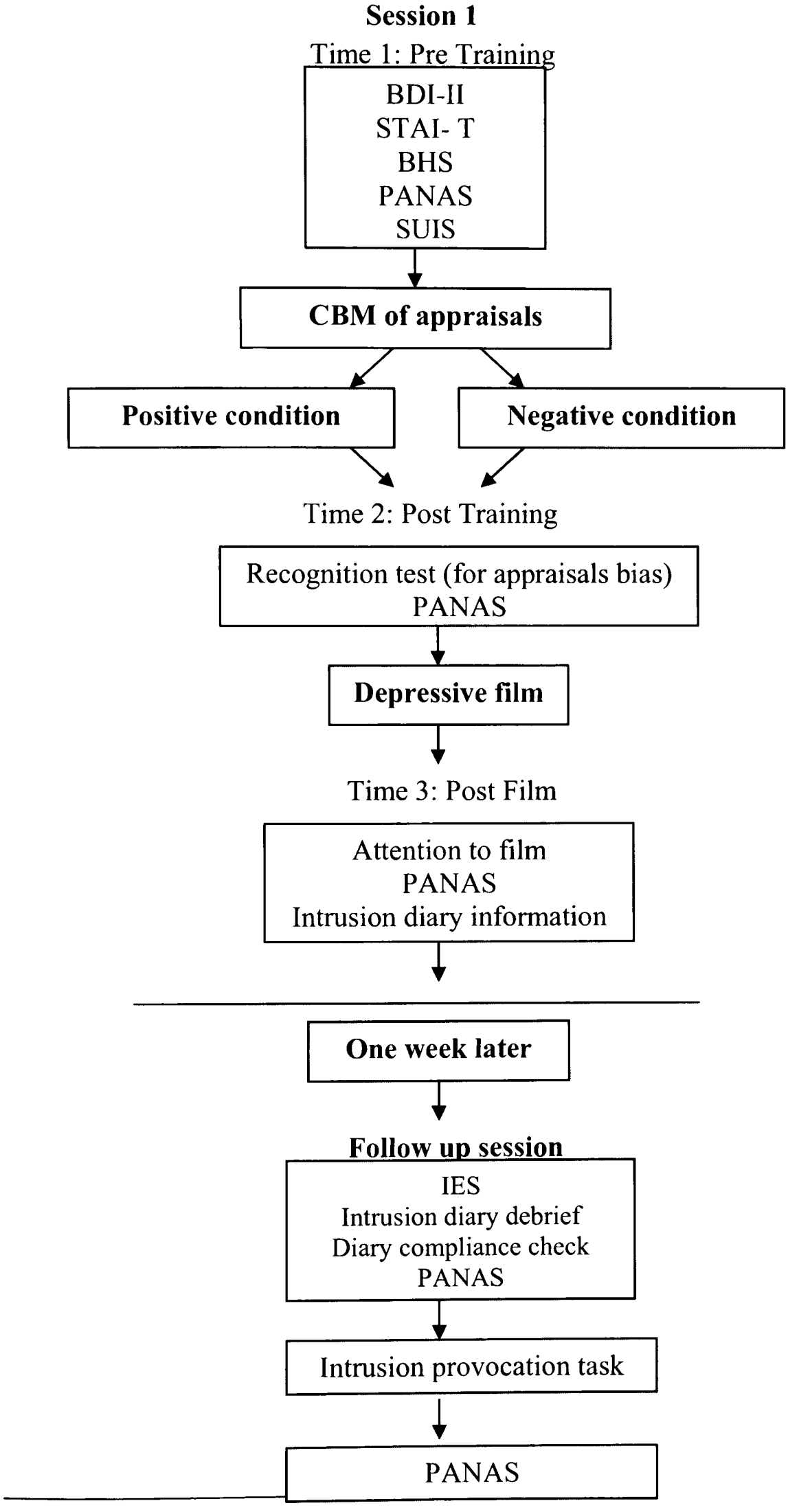


Procedure

Participants provided their informed consent to participate in the experiment and were subsequently randomly assigned to either the positive or negative CBM condition. Participants then completed the BDI-II, STAI-T, BHS, SUIS, and PANAS. Participants were then given instructions to complete the CBM of appraisals technique. Participants were then given instructions for the recognition test. Following the recognition test, participants again completed the PANAS at time 2. Participants then watched the depressing film and were re-administered the PANAS at time 3. They also completed ratings of the film. Finally, participants were given the intrusion diary along with instructions to record spontaneous intrusions of the film during the following week.

One week later, participants returned to the lab for a follow-up session. Participants completed the IES and diary compliance forms. Participants were then questioned about the intrusions that they recorded in the diary in order to verify that they were indeed spontaneous and were about the film. Participants then completed the PANAS (pre provocation task), followed by the intrusion provocation task. The PANAS was then re-administered (post provocation task). Finally, participants were debriefed and thanked for their time. For a full outline of the procedure, see Figure 6.2.

Figure 6.2. Schematic overview of the experimental procedure.[1]



[1] BDI-II = Beck Depression Inventory-II; STAI-T = Trait version for the Speilberger State-Trait Inventory; BHS = Beck Hopelessness Scale; PANAS = Positive and Negative Affect Schedule; SUIS = Spontaneous Use of Imagery Scale; IES = Impact of Events Scale.

Results

Comparison of Participants in the Positive and Negative Conditions at Baseline

There was no significant difference between the groups in terms of gender (χ^2 [1, $N = 48$] = 0.33, $p = .56$). The conditions were also comparable in terms of age, depression (BDI-II), trait anxiety (STAI-T), hopelessness (BHS), the tendency to use imagery (SUIS), and state positive and negative affect (PANAS), ($ts < 1.05$, $ps > .30$) (see Table 6.1).

Table 6.1

Characteristics of Participants at Baseline per Condition

	Positive Condition ($n = 24$)		Negative Condition ($n = 24$)	
Characteristic	*M*	*SD*	*M*	*SD*
Age (years)	28.50	9.86	30.54	11.95
Gender (%)				
Female	54		46	
Male	46		54	
STAI Trait	36.71	9.72	39.92	11.43
BDI-II	7.54	7.82	8.50	7.50
SUIS	39.21	8.34	36.71	9.33
PANAS positive	70.67	13.26	66.96	13.11
PANAS negative	29.54	10.83	28.75	8.14

Note. STAI = Speilberger State–Trait Anxiety Inventory, BDI-II = Beck Depression Inventory II, SUIS = Spontaneous Use of Imagery Scale and PANAS positive = Positive subscale of the Positive and Negative Affect Schedule and PANAS negative = Negative subscale of the Positive and Negative Affect Schedule.

Film Ratings and Diary Compliance

Conditions were compared using an independent samples *t*-test. There were no significant differences between conditions in the participant ratings of attention paid

to the film (M = 90.17, SD = 9.91), $t(46) = 0.46$, $p = .64$, or diary compliance, with participants reporting high levels of accuracy (M = 8.42, SD = 1.07), $t(46) = 1.08$, $p = .29$. There was also no significant difference between conditions in how personally relevant the film was (M = 3.61, SD = 2.74), $t(46) = 1.47$, $p = .15$, or how familiar participants were with the films (M = 4.20, SD = 2.42), $t(46) = 0.33$, $p = .75$.

Recognition Test (Test of Induced Appraisal Bias)

Participants' interpretation of novel ambiguous scripts was indexed by the recognition test. The conditions were compared using an independent samples t-test. As expected, the positive group endorsed more positive interpretations (M = 1.04, SD = 0.76) than the negative group (M = -0.53, SD = 1.14), $t(46) = 5.61$, $p < .001$, d = 1.62.

Effects of Film on Mood

A mixed model ANOVA with a between-subjects factor of condition (negative vs. positive CBM of appraisals) and a within-subjects factor of time (pre vs. post film) with the positive subscale of the PANAS as the dependent variable yielded a main effect of time, $F(1,46) = 10.67$, $p = .002$, $\eta_p^2 = 0.19$, and no main effect of condition, $F(1,46) = 1.93$, $p = .17$. There was no interaction between time and condition, $F(1,46) = 1.28$, $p = .26$. Similarly, for the negative subscales of the PANAS, there was a main effect of time, $F(1,46) = 5.98$, $p = .02$, $\eta_p^2 = 0.12$, no main effect of condition, $F(1,46) = 0.58$, $p = .45$, and no interaction between time and condition, $F(1,46) = 0.30$, $p = .59$. Means are presented in Table 6.2, showing the film resulted in mood deterioration across participants.

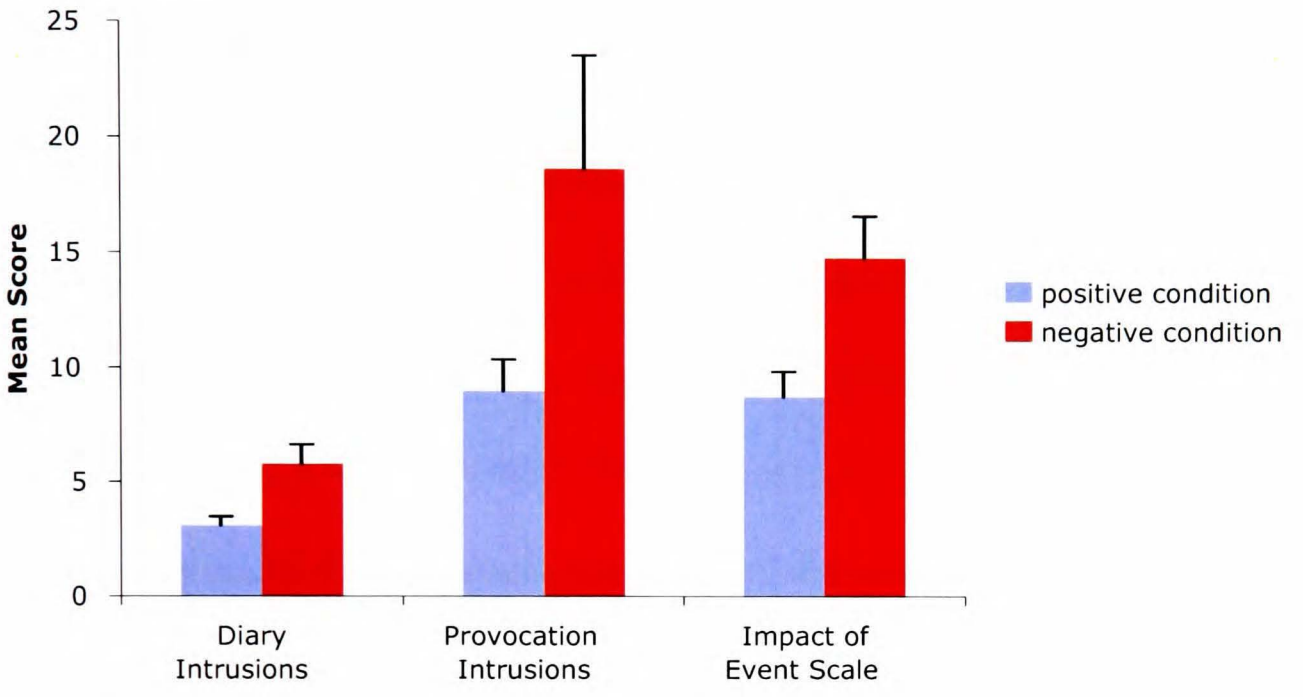
Intrusion Diary

Participants reported a range of both image and verbal thought intrusions about the film in the week following the CBM session. Some examples of verbal thought intrusions related to the films included: *"I thought of what it could be like being in prison"*, *"thinking abstractly about suicide"*, *"the woman jumping from the window – why?"* Some examples of image intrusions related to the films included: *"I saw the old man hanging"*, *"I saw the face of the young man who was to commit a suicide"*, *"I saw 'I was being bullied' in my mind"*.

Overall, the mean total number of intrusions (both image and verbal intrusions) reported in 1 week was 4.42 (SD = 3.49; range = 0 -16). As predicted, an independent samples t-test showed that participants in the negative condition reported significantly more intrusions (M = 5.75, SD = 4.19) compared to the positive condition (M = 3.08, SD = 1.91), $t(46) = 2.83$, $p = .008$, $d = 0.82$ (see Figure 6.3). This result was carried by the significant difference in the number of verbal thought intrusions (M = 0.42, SD = 0.58 for the positive condition; M = 2.54, SD = 3.37 for negative condition), $t(46) = 3.04$, $p = .006$, $d = 0.88$. By comparison, there was no significant difference between the positive (M = 1.58, SD = 1.41) and negative (M = 1.92, SD = 1.25) conditions in the number of image intrusions, $t(46) = 0.87$, $p = .39$.

Distress ratings of intrusions were analysed for only the 43 participants who reported intrusions. Independent samples t-tests revealed no significant differences between conditions in the subjective distress reported associated with intrusions (M = 2.25, SD = 1.99), $t(41) = 0.91$, $p = .37$. There was also no significant difference between conditions for either image intrusions, $t(36) = 0.50$, $p = .62$, or verbal thought intrusions, $t(21) = 0.36$, $p = .72$.

Figure 6.3. Mean frequency of intrusions reported in the one week diary and the intrusion provocation task and mean overall score for the Impact of Event Scale for positive and negative CBM of appraisals conditions. Error bars show one standard error of the mean.



IES

As predicted, between-group comparisons revealed that participants in the positive condition had lower overall scores on the IES than those in the negative condition, $t(46) = 2.90$, $p = .006$, $d = 0.84$ (see Figure 6.3). For the avoidance subscale, participants in the positive condition ($M = 3.38$, $SD = 3.36$) reported significantly lower scores than those in the negative condition ($M = 7.33$, $SD = 6.01$), $t(46) = 2.82$, $p = .008$, $d = 0.69$. While in the predicted direction, the difference on the intrusion subscale did not reach significance (positive condition; $M = 5.38$, $SD = 4.49$ vs. negative condition; $M = 7.50$, $SD = 4.91$), $t(46) = 1.57$, $p = .12$, $d = 0.45$.

Intrusion Provocation Task

There was a trend towards a greater overall number of intrusions following the provocation task in the negative condition than in the positive condition, $t(46) = 1.92$, $p = .066$, $d = 0.55$ (see Figure 6.3). For image intrusions alone, there was no significant difference between conditions (negative group: $M = 11.83$, $SD = 13.03$ vs. positive group:

$M = 7.21$, $SD = 5.44$), $t(46) = 1.60$, $p = .12$, but a trend (in the predicted direction) towards a difference between conditions for verbal thought intrusions (negative group: $M = 1.75$, $SD = 2.05$ vs. positive group: $M = 6.83$, $SD = 12.95$), $t(46) = 1.90$, $p = .06$, $d = 0.55$.

In line with predictions, participants who reported intrusions in the negative condition ($M = 2.94$, $SD = 2.34$) reported significantly greater distress associated with intrusions during the provocation task than those in the positive condition ($M = 1.47$, $SD = 1.80$), $t(41) = 2.39$, $p = .02$, $d = 0.52$. (Note: the analysis of distress ratings was conducted only on the 47 participants who reported intrusions). This difference was significant for both image intrusions (negative group: $M = 2.94$, $SD = 2.68$ vs. positive group: $M = 1.49$, $SD = 1.86$), $t(36) = 2.15$, $p = .038$, $d = 0.61$, and verbal thought intrusions (negative group: $M = 3.06$, $SD = 2.68$ vs. positive group: $M = 1.48$, $SD = 1.95$), $t(36) = 2.04$, $p = .049$, $d = 0.63$.

Table 6.2

Mood Levels Pre and Post Film (Session 1) and Mood Levels Pre and Post the Intrusion Provocation Task (Follow-up session)

	Positive Condition ($n = 24$)		Negative Condition ($n = 24$)	
Measure	*M*	*SD*	*M*	*SD*
PANAS positive pre film	65.54	18.13	61.83	17.65
PANAS negative pre film	27.25	7.47	28.42	9.14
PANAS positive post film	60.79	15.24	52.04	18.17
PANAS negative post film	30.67	8.24	33.79	18.06
PANAS positive pre provocation	67.13	17.59	64.83	16.98
PANAS negative pre provocation	28.13	7.83	28.63	10.22
PANAS positive post provocation	62.96	17.79	56.92	15.77
PANAS negative post provocation	27.67	9.86	29.42	9.06

Note. PANAS positive = Positive subscale of the Positive and Negative Affect Schedule; PANAS negative = Negative subscale of the Positive and Negative Affect Schedule and provocation = intrusion provocation task.

Discussion

The current study sought to examine whether the novel CBM of appraisals technique developed in Study 4 could alter negative appraisals about intrusive memories of a standardised negative event. The critical results were that, as predicted, compared to participants who underwent a session of negative CBM of appraisals, participants who underwent positive CBM of appraisals reported: 1) a greater positive appraisal bias and 2) reduced levels of intrusions evident by convergent measures of intrusive memories - i) intrusion frequency over one week reported in the intrusion diary; ii) scores on the Impact of Event Scale one week later iii) response to an intrusion provocation task one week later. Thus, as predicted, the CBM of appraisals task successfully manipulated appraisal bias, and these effects transferred downstream by reducing intrusive symptomatology related to the standardised negative event.

The finding of fewer intrusions of the film reported in the intrusion diary in the positive versus negative CBM of appraisals conditions was carried by the significant difference in the number of verbal thought intrusions. Whilst for imagery intrusions, the means were in the expected direction, the difference was not significant. It is possible that this was a result of a floor effect given the low frequency of image intrusions across both conditions (mean = 1.75, *SD* = 1.33). In comparison, many trauma film studies report greater than three imagery intrusions (Holmes et al., 2004; Holmes et al., 2009). However it may be that images and thoughts show some independence in this case (Hagenaars, Brewin, Van Minnen, Holmes, & Hoogduin, in press).

The current study indicates both the causal influence of maladaptive appraisals on intrusion frequency, and highlights the potential to modify them. The design provided an opportunity to test causality by employing negative and positive

conditions to manipulate appraisals and to examine the impact of these manipulations on intrusion frequency.

In terms of mechanisms, there are a range of potential pathways via which targeting maladaptive appraisals may have influenced intrusion frequency. Based on cognitive models of intrusive memories (Ehlers & Clark, 2000; Ehlers & Steil, 1995), it is plausible that changing maladaptive appraisals may have reduced the motivation to avoid (e.g., suppress) intrusions, which may in turn have reduced their occurrence and associated distress. However, the mechanisms of the observed effects cannot be determined from the current design. Further research is required to confirm the candidate cognitive mechanisms by which modifying appraisals of intrusions results in decreased or increased intrusion occurrence.

The use of an analogue negative event, the depressing film, provides a standardised event with which to compare intrusions between participants. Emotional film-clips have been widely used in laboratory studies of intrusions, and such research has provided compelling evidence about how to modulate flashbacks in the PTSD literature (Holmes & Bourne, 2008; Holmes et al., 2004). Nonetheless, for further generalisability, it would be interesting for future studies to use the current CBM of appraisals technique to influence the interpretations of naturally experienced intrusive autobiographical memories as measured by the negative appraisal subscale of the RIQ and the impact of naturally occurring stressful events. This will be explored in Experiment 6.

Future developments of this line of research will test the potential application of the CBM-I technique to address appraisals of intrusions in a clinical sample. It would be unethical to use negative CBM in a clinical sample, as it may exacerbate negative cognitive biases and, potentially, depressive symptoms. Hence,

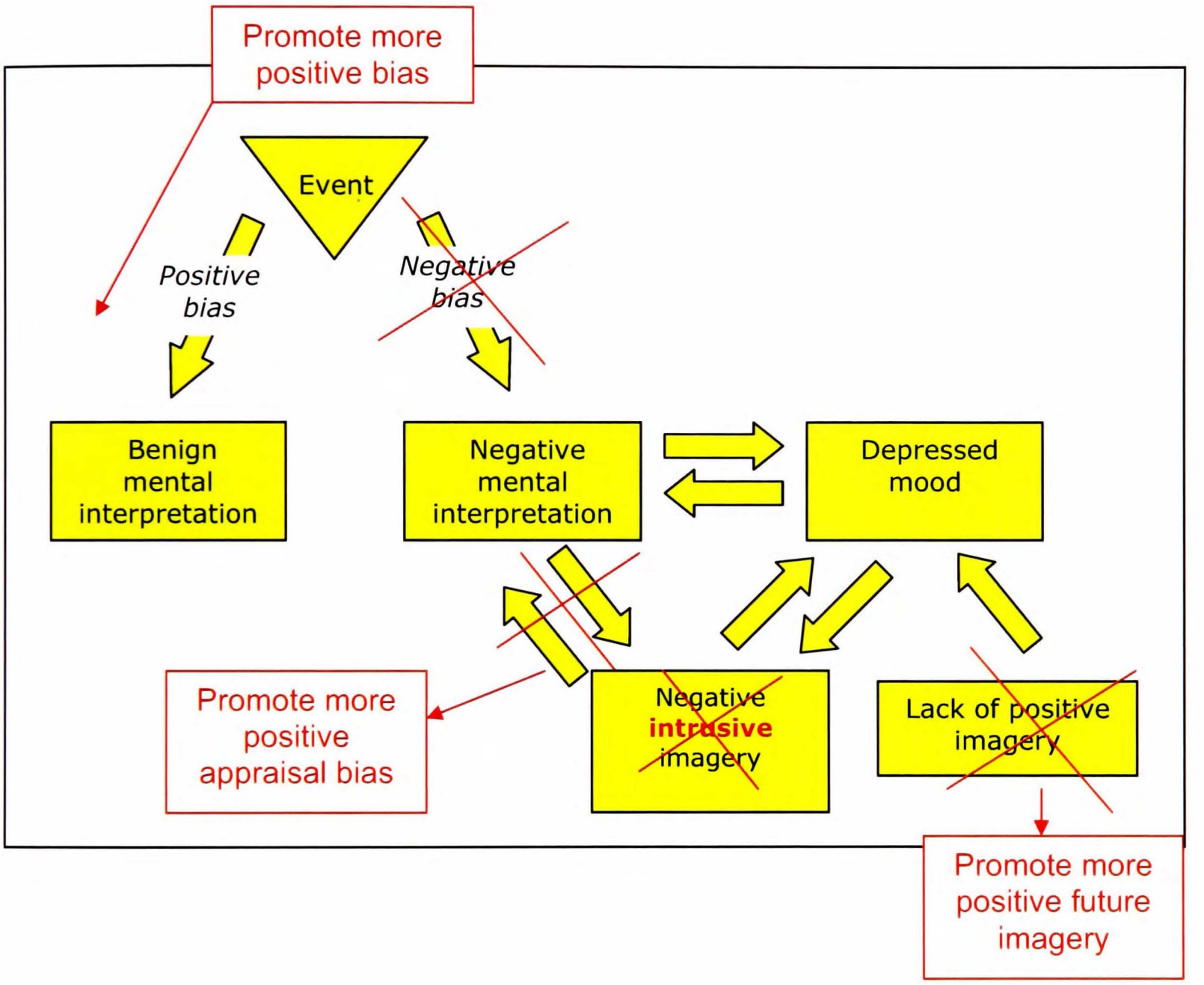
the use of a non-clinical sample in the current study was useful to test the potential effectiveness of adapting the CBM technique to target negative appraisals of intrusions i.e. mental events rather than external scenarios. However, future work could explore the effects of training positive appraisals in a clinical sample. This will be tested in Experiment 6. At this stage, conclusions about the potential clinical utility of the current CBM of appraisals task are limited to making comparisons between the positive and negative CBM conditions. Beyond the scope of the current thesis, future studies that compare the current conditions to a neutral condition, would provide the critical comparison condition that is needed to elucidate whether intrusions increase following negative training, decrease following positive training, or both.

The current study indicates that using CBM-I to target appraisals about intrusive memories has some ability to induce a more positive appraisal bias, and in turn reduce intrusive symptoms including frequency of intrusions (one week diary and on an intrusion provocation task), and decrease scores on a clinical measure of intrusive symptomatology (the IES). It is not clear what effect this manipulation would have on depressive symptoms and whether such changes would similarly occur if tested in participants with major depressive disorder. This will be examined in part in the next experiment. Whilst it is of interest to determine whether the CBM of appraisals technique would provide any clinical benefit to individuals with depression, in the search for clinical applications of CBM-I, Study 3b highlights that it would be beneficial to target both interpretation and mental imagery biases together. Experiment 6 will thus test the possible benefits of using several CBM-I techniques in a package referred to as 'multi-component CBM-I'. This package consisted of the CBM of appraisals task tested here and the auditory CBM-I technique from Experiment 1 and 2 in addition to a new CBM-I technique described in detail below

(Chapter 7). The next study will test this package in a clinical sample of individuals with major depressive disorder.

CHAPTER 7

Experiment 6: A Preliminary Treatment Study - Reducing Depressive Symptoms via Repeated Sessions of Multi-Component CBM-I in People with Depression



Aim

The final chapter of the current thesis presents in Part 1 an updated literature review outlining some of the recent developments in CBM research and their relevance to the current study. It then presents in Part 2 a preliminary study towards translating this line of research from the laboratory to the clinic comparing two groups of participants with major depressive disorder. Experiment 1 and Experiment 2 of this thesis have investigated what type of instructions to give for positive auditory CBM-I, to yield the most effective emotional and interpretation bias responses. The findings highlighted the importance of using instructions that discourage verbal processing, discourage comparisons with the positive material and instead encourage the use of field perspective imagery. Experiment 4 and Experiment 5 tested a newly developed CBM-I technique, CBM of appraisals. The results indicated that this technique could modify appraisals of intrusive memories of a depressive film and in turn reduce intrusive symptomatology, at least for a laboratory stressor.

Study 3a and 3b indicated that the tendency to use mental imagery and interpretation bias together are predictive of a significant proportion of the variance in depressive symptoms as measured by the BDI-II. Study 3b highlighted that a preponderance of negative imagery explained a significant proportion of the variance in depressive symptoms. This is consistent with the literature in depression highlighting the importance of negative intrusive memories (Patel et al. 2007, Starr & Moulds, 2006). The aforementioned CBM-I experiments (Experiment 1 and Experiment 2) indicate the important role imagery plays in the CBM-I procedure. A CBM-I technique which aims to facilitate the promotion of positive imagery using picture-word stimuli instead of auditory stimuli was recently developed (Holmes &

Coughtrey, 2008; Holmes, Mathews, Mackintosh, & Dalgleish, 2008). The use of picture stimuli provides a potentially helpful tool with which to assist in the generation of imagery and was thus included in the current experiment.

To explore the clinical potential of CBM-I for depression, the current study included a number of novel modifications from the previous experiments presented in this thesis. First, it moved the work from a non-clinical population to people with clinical depression. Second, instead of testing a single session of CBM-I, it used repeated sessions over one week. Further, as opposed to using one type of CBM-I technique, the current study combined three CBM-I techniques into a multi-component CBM-1 package. Fourth, the effect of CBM-1 in response to a stressor task other than a depressing film was also investigated. Finally, the durability of CBM-I was investigated by examining whether any changes were maintained two weeks after completing the multi-component CBM-I.

The aim of the current experiment was to use a mixed design to test the response to repeated sessions of multi-component positive CBM-I against a neutral control version in participants with depression. The multi-component CBM-I included three techniques: auditory CBM-I (Experiment 1 and 2), CBM of appraisals (Experiment 4 and 5) and a new picture-word CBM-I technique (Holmes & Coughtrey, 2008). It was predicted that after one week, compared to a neutral condition those participants allocated to the positive condition would report greater reductions in negative interpretation bias (SST and AST-R), negative appraisal bias (RIQ negative), depressive symptoms (Hamilton's Rating Scale for Depression and the BDI-II), anxiety symptoms (STAI-T), as well as intrusive and avoidance symptoms (IES) and that mood gains would be maintained at a two week follow up. Before describing this study, this chapter begins with an updated literature review.

Part 1: Translating CBM Research from the Lab to the Clinic - An Updated Literature Review

Until recently, limited research had explored the clinical potential of the CBM technique. As highlighted by Macleod, Koster and Fox (2009) in their commentary of the recent special issue of the Journal of Abnormal Psychology, a number of extensions have recently been made to CBM research. First, the populations with which CBM has been explored has been extended from non-clinical participants to include high trait anxious (Hirsch, Hayes, & Mathews, 2009; Salemink, Van den Hout, & Kindt, 2009) and dysphoric participants (Watkins, Baeyens, & Read, 2009; Watkins, Moberly, & Moulds, 2008), as well as clinically anxious (Amir, Beard, Burns, & Bomyea, 2009; Beard & Amir, 2008; Schmidt, Richey, Buckner, & Timpano, 2009) and depressed (Raes, Williams, & Hermans, 2009) populations. Second, in addition to CBM techniques that target interpretation and attentional bias, CBM techniques have been developed to target different cognitive biases associated with both anxiety and depression (Raes et al., 2009; Watkins et al., 2009). The effect of CBM techniques in response to a range of stressors has also been investigated (Holmes, Lang, & Shah, 2009; Moberly & Watkins, 2006; See, MacLeod, & Bridle, 2009; Watkins et al., 2008). Further, repeated sessions versus a single session of CBM have begun to be tested (Amir et al., 2009; Beard & Amir, 2008; Salemink et al., 2009). Finally, the inclusion of multiple CBM techniques has been investigated (Hirsch et al., 2009). Each of these extensions to CBM research will be discussed with relevant examples in turn. A summary of this translational CBM research in anxiety and depression published since beginning the current thesis is presented in Table 7.1, illustrating the rapid growth of studies in this area.

Table 7.1

A Summary of the Recent Developments in Published CBM Research Translating from the Lab to the Clinic Over the Past Two Years in Anxiety and Depression

References	Participants			Single vs. repeated sessions		Bias targeted	Inclusion of a stressor task	Depression or anxiety targeted
	Non-clinical	Sub-clinical	Clinical	Single	Repeated			
Amir, Beard, Burns & Bomyea (2009)			√		√	Attention bias	-	Anxiety
Amir, Weber, Beard, Bomyea & Taylor (2008)			√	√		Attention bias	√	Anxiety
Beard & Amir (2008)			√		√	Interpretation bias	-	Anxiety
Hazen, Vasey and Schmidt (2009)		√			√	Attention bias	-	Anxiety
Hirsch, Hayes & Mathews (2009)		√		√		Interpretation bias related to worry	-	Anxiety
Holmes, Coughtrey & Connor (2008)		√		√		Interpretation bias	-	Depression
Holmes, Lang & Shah (2009)	√			√		Interpretation bias	√	Depression
Joormann, Hertel, LeMoult & Gotlib (2009)			√		√	Negative memory bias	-	Depression
Lang, Moulds & Holmes (2009)	√			√		Appraisal bias for intrusive memories in depression	√	Depression
Mathews, Ridgeway, Cook and Yiend (2007)		√			√	Interpretation bias	-	Anxiety

Table 7.1 (continued)

References	Participants			Single vs. repeated sessions		Bias targeted	Inclusion of a stressor task	Depression or anxiety targeted
	Non-clinical	Sub-clinical	Clinical	Single	Repeated			
Raes, Williams & Hermans (2009)			√		√	Overgeneral autobiographical memory	-	Depression
Salemink, Van den Hout & Kindt (2009)		√			√	Interpretation bias	√	Anxiety
Schartau, Dalgleish & Dunn (2009)	√			√		Perspective broadening	√	Transdiagnostic
Schmidt, Richey, Buckner & Timpano (2009)			√		√	Attention bias	-	Anxiety
See, MacLeod & Bridle (2009)	√				√	Attention bias	√	Anxiety
Standage, Ashwin & Fox (2009)	√			√		Interpretation bias	√	Anxiety and Depression
Watkins, Beyens & Read (2009)		√			√	Abstract thinking style	-	Depression
Watkins and Moberly (2009)		√			√	Abstract thinking style	-	Depression
Watkins, Moberly and Moulds (2008)	√			√		Abstract thinking style	√	Depression

CBM Research in Sub-Clinical and Clinically Anxious and Depressed Participants

When the current thesis was begun, the CBM had largely only been tested in non-clinical populations. Increasingly, research has begun investigating the potential clinical applicability of various CBM techniques to both depression and anxiety (Amir et al., 2009; Beard & Amir, 2008; Schmidt et al., 2009). Before testing the technique in clinical participants, clinically relevant (sub-clinical) groups were utilised i.e., high trait anxious or dysphoric participants. For example, as explained in Chapter 1, Salemink et al. (2009) tested repeated sessions (eight consecutive days) of either a positive or a control CBM-I in 34 participants high trait anxious participants. Positive compared to neutral CBM-I reduced state and trait anxiety as well as general psychopathology after one week.

For dysphoric participants, Watkins and Moberly (2009) compared either eight sessions of relaxation training alone or relaxation training in combination with a CBM technique (explained in greater detail below) in which participants were trained to think more specifically and concretely (in contrast to abstractly). Participants who received concreteness CBM reported greater decreases in depressive symptoms and state rumination than those who received the relaxation training alone at the completion of the eight sessions.

Hazen, Vasey and Schmidt (2009) randomly assigned 24 severe worriers to five sessions of either CBM for attentional bias (CBM-A) or a control condition. Participants who received CBM-A reported greater reductions in both attention to threat bias and anxiety and depressive symptoms compared to the control condition upon completion of the five sessions.

Moving to clinical populations, Amir et al. (2009) found CBM-A proved successful in reducing anxiety symptoms in generalised anxiety disorder (GAD)

patients. In the Amir et al. (2009) study, 29 participants with GAD completed eight sessions (twice a week for four weeks) of either CBM-A or a control version of the CBM-A technique. The CBM-A technique tested in this study involved presenting participants with word pairs including one threat word (relevant to fears of individuals with anxiety) and a neutral matched word. A probe is also included, which participants must respond to. This probe is placed behind the neutral word 66% of the time (with no such contingency between the probe and neutral word in the control condition). This was designed to train participants to attend to the neutral and away from the threatening information.

Using a face (as opposed to word) version of the CBM-A technique, Schmidt et al. (2009) tested participants with social anxiety twice weekly for one month (a total of eight sessions). In contrast to the control condition, participants who completed CBM-A displayed greater reductions in both trait anxiety and social anxiety. These benefits were maintained at four month follow up (Schmidt et al., 2009). A single session of a face based CBM-A was tested by Amir, Weber, Beard, Bomyea and Taylor (2008) in individuals with social anxiety. Compared to a control condition, CBM-A resulted in greater decreases in threat related attentional bias and smaller increases in anxiety in response to a public speaking challenge. In summary, the abovementioned studies have indicated the ability of CBM techniques to successfully modify bias and depressive and anxious symptoms in sub-clinical and clinical populations.

CBM Effects on Response to Stressors

See et al. (2009) explored whether the effects of CBM transfer to responses to a naturalistic stressor. Forty participants who were students shortly beginning university study overseas (in 17 days) were randomly assigned to 16 sessions (over

16 days) of internet delivered benign CBM-A (training participants to attend to benign stimuli instead of threatening stimuli) or a control CBM-A technique. Participants that completed benign CBM-A reported greater reductions in trait anxiety and state anxiety in response to a real life stressor (moving overseas and beginning university) compared to those who completed the control CBM-A. In addition, a number of studies have demonstrated that the modified biases induced by CBM influenced subsequent responding to laboratory based stressors such as the Remote Associates Test (RAT), a negative mood induction, or a failure anagram task (Holmes et al., 2009; MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002; Moberly & Watkins, 2006; Watkins et al., 2008).

Repeated Sessions of CBM

Increasingly, in a search for more durable effects of CBM, studies have begun investigating the effects of including more than a single session of the procedure as in a number of studies described above. Whilst a single session of CBM has been shown to modify a variety of bias and emotions, the durability of such effects, has to my knowledge, only been tested after one day for interpretation bias (Yiend, Mackintosh, & Mathews, 2005). In contrast, as outlined above, Schmidt et al. (2009) showed the effects of repeated sessions of a CBM-A technique lasting up to a four month follow up.

Mathews et al. (2007) randomly assigned high trait anxious participants to four sessions over two weeks of positive CBM-I or a test-retest control condition. Participants who completed positive CBM-I reported a greater increase in positive interpretation bias, along with greater reductions in trait anxiety, maintained at one week follow up, compared to participants who completed negative CBM-I. Beard and Amir (2008) randomly assigned 27 socially anxious individuals to either eight

sessions of CBM-I over four weeks or a control condition. The participants with social anxiety who completed CBM-I reported greater decreases in social anxiety symptoms, and increases in benign interpretations, compared to participants in the control condition. In summary, much of the research outlined above and presented in Table 7.1 has highlighted the utility of including repeated sessions of CBM.

Differing CBM Techniques Targeting a Range of Cognitive Biases

CBM techniques are being developed targeting a range of cognitive biases associated with both depression and anxiety, in addition to interpretation and attention bias (MacLeod et al., 2009). For example, as outlined in Chapter 5 and 6, Mackintosh et al. (2008) extended the application of CBM to target appraisals of intrusive memories associated with PTSD in a non-clinical sample. In response to a traumatic film, participants who completed positive, rather than negative CBM of appraisals, rated their intrusive memories of a traumatic film as less distressing (in Experiment 1) and less frequent (in Experiment 2).

As previously discussed (Chapter 1), retrieval of overgeneral as opposed to specific autobiographical memories is a problematic feature of depression and predicts worse outcomes over the course of depression (J. M. G. Williams et al., 2007). As highlighted by Raes et al. (2009), simple remission of depressive symptoms does not always improve this overgeneral memory bias. Williams Teasdale, Segal and Soulsby (2000) and McBride, Segal, Kennedy and Gemar (2007) however, have shown that MBCT and standard cognitive therapy can improve memory specificity alongside improvements in depressive symptoms.

Raes et al. (2009) administered a new group-based CBM technique, aiming to increase memory specificity in patients with depression, namely memory specificity training (MEST). Ten female inpatients with depression completed one session of

MEST each week, in groups of three to eight, for four weeks. Memory specificity was significantly increased following MEST. Alongside these increases in specificity of memory recall were concomitant decreases in rumination and feelings of hopelessness that did not appear to be due to reductions in depressive symptoms (thus likely independent of the improvements in depression).

Another related problematic cognitive bias in depression is the tendency to think abstractly as opposed to concretely about self-relevant information (Beck, 1976 as cited in Watkins & Moberly, 2009). As outlined above, Moberly and Watkins (2006) tested a CBM technique aimed to induce abstract or concrete processing in dysphoric participants. The technique involved repeated presentation of 12 scenarios (half positive and half negative) with two different sets of instructions to induce abstract; "think about the causes, meanings, and implications of each situation" or concrete processing; "imagine the details of what is happening" (p. 284; Moberly & Watkins, 2006).These concrete instructions were almost identical to those used in the 'imagery' condition of Holmes and Mathews (2005). Participants focused on each scenario for one minute followed by writing responses to questions (differing dependent on condition) about each scenario. This was tested in response to a stressor task, the RAT. Watkins, Moberly and Moulds (2008) adapted the technique tested in Moberly and Watkins (2006) and instead used the scenarios and formatting similar to the CBM-I technique employed by Mathews and Mackintosh (2000). However, in contrast to Mathews and Mackintosh (2000), in Watkins et al. (2008) no specific valence (and thus interpretation of ambiguity) was trained with half of the resolutions of their CBM scenarios being positive and half negative. The different conditions attempted to induce either an abstract or concrete processing style with the instructions as in Moberly and Watkins (2006). Non-clinical participants trained to

process more concretely had smaller increases in negative emotion in response to a failure experience (anagram stress task) compared to those who were trained to process abstractly (Watkins et al., 2008). This CBM technique was then modified to form "concreteness training" (CNT) asking participants to imagine emotional events and to focus "on the specific details of an event, on what makes each event unique, and on the process of how it happened" (p. 56, Watkins et al., 2009). This was tested in 60 dysphoric participants in comparison to a control version of CNT referred to as bogus CNT (without instructions to concretely process) and a waiting list control condition. It involved an initial session followed by daily use of the program for one week. Greater reductions in depressive symptoms were displayed in participants who completed CNT compared to bogus CNT or the wait list control condition (Watkins et al., 2009).

The CNT (Watkins et al., 2009) can be thought of as akin to the imagery based auditory CBM-I used in the current thesis and Holmes et al. (2006; 2009). Indeed the CNT (Watkins et al., 2009) appear almost identical to the imagery instructions used in Holmes and Mathews (2005) with minor variations. The main aim of CNT however is to train individuals to use the imagery based processing (which invites individuals to be more concrete) when encountering any stimuli positive or negative. In contrast, the imagery based positive auditory CBM-I aims to boost imagery processing as well as modify an individuals tendency to interpret ambiguous information. In the positive imagery CBM-I condition, participants are thus trained to interpret ambiguous information more positively and employ more imagery processing.

Not only is overgeneral recall of autobiographical memories or more abstract thinking a problem with depression, a large body of research has highlighted that

depression is also associated with a greater recall of negative as opposed to positive memories (for a review see Matt, Vasquez, & Campbell, 1992). This memory bias has been targeted in a CBM technique developed by Joormann, Hertel, LeMoult and Gotlib (2009). Joormann et al. (2009) tested a single session of their CBM technique training 45 currently depressed participants and 45 never depressed controls to forget negative material. That is, participants learnt to associate neutral words with either positive or negative words and were then asked not to think of the negative words. Whilst suppressing thoughts of the negative words, participants were asked to either substitute thoughts of the negative word with (1) a newly learnt positive word (positive-substitute condition), (2) negative word (negative-substitute condition) or (3) no such instructions were offered (unaided condition). Results indicated that depressed participants were successful in forgetting the negative words when using both positive and negative substitutes but not in the unaided condition.

Schartau, Dalgleish and Dunn (2009) developed and tested a different CBM technique attempting to train participants to adopt a 'broader perspective' in response to a range of different situations such as negative experiences and to integrate additional positive information when considering these events. Study 1 used this technique with emotional film clips asking participants to adopt this broader perspective whilst watching the different films. Study 2 and 3 tested whether this technique would remain effective if the broader perspective was adopted *after* watching the films. Study 4 then applied this to response to naturally occurring autobiographical memories. Emotional and electrodermal responses to the film were reduced in participants who completed the CBM technique in comparison to a control condition. In addition, for participants higher in negative affect in Study 4,

completion of the CBM technique resulted in reductions in intrusive symptoms as measured by the IES (Schartau et al., 2009).

Combining CBM Techniques

Instead of using only a single CBM technique, Hirsch, Hayes and Mathews (2009) combined homograph based CBM-I (Grey & Mathews, 2000) and a variation of ambiguous scenario based CBM-I (Mathews & Mackintosh, 2000). These techniques were combined to increase the possibility that the modified interpretation bias would be more likely to generalise to more stimuli. Specifically, the combination of CBM-I techniques aimed to influence the frequency of negative thought intrusions occurring whilst worrying. Forty high worriers were randomly assigned to a single session of either benign CBM-I (training a benign interpretation bias) or a control CBM-I including 50% benign resolutions and 50% threatening resolutions. Benign CBM-I gave rise to fewer negative intrusive thoughts and less anxiety during a breathing task (following a period of worry) compared with the control CBM-I. These finding were then replicated in Hayes, Hirsch, Krebs and Mathews (in press). Hayes et al. (in press) extended these results by including a measure of interpretation bias (as this was not measured in Hirsch et al., 2009). The findings conclude that the induced interpretation bias mediated the effects of condition on frequency. It appears the effects of a combined CBM-I technique targeted at worry successfully modified additional cognitive features of worry.

Picture-Word CBM-I

To date, CBM-I techniques have used predominantly verbal stimuli (in both text and auditory form). As reviewed in Chapter 1 depression is associated with a lack of positive prospective imagery (Holmes, Lang, Moulds, & Steele,

2008; J. M. G. Williams et al., 1996). Whilst the existing imagery instruction auditory CBM-I technique encourages imagery processing, it could be beneficial to include visual stimuli to aid in the generation of vivid images. A picture-word CBM-I technique has recently been developed (Holmes & Coughtrey, 2008). This technique was based on the evaluative conditioning technique developed in Holmes, Mathews et al. (2008). Participants are presented with neutral picture stimuli of everyday events. These pictures are then presented in combination with a word or phrase relating to the valence of assigned condition. For example, as can be seen in Figure 7.1, participants could be presented with a picture of scones with jam and cream. In the positive condition this would be accompanied with the words "tasty treat", whereas in the negative condition the word "fattening" could be used. Holmes and Coughtrey (2008) tested positive, negative and neutral (including 50% positive and 50% negative combinations) versions of this technique in participants with dysphoria. For the neutral condition, this was accompanied by the positive word half the time and the negative word half the time. They found that the positive condition resulted in a greater increase in positive mood and a greater reduction in negative interpretation bias compared to the negative or neutral conditions. This beneficial effect also extended to a behavioural task, whereby participants in the positive condition caught more fish on a fishing game than negative or neutral condition participants.

Figure 7.1. An example of a positive and negative picture-word combination as presented for picture-word CBM-I in Holmes and Coughtrey (2008).

Positive: Tasty treat
Negative: Fattening

CBM-I in Clinically Depressed Populations

None of the aforementioned clinical investigations of the CBM technique for depression have yet targeted interpretation bias. Blackwell and Holmes (in press) utilised a singe case series design to test the effectiveness of one week (7 sessions) of positive auditory CBM-I (targeting interpretation bias) in seven clinically depressed participants. Results were promising with clinically significant decreases in depressive symptoms in 50% of the participants (as measured by the BDI-II) maintained at a two week follow up. Given that the design of Blackwell and Holmes (in press) was a single case series without a control condition it is not possible to attribute the improvements in depressive symptoms to the positive auditory CBM-I technique. It is possible that some of the effects were a result of spontaneous improvement over time. The current study thus employs an experimental design including comparison of positive CBM-I with a neutral control condition.

Part 2: Testing a Multi-Component CBM-I Package in Individuals with Major Depressive Disorder

Derivations of the Multi-component CBM-I Package in the Current Study

Blackwell and Holmes (in press) tested repeated sessions of only positive auditory CBM-I. Feedback indicated that a number of participants (three out of seven) reported that they found the task boring and repetitive. In addition, one of the key features of depression is problems maintaining concentration and attention. Providing some variety to the tasks completed each day may help participants to maintain interest and attention. Similar to Hirsch et al. (2009) the current study therefore aimed to combine techniques, specifically; (1) the positive auditory CBM-I technique for three full days (Chapter 2 and 3), (2) the picture-word CBM-I technique (above) for two full days and (3) the CBM of appraisals technique for one full day (Chapter 5 and 6).

In the current experiment, field perspective imagery instructions (Holmes, Coughtrey, & Connor, 2008) were included, alongside instructions not to compare the material presented with their own experiences. Participants were also instructed and given practice regarding imagining scenarios that were not personally relevant to them and were complete fantasy, for example, imagining sitting on an elephant flying through the sky (Holmes & Coughtrey, 2008). The instructions used in conjunction with the positive auditory CBM-I technique in the current study were the same as those used in Blackwell and Holmes (in press) and based on those used in Experiment 1 and 2.

Additional Outcome Measures

To assess the extent of the generalisability of the multi-component CBM-I technique, additional outcome measures to those used in the current thesis were included. First, the Hamilton's Rating Scale for Depression (HRSD; Hamilton, 1960)

was included alongside the BDI-II in the current study to facilitate comparisons with clinical studies in depression (Barnhofer et al., 2009; deRubeis et al., 2005; Dimidjian et al., 2006; Miskowiak et al., 2009). The HRSD is one of the most commonly used clinical measures in studies investigating treatments of depression in particular for pharmacotherapy (Hollon, Thase, & Markowitz, 2002; J. B. W. Williams, 1988).

Second, a measure of trait anxiety was included in the current study as assessed by the STAI-T. This was tested to facilitate comparisons with other CBM studies (Amir et al., 2009; Mathews et al., 2007; Salemink et al., 2009). In addition, given the high co-morbidity between depression and anxiety (Moffitt et al., 2007) it was possible that some of the effects of the multi-component CBM-I technique would transfer to anxiety. Further, as shown in Experiment 1 and 2 the stimuli used in positive auditory CBM-I are also relevant to anxiety with modifications of state anxiety across the CBM-I session.

Third, to determine whether repeated sessions of a multi-component CBM-I package would modify the appraisals of negative intrusive memories, the negative appraisal subscale of the Response to Intrusions Questionnaire (RIQ; Clohessy & Ehlers, 1999) was included. As outlined in Chapter 5, Starr and Moulds (2006) have demonstrated that the negative appraisals of intrusive memories, as measured by the RIQ, are predictive of depression. The RIQ was included in place of the recognition test used in Study 4 and Experiment 5 to allow for repeated administration and to test for generalisability of the appraisal bias to materials in a different form to those presented during CBM-I.

Fourth, to assess whether intrusive and avoidance symptoms would be modified, the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979) was also included. As outlined in Chapter 5 levels of intrusion and avoidance as measured

by the IES are associated with depression severity (Kuyken & Brewin, 1994) and predictive of depression over 6 months (Brewin, Reynolds, & Tata, 1999). Results of Experiment 5 indicated that the CBM of appraisals technique is able to modify the IES when anchored to a laboratory based stressor, a depressing film. The current study instead assesses these symptoms of intrusion and avoidance in response to stressful life events.

Fifth, the Scrambled Sentences Test (SST; Wenzlaff, 1993) was used in this study, as in Blackwell and Holmes (in press), to measure change in depressive interpretation bias. This measure was included in addition to the AST-R as a further test of interpretation bias reflecting generalisability to novel stimuli as it does not match the format of any of the individual components of the multi-component CBM-I package. The SST (explained in detail below) involves under cognitive load, unscrambling sentences to reveal either a positive or negative interpretation bias and has been shown to measure a bias relevant to depression. The SST is able to discriminate between individuals with a history of depression and never depressed controls (Rude, Covich, Jarrold, Hedlund, & Zentner, 2001) and able to predict diagnosis of depression 18 - 24 months after measurement (Rude, Valdez, Odom, & Ebrahimi, 2003).

Finally, a stressor task, a variation of the failure version of the RAT (McFarlin & Blascovich, 1984) was included in the current study as in Moberly and Watkins (2006) to assess whether the multi-component CBM-I package would influence vulnerability to depression.

Overview of the Current Study

In summary, the current study tested repeated sessions across a week of positive versus neutral version of a multi-component CBM-I technique using

participants with depression. This multi-component CBM-I technique combines auditory CBM-I that uses auditory descriptions to modify interpretation bias, picture-word CBM-I using picture and word combinations to modify interpretation bias and CBM of appraisals modifying depressive appraisals of intrusive memories. Outcome measures included depressive and anxious symptoms, interpretation and appraisal bias, and intrusive symptoms in participants with depression. The main research questions therefore were whether any benefits for patients with depression would be derived from the positive condition and if so would they be maintained at two week follow up.

Hypotheses

Interpretation Bias

1. Following repeated sessions of multi-component CBM-I, participants in the positive condition would report greater reductions in negative interpretation bias (as measured by the SST and the AST-R) compared to those in the neutral condition.

Depressed and Anxious Symptoms

2. After repeated sessions of multi-component CBM-I, participants in the positive condition compared to participants in the neutral condition would report greater decreases in depressive symptoms (BDI-II and HRSD) and anxiety symptoms (STAI-T). These changes in anxiety and depressive symptoms would be maintained at two week follow up.

Appraisal Bias

3. After positive compared to neutral multi-component CBM-I, participants would display greater reductions in their negative appraisals of intrusive memories as measured by the negative appraisals subscale of the RIQ.

Intrusive symptoms

4. Intrusive and avoidance symptoms, as measured by the IES, would be more greatly reduced in the positive condition compared to the neutral condition as demonstrated in Experiment 5.

Response to Stressor Task

5. After positive compared to neutral multi-component CBM-I participants would show smaller increases in negative affect and decreases in positive affect (PANAS) over the course of completing a stressful task (the RAT), and rate their performance on the RAT as better.

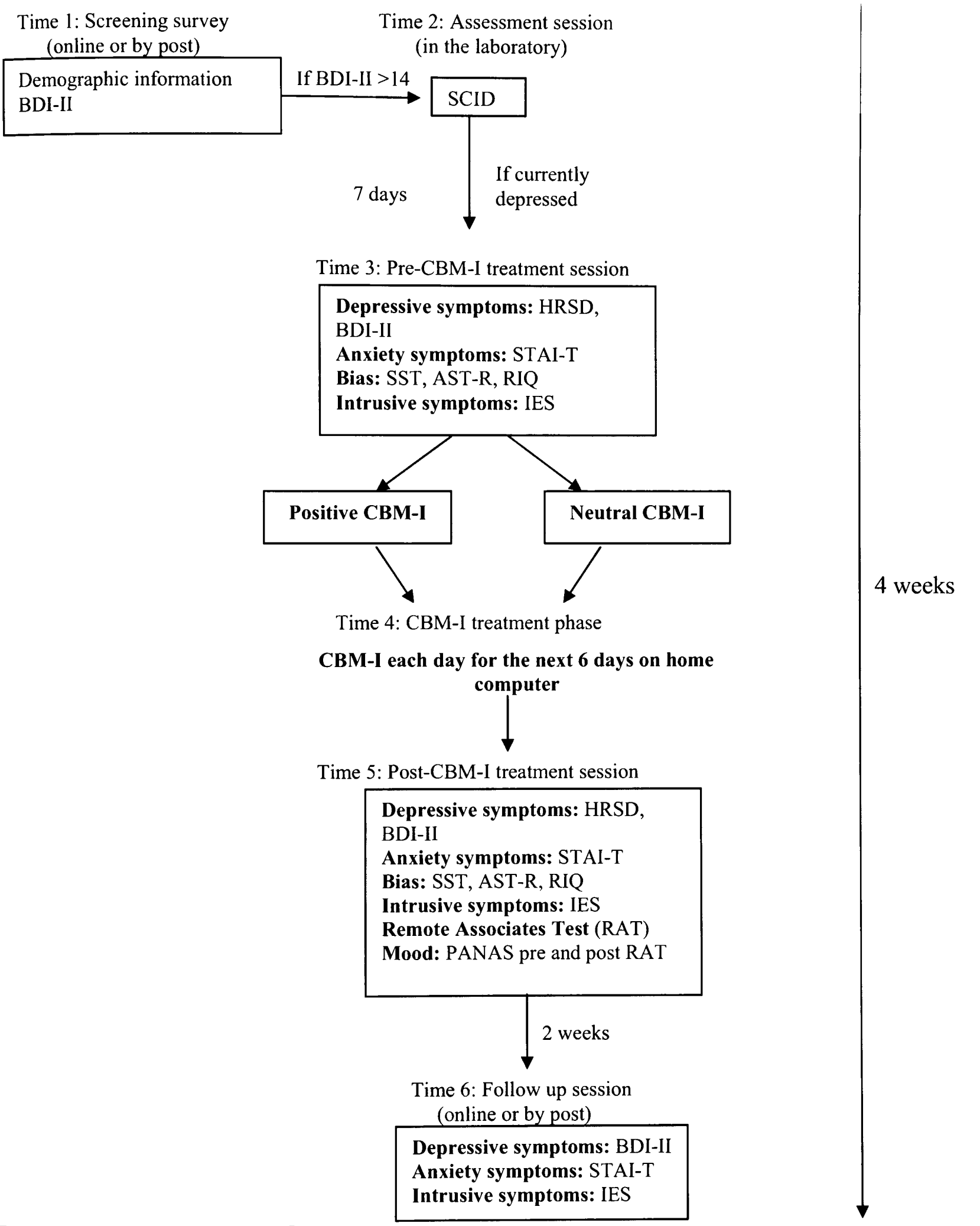
Method

Overview

For a diagrammatic overview of the procedure see Figure 7.2. Following completion of the screening survey (either online or via post), participants who scored higher then 14 on the Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996) were invited for an assessment session. Eligible participants (as determined in the assessment session) were randomly allocated to repeated sessions of either positive or neutral multi-component CBM-I and invited to return one week after the assessment session for the pre-CBM-I treatment session. During the pre-CBM-I treatment session participants completed measures of depression and anxiety symptoms along with measures of interpretation bias and intrusive symptoms. Participants were then

introduced to the multi-component CBM-I components guided by the experimenter. They were then provided with the CBM program to take home and complete once per day over the next week on their home computer. Participants returned one week later and again completed the measures of depression, anxiety, interpretation bias, appraisal bias and intrusive symptoms. Two weeks later, participants again completed the measures of depression, anxiety and intrusive symptoms online or by post.

Figure 7.2. Schematic overview of the experimental procedure.[1]



[1] BDI-II = Beck Depression Inventory II, SCID = Structured Clinical Interview for DSM-IV Axis 1 Disorders, HRSD = Hamilton's Rating Scale for Depression, STAI-T = Trait version of the State–Trait Anxiety Inventory, SST = Scrambled Sentences Test, AST-R = Ambiguous Scenarios Test- Revised, RIQ = Response to Intrusions Questionnaire, IES = Impact of Events Scale, RAT = Remote Associates Test, PANAS = Positive and Negative Affect Schedule.

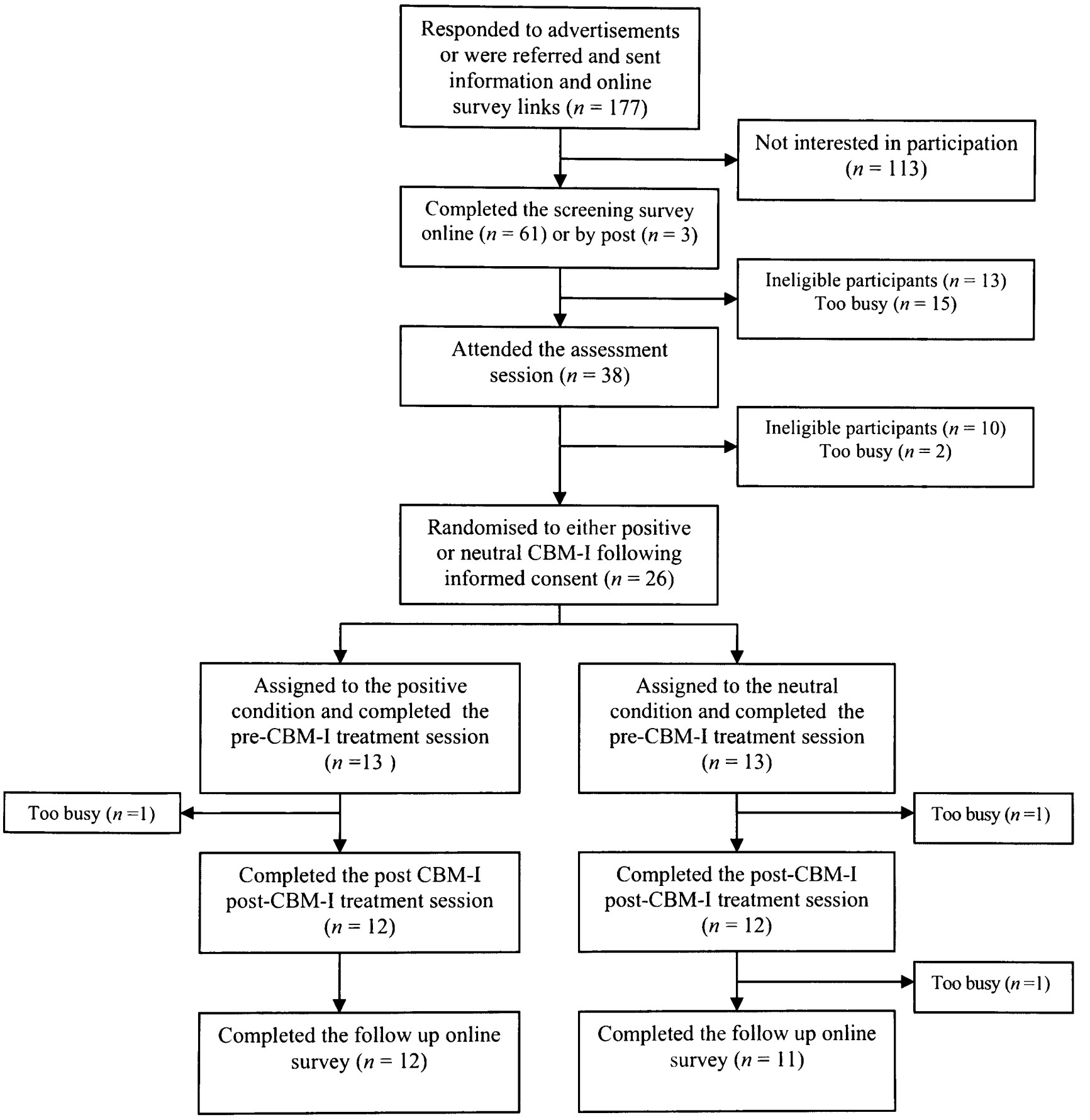
Participants

Participants with depression were recruited through referrals from general practitioners or psychiatrists and through advertisements placed online and around Oxford requesting people "for a study investigating the effects of thinking and low mood among people who are feeling down or depressed". Further information was sent to 177 people with the screening survey either by post or email. Sixty-four individuals completed the screening survey. Fifty-one participants scoring higher than 14 on the BDI-II were invited for an assessment session. Thirty-eight of the 51 invited participants, attended this session. Participants were included in the study if they met criteria for a current major depressive episode based on DSM-IV criteria using the SCID (First et al., 1996). Participants were excluded if they (a) failed to meet criteria for depression (n = 6); (b) were unable to attend the subsequent experimental sessions (n = 1); (c) experienced alcohol or drug abuse which would interfere with participation in the study (n = 0); (d) had a current diagnosis of psychosis (n = 0); (e) were assessed to be at immediate risk of suicide (n = 1); (f) reported a current neurological impairment (n = 0); (g) were currently receiving a psychological treatment for depression (n = 0); (h) changed antidepressant medication in the past week (n = 1); or (i) had a history of bipolar disorder (n = 1).

Two eligible participants chose not to attend the pre-CBM-I treatment session due to other commitments. Two participants who completed the pre-CBM-I treatment session, did not complete the post-CBM-I treatment session (one from the positive and one from the neutral condition). One participant failed to complete the follow up questionnaires within 10 days of completing the CBM-I program. Data for the follow up session of this participant was not included however all other data was included in the analysis. Twenty-three participants in total completed all experimental sessions. A

diagram indicating the participant flow is shown in Figure 7.3. This study was approved by the NHS Oxfordshire Research Ethics Committee (see Appendix 7. 1).

Figure 7.3. Diagram of the participant flow through the experiment.



Sample Size Estimation

The current study was a feasibility study and used a relatively small sample size. The sample size was estimated based on other preliminary treatment studies conducted prior to large randomised controlled trials (Barnhofer et al., 2009; Lyketsos et al., 2000; Riley, Lee, Cooper, Fairburn, & Shafran, 2007). For example, Barnhofer et al. (2009) conducted a preliminary study of Mindfulness-Based Cognitive Therapy for chronic depression randomly allocating 28 patients with chronic depression to either MBCT (n = 14) or treatment as usual (n = 14). In Riley et al.'s (2007) feasibility study for CBT for clinical perfectionism 20 individuals were randomly assigned either immediate CBT (n = 10) or a waiting list control condition (n = 10). In the current study12 people per group were tested.

Materials

Apparatus

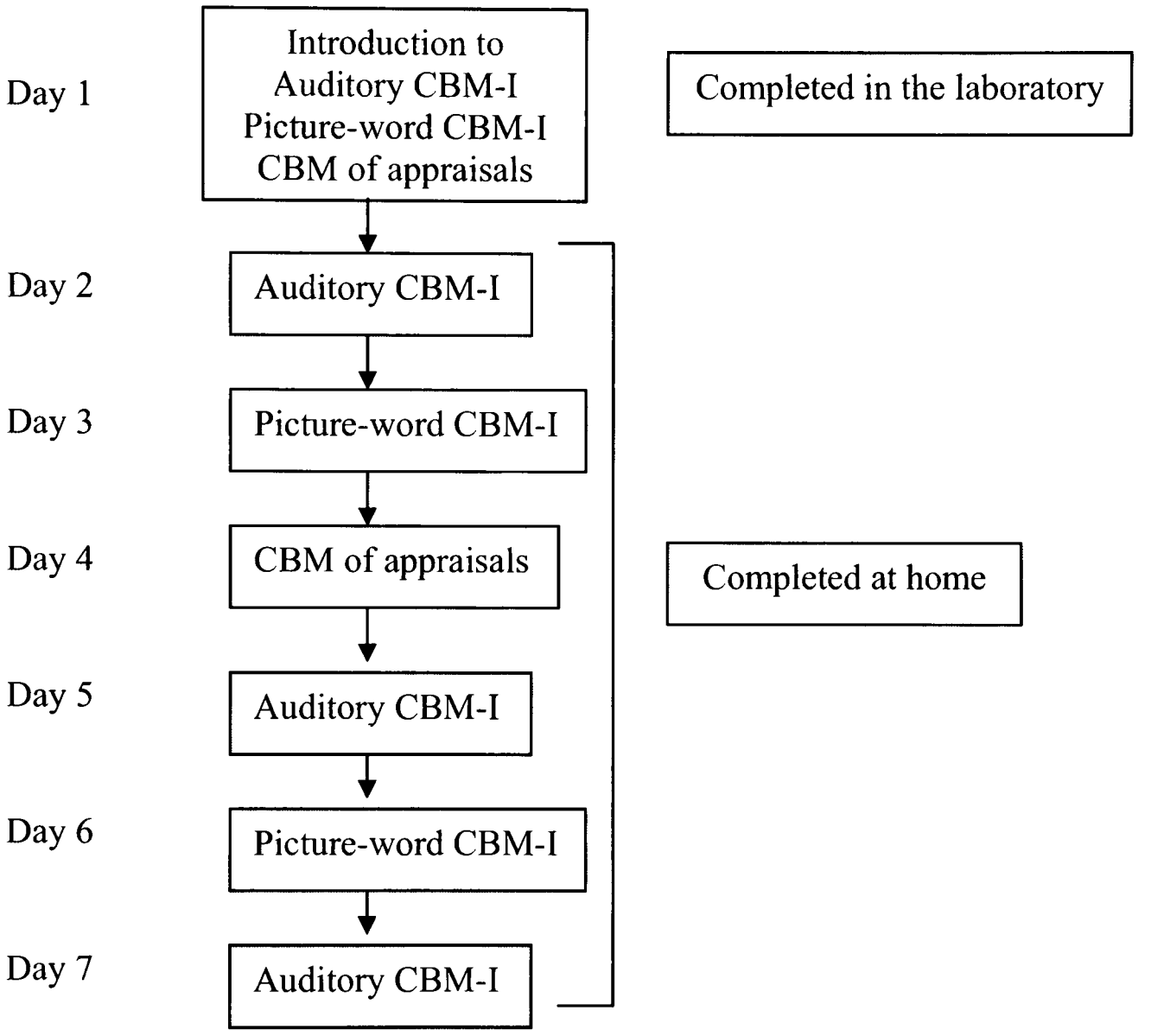
The Bristol Online Surveys (BOS, 2007) software was used to create the web-based survey for the screening and follow up session. E-prime software was used to programme the experiment (Version 2.0, Pittsburgh: Psychology Software Tools Inc.). As previously, the auditory paragraphs were recorded digitally using Cool Edit 2000 software (Phoenix; Syntrillium Software Corporation). The descriptions were read in different voices including two male and two female voices lasting approximately 10-13 seconds each.

Multi-Component CBM-I

A multi-component CBM-I technique was created. It included auditory CBM-I, picture-word CBM-I and CBM of appraisals. The different CBM-I components were

presented on separate days over one week, and are discussed in turn below. Figure 7.4 outlines the order of presentation of each of the individual components across the week.

Figure 7.4. Overview of the different CBM-I components of the multi-component CBM-I package used on each day in both the laboratory and at home across the week.



Auditory CBM-I Materials

Scenarios used in the auditory CBM-I technique included the 100 descriptions taken from Experiments 1 and 2 and a selection of additional descriptions taken from Blackwell and Holmes (in press). For a full outline of the 216 descriptions auditory CBM-I see Appendix 7.2. Of the 215 descriptions, 24 were presented at the pre-CBM-I treatment session to introduce participants to the technique. On subsequent days, participants were presented with 64 different auditory descriptions presented in

eight blocks of eight descriptions (as in Blackwell & Holmes, in press). Examples of the stimuli are presented in Table 7.2. Scenarios were presented randomly within each block. Short self-paced breaks were offered between blocks with reminder instructions, see Appendix 7.3. There was a 2 s gap after each auditory description followed by vividness ratings ("how vividly could you imagine the situation that was described?"). These were rated from 1 (*not at all vivid*) to 5 (*very vivid*). As in Experiment 1 and 2, the descriptions were presented over headphones.

Table 7.2

Examples of Four Auditory CBM-I Scenarios

Ambiguous scenario stem	Positive resolution	Neutral resolution (including 50% positive and 50% negative resolutions)
You buy a new outfit for a wedding in a rush. Putting it on you see it looks rather …	flattering	flattering *(positive resolution)*
It is your first day at a new job. When you wake up in the morning you feel full of …	energy and enthusiasm	anxiety and dread *(negative resolution)*
You are holding your new-born baby. It's only a few hours old. This moment overwhelms you with …	pride and joy	pride and joy *(positive resolution)*
You look around at where you live and at your possessions in your home. You realise how terribly …	lucky you are	doomed you are *(negative resolution)*

Picture-word CBM-I material

The 152 picture stimuli used in picture-word CBM-I were taken from McGillivray and Holmes (2009); Holmes and Coughtrey (2008) and Holmes, Mathews et al. (2008). These were colour photographs of neutral everyday stimuli

with dimensions of approximately 640 x 480 pixels. These were displayed on computer screen, in the laboratory 17" VDU. Each picture was combined with a word or short phrase, which provided a potential positive or negative interpretation of the picture. The same picture stimuli were used in both the positive and neutral condition with only the word combination changing In the positive condition, participants were repeatedly presented with positive words and in the neutral condition, 50% of the combinations were positive and 50% were negative. For an example of picture-word CBM-I stimuli, see Figure 7.5. A full outline of all picture-word combinations are presented in Appendix 7.4.

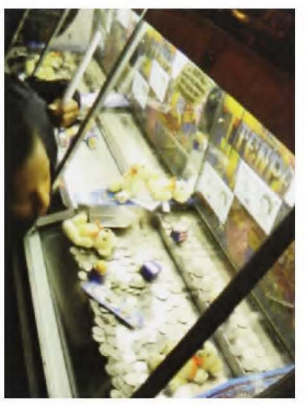
Each picture word combination was presented for 3000 ms followed by a black screen displaying "Close your eyes and IMAGINE." Similar to auditory CBM-I, participants were asked to rate how vividly they could imagine the combination of the picture and word.

At the pre-CBM-I treatment session, participants were introduced to the picture-word CBM-I technique with three sets of eight picture and word combinations. Day 3 and Day 6 included 64 pictures in eight blocks of eight, randomised within each block.

Figure 7.5. Examples of four picture-word combinations for (i) positive and (ii) neutral conditions.

(i) Positive condition picture-word combinations

Picturesque



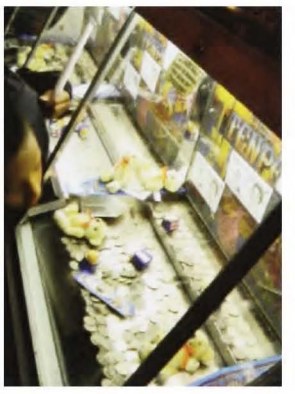
I win

Feeling flush

Cute

(ii) Neutral condition picture-word combinations *(composed of 50% positive words and 50% negative words)*

Picturesque



I win

Fraud

Screaming

CBM of Appraisals Material

The scripts used for the CBM of appraisals technique were those developed in Experiment 6 and tested in Experiment 7. The 80 items included are presented in Appendix 7.5. These were divided into eight blocks of eight scripts. As previously (in Experiment 4 and 5), 24 randomly selected statements, were followed by a comprehension question to focus participants on their task.

Measures

Screening and demographics survey. The BDI-II (Beck et al., 1996, see below) was used in the online survey. Demographic information was also included with questions regarding gender, age, and the number of years of education undertaken with multiple choice options "11 or less; 12-13; 14-15; 16-17; More than 17."

Structured Clinical Interview for DSM-IV Axis 1 Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 1996). The SCID-I is a semi-structured interview that assesses current and past diagnosis of axis 1 disorders according to DSM-IVcriteria (American Psychiatric Association, 2000). All SCID-I interviews were conduced by the experimenter. The SCID-I was used in the assessment session to determine whether participants were eligible for the study.

Hamilton Rating Scale for Depression (HRSD; Hamilton, 1960). The 17–item version of the HRSD interview is a widely used interview-based assessment tool to measure severity of depressive symptoms. It possesses high reliability and validity (Potts, Daniels, Burnam, & Wells, 1990; J. B. W. Williams, 1988) with Potts et al. (1990) reporting Crohnbach's alpha of 0.82 for depressed outpatients. Interveiwer ratings are made regarding depressed mood, feelings of guilt, work and activities, hypochondriasis, irritability and worry, somatic anxiety symptoms and suicidal thoughts. Two observational ratings are made of agitation and retardation of thought, speech and concentration as well as insight into their depressive illness. Eight items are rated on a three-point scale (0-2) examining sleep related disturbances, somatic symptoms, weight loss, genital symptoms (including loss of libido and menstrual disturbances)

HRSD Interviews were conducted by the experimenter at the pre-CBM-I treatment session and post-CBM-I treatment session. Audio recordings were collected for participants who consented (n = 2 declined). A subset of participant interviews including both the pre-CBM-I treatment session and post-CBM-I treatment session (n = 6) were randomly selected from each condition (n = 3). These were rated (excluding the three items that are based only on observation) by an independent psychology researcher trained to score the HSRD, who was blind to participant condition. Average agreement between the experimenter and the independent rater for the pre-CBM-I treatment session (prior to beginning CBM-I) HRSD scores was 94.4% and for the post-CBM-I treatment session (after completing multi-component CBM-I) HRSD 93.2% indicating good inter-rater reliability (Barker, Pistrang, & Elliot, 1996).

Stressor task. The failure version of the Remote Associates Test (RAT; McFarlin & Blascovich, 1984) was used to induce negative mood as in Brown and Dutton (1995). The instructions for the RAT task were adapted for a sample of depressed participants. Participants were informed that they "will be given a test designed to measure aspects of creativity" as in Moberly and Watkins (2006). Three words were presented simultaneously, which were all related semantically to a fourth word (e.g., spider would be the correct response to the set widow-bite-monkey). Participants were asked to write down the fourth related word. The word combinations were selected from the failure condition of McFarlin and Blascovich (1984) as being intentionally difficult to complete. It would be expected that participants would perform worse than they anticipated and this would be stressful. For a full list of word combinations, see Appendix 7.6.

Following two easy practice items, participants completed ten difficult experimental items. Participants were given 30 s to complete each item and record responses. However, the failure instructions given by Moberly and Watkins (2006) "previous studies indicate that amongst university students, scores of 7 or more indicate above-average levels of intelligence" were not used given the participants were clinically depressed. After the RAT, feedback was provided about the number of items correctly completed (mean = 1.13 out of 10, *SD* = 1.15). Participants then completed two questions concerning external attribution of failure; "how do you evaluate the general difficulty of the last test?" and internal attribution of failure; "how do you evaluate your performance in the last test?". Responses were made on a nine-point scale rating from 1 (very low/poor) to 9 (very high/good) (as in Reinecke & Holmes, 2009).

The Scrambled Sentences Test (SST; Rude, Wenzlaff, Gibbs, Vane, & Whitney, 2002). The SST can be used as a measure of interpretation bias specifically designed for depression (Rude et al., 2002; Wenzlaff & Bates, 1998). Participants were asked to unscramble a list of 20 "scrambled sentences" in 2.5 min under a cognitive load. Each scrambled sentence contained 6 words; participants were required to order 5 of the words to create a grammatically correct sentence by placing a number from 1 to 5 over them. This constrained participants to select a positively or negatively valenced sentence. For example "good feel very bad I usually" could be unscrambled as "I usually feel very bad" (negative valence) or "I usually feel very good" (positive valence). Prior to unscrambling, a 6 digit number was shown for 5 s and then hidden for 10 s. Participants were asked to hold this number in mind during the task and to write it down at the end of the 2.5 min. This procedure comprised the "Load" (the no-load condition was eliminated from this experiment due to its

repeated failure to produce any significant results above that found by the load condition, Rude et al., 2003; Rude et al., 2002). Two sets of 20 scrambled sentences were used in the current experiment, with a different set presented at the pre/post the CBM-I treatment session. Participants practised three benign example sentences and were then asked to complete the task as quickly as possible. Post-task, 86.9% of participants were able to report the 6 digit number they had been given accurately on all administrations.

Ambiguous Scenarios Test Revised (AST-R). The ambiguous test descriptions were the same as those included in Study 3b. The instructions and delivery were made in line with Experiment 1 and 2, in auditory form and with the instructions to "rate how emotionally pleasant or emotionally unpleasant you found the sentence by pressing the number key which best suits you, using a scale of 1-9 with 1 being the most unpleasant and 9 being the most pleasant and all the variations in between."

Questionnaire Measures of Depressed and Anxious Symptoms

The BDI-II (Beck et al., 1996) was used to assess levels of depressive symptoms as in Experiment 1, 2, 4,5 and 6 and Study 3a and Study 3b.

The STAI-T (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) was used to assess levels of anxiety symptoms as in Experiment 1, 2 and 5. Changes in anxiety following CBM in this chapter were examined in line with Mathews et al. (2007) and Salemink et al. (2009).

Questionnaire Measure of State Mood

The PANAS (Watson, Clark, & Carey, 1988) was used to measure state positive and negative moods. Some previous experiments in this thesis have used the extended version of this questionnaire (Watson & Clark, 1994). The current

experiment employed the 20 item "short form" of the PANAS from Watson et al. (1988) including ten positive and ten negative adjectives as in Chapter 6.

Questionnaire Measure of Appraisal Bias

The negative appraisals subscale of the RIQ (Clohessy & Ehlers, 1999) was used to assess appraisal bias for intrusive memories. As in Starr and Moulds (2006) participants were asked about a negative intrusive memory they had experienced in the past week. Participants then responded to six items, which assessed negative appraisals of intrusions. Ratings were made on a scale ranging from 1 (*totally disagree*) to 7 (*totally agree*). This subscale is reported have high internal consistency as reported in Starr and Moulds (2006), $\alpha = 0.84$.

Questionnaire of Intrusive Symptoms

The IES (Horowitz et al., 1979) was used to measure intrusive and avoidance symptomatology. It is a 15-item clinical measure that assesses subjective experiences following a specific life event. The original IES was used in the current study in contrast to Experiment 5 (which had anchored each item to the depressing film). The IES includes an intrusion subscale and an avoidance subscale. These subscales were assessed individually for intrusive and avoidance symptoms respectively.

Procedure

Time 1: Screening

Participants who expressed an interest in participating in a study relating to depression were given further information via email or by post and the opportunity to complete the screening survey online. In line with ethical procedures, participants were given a unique identifying number with which to complete the survey anonymously, and were then asked to contact the researcher over the phone or via

email with this number and their contact details if they wanted to participate. Participants who scored greater than 14 on the survey BDI-II (Beck et al., 1996) were invited for an assessment session.

Time 2: Assessment Session

After providing informed consent to participate in the assessment session, participants completed the SCID-I. Eligible participants then provided informed consent to participate in the pre-CBM-I treatment session.

Time 3: Pre-CBM-I Treatment Session

The HRSD was administered by the experimenter and audio recorded. Participants subsequently completed a number of self-report questionnaires including the RIQ, IES, BDI-II and the STAI-T, then measures of depressive interpretation bias (the SST followed by the AST-R).

The experimenter explained the instructions for each individual component of the multi-component CBM-I package in turn. First, the experimenter read the instructions for the auditory CBM-I technique. Participants were informed about what mental imagery means and involves (as in Experiment 2). The use of field imagery was emphasised (following Experiment 2 and Holmes, Coughtrey et al., 2008). These instructions were the same as in the field imagery condition from Experiment 2, with three variations: First, to clarify field perspective, participants were given a picture of clouds (see Figure 7.6) and asked to imagine "lying on your back looking up at the sky, try to imagine what you would be seeing through your own eyes as you looked up at the sky". It was then explained that they should try not to imagine seeing themselves from an observer perspective as shown in a picture of a man looking up at the sky (see Figure 7.6). Second, based on the findings from Chapter 3 and Chapter 5

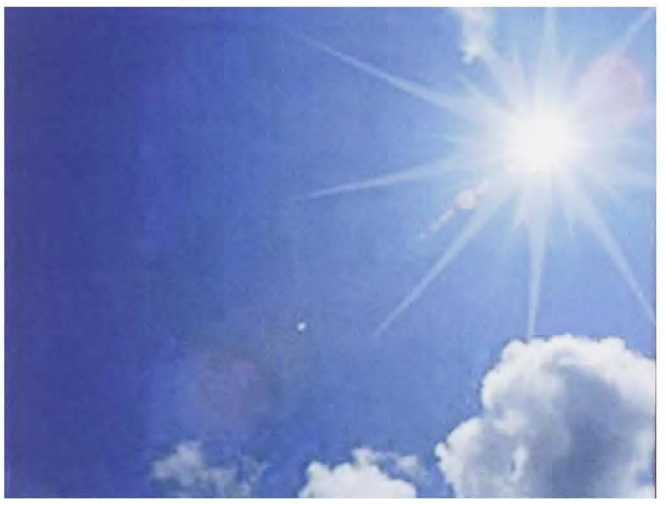
and used in Holmes and Coughtrey (2008), the instructions actively discouraged verbal processing and negative comparisons with the CBM-I material; "One thing to be aware of as well, is not to start analysing the scenarios or thinking about them in words – so for 'lying on the ground looking up at the sky', if you imagine this [show clouds picture; Figure 7.6a] try simply to concentrate on the image. You might find thoughts coming into your head like "what a clear sky, the weather hasn't been like that for ages, in fact the whole summer was a bit of a let-down, I'd really love some weather like that right now" but try not to start analysing the image like this – just concentrate on creating a vivid image."

Third, participants were encouraged to persevere with images even if it appeared they were a 'complete fantasy'. To illustrate this, participants were presented with a picture of a flying elephant (see Figure 7.6) and asked to imagine "sitting on the elephant flying through the sky". This picture was included (as in Holmes & Coughtrey, 2008) to help discourage the notion that the images should be realistic as previous participants had reported that the descriptions presented during CBM-I were often difficult to imagine when the situations described appeared unrealistic and associated with thoughts such as 'things never work out this way for me.'

Participants completed four examples of auditory CBM-I with the experimenter. They then proceeded to the computer to complete one example on their own. Once it was confirmed they had understood the task, participants completed the first block of auditory CBM-I. At the first break, the experimenter explored with the participant whether they had understood what they needed to do. At the conclusion of three auditory CBM-I blocks (24 trials), participants were introduced to the picture-word CBM-I.

Figure 7.6. Pictures presented during imagery instructions for auditory CBM-I to illustrate (a) field perspective imagery when imagining lying on the ground looking up at the sky; (b) observer perspective imagery when imagining lying on the ground looking up at the sky; (c) imagining when one has not previously had the experience such as sitting on the elephant flying through the sky.

(a) Field perspective imagery illustration



(b) Observer perspective imagery illustration

(c) Illustration of imagining unrealistic images

The experimenter next read the instructions for the picture-word CBM-I. Participants were asked to "produce a mental image incorporating the picture with the word". Four examples were given to participants during which they were asked to describe their resultant images aloud. Feedback regarding their performance was then provided. Participants then completed three blocks of picture-word CBM-I (24 trials).

The instructions for the CBM of appraisals technique are detailed in Study 4 and Experiment 5. Participants completed two blocks of CBM of appraisals (16 items).

Once participants had been introduced to the three components of multi-component CBM-I, the protocol for the next week was explained. The daily programs were installed on the participant's laptop or home computer. If participants did not have access to a computer, they were lent a laptop with the program already installed. Participants then attempted to locate and open the "daily programs" computer file with the experimenter to ensure they were able to do so on their own or borrowed computer. Participants then left with a copy of the daily program files, on a USB memory stick, including a new file to open each day labelled differently for each day e.g., "day 2". Participants were given motivational instructions (see Appendix 7. 7) and told that the computer would log their results. Participants were offered daily reminder emails (with $n = 4$ accepting this offer) and all encouraged to contact the experimenter by phone or email with any questions they had over the course of the week.

Time 4: CBM-I Treatment Phase

Participants completed CBM-I each day on their home computers for the following 6 days. Compliance was assessed by examining computer files when participants returned for the post-CBM-I treatment session.

Time 5: Post-CBM-I Treatment Session

Participants returned within 2 days of completing the CBM-I treatment phase. The HRSD was re-administered. Participants then re-completed the BDI-II, STAI-T, RIQ, IES, SST and the AST-R. Prior to and following the RAT, participants

completed the PANAS. Participants were then debriefed about the RAT and the study. Participants were then invited to give feedback about the study.

Time 6: Follow up Session

Two weeks following the completion of the post CBM-I session, participants were contacted and asked to complete the BDI-II (Beck et al., 1996), STAI-T (Spielberger et al., 1983), and IES (Horowitz et al., 1979) either over the internet (n = 22) or by post (n = 1). Participants were offered to contact the experimenter if they wished however, no participants did.

Statistical Analyses

Baseline characteristics. Baseline characteristics of participants in the positive and neutral conditions were compared using independent samples t tests or chi-square tests of independence.

Change from baseline analysis. A change from baseline analysis was completed in the current study, as in other clinical studies investigating the benefits of antidepressant medication and internet based interventions on depression (Christensen, Griffiths, & Jorm, 2004; George et al., 2000; Mertenyl, Brown, Zhang, Koke, & Prakash, 2002; Pandina et al., 2009; Shelton et al., 2001).

Differences between conditions in response to the repeated sessions of CBM-I were examined using change scores calculated by subtracting pre-CBM-I treatment session scores from the post-CBM-I treatment session scores and from follow up scores (creating 2 change scores; post-CBM-I treatment session score – pre-CBM-I treatment session score; follow up session score – pre-CBM-I treatment session score). An analysis of responses to the repeated sessions of CBM-I was then conducted using a mixed model analysis of variance (ANOVA) of change from

baseline for those measures with follow up data. The primary interest was the main effect of condition given that the baseline scores are included in the analysis. The between-subjects factor was condition (positive vs. neutral) and within-subjects factor was change from the pre-CBM-I treatment session (post-CBM-I treatment session vs. follow up). Significant effects were then decomposed by independent samples *t* tests and paired samples *t* tests, accordingly. An intention-to-treat population (as in Christensen et al., 2004; Christensen, Griffiths, Mackinnon, & Brittliffe, 2006) was used for the analysis whereby the missing data from participants who completed at least one session after the assessment session was imputed using a last-observation-carried-forward analysis (this included the one participant from the neutral condition who failed to return the follow up questionnaires). By assuming no changes resulting from the CBM-I technique, this approach is conservative (Barnhofer et al., 2009).

Results

Baseline Characteristics

A diagram to illustrate the participant flow is presented in Figure 7.3 outlining the participant intake and attrition throughout the study. Demographic characteristics of participants provided at the screening and the pre-CBM-I treatment session are presented in Table 7.3. There were no significant differences between conditions at screening or assessment on age, $t\ (22) = 0.98, p = .34$, gender, $\chi^2\ (1, N = 24) = 0.35, p = .64$, levels of education, $\chi^2\ (4, N = 24) = 3.81, p = .43$, current use of antidepressant medication, $\chi^2\ (1, N = 24) = 1.82, p = .37$ or previous receipt of psychological therapy, $\chi^2\ (1, N = 24) = 0, p > .05$. In addition, conditions did not significantly differ on pre-CBM-I treatment session scores for the BDI-II, HRSD, STAI-T, SST IES-A, IES-I, RIQ negative (for each measure $t\ [22] < 1$), except for IES-A ($t\ [22] = 1.54, p = .14$), RIQ negative ($t\ [22] = 1.03, p = .32$. Table 7.4 shows mean values for pre-

CBM-I treatment session BDI-II, HRSD, STAI-T, SST, AST-R, IES-A, IES-I, RIQ negative.

Table 7.3

Means and Standard Deviations for Demographic Characteristics, History of Past Psychological Treatment and Current Antidepressant Medication Regime for Participants in the Positive and Neutral Conditions

	Positive condition (n = 12)		Neutral condition (n = 12)	
	M	*SD*	*M*	*SD*
Age (years)	30.2	12.0	26.3	6.3
Gender (%)				
Female	67		83	
Male	33		17	
Years of Education				
11 or less	1		1	
12 -13	1		2	
14-15	3		4	
16- 17	5		1	
More than 17	2		4	
Previous psychological treatment	2		2	
Currently taking antidepressants:				
SSRI	4		2	
Tricyclic antidepressant + Lithium	1		0	

Note. SSRI = Selective serotonin reuptake inhibitor.

Participant Attrition

There was no significant difference between the positive (0.08%) or neutral conditions (0.08%) in the rates of attrition, $p > .05$ following random assignment to condition. Further, there were no significant differences between participants who completed the CBM-I treatment and those who were eligible and attended the assessment session and did not subsequently complete the CBM-I treatment on age, $t(36) = 1.04$, $p = .30$, screening BDI-II, $t(36) = 0.50$, $p = .62$, gender, χ^2 $(1, N = 38) = 1.31$, $p = .30$ or education, $\chi^2(4, N = 38) = 2.43$, $p = .66$. For participants who

completed the screening survey (including those who were not eligible) versus those participants who completed the CBM-I treatment phase, there was no significant difference in age, $t(62) = 0.80, p = .43$, there was a non-significant trend towards a difference in gender , χ^2 $(1, N = 64) = 3.89, p = .07$ and no significant difference on education, $\chi^2(4, N = 64) = 2.12, p = .71$.

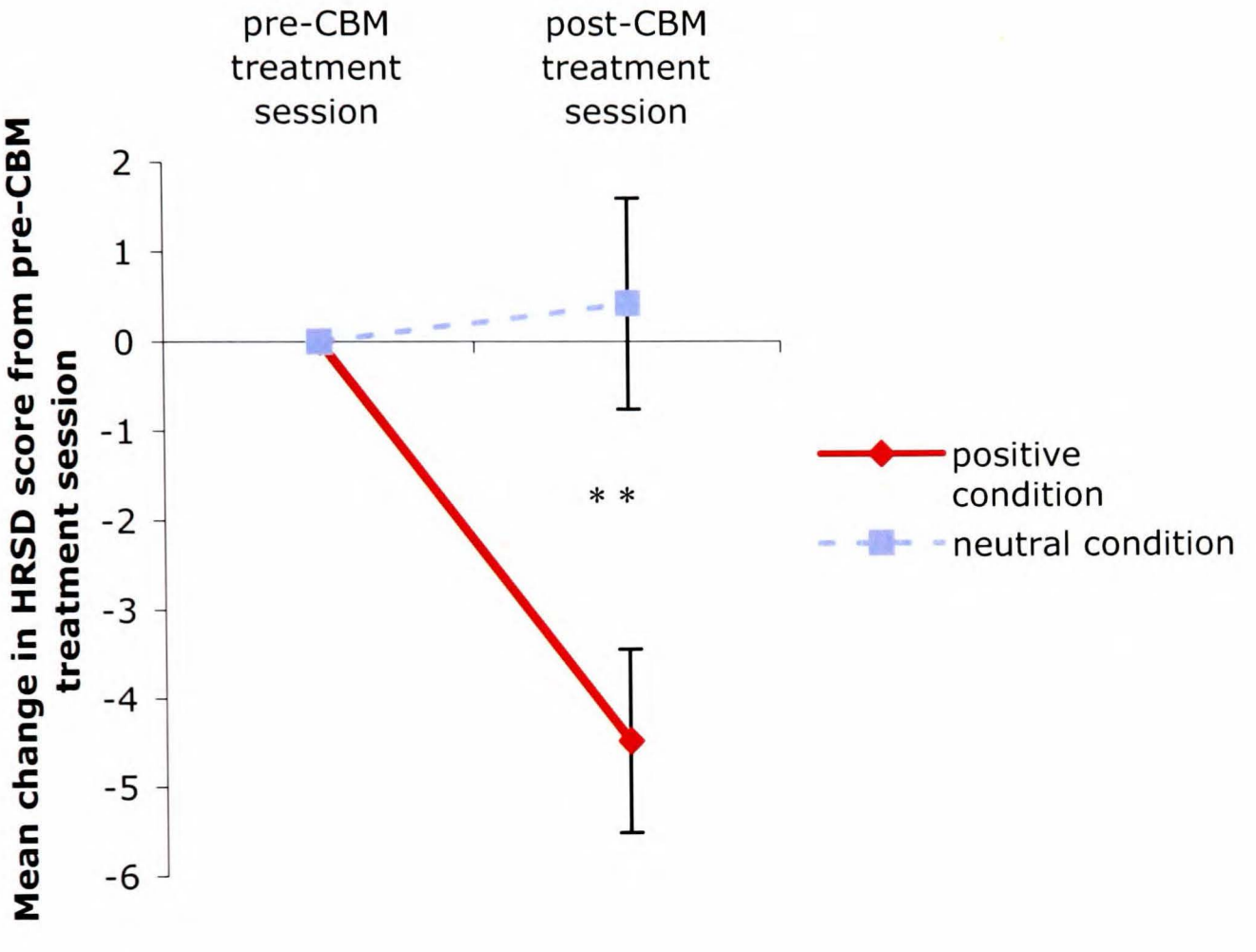
Adherence to the Daily Repeated Sessions of CBM-I

The number of completed CBM-I sessions across the week was recorded by participants and verified by computer files indicating whether the daily program had been completed. All participants completed at least four sessions across the week. Six participants failed to complete all seven sessions due to forgetfulness, lack of time or computer malfunctions. There was no significant difference between the positive ($M = 6.83, SD = 0.39$) or neutral ($M = 6.75, SD = 0.45$) conditions on the number of sessions completed out of seven, $t(22) = 0.48, p = .63$.

CBM-I Effects on Depressive Symptoms

HRSD. It was hypothesised that participants in the positive condition would demonstrate a greater decrease in depressive symptoms as measured by the interviewer rated HRSD scores than participants in the neutral condition. The analysis confirmed that indeed there was a greater decrease in depressive symptoms in the positive condition compared to the neutral condition, $t(22) = 3.11, p = .005, d = 1.27$, see Figure 7.7. Changes within each condition from pre-CBM-I to post-CBM-I were also investigated. There was a significant decrease in HRSD in the positive condition, $t(11) = 3.8, p = .003, d = 0.87$, and no significant change in the neutral condition, $t(11) = 0.4, p = .70$, See Figure 7.7. Mean scores at each time point are presented in Table 7.4.

Figure 7.7. Change in HRSD scores from the pre-CBM-I treatment session for positive and neutral Conditions. Error bars show one standard error of the mean.



Note: ** = $p < .01$ between conditions

Table 7.4

Means and Standard Deviations for Depression and Anxiety Measures (BDI-II, HRSD, STAI-T), Interpretation Bias (SST, AST-R), Appraisal Bias (RIQ negative) and Intrusive Symptoms (IES-A, IES-I) for the Positive and Neutral Conditions at the Pre-CBM-I Treatment, Post-CBM-I Treatment and Follow up Session.

		Positive Condition (n = 12)		Neutral Condition (n = 12)	
		M	*SD*	*M*	*SD*
BDI-II					
	Pre-CBM-I treatment session	25.50	7.89	27.42	11.07
	Post-CBM-I treatment session	18.92	11.20	26.92	9.37
	Follow up session	18.67	13.43	25.92	9.62
HRSD					
	Pre-CBM-I treatment session	14.67	4.03	16.08	7.40
	Post-CBM-I treatment session	10.17	6.07	16.50	6.20
STAI-T					
	Pre-CBM-I treatment session	62.58	6.32	63.25	8.32
	Post-CBM-I treatment session	54.67	9.64	59.58	6.63
	Follow up session	53.75	9.87	58.67	7.52
SST					
	Pre-CBM-I treatment session	0.46	0.22	0.48	0.21
	Post-CBM-I treatment session	0.33	0.24	0.55	0.17
AST-R					
	Pre-CBM-I treatment session	4.56	1.01	4.44	0.94
	Post-CBM-I treatment session	5.34	1.18	4.49	0.86
RIQ negative					
	Pre-CBM-I treatment session	23.50	6.02	20.33	8.85
	Post-CBM-I treatment session	15.08	7.30	18.67	5.02
IES-A					
	Pre-CBM-I treatment session	20.33	8.50	25.17	6.83
	Post-CBM-I treatment session	18.92	7.23	23.00	6.09
	Follow up session	21.75	5.14	26.08	4.91
IES-I					
	Pre-CBM-I treatment session	20.83	7.28	21.08	7.22
	Post-CBM-I treatment session	11.92	5.52	18.75	6.10
	Follow up session	21.75	5.52	22.00	4.49

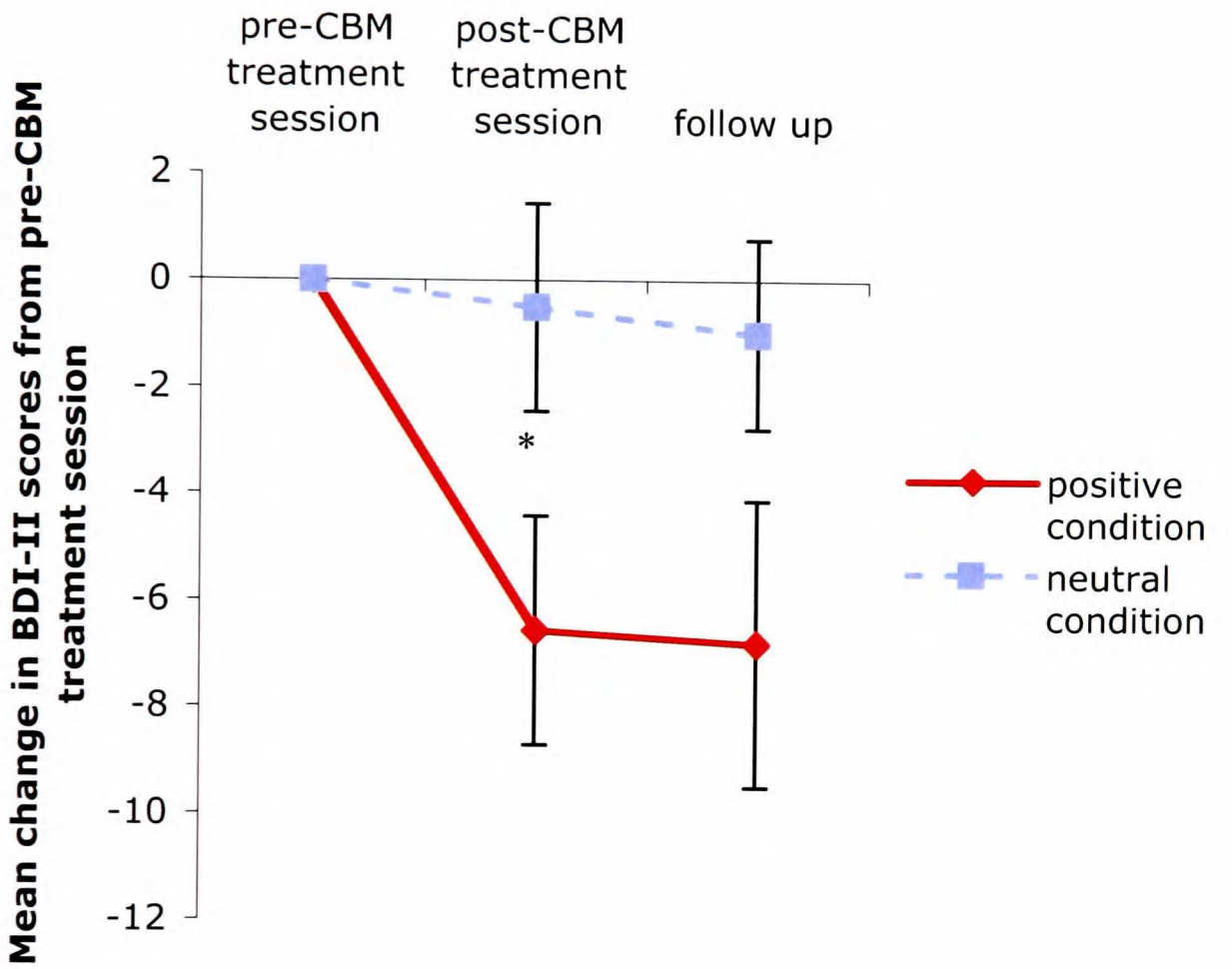
Note. BDI-II = Beck Depression Inventory-II; STAI-T = Trait subscale of the State–Trait Anxiety Inventory; SST = Scrambled Sentences Test; AST-R = Ambiguous Scenarios Test- Revised; RIQ negative = Negative appraisals subscale of the Response to Intrusions Questionnaire; IES-A = Avoidance subscale of the Impact of Event scale; IES-I = Intrusion subscale of the Impact of Event scale.

BDI-II. The BDI-II was used to assess the effects on self-reported depressive symptoms. In addition to the pre-CBM-I treatment session and post-CBM-I treatment session, the BDI-II was also included at the two week follow up, thus the analysis differed from above. A mixed model ANOVA of change from baseline (pre-CBM-I treatment session) was conducted with grouping factor, condition (positive vs. neutral) and within subjects factor, change from pre-CBM-I treatment session (post-CBM-I treatment session vs. follow up session). It was predicted that positive CBM-I would give rise to greater decreases in BDI-II scores across the CBM-I treatment phase (as assessed using change scores) than neutral CBM-I and this would remain at the follow up session. As hypothesised, there was a significant main effect of condition, $F(1,22) = 4.78$, $p = .04$, $\eta_p^2 = 0.18$, suggesting that the positive and neutral conditions at the post-CBM-I treatment session and at the follow-up session had different changes in BDI-II from the pre-CBM-1 treatment session to the post-CBM-I treatment session and to the follow up session. There was no significant main effect of time, $F(1,21) = 0.07$, $p = .79$ and no significant interaction between time and condition, $F(1,21) = 0.08$, $p = 0.93$.

As can be seen in Figure 7.8, reductions in BDI-II from the pre-CBM-I treatment session to the post-CBM-I treatment session were significantly greater in the positive compared to neutral condition, $t(22) = 2.10$, $p = .048$, $d = 0.90$. There was a trend towards a greater reduction in the positive condition from the pre-CBM-I treatment session to the follow up session compared to the neutral CBM-I, $t(22) = 1.81$, $p = .08$, $d = 0.45$. Within the positive condition, from the pre-CBM-I treatment session to the post-CBM-I treatment session there was a significant decrease in BDI-II, $t(11) = 3.05$, $p = .01$, $d = 0.68$ as well as to the follow up session, $t(11) = 2.53$, $p = .03$, $d = 0.62$. In contrast, within the neutral condition there were no significant

decreases in BDI-II from the pre-CBM-I treatment session to either the post-CBM-I treatment session, $t(11) = 0.29$, $p = .80$ or follow up session, $t(11) = 0.26$, $p = .80$ for means see Table 7.4.

Figure 7.8. Change in BDI-II scores from the pre-CBM-I treatment session for positive and neutral conditions. Error bars show one standard error of the mean.



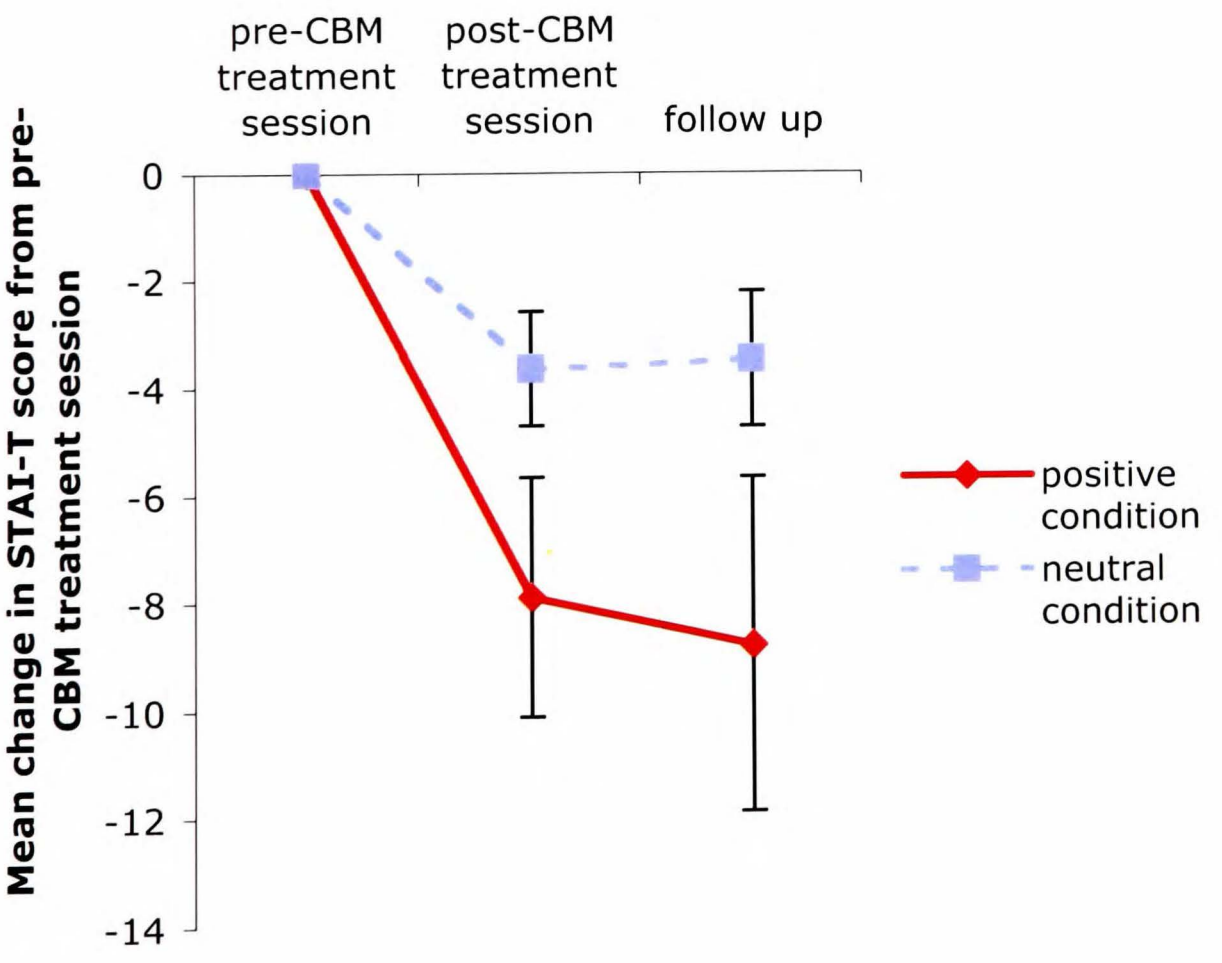
Note: * = p <.05 between conditions

CBM-I Effects on Anxiety Symptoms

It was expected that repeated sessions of positive CBM-I compared to neutral CBM-I would result in greater reductions in anxiety across the CBM-I treatment phase and that these reductions would be maintained at follow up. The STAI-T was included at the two week follow up, thus the analysis was the same as the BDI-II. There was no significant main effect of time, $F(21) = 0.07$, $p = .79$ or interaction $F(21) = 0.15$, $p = .71$. There was a non-significant trend towards a main effect of

condition, $F(21) = 3.52$, $p = .08$, $\eta_p^2 = 0.14$. Strictly since this was not < .05 this should not be decomposed further. However given the specific hypotheses regarding the effects of CBM-I on anxiety and the small sample size, this effect was examined. As can be seen in Figure 7.9 there was a trend towards a greater decrease of anxiety in the positive compared to neutral condition from the pre-CBM-I treatment session to the post-CBM-I treatment session, $t(22) = 1.72$, $p = .099$, $d = 1.15$. However, there was no significant difference in the change in anxiety between conditions from the pre-CBM-I treatment session to the follow-up session, $t(22) = 1.58$, $p = .13$. From the pre-CBM-I treatment session to the post-CBM-I treatment session, there was a significant decrease in anxiety in both the positive, $t(11) = 3.55$, $p = .005$, $d = 0.97$, and neutral conditions, $t(11) = 3.46$, $p = .005$, $d = 0.49$.

Figure 7.9. Change in STAI-T scores from the pre-CBM-I treatment session for positive and neutral conditions.



CBM-I Effects on Interpretation Bias

SST. As in previous studies (Holmes et al., 2009; Rude et al., 2003; Rude et al., 2002), a total negativity score was produced by calculating the number of negatively valenced sentences over the total number of sentences completed (of a possible 20). As predicted, positive CBM-I (mean change = -0.13, $SD = 0.17$) gave rise to a greater decrease in negative bias than neutral CBM-I (mean change = 0.07, $SD = 0.26$), $t(22) = 2.2$, $p = .04$, $d = 0.76$, see Table 7.4. Within the positive condition, there was a significant decrease in negativity $t(11) = 2.62$, $p = .03$, $d = 0.57$ and no significant change in the neutral condition, $t(11) = 0.92$, $p = .38$.

AST-R. Participants rated the emotionality of 10 ambiguous paragraphs both at the pre-CBM-I treatment session and post-CBM-I treatment session as an index of interpretation bias. It was predicted that, compared to participants given positive CBM-I, those given neutral CBM-I would rate scenarios more positively after the CBM-I treatment phase. Comparisons between positive and neutral groups indicated a non- significant trend towards a greater reduction in negative interpretation bias across the CBM-I treatment phase in the positive compared to neutral condition, $t(22) = 1.92$, $p = .07$, $d = 0.78$, see Table 7.4.

CBM-I Effects on Appraisal Bias

RIQ. Positive CBM-I participants reported greater reductions in negative appraisals of intrusive memories compared to neutral CBM-I participants, $t(22) = 2.75$, $p = .01$, $d = 1.05$, on the negative appraisals subscale of the RIQ.

CBM-I Effects on Intrusive Symptoms

IES-A. For the avoidance subscale of the IES (1ES-A) there was a significant main effect of time $F(1,22) = 5.76$, $p = .03$, $\eta_p^2 = 0.21$ and no interaction between

time and condition $F(1,22) = 0.1$, $p = .76$. Contrary to prediction, there was no significant main effect of condition $F(1,22) = 0.02$, $p = .89$.

IES-I. For the intrusion subscale of the IES (IES-I) there was a significant main effect of time $F(1,22) = 43.14$, $p < .001$, $\eta_p^2 = 0.66$. There was also a significant interaction between time and condition $F(1,22) = 7.37$, $p = .01$, $\eta_p^2 = 0.25$ and no significant main effect of condition $F(1,22) = 2.52$, $p = .13$. Independent samples t tests revealed greater decreases in IES-I scores from the pre-CBM-I treatment session to the post-CBM-I treatment session in the positive condition (mean change = -8.9, $SD = 7.65$) compared to the neutral condition (mean change = -2.3, $SD = 5.33$), t (22) = 2.45, $p = .02$, d =I.24. There was however no difference between conditions from the pre-CBM-I treatment session to the follow up session, $t(22) = 0.34$, $p = .74$. From the pre-CBM-I treatment session to the post-CBM-I treatment session, within the positive condition, there were significant reductions in IES-I scores, $t(11) = 4.04$, $p = .002$, $d = 1.38$ and no reductions in the neutral condition, $t(11) = 1.52$, $p = 0.16$. Overall, these results indicate that positive condition participants reported lower levels of symptomatology associated with intrusions over the past week compared to neutral condition participants.

CBM-I Effects on a Stressor Task (the RAT)

Predicted that following the stressor task positive CBM-I compared to neutral CBM-I would result in less mood deterioration. For the positive subscales of the PANAS, there was no significant difference between the changes reported in the positive condition (mean reduction = -1.41, SD =3.2) or the neutral condition (mean reduction of -2.08, $SD = 2.64$), $t(22) = 0.56$, $p = .58$. For the negative subscales of the PANAS there was also no significant difference between the positive condition (mean

increase = 2.00, *SD* = 6.55) and neutral condition (mean increase = 1.00, *SD* = 3.16), $t(22) = 0.48$, $p = .64$.

For the RAT feedback forms there was a non-significant trend towards more positive ratings of performance by positive CBM-I participants ($M = 2.17$, $SD = 1.75$) compared to neutral CBM-I participants ($M = 2.35$, $SD = 0.45$), $t(22) = 1.76$, $p = .09$, $d = 2.04$. For ratings of difficulty, there was no significant difference between positive ($M = 7.33$, $SD = 0.98$) and neutral ($M = 7.17$, $SD = 2.04$) conditions, $t(22) = 0.25$, $p = .80$. There was also no difference between conditions in the number of associates completed, correctly with mean number correct in the positive condition ($M = 1.42$, $SD = 1.38$) and in the neutral condition ($M = 0.83$, $SD = 0.83$), $t(22) = 1.25$, $p = .22$.

Clinically Significant Change in Depressive Symptoms

In addition to examining the statistical significance of change in depressive symptoms, their clinical significance was investigated. As in Blackwell and Holmes (in press) for the BDI-II, clinically significant change was defined by a move from one category of depression to another (e.g., from severe to moderate depression) and change greater than the reliable change index (RCI) based on criteria for calculating RCI provided by Jacobson and Truax (1991). As applied in Blackwell and Holmes (in press) and suggested by Jacobson and Truax (1991) an RCI for BDI-II scores of 7.16 was applied. Thus a reduction of greater than 7.16 in BDI-II score is considered clinically significant change if accompanied with a change in depressive category. The cut off scores for BDI-II categories of depression were taken from Beck et al. (1996); 0-13 – minimal depression; 14-19 – mild depression; 20-28 moderate depression; 29-63 – severe depression.

Fifty percent of positive CBM-I participants compared to 8.3 % of neutral CBM-I participants reported clinically significant change in depressive symptoms as measured by the BDI-II from the assessment session to the follow up session. There was a non-significant trend towards a difference between conditions, χ^2 (1, N = 24) = 5.04, p = .07.

On the HRSD, clinically significant change is defined as an improvement of 50% or greater (Hollon et al., 2002). A non-significant trend towards greater clinically significant change in HRSD was reported by 33.3% of participants in the positive condition compared to 0% of the neutral condition participants, χ^2 (1, N = 24) = 4.80, p = .093. These changes however refer only to change from the pre-CBM-I treatment session to the post-CBM-I treatment session. In contrast, the BDI-II provides evidence for clinically significant change maintained at *follow up* with 50% of positive condition participants reporting such change.

Clinically Significant Change in Anxiety Symptoms

For anxiety measured by the STAI-T, categorisation of levels of severity are not available. Instead, a cut-off score is used along with the Reliable Change Index (RCI) to assess clinical significance (Jacobson & Truax, 1991). For clinically significant change, participants must fall below the cut-off (more closely resembling a non-clinical population) and have changed more than the RCI. As in Fisher and Durham (1999) for the STAI-T, RCI = 7.86 and cut-off = 45.7. There was no clinically significant difference between positive (25%) and neutral (0%) conditions, χ^2 (1, N = 24) = 3.43, p = .22.

Mechanisms of Change for the Multi-Component CBM-I Package

To assess whether the change in depressive and intrusive symptoms following CBM-I were associated with a change in cognitive bias, correlations between change in bias and change in symptoms over the training phase were conducted. These analyses were completed on bias measures that were significantly modified across the CBM-I treatment phase thus the SST and the negative appraisal subscale of the RIQ. Correlations were performed between these measures and the change across the CBM-I treatment phase on the HRSD, BDI-II, and IES-I.

For the SST, there was a non-significant trend towards a correlation with the change in HRSD, $r(23) = .40$, $p = .054$ but no significant correlation with the change in BDI-II, $r(23) = .23$, $p = .27$. There was however a significant correlation with the change of intrusive symptoms as measured by the intrusion subscale of the IES, $r(23) = 0.42$, $p = .04$.

For the negative appraisals subscale of the RIQ, there was a significant correlation with the change in depressive symptoms as measured by both the HRSD, $r(23) = 0.42$, $p = .04$ and the BDI-II, $r(23) = .67$ $p < .001$. There was also a significant correlation between the change in RIQ negative and the IES intrusion subscale, $r(23) = .60$, $p = .002$. Note, corrections for multiple comparisons were not applied.

Discussion

The primary research question was whether repeated sessions of positive multi-component CBM-I over one week could provide any benefit to individuals with depression. Whilst only conducted in a small sample, the results of the current preliminary treatment study show some promising indications: Positive CBM-I compared to neutral CBM-I gave rise to greater improvements on measures of

depressive interpretation bias, appraisal bias, depressive symptoms and intrusive symptoms.

Multi-component CBM-I and Clinically Significant Change in Depressive Symptoms

Considering these findings in more detail, the first critical result was that, as predicted, positive CBM-I gave rise to greater reductions in depressive symptoms than neutral CBM-I according to both self-report (BDI-II) and interviewer assessments (HRSD). The reductions in self-reported depressive symptoms in the positive CBM-I were greater than neutral CBM-I at two-week follow up at trend level. Moreover, 50% of those participants who completed positive CBM-I compared to only 8.3% of those who completed neutral CBM-I reported clinically significant reductions in these symptoms as measured by the BDI-II. On the HRSD, 33.3% of positive CBM-I participants compared to 0% of neutral CBM-I participants showed clinically significant change.

How do these results compare to treatment trials? At first glance, these results seem encouraging compared to other "therapist free" treatments such as antidepressants. It could be argued that giving the computer package is akin at least in some ways to a clinician prescribing antidepressants. A review by Hollon et al. (2002) suggests that trials investigating antidepressant medication on average report a rate of clinically significant responding of 50% in depressed samples. However, Hollon et al. (2002) noted that when previous trials were re-analysed by Khan Warner & Brown (2000, as cited in Hollon et al., 2002), including unpublished studies submitted to the food and drug authority, the percentage of clinically significant responding was reduced to 40%. Against such rates, the current study appears promising.

However, in comparison to trials using face-to-face therapy, the results appear less strong. In a trial of behavioural activation, cognitive therapy and antidepressant medication, Dimidjian et al. (2006) reported varying levels of responding (with some at similar levels to the current study) across more and less severely depressed individuals (high severity and low severity respectively). For comparison, the sample in the current thesis was on average a low severity sample. Dimidjian et al. (2006) find that on the BDI-II, response to cognitive therapy was 48% (high severity) or 65% (low severity), to behavioural activation response was 76% (high severity) or 50% (low severity) and response to antidepressant medication was 49% (high severity) or 56% (low severity). For the HRSD, overall, 60% of participants responded to cognitive therapy, 39% to behavioural activation and 47% to antidepressant medication. DeReubeis et al. (2005) reported higher levels of responding on the HRSD with 68% of participants who responded to cognitive therapy and 58% to antidepressant medication. It is noted that these cognitive trials showing high success rates differ in several respects, including their delivery by a therapist and also a larger number of sessions over an extended time period.

How do these results compare to other CBM studies? CBM studies do not typically report 'clinically significant' change but instead use estimates of effect size. In the current study, for depressive and anxious symptoms, effect sizes were medium to large (between $d = 0.45$ and $d = 1.27$). For CBM-A in participants with generalised anxiety disorder, Amir et al. (2009) report medium to large effect sizes (between $d = 0.72$ and $d = 0.88$) on anxiety symptoms. Schmidt et al. (2009) in participants with social anxiety report small to medium effect sizes (between d = 0.35 and $d = 0.58$) for social anxiety symptoms. Watkins et al. (2009) found large effect sizes for depressive

symptoms (between $d = 1.00$ and $d = 1.36$). The current results are thus in a similar ballpark to these studies.

How do these results compare to other computerised therapeutic packages (other than CBM)? The current multi-component CBM-I package has shown greater between group effect sizes from pre to post CBM-I treatment than those reported by some other computerised therapeutic packages. For example, Proudfoot et al. (2004) reported a medium between group effect size ($d = 0.65$) comparing treatment as usual and the CCBT package 'Beating the Blues'. This effect size is lower than in the current study, which reports a large effect size ($d = 0.90$). Interestingly the NICE guidelines currently recommends the use of 'Beating the Blues' in the treatment of mild to moderate depression (National Institute for Health and Clinical Excellence, 2006). The decrease in depressive symptoms in the current study was also greater than those reported for Overcoming Depression on the Internet (ODIN) where Clarke et al. (2002) report no significant treatment effects on depression.

Overall the current CBM-I seems promising relative to antidepressant medication, behavioural activation, other CBM techniques and other computerised therapeutic packages. It is worth considering that CBM-I may perhaps not be considered simply as a stand alone treatment but could be developed as an adjunct to other treatments. Given that application of this package does not require a therapist and thus more easily disseminable and cost-effective, this idea it is worthy of further research.

Multi-Component CBM-I and Anxiety

For anxiety, there was only a trend towards a greater decrease in symptoms following positive compared to neutral CBM-I in the current study. At the two-week follow up, there was no significant difference between positive and neutral CBM-I

conditions. Given the small sample size, it is possible there was insufficient power to significantly detect a greater effect of positive CBM-I on anxiety. However, in contrast to expectations, both conditions resulted in decreases in anxiety symptoms across the study. It is possible that the significant reductions in anxiety seen in the neutral condition are due to the exposure to positive material. The neutral CBM-I involved 50% positive and 50% negative stimuli. Given that the participants in the current study were clinically depressed, it is likely that they may have anticipated negative material upon each presentation. The 50% positive material training may have modified this tendency. In fact Mathews, Ridgeway, Cook and Yiend (2007) presented positive CBM-I stimuli in a graded manner instead of presenting only positive material and found promising results. It is also possible, as suggested by a behavioural activation approach (Jacobson et al., 1996), simply completing a task each day and meeting with the experimenter could have had beneficial effects. However, it is unclear why there was no positive impact of the neutral condition for depressive symptoms. This effect requires further exploration. It is important to note however, that although some stimuli were relevant to anxiety, and anxiety is an important co-morbidity of depression, the main focus was on depression.

Multi-Component CBM-I and Intrusive and Avoidant Symptoms

As hypothesised, positive CBM-I resulted in greater decreases on the intrusion subscale of the IES compared with neutral CBM-I after one week. A difference between groups was not maintained at the two-week follow up. This is possibly due to the inclusion of only one introductory session and one full session at home of the CBM of appraisals technique in the multi-component package (in contrast to two full sessions of picture word CBM-I and three full sessions of auditory

CBM-I, see Figure 7.4). In the future, it may be beneficial to include additional CBM of appraisals sessions.

Multi-Component CBM-I and Bias

Before it is possible to conclude that the changes in depressive and, at least initial changes, in intrusive symptoms may be attributed to improvements in interpretation and appraisal bias, it is important to establish that there were differences in biases between conditions. Indeed, compared to neutral CBM-I, positive CBM-I led to significantly greater reductions in depressive bias as measured by the SST and reduced negative appraisals of intrusive memories as measured by the RIQ compared to neutral CBM-I. The effect did not reach significance on the AST-R, however the means were in the expected direction, with a medium effect size suggesting there was insufficient power to detect the effect.

It would be interesting to conduct a mediational analysis to confirm that the changes in interpretation bias induced by CBM-I mediated the change in symptoms in response to CBM-I. Mediational analysis requires a larger sample and was thus not completed in the current study (N = 24). However, in the current study, correlations were conducted between changes in interpretation and appraisal bias with changes in depressive, and intrusive symptoms over the CBM-I treatment phase. Findings are consistent with the hypothesis that bias change promoted the changes in symptomatology, but formal testing of this is required. Future studies should seek to replicate the current results in a larger sample and conduct such mediational analysis.

The RAT was included as a laboratory stressor task. Some indication of transfer of the induced positive interpretation bias was seen for participants' perceived failure ratings for the RAT, but only at trend level. However, no differences in mood reactions were found. One potential reason for this was the

modification of instructions (see the Introduction and Method) to reduce the potential negative impact of the RAT for the clinical sample. However this may have produced a floor effect with little emotional impact given a PANAS change of only 1.75, whereas Moberly and Watkins (2006) found a change of 4.23 (across both conditions). In the future, using a task that gives a greater emotional impact could allow for differential responding between conditions to be revealed.

Limitations of the Current Study

It is important to acknowledge some of the limitations of the current study. The small sample size ($N = 24$) used in the current study provides preliminary evidence for the potential of the multi-component CBM-I package. However, given the small sample size, the results have limited generalisability and require replication in a larger sample. A power analysis of the sample size used in the current study (with 12 participants in each group) indicates a power of 22% to detect a difference in effect size of 0.5 [suggested to be clinically significant according to NICE guidelines for depression (National Institute for Health and Clinical Excellence, 2004)]. Future studies should endeavour to include 64 participants per group to achieve 80% power to detect effects.

One potential confound for the current results was that debriefing took place at the end of the final session. It is possible that this may have influenced responding on the follow up measures. Future studies should attempt to debrief participants at a follow up session.

Demand effects cannot be ruled out as a possible influence on the findings. Demand effects are a problem across all studies that rely on self-report measures. Future studies could include complementary physiological measures such as the eye blink response (Lawson, Macleod, & Hammond, 2002) as a measure of interpretation

bias in depression. In addition, it would be of interest to determine whether the effects of the CBM-I extend to changes in objective measures of neurobiological dysfunction such as cortisol levels (MacLeod et al., 2009), or fMRI response (Browning, Holmes, Murphy, Goodwin, & Harmer, in press; Fox, 2008).

The experimenter in the current study was not blind to participant condition and thus experimenter effects cannot be ruled out. Future studies should endeavour to have an experimenter who is unaware of condition. Of particular relevance to this, is the interviewer rated HRSD in the pre-CBM-I treatment session and post-CBM-I treatment session that could, in the future be conducted by an alternative experimenter. To minimise the potential bias, a subset of audio recordings of the HRSD interviews were scored by a researcher blind to condition with average agreement between raters of 94.4%. However, this does not rule out bias

Whilst the multiple CBM-I package in the current study shifted bias and depressive symptoms in the predicted directions, it is not possible to determine the effectiveness of each individual CBM-I component. It is therefore unclear whether the results reflect an additive effect of each CBM-I technique or simply the impact of one in particular. That is, it is not possible to determine the active ingredient responsible for promoting the benefits of the multi-component CBM-I package. There was no measure of interpretation or appraisal bias included at the two week follow up session and thus it is not possible to determine whether the bias was maintained across the period. Future studies should include a measure of interpretation bias and appraisal bias at the follow up session. A larger follow up session would also be useful to include.

Whilst not significantly different between conditions, it must be noted that there were more participants currently taking antidepressant medication in the

positive compared to neutral condition. It cannot be ruled out as a partial explanation for the greater effects within the positive condition. Future studies should seek to replicate the findings in an unmedicated sample.

Future Directions

The CBM-I technique presents a novel, easily disseminable, accessible potentially therapeutic technique. Further research is required to explore its clinical applicability. The optimal schedule for sessions may be daily, weekly or some wider interval. For example, Schmidt et al. (2009) found two sessions per week for four weeks of CBM-A (CBM targeting attention bias) resulting in modifications maintained at four week follow up. An extended follow up period is important to further determine the durability of the technique.

Future research could further extend the time during which the technique is offered for example instead of every day for one week, once a week for two months more comparable with psychotherapeutic interventions. It would also be of interest to examine the effects of CBM-I as an adjunctive treatment to for example, antidepressant medication or CBT. It is likely that in future clinical translations, CBM-I might best be developed as an adjunctive rather than stand alone treatment.

As outlined in the Introduction, a number of CBM techniques have been recently developed to target different cognitive biases in depression. It would be of interest to determine whether the CBM-I techniques tested in the current study result in changes in other processing biases such as overgeneral autobiographical memory (J. M. G. Williams et al., 2007) or reduced concrete thinking (Watkins et al., 2009). Specifically, it would be interesting to test whether the promotion of imagery processing in the current CBM-I package would increase specificity of memories

(Autobiographical Memory Test) or increase concreteness of processing (observer-rated measure of concreteness processing, Watkins et al., 2009).

Improving the individual self-relevance of the material presented during CBM-I could potentially improve the emotional impact of the stimuli. Participants have reported that they found it easier to imagine descriptions that were personally relevant. Future studies could introduce thematically relevant material selection that could be selected by participants. Amir et al. (2009) for example asked participants to make emotionality ratings of items prior to beginning the training procedure which then determined the material presented to the individual participants.

Conclusions

The current experiment extends the findings from the case series study in Blackwell and Holmes (in press) in a number of ways. First, by showing improvements in depressive symptoms in comparison to a control condition the current results suggest improvements can be attributed to positive CBM-I and not simply a result of spontaneous recovery or the mere completion of a computer task. Second, the current study demonstrated some additional improvements in appraisal bias, anxious symptoms and intrusive symptoms (not previously included in Blackwell & Holmes, in press). Third, the current study employed a mix of CBM-I techniques, and found these successful in promoting positive emotional effects. This study thus provides the first experimental test of the usefulness of CBM-I technique in depression. Overall, the findings suggest that the imagery-oriented multi-component CBM-I package holds promise as a therapeutic technique to be developed for depression and warrants further investigation.

CHAPTER 8

General Discussion

Overview of the Thesis

The overarching aim of the current thesis was to develop a positive CBM-I technique using imagery in the context of depressed mood. As outlined in Chapter 1, when the current thesis was begun, CBM-I had only been tested in anxiety. Given the high levels of co-morbidity between depression and anxiety (Moffitt et al., 2007), in addition to the move towards transdiagnostic therapeutic approaches (Harvey, Watkins, Mansell, & Shafran, 2004), the applicability of CBM-I to depression appeared promising.

A key theme of the thesis has been to explore how best to employ imagery in CBM-1. The starting point was based on previous work indicating the powerful effect of imagery in CBM-I in promoting positive mood. However, the current thesis was able to pinpoint more specifically such effects and test which aspects of imagery were optimal. There are clearly many cognitive processes that are implicated in the development and maintenance of depression such as overgeneral autobiographical memory (Williams et al., 2007) and rumination (Nolen-Hoeksema, 1991). The current thesis focused on just two complementary processes discussed by Holmes, Lang and Deeprose (2009), a negative interpretation bias and a mental imagery bias (characterised by a lack of positive imagery and a preponderance of negative imagery).

A series of three experiments (Experiment 1, 2, 5), in addition to three studies (Study 3a, 3b and 4) carried out in non-clinical samples explored the role these biases play in depressed mood and their application in CBM-I. These studies and experiments culminated in the final experiment (Experiment 6) where a multi-

component, positive imagery-oriented CBM-I technique was tested in a clinically depressed population.

Main Findings of the Thesis

Experiments 1 and 2 investigated ingredients involved in promoting, rather than inhibiting, positive emotional and bias effects using the positive auditory CBM-I technique. Specifically, Experiment 1 focused on why verbal processing instructions for positive auditory CBM-I had previously led to an increase in negative (as opposed to positive) emotions and bias (as found in Experiment 1 Holmes, Lang, & Shah, 2009; Holmes, Mathews, Dalgleish, & Mackintosh, 2006). The results suggested that making unfavourable comparisons between the self and the positive material presented during CBM-I was at least partially responsible for the negative effects (Holmes et al., 2009, Experiment 2). It is possible that making such comparisons with positive information regardless of whether the mode of processing is verbal could result in mood deterioration. Therefore, Experiment 2 investigated whether making such comparisons in an imagery mode would yield similar effects.

As explained in Chapter 3, verbal processing may be particularly conducive to making comparisons. In contrast to verbal processing, the absorbing nature of imagery (Holmes & Mathews, 2005) suggests that imagery processing may be less likely to encourage comparisons between the self and material presented during CBM-I. However, it has been suggested that observer perspective imagery may be more likely to encourage comparisons than field perspective imagery (Kuyken & Howell, 2006). Whilst non-clinical individuals tend to typically adopt a field perspective, individuals high in dysphoria or clinically depressed individuals have a greater tendency to imagine from an observer perspective (Lemogne et al., 2006). Thus in Experiment 2, to select an imagery instruction condition least likely to

encourage comparisons with the positive auditory CBM-I material, field perspective imagery instructions were used. This condition was contrasted with an imagery comparison condition in which participants were asked to compare images.

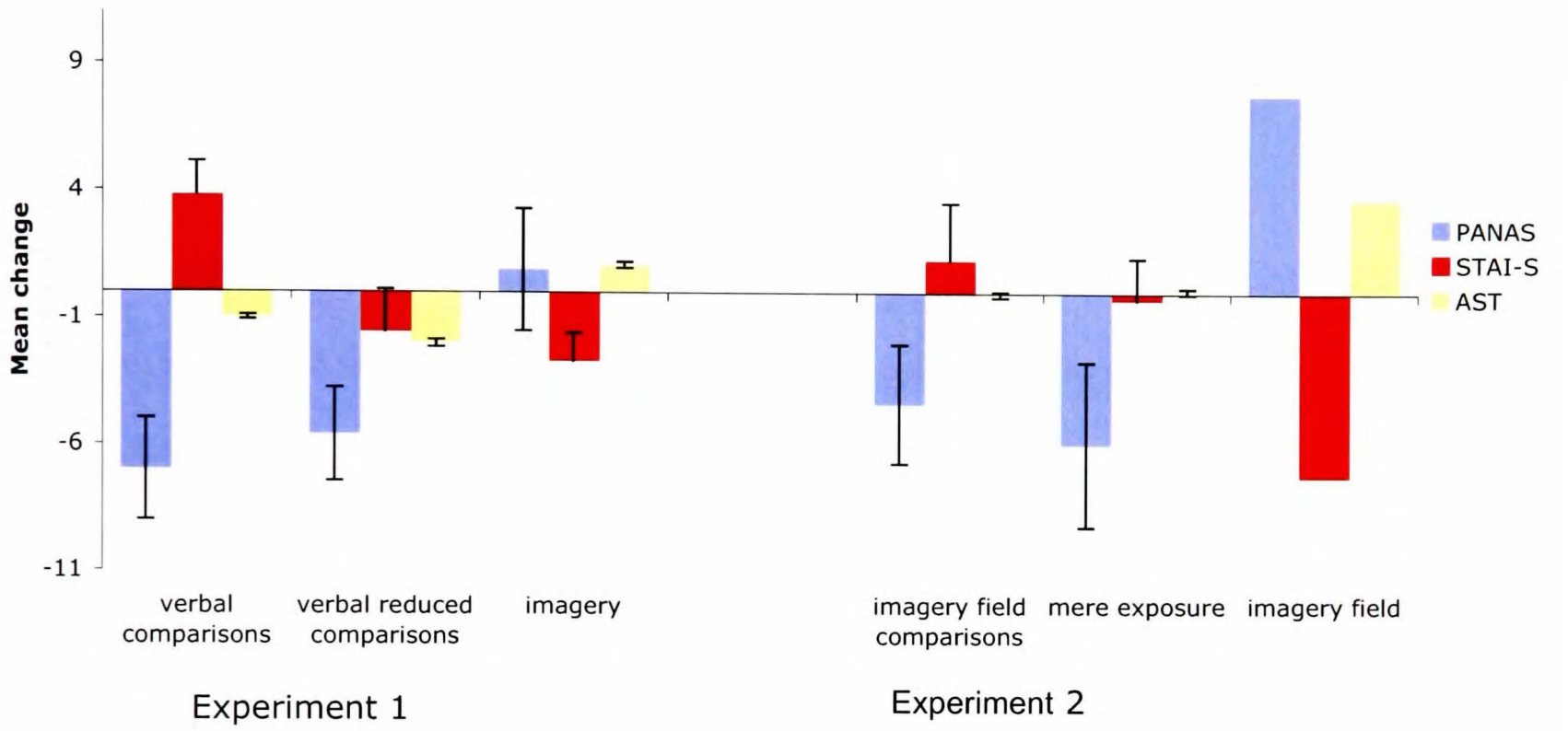
Experiment 2 included a third condition - mere exposure to the CBM-I material - a condition that had been lacking in Experiment 1. Results from Experiment 1 also indicated that a general imagery condition as opposed to two verbal conditions was more effective at promoting positive emotion. However, from this experimental design it was only possible to conclude that the imagery condition was superior relative to the two verbal conditions, and not that imagery actually enhanced the effects of the CBM-I technique per se. Experiment 2 thus included a mere exposure control condition with no direct processing instructions. This allowed a test of whether an imagery field condition could be claimed to be beneficial.

Experiment 2 demonstrated for the first time, that those participants in the field perspective made more positive gains than those given 'mere exposure' to the positive CBM-I material. Further, in line with the aforementioned rationale about comparisons, the field perspective participants rated that they made less comparisons with the CBM-I material than both the imagery field-comparisons and mere exposure conditions.

Overall, the first two experiments indicated that making comparisons with positive material can lead to negative emotional effects whether in a verbal or imagery processing mode. That is, the results suggest that 'comparisons' rather than mode of processing is critical in generating the negative emotional effects of positive auditory CBM-I seen in Holmes, Lang and Shah (2009, Experiment 1) and Holmes et al. (2006). To provide an overview of results, Figure 8.1 presents the changes in mood and bias from pre to post CBM-I in both Experiments 1 and 2 of the current

thesis. The AST scores in Figure 8.1 have been multiplied by ten to make the results more visible.

Figure 8.1. Mean change in positive affect (PANAS), state anxiety (STAI-S), positive affect and interpretation bias (AST) from pre-CBM-I to post-CBM-I in Experiment 1 and Experiment 2. Error bars show one standard error of the mean.



In Figure 8.1, positive mood and bias improvements are indicated by bars above the x axis. In contrast, improvements in anxiety are indicated by bars below the x axis. The results indicate that imagery processing is important in promoting positive emotional effects using positive auditory CBM-I. However, it is not just imagery processing that is important, but field perspective imagery specifically (see far right position of Figure 8.1). Compared to mere exposure, imagining from a field perspective improves the emotional and bias effects of positive auditory CBM-I. Field perspective instructions alongside active discouragement of making comparisons with the CBM-I material were thus adopted in the last clinical study (Experiment 6).

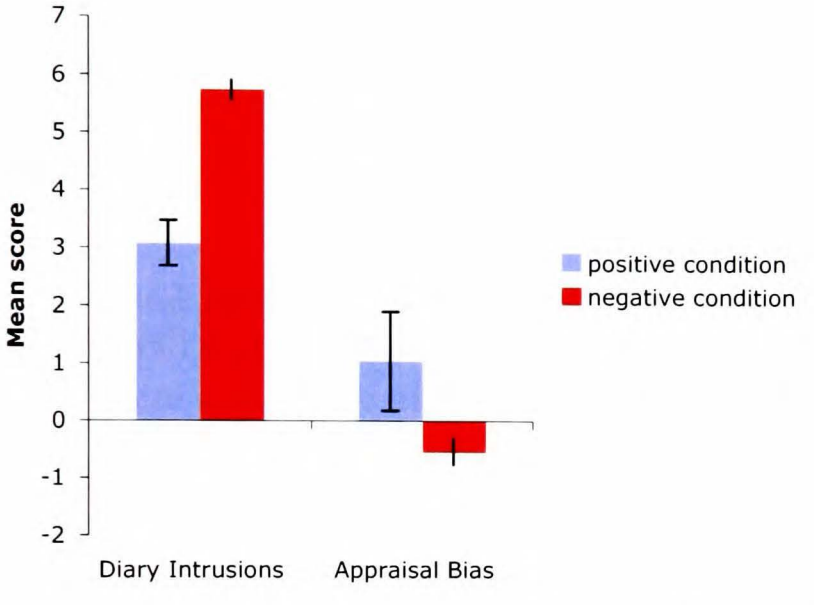
Studies 3a and 3b investigated the role of interpretation bias (as measured by the AST and AST-R) alongside the trait tendency to use imagery (SUIS) in accounting for the variance in depressive symptoms (BDI-II) in two large unselected samples. Given that the AST measures had been developed in the context of anxiety, and to my knowledge no published studies had confirmed that the current AST measures a bias relevant to depressive symptoms this was also investigated in Study 3a. The AST successfully discriminated between high and low dysphoric participants suggesting that the AST measures interpretation bias relevant to depressive symptoms. This enquiry was important in the context of the CBM-I research, as it can be informative to assess biases in populations of interest as part of developing CBM techniques (MacLeod, Koster, & Fox, 2009).

The findings from both Studies 3a and 3b highlighted the combined ability of imagery and interpretation biases to explain between 13.8% and 27.2% of the variance of depressive symptoms. In particular, Study 3b highlighted the role of negative intrusive imagery (and to a lesser extent a lack of positive intrusive imagery) in depressive symptoms. These findings are consistent with the combined cognitive bias hypothesis which suggests that biases should not be examined in isolation (Hirsch, Clark, & Mathews, 2006). These results led to the proposal that negative imagery should also be targeted in CBM-I for depressed mood. Intrusive memories in depression are an example of such imagery (Patel et al., 2007).

Study 4 (a pilot study for Experiment 5) and Experiment 5 focused on developing and testing a CBM-I technique targeting negative interpretations of intrusive memories (a negative appraisal bias) - "CBM of appraisals". As can be seen in Figure 8.2, relative to a negative CBM of appraisals training, a positive condition

led to more positive appraisal bias and fewer intrusive memories for a standardised negative event - a depressive film - after one week (Lang, Moulds, & Holmes, 2009).

Figure 8.2. Mean frequency of intrusions reported in the one week diary (diary intrusions) and the mean appraisal bias score on the recognition test in both the positive and negative CBM of appraisals conditions in Experiment 6. Error bars show one standard error of the mean.



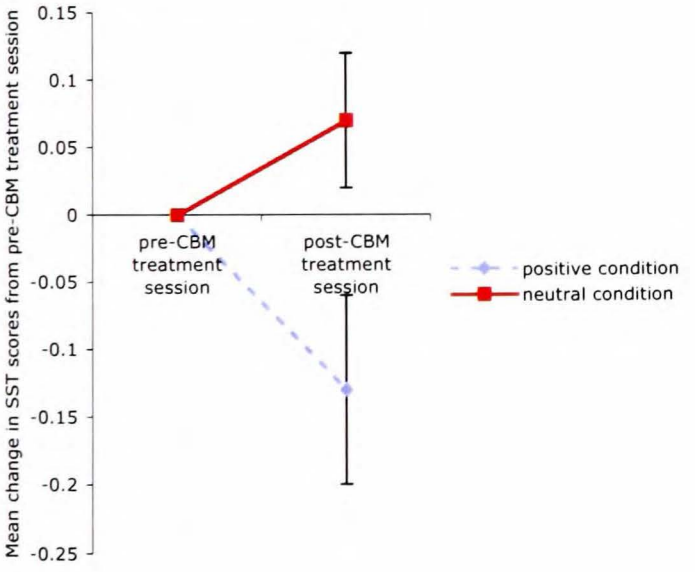
The thesis culminated in a final experiment (Experiment 6), a preliminary treatment study that was developed based on a combination of findings from the previous studies. Twenty four participants with clinical depression took part. The multi-component CBM-I technique comprised auditory CBM-I (Experiment 1 and 2), the CBM of appraisals technique developed in Study 4 and Experiment 5 and a new picture-word CBM-I technique. Experiment 6 incorporated the instructions indicated in Experiments 1 and 2 to use field perspective imagery whilst discouraging individuals from comparing themselves with the positive material.

Key results from Experiment 6 are highlighted in Figure 8.3 a-d, which show the changes from the pre-CBM-I treatment session to post-CBM-I treatment and, where relevant, the two week follow up session for the positive and neutral conditions. Four aspects are graphed: depressive interpretation bias as measured by the SST, appraisal bias as measured by the RIQ, depressive symptoms (BDI-II) and

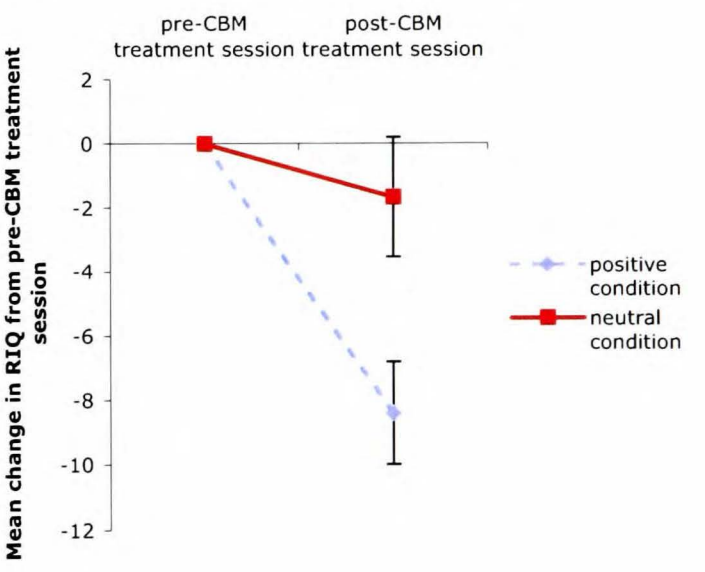
intrusive symptoms (IES intrusion). As can be seen in Figure 8.3, positive compared to neural multi-component CBM-I led to improvements in interpretation bias, appraisal bias, depressive symptoms and intrusive symptoms (at least from pre to post CBM-I). While depressive symptoms appeared to be maintained at two week follow up, improvement in intrusive symptomatology was not. Reasons for this have been explored in Chapter 7. Overall, however, the results of this preliminary treatment study suggest the potential clinical benefit of a multi-component imagery-oriented CBM-I package.

Figure 8.3. Change in (a) Interpretation bias (SST) (b) Appraisal bias (RIQ) (c) depressive symptoms (BDI-II) (d) intrusive symptoms (IES intrusion subscale) from the pre-CBM-I treatment session for the positive and neutral conditions separately in Experiment 6.

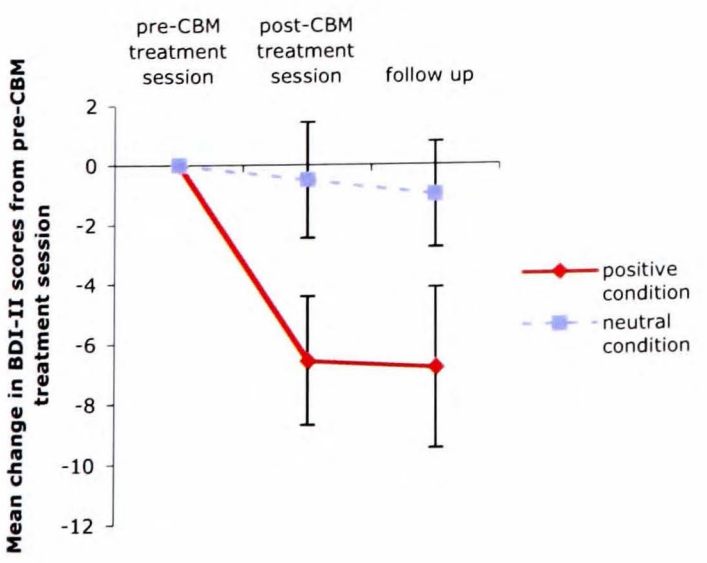
(a) Interpretation bias (SST)



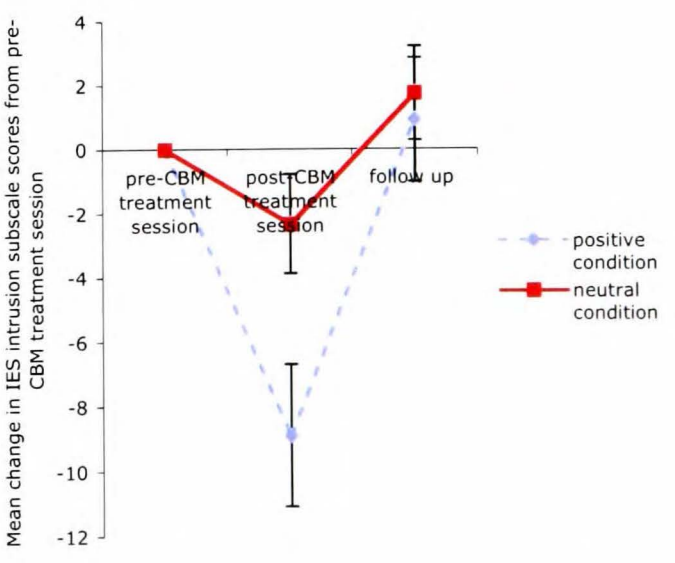
(b) Appraisal bias (RIQ)



(c) Depressive symptoms (BDI-II)



(d) Intrusive symptoms (IES intrusion subscale)

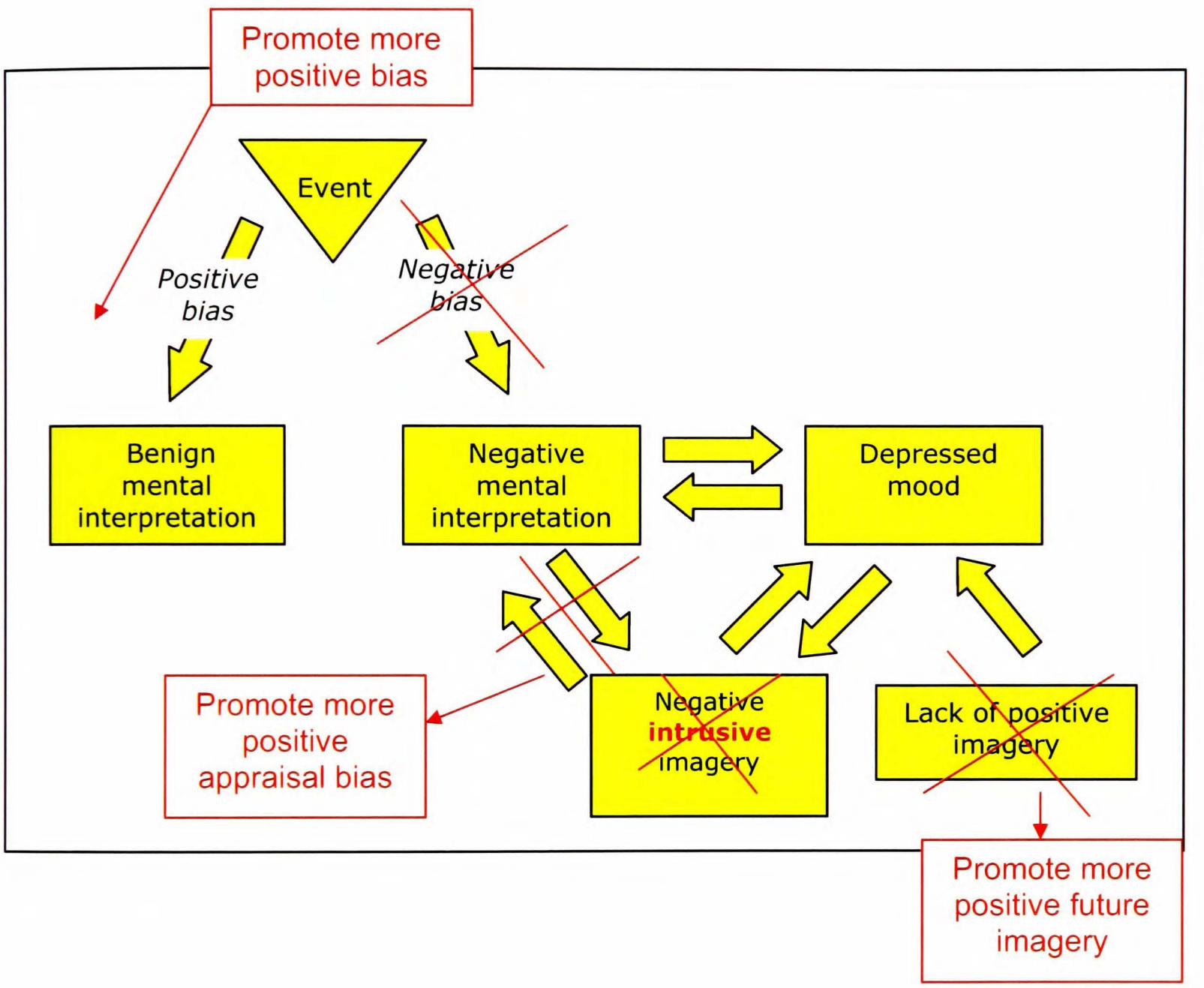


Implications of the Findings

Implications From the Guiding Framework Presented in Chapter 1

Figure 8.4 presents an updated version of the Holmes, Lang and Deeprose (2009) model presented in Chapter 1. This illustrates in red the therapeutic directions that have been suggested by the CBM-I techniques developed in the current thesis, and tested more specifically in Experiment 6. The red box on the top left hand side "promote more positive bias" refers to the basic tenet and indicates the attempts of the positive, imagery-oriented auditory CBM-I and picture-word CBM-I to promote more positive interpretation bias. In so doing, this technique attempts to reduce negative bias (indicated by the red cross over 'negative bias'). The red box on the bottom right hand side – "promote more positive imagery" - represents another key aim of the positive auditory CBM-I technique (along with picture word CBM-I). The promotion of more positive future imagery is intended to help overcome the lack of positive prospective imagery associated with depressed mood (Holmes, Lang, Moulds, & Steele, 2008; Schacter, Addis, & Buckner, 2007; Williams et al., 1996). The red box on the bottom left hand side indicates the target of CBM of appraisals technique - "promote more positive appraisal bias" – In turn, this should reduce negative intrusive imagery (indicated by the red cross over 'negative intrusive imagery').

Figure 8.4. Updated version of the model presented in Chapter 1, with parts in red to highlight processes examined in the current thesis. Underlying figure is from the experimental psychopathology sub-components model of depression focussing on mental imagery and interpretation bias presented in Holmes, Lang and Deeprose (2009).



It will be interesting for future developments to focus on the overall formulation of this sub-component model. The positive, imagery-oriented CBM-I that was developed in the current thesis focused on promoting positive future imagery. This is important given that using imagery can increase the perceived probability that an imagined event will occur (Sherman, Cialdini, Schwarztman, & Reynolds, 1985) and increase the likelihood of action (Libby, Shaeffer, Eibach, & Slemmer, 2007; Pham & Taylor, 1999). In addition, it is important given that depressed mood is

associated with a lack of positive prospective imagery (Holmes, Lang et al., 2008; Schacter et al., 2007; Williams et al., 1996). Further, Sharot, Riccardi, Raio, and Phelps (2007) emphasised the importance of imagining a positive future in developing an optimism bias which appears to be lacking in depression. Schacter et al. (2007) also highlighted the overlap in neural circuitry involved in autobiographical memory with that used for prospective imagining. Consistent with associations between autobiographical memory and prospective imagery J. M. G. Williams et al. (1996) found that when induced to recall specific memories of the past, the specificity of the images of the future was increased.

Implications from Specific Studies

The implications of each of the individual studies have been outlined in each associated chapter. Two illustrative examples of these implications are provided below. First, in Experiment 2 field perspective imagery compared to mere exposure led to more positive bias and emotion. These findings provide the first direct evidence that imagery field perspective instructions are better than being merely exposed to positive CBM-I material. Previous studies have only indicated that for positive auditory CBM-I, imagery conditions are superior relative to verbal instruction conditions (Holmes, Lang & Shah, 2009, Experiment 1, Holmes et al., 2006) or observer perspective imagery conditions (Holmes, Coughtrey, & Connor, 2008). Observer perspective imagery compared to field perspective imagery can be protective against negative emotion (McIsaac & Eich, 2004), and is associated with reduced emotional intensity of both positive and negative emotions (Berntsen & Rubin, 2006). It is possible that imagining positive information from a field perspective may have allowed for greater engagement with emotion (as suggested by Holmes, Coughtrey et al., 2008), promoting the more positive emotional effects that

were found. Moreover, results from this thesis suggest that field perspective may be beneficial where it discourages unfavourable comparisons with positive material.

Second, in Experiment 5, a positive versus negative CBM of appraisals task successfully manipulated appraisal bias, and these effects transferred downstream by a relative reduction in intrusive symptomatology related to the depressive film. To date, the research examining depressive appraisals of intrusive memories in depression had been correlational in nature. This study was thus the first to experimentally manipulate depressive appraisals of intrusions and thus demonstrate the causal impact that such appraisals have on the frequency of intrusions following depression-related events.

Implications Concerning CBM-I More Broadly

Having considered two implications from individual experiments, the broader implications of this line of research is discussed. Successful CBM-I for depression would present development of an easily disseminable, cost effective way of potentially helping many people with depression. CBM-I offers potentially a therapist free, computerised technique that could potentially be offered on the internet allowing access for remote populations. From the national statistics omnibus survey, 70% of UK households reported having internet access (Office for National Statistics, 2009). Access to mental health in rural Australia, for example, is particularly difficult (Morley et al., 2007) and using internet administration would facilitate access with interventions such as CBM-I. In addition, CBM-I could potentially reach patients waiting for treatment for depression or as an alternative option for those unwilling to take medication or who choose not to participate in talking therapy. It would also provide the opportunity for self-administration for individuals who are unable to attend therapy due to work or family commitments, or for those individuals who wish

to stay anonymous who would not otherwise seek help. It is noted that the CBM-I developed in the current thesis is not fully "therapist free" since the experimenter spent one session explaining how to use the computerised package. Future studies could seek to fully automate this process, for example, by a web tutorial.

The multi-component CBM-I package tested in Experiment 6 appeared promising relative to antidepressant medication, behavioural activation other CBM techniques and other computerised therapeutic packages (Amir, Beard, Burns, & Bomyea, 2009; Hollon, Thase, & Markowitz, 2002; Proudfoot et al., 2004). It did not reach the levels of clinical significance shown by recent CBT trials (deRubeis et al., 2005; Dimidjian et al., 2006). However, it is interesting to consider that CBM-I may perhaps not be best seen as a stand alone treatment but rather could be developed as an adjunctive to other treatments. Given that application of this package, as outlined above, may not ultimately require a therapist and it could be easily disseminable and cost-effective. Given the potential clinical implications of such an approach, the findings of Experiment 6 suggest that the technique is worthy of further research.

Limitations of the Research Presented in the Thesis

Whilst a number of the limitations of each of the individual experiments are outlined within the respective chapters, a number of general limitations will be outlined below. One limitation of the current thesis is that the focus here was on a small subset of cognitive processes that are able to predict only, as suggested by Study 3a and Study 3b, between 13.8% and 28.5 % of the variance in depressive symptoms. A number of other processes which are known to make significant contributions to depression such as overgeneral autobiographical memory (Williams et al., 2007) and rumination (Nolen-Hoeksema, 1991), were not considered alongside the current focus on imagery and interpretation bias. In addition, no measure was

included in any of the studies to assess the impact of manipulations on these other cognitive variables. It is thus not clear whether any of these processes would have been influenced. Theoretically it would be predicted that overgeneral autobiographical memory would be reduced following the positive multi-component CBM-I package. This is because the CBM-I package aims to promote more positive future imagery and such imagery has been found to be positively associated with specificity of memory recall (Williams et al., 1996). It would also be predicted that rumination would be reduced given the emphasis on imagery and reducing verbal comparative processing of the multi-component CBM-I. Future research should seek to test in more processes at once.

All the studies conducted in the current thesis have relied heavily on self-report measures and thus demand cannot be ruled out as a potential influence. Future studies should seek convergent evidence from measures less susceptible to demand. For example, future studies should seek to test whether the manipulations would influence salivary cortisol levels or psychophysiological measures such as skin conductance. Neuroimaging techniques also provide the opportunity for convergent evidence to be sought given the recent evidence suggesting a role for the lateral prefrontal cortex in mediating CBM-A (Browning, Holmes, Murphy, Goodwin, & Harmer, in press). Further to this, Fox (2008) suggested that brain imagining techniques will be useful in investigating interpretation/appraisal biases.

All studies, except the final experiment were tested in non-clinical populations. Only limited conclusions regarding the generalisability of such results can be drawn. The findings however have provided a useful analogue for depressed mood from which the final clinical experiment was built. It would clearly be unethical to use negative CBM in a clinical sample, as it may exacerbate cognitive

biases and, potentially, depressive symptoms. Hence, the use of a non-clinical sample allowed Experiment 5 to test the potential effectiveness of adapting the CBM paradigm to target *negative* appraisals of intrusions.

Future Directions

Within each of the preceding chapters, future directions for research have been highlighted. An exciting clinical direction for future research would be a larger randomised controlled trial of the multi-component CBM-I technique in people with depression. Some modifications to the current version have been suggested in Chapter 7, such as adding an additional session of appraisals training and recruiting only an unmedicated depressed sample. In addition, to improve the accessibility, durability and effectiveness of CBM-I there are a number of possible lines of research. Accessibility of CBM-I could be improved though the modification of CBM-I so that it would also be available over the internet. Furthermore, individually tailoring the self-relevance of the material presented during CBM-I (as described in Chapter 7) could potentially improve the impact of the stimuli, though this remains to be tested. The optimal schedule for CBM-I sessions should also be explored to determine whether it should be daily, weekly or some wider interval.

It would be also of interest to examine the effects of CBM-I as an adjunctive treatment to, for example, antidepressant medication or CBT. It is possible that in future clinical translating CBM-I might best be developed as an adjunctive rather than stand alone treatment. In summary, the findings of the current thesis suggest that multi-component CBM-I holds promise for further clinical research and development as part of a wider treatment approach to reach people with depression.

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APPENDIX 2.1

The 100 scenarios used in positive auditory CBM-I in Experiments 1 and 2 taken from Holmes, Mathews, Dalgleish and Mackintosh (2006)

A neighbour asks you to accompany him to a book club for the first time. You have not taken part in a book club before. Other people's reactions on hearing your views on the book make you feel proud.
At your computer lesson you finish your work early and so the lecturer gives you a new task to do. You don't understand the task and ask for advice. The lecturer says that your request is a sign of being a good student.
At a dinner party, you are introduced to someone new and chat to them for quite a while before they make their excuses and leave. When you telephone them the next week to suggest meeting again, they reply that it would be great.
You are at home alone watching TV. You must have been dozing because you suddenly wake up. You have the impression that you heard a frightening noise and then realise with relief that it was your partner returning home.
Your daughter goes horse riding every weekend and you reluctantly agree to go with her. When you get there the riding instructor gives you a large horse to ride. Soon the horse starts to gallop fast and you find you are enjoying the excitement.
You join a tennis club and before long you are asked to play in a doubles match. It's a tough match and afterwards you discuss your performance with your partner who says that you were great to play with.
A vacancy for a post of reporter arises at your local newspaper. You are interested but think you are under-qualified and so ask for details. The people you speak to think that you would be ideal for the job.
Your orchestra asks you to play a solo at the next concert. You only have time to practise it once before you play it. At the first rehearsal you make one mistake. The conductor comments that your work is excellent.
Your friend is very keen on skating and persuades you to try it out. At the rink you put on the skates and step on the ice. You glide forward, slowly at first, then faster, and realise that you are doing really rather better than expected.
You receive an essay back from your tutor and do not get the grade that you had expected. She tells you that this is because, on this occasion, your work was outstanding.

You organise a Christmas party for your friends every year. Last time it didn't go that well, and so you worry about what will happen this year. At the party you realise that this year everyone is really having fun.
Some important people are visiting the office and you are asked at the last minute to present a project to them. You have little time to prepare yourself. Afterwards, you felt that your performance was surprisingly good.
You are given the task of arranging the annual office party. Despite having little time or funds, you do your best to organise food, drink and entertainment. On the night of the party, you realise you have been successful.
You've been a member of a choir for several years. A friend asks you at very short notice to sing with another group at a large concert. As you sing you feel the music flow and your voices blend together beautifully.
You arrange a family reunion for your father's birthday. On drawing up the guest list, your mother points out those relatives who do not always see eye to eye. On the day, the house is soon full and you realise with pleasure that people are getting on well.
You've taken an exam as part of an evening course and are worried you did not do very well. At the next class the grades are on the notice board and everyone is looking. The sight of your grade makes you feel elated and fills you with confidence.
Your club asks you to swim in a competition as they are short of swimmers. You come third in your first race and, as you get out of the pool, your team mates are ready to talk with you. They say your efforts were fantastic.
When collecting your child from school you hear some parents gossiping. As you walk closer, you overhear your name. When they see you they look embarrassed but smile. What you heard them say makes you feel proud.
It is your first day at a new job and you are rather flustered when you report as requested to your manager. However, her first impression of you seems to be that you are keen and efficient.
You receive a letter out of the blue from an old friend with whom you had a disagreement a few years ago. She wants to meet and explains that she has some issues to discuss. From her tone you feel that the conversation will go positively.
You are persuaded to go on holiday to Rome - a place you had really wanted to visit. The flight and lodgings are more than you can afford, but you pay for them on credit. Afterwards, you reflect that the whole experience was really worthwhile.

A housebound neighbour asks you to get a present for her niece's birthday. You can't spare much time to shop. When you give her the present to wrap up it is obvious that she thinks it is ideal.
Your company has sent you on a course. Your tutor tells each member of the group to stand up and introduce themselves. You nervously stand, not sure of what to say. The feedback from the group; however, is that you sounded confident and assured.
You have decided to go caving even though you feel nervous about being in such an enclosed space. Going deep inside the first cave you realise you feel very brave and proud of trying it out.
As part of a language course you have to take a difficult oral exam. The material was barely covered in class and you were told to do some practice that you had little time to do. After the exam you are told you performed exceptionally well.
Your partner asks you to go to their company dinner. You have not met any of their work colleagues before and worry you will have nothing in common. Once you are there you find that the conversation is animated.
You visit a new hairdresser who persuades you to try a completely different cut. You are somewhat apprehensive, but when you see the finished style you feel fantastic.
As a member of a local charity you are given the task of promoting your fund raising events on local radio for the first time. You worry that your voice is shaky during the interview. However, afterwards you receive feedback that you sounded great.
A neighbour asks you to look after her little girl while she visits a friend in hospital. The five-year old cries when her mother leaves but then goes to play in the garden. After a few minutes you go out and see she is quite content, playing happily.
Your best friend convinces you to go on a blind date and as you sit in the bar waiting to meet your date, you think about how it will go. You feel excited and look forward to meeting the person. It will be fun.
Your partner asks you to buy a present for their sister's birthday, as they are busy. You dash into town and pick up some perfume. When the sister opens it she doesn't say anything. Knowing her as you do, you realise the choice was perfect.
You have recently started a new job and your boss calls a meeting to discuss a new project which will involve most of the staff in your office. You are singled out to contribute your ideas. You sense that your boss finds your ideas very impressive.
As you walk into the interview room the panel of interviewers welcomes you and

proceeds to ask some tough questions. As the interview progresses you feel you are avoiding any mistakes and performing really well.
As you are walking down a quiet street you see your usually friendly neighbour on the other side. You call out and wave at her but she does not answer you. You know this is because she is simply very busy and does not see you.
You are about to meet your friend for a drink. You get ready and as you're about to leave, he phones to say he won't be coming. He warmly explains that something unavoidable has come up but he really wants to see you soon.
A new task is assigned to your department at work and your supervisor tells you that you're responsible for it. You have no guidelines to follow, so you ask a colleague for advice. Your colleague thinks that you are being very thoughtful and sensible.
You have gone to a house-warming party despite being a bit under the weather. After a glass of wine, the drink begins to take effect and you notice that you are beginning to feel pleasantly relaxed and much better.
You invite some work colleagues to your house for a dinner party, even though you know they rarely meet up. As you are clearing up afterwards you think that the evening was really quite successful.
Your boss asks you to do a task to help her out. Although you finish it quickly you are worried that there might be several mistakes in it. When your boss looks at it, it is clear she thinks it is very impressive.
Your firm is raising money for a local hospital. You're put in charge of your department's efforts. You arrange a meeting to discuss it and afterwards, feel how very motivated and positive everyone is.
You decide to redecorate your kitchen yourself, even though the work involved looks quite tricky. When you have finished, you inspect what you have done and think to yourself that your efforts were really successful.
You are on holiday at a mountain resort and are learning how to ski. This is your first attempt to ski downhill on your own. At a moderate speed you approach the first bend knowing that you will do well.
You overhear some friends making comments about your partner. As you listen, what they say makes you feel proud.
During a discussion, you end up debating an issue with colleagues. One of them tells you that they find your views challenging. When the issue comes up next in the group

conversation, you find that the others completely support you.
You are in a reflective mood and think back on past achievements and disappointments that you have experienced during your life. Overall, your main feeling about life so far is one of pleasure and fulfilment.
You wake up in bed with your partner who is still asleep. You look at them and feel a wave of tenderness.
You buy a new outfit for a wedding in a rush. Putting it on you see it looks rather flattering.
It's New Year's eve. You think about the year ahead of you. Doing this makes you feel decidedly positive and optimistic.
It's Christmas day and your family are gathered around you. You look at them with a rush of love and pride.
You've just come back from a summer holiday you really needed. It has left you well rested and relaxed.
You are starting a new job that you very much want. You think about what it will be like and feel extremely optimistic.
You have been doing some local charity work. You go to the charity to give them a cheque. Your efforts are greatly appreciated.
You have had a busy day at work and feel you need to 'switch off' and be looked after. You come home in the evening and your partner gives you a big hug.
You go to the station to meet a friend you have not seen for a long time. Greeting them they give you a warm embrace.
You are sitting in the kitchen at home and catch your partner looking at you. They meet your glance with a big smile.
It's the anniversary day of when you and your partner first met. You realise how much you love them.
It's your birthday, and your partner reaches over to you with a present. You open it and feel incredibly happy.
You look around at where you live and at your possessions in your home. You realise how terribly lucky you are.
You read about a horrible natural disaster in the newspaper. Thinking about your own life you realise how fortunate you are.
You go to a restaurant and order your favourite food from the menu. When it arrives you

find that it is mouth watering.
You go to a place you visited on holiday as a child. Walking around, it brings back very happy memories.
You meet your best friend for a coffee in a local cafe. As you chat the time disappears and you are struck by the closeness of your friendship.
You wake up, get out of bed, stretch and really notice how you feel energetic and healthy today.
You watch your child in their school play. As they perform on the stage, tears of pride well up in your eyes.
You have had a quarrel with a family member, and go to talk to them again. As you settle your differences you are struck by a sense of forgiveness. You feel very hopeful.
You are about to move with your partner into a new home. You think about living there with hope and optimism.
You have an annoying row with your partner. When later in the day the pair of you make amends, you realise how incredibly fond of them you are.
You are standing alone on a beach by the sea. Being there fills you with a sense of calmness.
You go for a country walk in a wood. In a glen you see a young deer run past, and you think about how wonderful nature is.
You have planted lots of bulbs in the garden. It is spring and they are starting to grow. The plants coming up are healthy and beautiful.
You receive an unexpected letter. Opening it you find a cheque and think about what you will do with this welcome windfall.
You climb a steep hill and get to the top. You find that the view is far reaching and exhilarating.
You go to a wedding where you know very few other guests. When you get there you find that the other guests are very welcoming and friendly.
You switch on the radio in your kitchen to a popular music channel. The songs make you feel lively and you want to dance around.
It's Saturday morning - the start of the weekend - and you have many things to do. You are feeling lively and energetic, and make an enthusiastic start.
A friend is doing a massage course. They practise on you and you find that it is soothing and relaxing,

You have had a hard day at work and there are a lot of office politics. At home you talk about it with your partner, who is understanding and sympathetic towards you.
You are on holiday in a strange city. You can't read the road signs or speak the language. However, when you ask for directions the locals are amazingly friendly and helpful.
It's a rainy day and you go outside with your umbrella. As the rain falls around you, you notice your step quicken and you whistle and feel surprisingly cheerful.
You are lying on your sofa, with thoughts of what happened today running through your mind. They make you feel content and that life, overall, is good.
A junior colleague is stuck with a deadline. You realise they are struggling and go over and offer to help them. They respond with gratefully with a big smile.
In a local café you order a large coffee. Drinking it makes you feel bright and alert.
You have many presents to buy this Christmas and go out shopping with a big list. After an hour you look at your list you realise how very efficient you are being.
You have known your friend for many years. You have a personal secret you need to share with them, and you know with confidence that you can trust them.
It's July, and you are walking down the street. The weather makes you feel relaxed and carefree.
You go swimming at the local pool for exercise. A half hour of lengths leaves you feeling vigorous and invigorated.
Your partner tells you they have got the job promotion they have been hoping for. You are delighted for them and suggest celebrating together.
Your friend tells you about their new exercise project that they would like you to join in with. Your reply is enthusiastic as you think about how fit and well this will make you.
You used to worry about all sorts of things. Now you are a little older, you are much more confident in yourself.
You have started an evening class which is tough going. You are determined to succeed, and after a while it becomes much easier and more enjoyable.
Your doctor tells you to do more exercise. After a couple of weeks your determination in doing this leaves you feeling much better.
You are doing DIY at home, and there is a job that needs some strength. You realise with surprise that you are actually strong and fit enough to do it.
You meet your partner for an evening out. Spending the evening with them leaves you feeling very happy and lucky.

It's a rainy grey day and you sit to have a cup of tea. You let your mind wander back over your last holiday and it brings back many happy memories
You give a speech at your friend's wedding. When you have finished the audience respond with a great round of applause.
You are outside playing a game of football and almost by accident score a winning goal. The spectators roar with enthusiasm.
You are holding your new-born baby. Is only a few hours old. This moment overwhelms you with pride and joy
Your cat is hungry. You put some milk in a saucer and give it to them. They come up to your leg and purr with contentment
As you are coming home through the front door, your dog runs towards you and greets you with enthusiasm and affection.
You think back to your time at school, and realise that there were some particularly happy moments that you cherish.

APPENDIX 2.2

The ambiguous test descriptions from the Ambiguous Scenarios Test (AST) taken from Holmes, Mathews, Dalgleish and Mackintosh (2006) and administered in Experiments 1 and 2, and Study 3a

Instructions given to explain the AST:

> *"On the headphones you will hear a set of sentences after each sentence you will be asked to rate how emotionally pleasant or unpleasant you find the sentence at this very moment. The first sentence you hear will be a practise sentence. Whilst you are hearing the sentences the screen will be blank. A rating scale will appear once the sentence is complete. You will be then asked to rate how emotionally pleasant or emotionally unpleasant you found the sentence by pressing the number key which best suits you, using a scale of 1-9 with 1 being the most unpleasant and 9 being the most pleasant and all the variations in between. Please feel free to use the whole range. Once you have made your rating it will go onto the next sentence."*

Sentences were rated on a scale of 1 – 9:

1 = extremely UNpleasant (negative)
2 = very UNpleasant
3 = somewhat UNpleasant
4 = slightly UNpleasant
5 = neutral/neither
6 = slightly pleasant
7 = somewhat pleasant
8 = very pleasant
9 = extremely pleasant (positive)

Table 2.1A presents the ambiguous test descriptions (administered in auditory form) as presented during the AST. The possible positive and negative/neutral interpretations that could be made are showed on the right columns of the table.

Table 2.1A
Ambiguous test descriptions presented during the AST.

Ambiguous test descriptions	**Positive interpretation**	**Negative / Neutral interpretation**
Your neighbours have just had a new baby. You hear it crying. Through the window you see how the husband *holds* it.	soothes / hugs	grabs
It is an overcast day and you are sitting on the beach. You look up to notice the weather really begin to *change*.	brighten	worsen
You are going to see your best friend at the station. You	happy	disappointed

haven't seen them for years. When you arrive you feel *emotional.*		
You are hosting a dinner party to introduce your friends. At the table you notice *how* your are friends are interacting	well	awkwardly
You are watching the lottery results on TV. As the numbers are called you suddenly find out your *result.*	winning	usual/loosing
You buy a new outfit for a party. Other people's reactions show how you *look.*	great	terrible
You are out in the countryside. Walking down a road you pass a small hedgehog which is *there.*	cute	squashed
It's the morning of your birthday. The postman comes down the street with *their bag.*	full	empty
It's a special anniversary with your partner. You have got them a special gift. As they open it their reaction is *clear.*	delighted	disappointed
You have recently taken an important exam. Your results arrive with an unexpected letter of explanation about *your grade*	top / high	failed / poor

APPENDIX 2.3

Auditory CBM-I instructions for the (a) verbal comparisons condition (b) verbal reduced-comparisons condition and (c) imagery condition used in Experiment 1

Differences between the verbal comparisons condition and the verbal reduced comparisons condition are highlighted in yellow in the verbal comparisons condition instructions.

(a) Verbal comparisons condition instructions adapted from Holmes, Mathews, Dalgleish and Mackintosh (2006) and Holmes, Lang and Shah (2009)

During the next part of the experiment you will hear sentences through the headphones. I would like you to please process the sentences verbally and compare the situation with how things really are for you in reality.

Aim: What I'm going to do now is firstly do an exercise to practise processing the sentences verbally. I'll then take you through 4 examples of the type that will be in the experiment to help you concentrate on processing sentences verbally and comparing with how things are for you.

Definition: Sometimes we think in words, sometimes we think more in mental pictures or other sensations. By 'thinking in words' I mean using verbal language of the sort you would use when you speak. This is the way I want you to focus on the sentences you will hear followed by a comparison of the information with how things are for you in reality.

Motivation: Focussing in a logical, abstract way on the words and meaning of text has been found to enhance people's processing of it. Furthermore, comparing the information with how things are for oneself further improves processing. We are investigating these effects. Please do your best to focus on the words and meaning while listening to the sentences and compare the information with how things really are for you in reality. You will be asked questions about the sentences later. You will now receive some training in how to do this

Exercise: "Thinking about a lemon".

Please focus on the words in the sentence and their meanings.

As you go through I am going to ask you:

How difficult was it to understand the meaning of the description?

Read the sections on the left column, and ask. How difficult was it to understand the meaning of the description? Then mention the part in "notes" below, to illustrate the complexity and importance of focussing on verbal meanings. Remind participants to please focus on the words in the sentence and their meanings. DO NOT SHUT EYES.

Experimenter says:	Notes for expt. to prompt:	verbal rating (1 – 5)
You have bought a yellow, citrus fruit.	rating should be low i.e. easy - as it means a lemon How difficult was it to understand the meaning of the description?	

The lemon cost more than an orange, but less than a lime.	Do limes cost more than oranges? How difficult was it to understand the meaning of the description?	
You pick up a knife to cut it and it drops on the floor	What drops on the floor – the knife or the lemon? How difficult was it to understand the meaning of the description?	
You rinse the lemon and start again	Start doing what again? Cut it? Dropping it? How difficult was it to understand the meaning of the description?	

Experimental examples to use for verbal comparisons training

Please focus on the words and their meanings in the sentences. Compare the description with how things really are for you in reality.

As you go through you will be asked:

How different was the description from how things really are for you in reality?

1	2	3	4	5
not at all different	slightly different	somewhat different	very different	extremely different

- In these next examples, you may find that it's unclear what is about to happen, but focussing verbally on the meanings of the words in the sentence and comparing with how things really are for you in reality can help you.
- Please focus on the words and meaning as the sentence unfolds ensure you make a comparison with how things really are. You will have questions after each.
- *Please DO NOT SHUT YOUR EYES while listening.*
- Please concentrate on your task, as it is easy to slip into your normal way of thinking.
- Answer as quickly as you can without rushing.
- When making the comparison make sure you compare the situation with how things tend to be.

During the examples, prompt for understanding and comparison when appropriate, by asking the participants to describe the words and meaning and how different it was from how it normally is

Sample sentences (experimenter reads these aloud):

1. You are waiting for the raffles prizes to be drawn at your local pub. There are lots of things you want in the prizes. The first number is called and you leap out of your chair!

V = Are you always the one to win raffle prizes? YES *(give feedback on answer and highlight the importance of focussing on the comparisons, words and meaning each time). Did you focus on the comparison?*
If NO – what usually happens for you?
Are you always a lucky person?

- How different was this description compared to how things really are for you in reality? (1-5)

2. You have just been interviewed for your dream job, and asked to wait outside while they discuss the outcome. When you are called back in you see the panel is beaming at you.
V = would you always have this experience in a job interview?
Would you expect the panel to give you the job
If NO – what usually happens for you?

- How different was this description compared to how things really are for you in reality? (1-5)

3. You are driving down a road at high speed as you are late for an appointment. You suddenly realise you have to take a right turn so quickly indicate. As the car takes the turning you realise you are skidding but safe.
V = Are you always an infallible driver?
If NO – what usually happens for you?

- How different was this description compared to how things really are for you in reality? (1-5)

4. You have been planning a July party with an outdoor buffet and a band. Obviously you are hoping for a sunny day. On the morning of the party, you open the curtains to see that the sky looks ominous.
V = does the weather always do what you want?
If NO – what usually happens for you?

- How different was this description compared to how things really are for you in reality? (1-5)

(b) Verbal reduced-comparisons condition instructions adapted from Holmes, Mathews, Dalgleish and Mackintosh (2006) and Holmes, Lang and Shah (2009)

During the next part of the experiment you will hear sentences through the headphones. I would like you to please process the sentences verbally.

Aim: We will begin with an exercise. This is to help you concentrate on processing the sentences verbally, that is focussing on the individual words. I'm then going to take you through *four examples of the type that will be in the experiment* to help you concentrate on processing sentences verbally.

Definition: Sometimes we think in words, sometimes we think more in mental pictures or other sensations. By 'thinking in words' I mean using verbal language of the sort you would use when you speak. This is the way I want you to focus on the sentences you will hear.

Motivation: Focussing in a logical, abstract way on the words of text has been found to enhance people's processing of it. We are investigating these effects. Please do your best to focus on the words while listening to the sentences. You will be asked questions about the sentences later. You will now receive some training in how to do this

Please focus on the words in the sentence.

As you go through, the description will be quite quick so I am going to ask you:

How difficult it was to understand the description?

1	2	3	4	5
not at all difficult	slightly difficult	somewhat difficult	very difficult	extremely difficult

Exercise: "Thinking about a lemon".

Please focus on the words in the sentence

As you go through I am going to ask you:

How difficult was it to understand the meaning of the description?

Read the sections on the left column, and ask. How difficult was it to understand the description? Then mention the part in "notes" below, to illustrate the complexity and importance of focussing on words. Remind participants to please focus on the words in the sentence. DO NOT SHUT EYES.

Experimenter says:	Notes for expt. to prompt:	Understand rating (1 – 5)
You have bought a yellow, citrus fruit.	rating should be low i.e. easy - as it means a lemon How difficult was it to understand the description?	
The lemon cost more than an orange, but less than a lime.	Do limes cost more than oranges? How difficult was it to	

	understand the description?	
You pick up a knife to cut it and it drops on the floor	What drops on the floor – the knife or the lemon? How difficult was it to understand the description?	
You rinse the lemon and start again	Start doing what again? Cut it? Dropping it? How difficult was it to understand the description?	

Experimental examples

- In these next examples, you may find that it's unclear what is about to happen, but focussing verbally on the words in the sentence can help you.
- Please focus on the words as the sentence unfolds. You will have questions after each.
- *Please DO NOT SHUT YOUR EYES while listening.*
- Please concentrate on your task, as it is easy to slip into your normal way of thinking.
- Answer as quickly as you can without rushing.
- Be aware the speed may vary of the sentences.

During the examples, prompt for understanding when appropriate, by asking the participants to describe the words

Sample sentences (experimenter reads these aloud):

1. You are waiting for the raffles prizes to be drawn at your local pub. There are lots of things you want in the prizes. The first number is called and you leap out of your chair!
V = do the prizes in the raffle appeal to you? YES
How difficult was it to understand the description? (1-5)

2. You have just been interviewed for your dream job, and asked to wait outside while they discuss the outcome. When you are called back in you see the panel is beaming at you.
V = while you were away did the panel members come to a decision about your job? YES

- How difficult was it to understand the description? (1-5)

3. You are driving down a road at high speed as you are late for an appointment. You suddenly realise you have to take a right turn so quickly indicate. As the car takes the turning you realise you are skidding but safe.
V = had you known for a while you had to turn? NO

- How difficult was it to understand the description? (1-5)

4. You have been planning a July party with an outdoor buffet and a band. Obviously you are hoping for a sunny day. On the morning of the party, you open the curtains to see that the sky looks ominous.
V = Are you checking the weather because of where your reception will be held? YES

- How difficult was it to understand the description?

(c) Imagery condition instructions taken from Holmes, Mathews, Dalgleish and Mackintosh (2006) and Holmes, Lang and Shah (2009)

Aim: This exercise is to help you enhance your awareness of using mental imagery.

Definition: Sometimes we think in words, sometimes we think more in mental pictures or other sensations. By a mental image I mean when you 'see in your minds eye", "hear with your minds ear" and so on, and how you feel (emotionally) in your imagination. You can have a mental image in any sensory modality. (Confirm participant understands)

Motivation: "Producing a vivid image of text has been found to enhance people's processing of it. We are investigating these effects. Please do your best to produce a vivid image when listening to the sentences. You will be asked questions about the sentences later. You will now receive some training in how to do this."

Exercise: "Imagining a lemon".
I am going to ask you to imagine a situation, and as you go along pay attention to what you can picture and feel in your imagination.

In all the imagination tasks we do, please imagine it happening to yourself, as if you are there and you are actively involved in the situation. Imagine as *vividly* as possible.

As you go through I am going to ask you:
How vividly could you imagine the situation that was described? Please use the scale below:

1	2	3	4	5
not at all vivid	slightly vivid	somewhat vivid	very vivid	extremely vivid

- Now go through the following SWIFTLY, note the vividness rating in the table:

Experimenter says:	Notes:	vividness rating (1 – 5)
PLEASE SHUT YOUR EYES imagine holding a lemon	How vivid is this?	
Imagine shining a light on the lemon and look at its skin - what can you see?	(should say pitted bumps etc, if not ask them to look closer at the surface of the lemon) How vivid is this? (vividness should be higher)	
Now cut into it with knife, smell the juice	Could you smell it? Can you see the inside of the lemon? What does that look like? How vivid is this?	
Now you suddenly squeeze the lemon, and it squirts into your eye (rub in eyes if necessary).	Could you feel the pain? Other emotions e.g. Irritated?	

You splash cool water in your eyes, it feels better now.	How vivid is this?	

Experimental examples to imagine:

- In these next examples, you may find that it's unclear what is about to happen. Focussing on imagery can help you. Your main job is to imagine the OUTCOME once it is clear what you heard.
- Please then FOCUS on your image of the outcome
- you will now do four examples of the type that will be in the experiment
- Please SHUT YOUR EYES while listening. Make sure you have focussed on the image of the outcome before answering.
- Please imagine the event happening to yourself.
- Concentrate, as it is easy to slip into your normal way of thinking.
- Answer the questions as quickly as you can without rushing.
- *During the examples, prompt for image detail and emotion when appropriate, by asking the participants to describe the self-image aloud. Check they are focussing on the positive / negative OUTCOME in particular.*

Sample sentences (experimenter reads these aloud): N.B. check that images generated are self images each time

1. You are waiting for the raffles prizes to be drawn at your local pub. There are lots of things you want in the prizes. The first number is called and you leap out of your chair!

I = Are you feeling positively excited as you jump? *YES (give feedback on the correct answer and why if necessary. Point out how having an image makes it easier.*

- How vividly could you imagine the situation that was described?

Check the imagined outcome – you win first prize? Focus on the positive moment – cut off immediately if start to worry about social shyness etc and ask to refocus on a good bit.

2. You have just been interviewed for your dream job, and asked to wait outside while they discuss the outcome. When you are called back in you see the panel is beaming at you.

I = can you see them looking positively at you? YES

How vividly could you imagine the situation that was described?

Check the imagined outcome – you got the dream job

3. You are driving down a road at high speed as you are late for an appointment. You suddenly realise you have to take a right turn so quickly indicate. As the car takes the turning you realise you are skidding but safe.

I = can you feel that feeling of relief as you turn safely? YES *Point out how the outcome can be skidding but easily taking the corner and getting there on time)*

- How vividly could you imagine the situation that was described?

Check the imagined outcome – you gain control of the car and you are safe.

4. You have been planning a July wedding followed by an outdoor buffet with a band. Obviously you are hoping for a sunny day. On the morning of the wedding, you open the curtains to see that the sky looks ominous.

I = is it pouring with rain when you check the weather? NO

- How vividly could you imagine the situation that was described?

Check the imagined outcome – it clears up and gets brighter for the wedding, i.e. could be negative but actually goes OK

APPENDIX 3.1

Auditory CBM-I instructions for the (a) imagery field condition, (b) imagery field-comparisons condition and (c) mere exposure condition used in Experiment 2.

Differences between the imagery field condition and the imagery field comparisons condition are highlighted in yellow in the imagery field comparisons condition instructions.

(a) Imagery field condition instructions taken from Holmes, Coughtrey and Connor (2008)

Aim: "For the next part of the experiment, I'm going to take you through an exercise to help you enhance your awareness of using mental imagery."

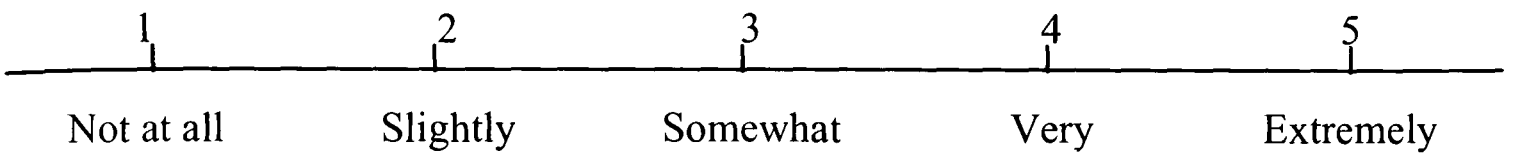
Definition: "We'll start by thinking about what mental imagery actually means. Sometimes we think in words and sometimes we think more in mental pictures or other sensations. By a mental image I mean when you 'see in your minds eye", "hear with your minds ear" and so on, and how you feel in your imagination. You can have a mental image in any sensory modality. *(Confirm participant understands- ask them to give their own definition of what they think mental imagery is. If you think they are struggling to understand, ask them to imagine hearing the song happy birthday in their minds ear, or ask them to imagine seeing something on the TV last night etc.)* For the purpose of this experiment, we're interested in mental imagery that you imagine through your own eyes, happening to yourself.

Motivation: "The reason we're interested in this is because it has been found that people's capability to process text is enhanced by producing a vivid mental image, and it is this effect that we are investigating. Soon you'll be listening to some more sentences, and while you're doing this I'd like you to produce a vivid mental image, as though you're looking at the situation described through your own eyes and being actively involved in the situation. You will now receive some training in how to do this."

Exercise: Imagining a lemon
"I am going to ask you to imagine a situation, and as you go along pay attention to what you can picture in your imagination."

In all the imagination tasks we do, please imagine it happening to yourself, as if you are there and you are actively involved in the situation and seeing what is happening through your own eyes. Don't imagine from an observer's perspective, and try to imagine as *vividly* as possible.

"As we go through I am going to ask you "To what extent are you experiencing this through your own eyes (as if you are actively involved)?"' Please use this scale to make your rating. During the task I'll ask you to shut your eyes, as this will help you imagine the situation more vividly, but you can open your eyes if you need to refer to the scale whilst answering."



"So, please shut your eyes and imagine yourself being actively involved and taking part in the situation, rather than seeing yourself doing it.

Go through the following swiftly. Anchor the ratings, so if a participant says 3, say "3 – so somewhat as if it were happening to you."

Experimenter says:	Notes:	Rating (1 – 5)
PLEASE SHUT YOUR EYES Imagine holding a lemon (you can mime holding a lemon in your hand if this makes it easier for you)	"To what extent are you experiencing this through your own eyes (as if you are actively involved)?"	
Now imagine you are shining a light on the lemon and look at its skin - what can you see? (take a torch with your other hand, and shine it onto the lemon so you can see it more clearly. Now what can you see?)	(Participant should give detailed description, e.g. pitted bumps etc. If not, ask them to look closer at the surface of the lemon) "To what extent are you experiencing this through your own eyes (as if you are actively involved)?"	
Now cut into it with knife and smell the juice. Ask participant to scratch lemon's skin if necessary. *Now bring the lemon right up to your face* and have a really close look at it.	Could you smell it? Can you see the inside of the lemon? What does that look like? "To what extent are you experiencing this through your own eyes (as if you are actively involved)?"	
You suddenly squeeze the lemon, and it squirts into your eye (rub in eyes if necessary. Participants should give a jolt if they are imagining it properly). You splash cool water in your eyes, it feels better now.	"Could you feel the pain?" Other emotions e.g. Irritation? "To what extent are you experiencing this through your own eyes (as if you are actively involved)?"	

Key ways to distinguish if someone is using observer perspective, and not field imagery.

- Language:
  - I can see myself….

    - I'm looking at…
- Participant makes no reaction to juice squirting in eyes

"How did you find that?" Encourage and reassure participant

Experimental examples to imagine:

- "In these next examples, you may find that it's unclear what is about to happen, but focusing on imagery can help you. Your main job is to imagine the OUTCOME of the situation – do you understand what I mean by the outcome? (If no: "I mean what happens immediately afterwards"). Some of them will be easier to imagine than others, so you aren't expected to be able to imagine them all as a '5.'
- We will now go through four examples of the type that will be in the experiment
- Please SHUT YOUR EYES while listening. Make sure you have focused on the image of the outcome before answering and imagine it really happening to you.
- Please imagine yourself in the situations described, observing the events through your own eyes. Don't start verbally comparing and analysing the scenarios. Please stick in the imagery even if it's complete fantasy as it's possible to imagine anything.
- Concentrate, as it is easy to slip into your normal way of thinking.
- Answer the questions promptly but don't rush.

- *During the examples, prompt for image detail and emotion when appropriate, by asking the participant to describe the self-image aloud. Check they are focusing on the positive OUTCOME in particular. Give positive feedback when they have answered correctly.*

Sample sentences (experimenter reads these aloud): N.B. check each time that images generated are using field perspective and beware of past tense.

Give lots of positive feedback when the participant answers correctly

1. You are waiting for the raffles prizes to be drawn at your local pub. There are lots of things you want in the prizes. The first number is called and you leap out of your chair!
"What are you imagining?
"To what extent are you experiencing this through your own eyes (as if you are actively involved)?"
* What did you imagine as the outcome of the situation? *(use this as a prompt if they haven't described the outcome)*
Check the imagined outcome – self or friend wins first prize. Focus on the positive moment – cut off immediately if start to worry about social shyness etc and ask to refocus on a good bit.
*Give them the outcome if didn't get it and ask to imagine

*point out that even if they haven't been in the situation, IMAGINE! Check they are not slipping into verbal analysis and relating the situation to their own life and to negative occurrences.

2. You have just been interviewed for your dream job, and asked to wait outside while they discuss the outcome. When you are called back in you see the panel is looking up and beaming at you.
"What are you imagining? How are you feeling? To what extent are you experiencing this through your own eyes (as if you are actively involved)?"
* "What did you imagine as the outcome?" *(use this as a prompt if they haven't described the outcome)*
Check the imagined outcome –being given the dream job
*Give them the outcome if didn't get it and ask to imagine

Very good. If you're ready, we'll move on to the next one.

3. You are driving down a road at high speed as you are late for an appointment. You suddenly realise you have to take a right turn so quickly indicate. As the car takes the turning you realise you are skidding but safe.
"What are you imagining? How are you feeling? To what extent are you experiencing this through your own eyes (as if you are actively involved)?"
I = can you feel that feeling of relief as you turn safely? YES *Point out how the outcome can be skidding but easily taking the corner and getting there on time)*
What did you imagine as the outcome? (use this as a prompt if they haven't described the outcome)
Check the imagined outcome – you gain control of the car and you are safe. Focus on the outcome, not the skidding.
*Give them the outcome if didn't get it and ask to imagine
Very good. If you're ready, we'll move on to the next one.

4. You have been planning a July wedding followed by an outdoor buffet with a band. Obviously you are hoping for a sunny day. On the morning of the wedding, you open the curtains to see that the sky looks cloudy.
"What can you see when you look outside? What are you imagining? How are you feeling? To what extent are you experiencing this through your own eyes (as if you are actively involved?"
What did you imagine as the outcome of the situation? (use this as a prompt if they haven't described the outcome)
Check the imagined outcome – good weather & successful wedding
*Give them the outcome if didn't get it and ask to imagine. If having difficulty: "Can you imagine fluffy white clouds instead of grey ones? Try imagining the clouds blowing away and your wedding being a success."

"Very good. If you're ready, we'll move on to the computer now. You'll hear more sentences similar to the ones we've just been through.

- After each scenario you will be asked to make a rating like we've just practised.
- We're interested in the extent to which people are able to imagine a situation from a personal point of view, that is, through their own eyes as if it is happening to them.
- If you're having trouble imagining the situation, don't worry about it, make your rating and move on to the next one. Just imagine what you can for each

one, all the time making sure you are imagining the situation through your own eyes and actively taking part.

- After each scenario, you will hear a beep, and the rating scale will appear on the screen, then make your rating using the number keys 1 – 5. You can open your eyes in order to make your rating.
- The first trial is just a practise, and after that there will be five blocks with twenty scenarios in each. After each block you'll be able to take a brief break and go over the instructions."

Go through the practice example on computer

- Check participant understands: "do you understand what to do – can you describe the scenario to me?"
- Check participant has eyes CLOSED
- Check participant is using FIELD VIEWPOINT for imagery "were you imagining the situation through your own eyes, as though you were actively involved?
- Check participant is not slipping into verbal thinking "make sure you're not verbally comparing and analysing the scenarios, just keep focusing on imagining yourself in the situations described."
- Check participant is using correct keys to make their rating and not pressing spacebar, etc

"If you have any difficulty imagining the scenarios through your own eyes, please let me know at the end of the experiment."

(b) Imagery field-comparisons condition instructions:

Aim: "For the next part of the experiment, I'm going to take you through an exercise to help you enhance your awareness of using mental imagery."

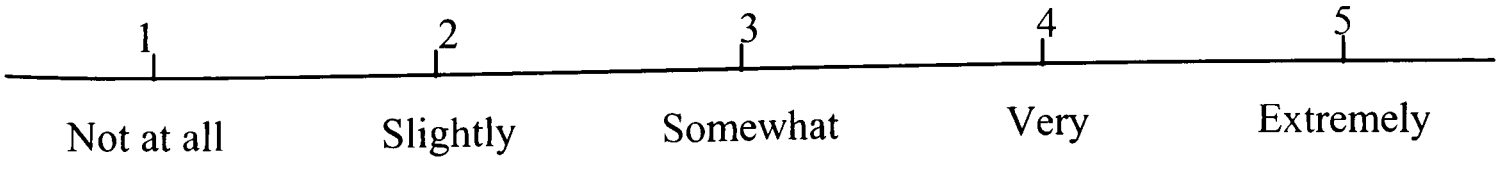
Definition: "We'll start by thinking about what mental imagery actually means. Sometimes we think in words and sometimes we think more in mental pictures or other sensations. By a mental image I mean when you 'see in your minds eye", "hear with your minds ear" and so on, and how you feel in your imagination. You can have a mental image in any sensory modality. *(Confirm participant understands- ask them to give their own definition of what they think mental imagery is. If you think they are struggling to understand, ask them to imagine hearing the song happy birthday in their minds ear, or ask them to imagine seeing something on the TV last night etc.)*
For the purpose of this experiment, we're interested in mental imagery that you imagine through your own eyes, happening to yourself.
This is the way I want you to focus on imagining the sentences you will hear followed by a comparison in your imagination with how things really are for you in reality.

Motivation: "The reason we're interested in this is because it has been found that people's capability to process text is enhanced by producing a vivid mental image. Furthermore, comparing the image with how an image of how things are for oneself further improves processing. We are investigating these effects. Soon you'll be listening to some more sentences, and while you're doing this I'd like you to produce a vivid mental image, as though you're looking at the situation described through your own eyes and being actively involved in the situation and compare this image, with an image of how things really are for you in reality. You will now receive some training in how to do this."

Exercise: Imagining a lemon
"I am going to ask you to imagine a situation, and as you go along pay attention to what you can picture in your imagination."

In all the imagination tasks we do, please imagine it happening to yourself, as if you are there and you are actively involved in the situation and seeing what is happening through your own eyes. Don't imagine from an observer's perspective, and try to imagine as *vividly* as possible.

"As we go through I am going to ask you "To what extent are you experiencing this through your own eyes (as if you are actively involved)?"' Please use this scale to make your rating. During the task I'll ask you to shut your eyes, as this will help you imagine the situation more vividly, but you can open your eyes if you need to refer to the scale whilst answering."



"So, please shut your eyes and imagine yourself being actively involved and taking part in the situation, rather than seeing yourself doing it.

Go through the following swiftly. Anchor the ratings, so if a participant says 3, say "3 – so somewhat as if it were happening to you."

Experimenter says:	Notes:	Rating (1 – 5)
PLEASE SHUT YOUR EYES Imagine holding a lemon (you can mime holding a lemon in your hand if this makes it easier for you)	"To what extent are you experiencing this through your own eyes (as if you are actively involved)?"	
Now imagine you are shining a light on the lemon and look at its skin - what can you see? (take a torch with your other hand, and shine it onto the lemon so you can see it more clearly. Now what can you see?)	(Participant should give detailed description, e.g. pitted bumps etc. If not, ask them to look closer at the surface of the lemon) "To what extent are you experiencing this through your own eyes (as if you are actively involved)?"	
Now cut into it with knife and smell the juice. Ask participant to scratch lemon's skin if necessary. *Now bring the lemon right up to your face* and have a really close look at it.	Could you smell it? Can you see the inside of the lemon? What does that look like? "To what extent are you experiencing this through your own eyes (as if you are actively involved)?"	
You suddenly squeeze the lemon, and it squirts into your eye (rub in eyes if necessary. Participants should give a jolt if they are imagining it properly). You splash cool water in your eyes, it feels better now.	"Could you feel the pain?" Other emotions e.g. Irritation? "To what extent are you experiencing this through your own eyes (as if you are actively involved)?"	

Key ways to distinguish if someone is using observer perspective, and not field imagery.

- Language:
  - I can see myself....
  - I'm looking at...
- Participant makes no reaction to juice squirting in eyes

"How did you find that?" Encourage and reassure participant

Experimental examples to imagine:

- "In these next examples, you may find that it's unclear what is about to happen, but focusing on imagery can help you. Along with comparing the image with an image of how things are for you in reality. Your main job is to imagine the OUTCOME once it is clear what you heard and them compare this image with how an image of how this would be for you in reality
- Please then FOCUS on your comparisons of the outcome of this image
- We will now go through four examples of the type that will be in the experiment
- Please SHUT YOUR EYES while listening. Make sure you have focused on the image of the outcome before answering and imagine it really happening to you.
- Please imagine yourself in the situations described, observing the events through your own eyes. Don't start verbally analysing the scenarios. Please stick in the imagery even if it's complete fantasy as it's possible to imagine anything.
- Concentrate, as it is easy to slip into your normal way of thinking.
- Answer the questions promptly but don't rush.

- *During the examples, prompt for image detail and emotion when appropriate, by asking the participant to describe the self-image aloud and then the comparative image. Check they are focusing on the positive OUTCOME and comparing with their own outcome. Give positive feedback when they have answered correctly.*

As you go through you will be asked:

How different was this image compared to your image of how things really are for you in reality?

1	2	3	4	5
Not at all Different	Slightly different	Somewhat different	Very different	Extremely different

Sample sentences (experimenter reads these aloud): N.B. check each time that images generated are using field perspective and beware of past tense.

Give lots of positive feedback when the participant answers correctly

1. You are waiting for the raffles prizes to be drawn at your local pub. There are lots of things you want in the prizes. The first number is called and you leap out of your chair!
"What are you imagining? What was your image of how things really are for you in reality?
"How different was this image compared to your image of how things really are for you in reality?"
* What did you imagine as the outcome of the situation? How would this have really turned out for you? *(use this as a prompt if they haven't described the outcome)*
Check the imagined outcome – self or friend wins first prize. Focus on the positive moment then compare with own reaction.
*Give them the outcome if didn't get it and ask to imagine and compare

*point out that even if they haven't been in the situation, IMAGINE! Check they are not slipping into verbal analysis and make sure they are relating the situation to their own life.

2. You have just been interviewed for your dream job, and asked to wait outside while they discuss the outcome. When you are called back in you see the panel is looking up and beaming at you.
"What are you imagining? What was your image of how things really are for you in reality?
"How different was this image compared to you image of how things really are for you in reality?"
* What did you imagine as the outcome of the situation? How would this have really turned out for you? *(use this as a prompt if they haven't described the outcome)*
Check the imagined outcome –being given the dream job
*Give them the outcome if didn't get it and ask to imagine

Very good. If you're ready, we'll move on to the next one.

3. You are driving down a road at high speed as you are late for an appointment. You suddenly realise you have to take a right turn so quickly indicate. As the car takes the turning you realise you are skidding but safe.
""What are you imagining? What was your image of how things really are for you in reality?
"How different was this image compared to you image of how things really are for you in reality?"
* What did you imagine as the outcome of the situation? How would this have really turned out for you? *(use this as a prompt if they haven't described the outcome)*
I = can you feel that feeling of relief as you turn safely? YES *Point out how the outcome can be skidding but easily taking the corner and getting there on time)*
What did you imagine as the outcome? (use this as a prompt if they haven't described the outcome)
Check the imagined outcome – you gain control of the car and you are safe. Focus on the outcome, not the skidding.
*Give them the outcome if didn't get it and ask to imagine
Very good. If you're ready, we'll move on to the next one.

4. You have been planning a July wedding followed by an outdoor buffet with a band. Obviously you are hoping for a sunny day. On the morning of the wedding, you open the curtains to see that the sky looks cloudy.
"What can you see when you look outside? "What are you imagining? What was your image of how things really are for you in reality?
"How different was this image compared to you image of how things really are for you in reality?"
* What did you imagine as the outcome of the situation? How would this have really turned out for you? *(use this as a prompt if they haven't described the outcome)*
Check the imagined outcome – good weather & successful wedding
*Give them the outcome if didn't get it and ask to imagine. If having difficulty: "Can you imagine fluffy white clouds instead of grey ones? Try imagining the clouds blowing away and your wedding being a success."

"Very good. If you're ready, we'll move on to the computer now. You'll hear more sentences similar to the ones we've just been through.

- After each scenario you will be asked to make a rating like we've just practised.
- We're interested in the extent to which people are able to imagine a situation from a personal point of view, that is, through their own eyes as if it is happening to them and how different this image is to how things really are for them in reality.
- If you're having trouble imagining the situation, don't worry about it, make your rating and move on to the next one. Just imagine what you can for each one, all the time making sure you are imagining the situation through your own eyes and actively taking part.
- After each scenario, you will hear a beep, and the rating scale will appear on the screen, then make your rating using the number keys 1 – 5. You can open your eyes in order to make your rating.
- The first trial is just a practise, and after that there will be five blocks with twenty scenarios in each. After each block you'll be able to take a brief break and go over the instructions."

Go through the practice example on computer

- Check participant understands: "do you understand what to do – can you describe the scenario to me?"
- Check participant has eyes CLOSED
- Check participant is using FIELD VIEWPOINT and COMPARING for imagery "were you imagining the situation through your own eyes, as though you were actively involved? Were you comparing your image with an image of how things really are for you in reality
- Check participant is not slipping into verbal thinking "make sure you're not verbally comparing and analysing the scenarios, just keep focusing on imagining yourself in the situations described."
- Check participant is using correct keys to make their rating and not pressing spacebar, etc

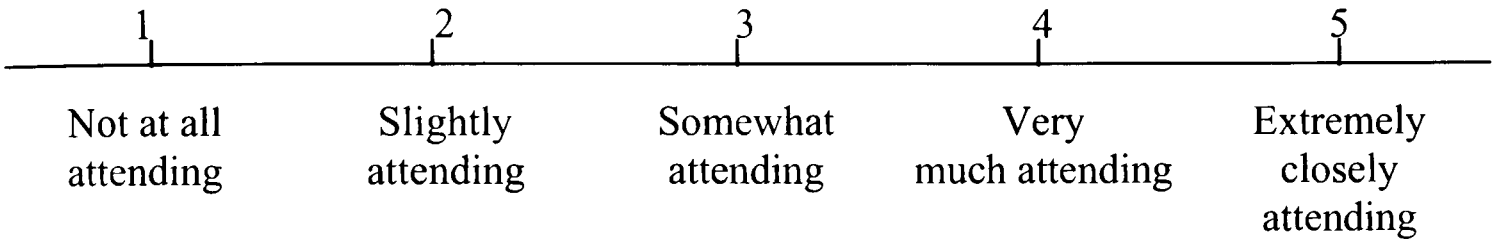
"If you have any difficulty imagining the scenarios through your own eyes or making comparisons please let me know at the end of the experiment."

(c) Mere exposure control condition instructions

"In these next examples, you may find that it's unclear what is about to happen, but focusing can help you. Your main job is to focus on the sentences you hear.

- We will now go through four examples of the type that will be in the experiment
- Make sure you have focused on the description before answering
- Answer the questions promptly but don't rush.

"As we go through I am going to ask you 'How much were you attending to the sentence you just heard?' Please use this scale to make your rating."



Sample sentences (experimenter reads these aloud):

Give lots of positive feedback when the participant answers

1. You are waiting for the raffles prizes to be drawn at your local pub. There are lots of things you want in the prizes. The first number is called and you leap out of your chair!
"How much were you attending to the sentence you just heard?"

2. You have just been interviewed for your dream job, and asked to wait outside while they discuss the outcome. When you are called back in you see the panel is looking up and beaming at you.
"How much were you attending to the sentence you just heard?"

3. You are driving down a road at high speed as you are late for an appointment. You suddenly realise you have to take a right turn so quickly indicate. As the car takes the turning you realise you are skidding but safe.

"How much were you attending to the sentence you just heard?"

4. You have been planning a July wedding followed by an outdoor buffet with a band. Obviously you are hoping for a sunny day. On the morning of the wedding, you open the curtains to see that the sky looks cloudy.
"How much were you attending to the sentence you just heard?"

"Very good. If you're ready, we'll move on to the computer now. You'll hear more sentences similar to the ones we've just been through.

- After each scenario you will be asked to make a rating like we've just practised.

- After each scenario, you will hear a beep, and the rating scale will appear on the screen, then make your rating using the number keys 1 – 5.
- The first trial is just a practise, and after that there will be five blocks with twenty scenarios in each. After each block you'll be able to take a brief break and go over the instructions."

Go through the practice example on computer

- Check participant understands: "do you understand what to do – can you describe the scenario to me?"
- Check participant is using correct keys to make their rating and not pressing spacebar, etc

"If you have any difficulties please let me know at the end of the experiment."

APPENDIX 4.1

The ten ambiguous test descriptions used in the Ambiguous Scenarios Test – Revised (AST-R) taken from Berna (2009) used in Blackwell (2009) and used in Study 3b and Experiment 6.

Table 4.1A presents the ambiguous test descriptions (administered online in Study 3a and in auditory form in Experiment 6) as presented during the AST-R. The possible positive and negative/neutral interpretations that could be made are showed on the right columns of the table. The two original items from Experiment 1, 2 and Study 3a are highlighted in yellow.

Table 4.1A
Ambiguous test descriptions presented during the Ambiguous Scenarios Test- Revised

Ambiguous test descriptions	**Positive interpretation**	**Negative / Neutral interpretation**
You wake up, get out of bed, stretch and really notice how you feel today.	Invigorated	Tired and pessimistic
You are going to see your sister in her school play. You've left it to the last minute to get there. As you drive up to the school and see the parking bays you anticipate the time it will take you to arrive.	no time at all	a great deal of time
You think back to your time at school, and realise that there were some important moments that still affect who you are today.	positive memories	negative memories
You are interested in a job, but think you might be under-qualified and so ask for details. When you speak to the people, you realise what your chances are to get the job.	good chances	bad chances
You are going to see your best friend at the station. You haven't seen them for years. When you arrive you feel *emotional*.	happy	disappointed
You give a speech at your friend's wedding. When you have finished, you observe the audience's reaction.	positive	negative
You are debating an issue with colleagues. One of them tells you that they find your views challenging.	interesting	argumentative
Your neighbours have just had a new baby. You hear it crying. Through the window you see how the husband holds it.	soothes / hugs	grabs

You are starting a new job that you very much want. You think about what it will be like.	great experience	terrible experience
You are camping in a forest and are very cold. You decide to light a fire. The flames grow in intensity much faster than you imagined.	under control	out of control

APPENDIX 5.1

The 80 CBM of appraisals stimuli developed in the pilot study in Chapter 5 and tested in Experiment 5 with original questionnaire items from which they were derived.

Original questionnaire items from which the CBM of appraisals item was derived	Positive condition CBM of appraisals item	Negative condition CBM of appraisals item
Response to Intrusions Questionnaire (RIQ; Clohessy & Ehlers, 1999)		
Intrusive memories mean that something is wrong with me	Intrusive memories mean that nothing is wrong with me	Intrusive memories mean that something is wrong with me
	Intrusive memories mean that everything is alright with me	Intrusive memories mean that everything is wrong with me
	When I am sitting around and a sad memory pops into my mind this means that I am quite normal	When I am sitting around and a sad memory pops into my mind this means that I am quite abnormal
	Unexpected thoughts of negative events are completely normal	Unexpected thoughts of negative events are completely abnormal
	After a negative experience, reliving the events in your minds eye indicates you are emotionally intelligent	After a negative experience, reliving the events in your minds eye indicates you are emotionally vulnerable
	Having intrusive memories mean that I am sane	Having intrusive memories mean that I am insane
Intrusive memories mean that someday I will go out of my mind	Having an intrusive memory does not mean that I will not go out of my mind	Having an intrusive memory does means that I will go out of my mind
	Having an intrusive memory means that in the future I will be better	Having an intrusive memory means that in the future I will be worse
	Having an unexpected image in my mind means that I will feel better soon	Having an unexpected image in my mind means that I will never feel better
	Intrusive memories mean that my future is promising	Intrusive memories mean that my future is bleak
	Reflecting on memories of unpleasant events means that later on they are likely to seem	Reflecting on memories of unpleasant events means that later on they are likely to seem

	more positive	more disturbed
Intrusive memories mean that I am inadequate	Intrusive memories mean that I am more than adequate	Intrusive memories mean that I am inadequate
	I feel that regular intrusive memories about a past event should be common	I feel that regular intrusive memories about a past event should be absent
	I keep having these unwanted memories about an event. This kind of re-experiencing of something unpleasant indicates that I am dealing with it in a way that is quite typical	I keep having these unwanted memories about an event. This kind of re-experiencing of something unpleasant indicates that I am dealing with it in a way that is quite disturbed
	An intrusive memory means that I am sufficient	An intrusive memory means that I am insufficient
Intrusive memories mean that I have a psychological problem	Intrusive memories mean that I don't have a psychological problem	Intrusive memories mean that I have a psychological problem
	Having a memory which pops into mind spontaneously means that I am sane	Having a memory which pops into mind spontaneously means that I am insane
	I feel that the presence of an intrusive memory shows that I'm normal	I feel that the presence of an intrusive memory shows that I'm not normal
Intrusive memories mean that I cannot cope	Intrusive memories mean that I am coping well	Intrusive memories mean that I am coping badly
	Intrusive memories mean that I can cope	Intrusive memories mean that I cannot cope
	The recurring thoughts which I keep having about negative events must mean that I am dealing with it	The recurring thoughts which I keep having about negative events must mean that I am going mad
After having intrusive memories I dwell on them	After having intrusive memories I don't really try to think about them	After having intrusive memories I really try to think about them
	After having intrusive memories I don't dwell on them	After having intrusive memories I dwell on them
After having intrusive memories I worry that something like that could happen to me again	After having intrusive memories I think that nothing like that could happen to me again	After having intrusive memories I worry that something like that could happen to me again

	After having intrusive memories I think that something like that could never happen to me again	After having intrusive memories I think that something like that could definitely happen to me again
	I feel that having an intrusive memory more than once is not a problem	I feel that having an intrusive memory more than once is problematic
After having intrusive memories I try to push them out of my mind	After having intrusive memories I try to keep them in my mind	After having intrusive memories I try to push them out of my mind
	Following intrusive memories I find the best thing to do is quietly ponder	Following intrusive memories I find the best thing to do is push them away
When I have intrusive memories I feel detached	When I have intrusive memories I feel in the moment	When I have intrusive memories I feel detached
When I have intrusive memories I feel numb	When I have intrusive memories I feel full of life	When I have intrusive memories I feel numb
Need to control subscale of Interpretation of Intrusions Inventory (III; Obsessive Compulsive Cognitions Working Group, 2001)		
When I have an intrusive thought I feel I must regain control of this thought	When I have an intrusive thought I feel I don't need to regain control of it	When I have an intrusive thought I feel I must regain control of it
	Having control over intrusive thoughts is unimportant	Having control over intrusive thoughts is important
When I have an intrusive thought I feel because I've had this thought, what I'm doing will be ruined	When I have an intrusive thought I feel because I've had this thought, what I'm doing will be fine	When I have an intrusive thought I feel because I've had this thought, what I'm doing will be ruined
	When an intrusive memory occurs I predict I will have a positive response	When an intrusive memory occurs I predict I will have a negative response
When I have an intrusive thought I feel because I can't control this thought, I am a weak person	When I have an intrusive thought I feel because I can't control this thought, I am a strong person	When I have an intrusive thought I feel because I can't control this thought, I am a weak person

When I have an intrusive thought I feel that having this intrusive thought means that I could lose control of my mind	No control over thoughts makes me a normal person When I have an intrusive thought I feel that having this intrusive thought means that I won't lose control of my mind	No control over thoughts makes me an abnormal person When I have an intrusive thought I feel that having this intrusive thought means that I will lose control of my mind
When I have an intrusive thought I feel that I would be a better person if I gained more control over this thought	When I have an intrusive thought I feel that if I gained more control over this thought I would not be a better person	When I have an intrusive thought I feel that if I gained more control over this thought I would be a better person
When I have an intrusive thought I feel having this intrusive thought means I'm out of control	When I have an intrusive thought I feel having this intrusive thought means I'm in control	When I have an intrusive thought I feel having this intrusive thought means I'm out of control
When I have an intrusive thought I feel that if I don't control this unwanted thought something bad is bound to happen	When I have an intrusive thought I feel that if I don't control this unwanted thought something good is bound to happen	When I have an intrusive thought I feel that if I don't control this unwanted thought something bad is bound to happen
When I have an intrusive thought I feel that I must have control over this thought	When I have an intrusive thought I feel that I don't need control over this thought	When I have an intrusive thought I feel that I must have control over this thought
When I have an intrusive thought I feel that I should not be thinking this kind of thing	When I have an intrusive thought I feel that I should be thinking this kind of thing	When I have an intrusive thought I feel that I should not be thinking this kind of thing
When I have an intrusive thought I feel that if I don't control this thought, I'll be punished	When I have an intrusive thought I feel that if I don't control this thought, I'll be rewarded	When I have an intrusive thought I feel that if I don't control this thought, I'll be punished
	I want to control negative thoughts which occur to me and feel this is possible	I want to control negative thoughts which occur to me and feel this is impossible
	I find it impossible to block recurring thoughts of an event from my mind. This reaction suggests that I am quite sane	I find it impossible to block recurring thoughts of an event from my mind. This reaction suggests that I am quite insane
	When a thought comes to mind the best thing to do is to let it pass	When a thought comes to mind the best thing to do is to try to control it

	When I think about an event without wanting to I feel this means I'm completely normal	When I think about an event without wanting to I feel this means I'm completely crazy
	Intrusions leave me feeling contented	Intrusions leave me feeling miserable
	I feel that intrusions in other people are common	I feel that intrusions in other people are absent
	I view the fact that I am unable to control my thoughts as a sign of normality	I view the fact that I am unable to control my thoughts as a sign of weakness
	Thinking suddenly of a negative event is something that intrigues me	Thinking suddenly of a negative event is something that terrifies me
	When unpleasant thoughts about the event pop into mind unexpectedly it shows you are adjusted	When unpleasant thoughts about the event pop into mind unexpectedly it shows you are maladjusted
	When a thought about a negative event comes to mind, the best thing is to quietly ponder	When a thought about a negative event comes to mind, the best thing is block it out
Having this unwanted thought means I will act on it	Having this unwanted thought means I won't act on it	Having this unwanted thought means I will act on it
Because I've thought of bad things that might happen, I must act to prevent them	Because I've thought of bad things that might happen, to prevent them, I must do nothing	Because I've thought of bad things that might happen, to prevent them, I must act
Because I have this thought, it must be important	Because I have this thought, doesn't mean it must be important	Because I have this thought, means it must be important
Thinking this could make it happen	Thinking this doesn't make it happen	Thinking this could make it happen
This intrusive thought could be an omen	Having an intrusive thought doesn't mean that its an omen	Having an intrusive thought means that its an omen
If I don't do something about this intrusive thought, it will be my fault if something terrible happens	If I don't do something about this intrusive thought, it will not be my fault if something terrible happens	If I don't do something about this intrusive thought, it will be my fault if something terrible happens
I am irresponsible if I don't resist this unwanted thought.	If I resist this unwanted thought I am responsible	If I resist this unwanted thought I am irresponsible

It's wrong to ignore this unwanted thought	Ignoring this unwanted thought is right	Ignoring this unwanted thought is wrong
Having this thought means I am weird or abnormal	Having this thought means I am not weird or abnormal	Having this thought means I am weird or abnormal
Having this intrusive thought means I am a terrible person	Having this intrusive thought means I am a good person	Having this intrusive thought means I am a terrible person
Cognitive intrusions questionnaire (CIQ; Freeston, Ladouceur, Thibodeau & Gagnon, 1992)		
How often does this thought or image enter your mind	These images enter my mind infrequently	These images enter my mind frequently
	I have spontaneous images which pop into my mind rarely	I have spontaneous images which pop into my mind often
How guilty does this intrusive thought make you feel	Having intrusive thoughts makes me feel fine	Having intrusive thoughts makes me feel guilty
How sad or unhappy does this intrusive thought make you feel	Intrusive thoughts make me feel happy	Intrusive thoughts make me feel sad
How worried or anxious does this intrusive thought make you feel	Intrusive thoughts make me feel worried	Intrusive thoughts make me feel relaxed
	When memories of negative events pop into my mind spontaneously, I don't feel at ease	When memories of negative events pop into my mind spontaneously, I don't feel uneasy
How much do you disapprove of having this thought or image enter your mind	Having these thoughts or images enter my mind fills me with approval	Having these thoughts or images enter my mind fills me with disapproval
How insecure does this intrusive thought make you feel	Having an intrusive thought makes me feel secure	Having an intrusive thought makes me feel insecure
How ashamed does this intrusive thought make you feel	Having an intrusive thought makes me feel proud	Having an intrusive thought makes me feel ashamed

APPENDIX 5.2

The ten recognition test items developed in the pilot study in Chapter 5 and tested in Experiment 5 to accompany the CBM of appraisals technique.

Each recognition title includes a title, the description and the associated positive and negative targets and foils.

1) Responding to intrusive memories

After having spontaneous memories I try to get myself to react in a certain way that I feel is appropriate

When I have spontaneous memories pop into my head, I always try to think about and work through them [pos target]
When I have spontaneous memories pop into my head, I always try to push them out of my mind [neg target]
When I have spontaneous memories pop into my head, I feel myself feeling more positive [pos foil]
When I have spontaneous memories pop into my head, I feel myself feeling more negative [neg foil]

2) Past actions

Unintentionally thinking about past negative events makes me think about my past actions
Unintentionally thinking about past negative events make me think about the positive things I have done [pos target]
Unintentionally thinking about past negative events makes me think about what I could have done differently [neg target]
Unintentionally thinking about past negative events makes me think about about how positive I feel about myself [pos foil]
Unintentionally thinking about past negative events makes me think about how negative I feel about myself [neg foil]

3) Adequacy feelings

Having intrusive memories makes me think about how adequate I feel

It seems that when I have intrusive memories I feel completely adequate [pos target]
It seems that when I have intrusive memories I feel completely inadequate [neg target]
It seems that when I have intrusive memories I feel I know how great I really am [pos foil]
It seems that when I have intrusive memories I feel I know how terrible I really am [neg foil]

4) Avoiding the subject

Following an intrusive memory I find myself knowing how I want to deal with it

Since my intrusive memory I find myself trying to quietly ponder [pos target]
Since my intrusive memory I find myself trying to actively avoid thinking about it [neg target]
Since my intrusive memory I find myself trying to organise new things to do [pos foil]
Since my intrusive memory I find myself trying to think about all the things I did wrong [neg foil]

5) Frequency of memories

Having a number of memories pop into my mind spontaneously over and over again produces a range of feelings

Having an intrusive memory occur more than once is not at all problematic [pos target]
Having an intrusive memory occur more than once is extremely problematic [neg target]
Having an intrusive memory occur more than once is decidedly pleasant [pos foil]
Having an intrusive memory occur more than once is decidedly unpleasant [neg foil]

6) Intrusive memories

Negative memories frequently pop into mind when I'm not trying to think about them. I know what reaction I would receive if people were aware of this.

If people were aware of my negative memories, which pop into mind, they would view me as normal [pos target]
If people were aware of my negative memories, which pop into mind, they would view me as crazy [neg target]
If people were aware of my negative memories, which pop into mind, they would view me as a fun person [pos foil]
If people were aware of my negative memories, which pop into mind, they would view me as a boring person [neg foil]

7) Responses to negative events

Responses to negative events are variable. Having intrusive images is indicative of the way I seem to be coping.

Responses to negative events are variable but my reactions mean my coping skills are normal [pos target]
Responses to negative events are variable but my reactions mean my coping skills are abnormal [neg target]

Responses to negative events are variable but my reactions reveal how superior I am [pos foil]
Responses to negative events are variable but my reactions reveal how inferior I am [neg foil]

8) Contemplating the future

Having intrusive memories has prompted my view of what is likely to come in the future

When considering the future, I feel that I am optimistic about what is to come [pos target]
When considering the future, I feel that I am pessimistic about what is to come [neg target]
When considering the future, I feel that I am going to do better in my relationships [pos foil]
When considering the future, I feel that I am going to do worse in my relationships [neg foil]

9) Examining myself

Having intrusive memories has made me feel different about myself

When I look at myself now, I feel that I am completely normal [pos target]
When I look at myself now, I feel that I am going crazy [neg target]
When I look at myself now, I feel I have a greater desire to play games [pos foil]
When I look at myself now, I feel I have a weaker desire to play games [neg foil]

10) Evaluating my response

Having evaluated my response to an intrusive memory, I clearly see how I responded

Having evaluated my response to an intrusive memory, I see my response as wholly adequate [pos target]
Having evaluated my response to an intrusive memory, I see my response as wholly inadequate [neg target]
Having evaluated my response to an intrusive memory, I see my response as the best thing I've done all week [pos foil]
Having evaluated my response to an intrusive memory, I see my response as the worst thing I've done all week [neg foil]

APPENDIX 6.1

The Impact of Event Scale (Horowitz, Wilner. & Alvarez, 1979) adapted as in Holmes, James, Coode-Bate, and Deeprose (2009) and used in Experiment 5.

DIRECTONS: Below is a list of comments made by people after stressful life events. Please read each item, indicating how frequently each comment was true for you DURING THE PAST SEVEN DAYS ***in relation to the topics in films you saw in last week's experiment***. If they did not occur during that time, please circle the "not at all" answer.

		Not at all	Rarely	Sometimes	Often
1.	**I thought about the film when I didn't mean to .....**	0	1	3	5
2.	**I avoided letting myself get upset when I thought about the film or was reminded of the film .....**	0	1	3	5
3.	**I tried to remove the film from my memory .....**	0	1	3	5
4	**I had trouble falling asleep or staying asleep, because of pictures or thoughts that came into my mind .....**	0	1	3	5
5	**I had waves of strong feelings about the film .....**	0	1	3	5
6	**I had dreams about the film.....**	0	1	3	5
7	**I stayed away from reminders of the film .....**	0	1	3	5
8	**I felt as if it hadn't happened or wasn't real.....**	0	1	3	5
9.	**I tried not to talk about the film.....**	0	1	3	5
10.	**Pictures about the film popped in to my mind .....**	0	1	3	5
11.	**Other things kept making me think about the film .....**	0	1	3	5
12.	**I was aware that I still had a lot of feelings about the film, but I didn't deal with them.....**	0	1	3	5
13.	**I tried not to think about the film .....**	0	1	3	5
14.	**Any reminder brought back feelings about the film .....**	0	1	3	5
15.	**My feelings about the film were kind of numb .....**	0	1	3	5

APPENDIX 6.2

An outline of the film clips included in the depression film used in Experiment 5

The 13 minute 35 second depression film was compiled of footage taken from the public domain including commercial films and public information videos.

Clip 1: 4 minutes 42 seconds

Marvin, N., Lester, D.V., Glotzer, L (Producer) & Darabont, F. (Director). (1994). The Shawshank Redemption [Motion Picture] USA: Castlerock entertainment

Clip 1 was taken from the movie 'The Shawshank Redemption' directed by Frank Darabont. This clip has been used in Cribbs, Moulds and Carter (2006) to induce sad mood and in Williams and Moulds (2007) to induce intrusions. Williams and Moulds (2007) showed a mean of 5.94 intrusions per person over a 2 minute period immediately after viewing this film clip.

The scene depicts the release of an old man from prison attempting to integrate back into society. It finishes with the old man committing suicide by hanging.

Clip 2: 36 seconds

DOE: Pay Attention - Texting (2002) [Online video clip]
Previously available at TV Ark Library http://www.tv-ark.org.uk, retrieved 13th October 2006.

Clip 2 is an edited public information clip depicting a teenage boy and girl flirting. This is followed by the death of the boy after getting hit by a car and the grieving of the girl and other friends. The editing removed traumatic aspects of the film including a graphic scene showing the teenage boy being hit by a van and the blood associated with the accident.

Schaefer, Nils, Sanchez and Philippot (2008) invited 364 participants to rate 40 film clips for emotional content. The films that were highly rated as inducing sad mood were selected. These film clips were then piloted on members of the department of psychiatry for their ability to induce intrusions. "The dead poets society" (clip 3) and "the dreamlife of angels" (clip 5) were the clips associated with the greatest number of intrusions.

Clip 3: 5 mins 23 seconds

Haft, S., Junger Witt, P., Thomas, T. (Producer) & Weir, P. (Director). (1989). Dead Poets Society [Motion Picture] USA: Buena Vista Home Entertainment

Clip 3 was taken from the commercial film 'Dead Poets Society.' The clip portrays the suicide of a young man and the subsequent reaction of his friends and family.

Clip 4: 1 minute

Bullying (2003) [Online video clip] Available:
http://www.nationalarchives.gov.uk/films/1979to2006/filmpage_bullying.htm
Public Information Film sponsored by the Central Office of Information for the Department of Education and Skills.

Clip 4 is a public information film namely "don't suffer in silence" it shows children attempting to communicate the fact that they are being bullied in a variety of ways.

Clip 5: 1 minute 54 seconds

Marquis, F. (Producer) & Zonca, E. (Director). (1998). The Dreamlife of Angels [Motion Picture] France: Les productions Bagheera, France 3 cinema.

Clip 5 was taken from the commercial film "the dreamlife of angels.' The scene depicts the arrival home of a young woman who finds her friend in bed. Shortly after moving around the apartment, she walks into another room in which she sees her friend jump out of the window committing suicide.

APPENDIX 6.3

The intrusion diary used in Experiment 5, taken from Holmes, Brewin and Hennessy (2004) and Holmes, James, Coode-Bate & Deeprose (2009).

PARTICIPANT DIARY

Participant No.:

Date started:

Date completed:

If you have any questions or problems, please do not hesitate to contact me at tamara.lang@psych.ox.ac.uk

If you would like to discuss anything related to the experiment or your reactions to it, please do not hesitate to contact the responsible Investigator, Dr. Emily Holmes, at any point in the week after the film or beyond. Dr. Emily Holmes can be contacted at the University Dept of Psychiatry, Warneford Hospital, Oxford, OX3 7JX, tel: 01865 223912 or emailed at emily.holmes@psych.ox.ac.uk.

Follow up Session Appointment Card

Date:

Time:

Duration:

Thank you for completing the diary, even if you have zero intrusions, we are still interested. Your participation is very much appreciated. Don't forget to bring this diary with you to the follow up session, you will then be given the payment and information about the purpose of the study.

Thank you!!!

Appendix 6.3

Introduction

❖If over the next week you experience any **spontaneously occurring intrusions/memories** about the film you have just watched, I would be very grateful if you could note them down in the diary.

❖Note that this is only for intrusions/memories that pop into your mind **spontaneously**, not times when you deliberately think about it.

❖What goes through our minds can either take the form of words and phrases ("verbal thoughts"), or it can be like mental pictures ("images"). Although mental images often take the form of pictures they can actually include any of the five senses, so you can imagine sounds too.

❖For each intrusion, mark 'I', 'T' or 'IT' on pages 3 and 4 for the corresponding time, or **write down that you have had Zero** in that time frame, and then fill in the details of the content of intrusion pages 5, 6 and 7.

❖If you are on occasion unable to record details, please make sure you record that an intrusion has occurred and the date.

PLEASE KEEP THIS DIARY – IT IS VITAL FOR THE EXPERIMENT. THANK YOU!!!!

Date/ Day of Intrusion	Was it an Image (I), Thought (T) or both (IT)?	What was the **content** of the intrusion? (e.g. subject matter)	What, if anything, triggered the intrusion?	How **distressed** were you at the intrusion? 0 (not at all) - 10 (extremely)?	**Perspective**: First person = F (as if seeing through your own eyes) or Third person = T (as if you are watching yourself.

Date / Day of Intrusion	Was it an Image (I), Thought (T) or both (IT)?	What was the **content** of the intrusion? (e.g. subject matter)	What, if anything, triggered the intrusion?	How **distressed** were you at the intrusion? 0 (not at all) - 10 (extremely)?	**Perspective**: First person = F (as if seeing through your own eyes) or Third person = T (as if you are watching yourself.

Mark each intrusion as 'I' for image, 'T' for thought or IT if it is a combination of both. Otherwise write '0' for that timeframe.

Example Day 1					
Morning	0				
Afternoon	I				
Evening	I				

Day 1 Date:					
Morning					
Afternoon					
Evening					

Day 2 Date:					
Morning					
Afternoon					
Evening					

Day 3 Date:					
Morning					
Afternoon					
Evening					

Please remember to fill in the content page for each intrusion indicated.
Thank you

Appendix 6.3.4

Content Page

Intrusions of the film can include **mental images**, (that is 'see' or 'hear' in your minds eye) and/or **verbal thought**, (thoughts about using verbal language when we talk) or combination of both image plus verbal thoughts.

Date / Day of Intrusion	Was it an Image (I), Thought (T) or both (IT)?	What was the content of the intrusion? (e.g. subject matter)	What, if anything, triggered the intrusion?	How distressed were you at the intrusion? 0 (not at all) - 10 (extremely)?	Perspective: First person = F (as if seeing through your own eyes) or Third person = T (as if you are watching yourself.
Day 1	I	I saw myself back in the classroom	Opening my notebook	5	T
Day 1	I	I smelt my old classroom	Heard a whistle blow	4	F

Appendix 6.3

Day 4 Date:	
Morning	
Afternoon	
Evening	

Day 5 Date:	
Morning	
Afternoon	
Evening	

Day 6 Date:	
Morning	
Afternoon	
Evening	

Day 7 Date:	
Morning	
Afternoon	
Evening	

Please remember to fill in the content page for each intrusion indicated.
Thank you

APPENDIX 7.1

Approval letter from the National Health Services Research Ethics Committee and Research and Development Committee

NHS
National Research Ethics Service
Mid and South Buckinghamshire Research Ethics Committee
2nd Floor, Astral House
Chaucer Business Park
Granville Way
Bicester
OX26 4JT

Telephone: 01869 604 076
Facsimile: 01869 604 055
Email: scsha.BucksREC@nhs.net

01 December 2008

Ms Tamara Lang
DPhil Student
University of Oxford
Department of Psychiatry
Warneford Hospital

Dear Ms Lang

Full title of study: **A controlled test of repeated sessions of positive interpretation training for depression**

REC reference number: **08/H0607/74**

Thank you for your letter of 22 November 2008, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Vice-Chair (Acting Chair).

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

The Committee has designated this study as exempt from site-specific assessment (SSA). The favourable opinion for the study applies to all sites involved in the research. There is no requirement for other Local Research Ethics Committees to be informed or SSA to be carried out at each site.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission at NHS sites ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Participant Consent Form: Consent to Research	1.0	04 September 2008
Participant Consent Form: Consent to Assessment	1.0	04 September 2008
Advertisement	1.0	15 September 2008
Letter from Sponsor		16 September 2008
Covering Letter		18 September 2008
Protocol	1.0	19 September 2008
Investigator CV	Tamara Lang	
Application		19 September 2008
Online survey information about confidentiality and consent	1.0	05 September 2008
CV - Dr Emily Holmes		
Structured Clinical Interview for DSM-IV		
Questionnaire: BHS		
Questionnaire: BSS		
Questionnaire: SLC-90-R		
Questionnaire: BD		
Questionnaire: THC		
Questionnaire: SHS		
Questionnaire: SUIS		
Questionnaire: STAI 1&2		
Questionnaire: PANAS (Day)		
Questionnaire: PANAS (State)		
Questionnaire: PANAS (Trait)		
Questionnaire: IES-R		
Questionnaire: SINE		
Questionnaire: VAS-B	1	15 September 2008
Feedback Interview Question Guide	1	11 September 2008
Response to Request for Further Information		22 November 2008
Participant Information Sheet	2	21 November 2008

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Website http://www.nres.npsa.nhs.uk
After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email referencegroup@nres.npsa.nhs.uk.

08/H0607/74	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project

Yours sincerely

Dr Michael Bowker
Chair

Enclosures: "After ethical review – guidance for researchers"

Copy to: Heather House, University of Oxford, Clinical Trials and Research Governance, Manor House, John Radcliffe Hospital

Oxfordshire and Buckinghamshire Mental Health NHS
NHS Foundation Trust

Professor Tom Burns
Research & Development Lead
Department of Psychiatry University of Oxford
Warneford Hospital
Oxford OX3 7JX

Tel: 01865 226474
Fax: 01865 793101
e-mail: tom.burns@psych.ox.ac.uk

7th November 2008

Ref: TB/jrn
Ms Tamara Lang
DPhil Student
University Department of Psychiatry
Warneford Hospital
Warneford Lane
Oxford OX3 7JX

Dear Ms Lang

Project Title: A controlled test of repeated sessions of positive interpretation training for depression
Rec No: 08/H0607/74 Ref: OBMH701

The above research study has been reviewed by the Trust's R&D Lead Director and confirm that Oxfordshire and Buckinghamshire Mental Health NHS Foundation Trust will provide management approval for this study, as described in your application to the National Research Ethics Service. This confirmation is dependent on the formal approval of the National Research Ethics Service.

I must remind you of the declaration that was signed in Site-Specific Information form. This explains your responsibilities as a researcher including adherence to the principles of the Research Governance Framework, Good Clinical Practice and the Data Protection Act.

Trust Management approval is on-going and dependent upon completion of satisfactory annual reports when requested. It is a condition of management approval that you inform the Trust R&D department of any amendments to the protocol, changes to the project end date and that you submit a final report on completion of the study.

I wish you every success with the study

Yours sincerely

Tom Burns

Professor Tom Burns

Research & Development Lead Director
Oxfordshire and Buckinghamshire Mental Health NHS Foundation Trust

APPENDIX 7.2

The 216 scenarios included in auditory CBM-I used in Experiment 6 taken from Blackwell and Holmes (in press), Holmes, Lang and Shah (2009) and Holmes, Mathews, Dalgleish and Mackintosh (2006).

All descriptions were presented in a randomised order within each block. Each block contains 8 descriptions. There are two conditions including the positive condition (all positive resolutions) and the neutral condition (consisting of 50% positive and 50% negative resolutions).

Day 1

Block	Positive condition scenarios	Neutral condition scenarios
1	You buy a new suitcase to take on holiday. When you get out everything you need to pack in it you realise that you have more than you thought when you bought the suitcase. It all fits in very snugly.	You buy a new suitcase to take on holiday. When you get out everything you need to pack in it you realise that you have more than you thought when you bought the suitcase. Hardly any of it fits in.
1	You have been invited to a dinner party by a friend but will not know any of the other people there. Thinking about it, you are filled with excitement at the thought of meeting new people.	You have been invited to a dinner party by a friend but will not know any of the other people there. Thinking about it, you are filled with excitement at the thought of meeting new people.
1	A housebound neighbour asks you to get a present for her niece's birthday. You can't spare much time to shop. When you give her the present to wrap up it is obvious that she thinks it is ideal.	A housebound neighbour asks you to get a present for her niece's birthday. You can't spare much time to shop. When you give her the present to wrap up it is obvious that she thinks it is amiss.
1	It's the start of an important day. You feel excited and look forward to the day ahead.	It's the start of an important day. You feel exhausted and dread the day ahead.
1	You are thinking back about the choices you have made in life. You feel content and realise that you have made good choices.	You are thinking back about the choices you have made in life. You feel content and realise that you have made good choices.
1	You buy a new outfit for a wedding in a rush. Putting it on you see it looks rather flattering.	You buy a new outfit for a wedding in a rush. Putting it on you see it looks rather flattering.

1	You have been working in the garden for the afternoon, and are muddy and tired. You run a warm, soothing bath and relax, feeling pleased at the work you have done.	You have been working in the garden for the afternoon, and are muddy and tired. You run a warm, soothing bath and relax, feeling pleased at the work you have done.
1	It's Christmas day and your family are gathered around you. You look at them with a rush of love and pride.	It's Christmas day and your family are gathered around you. You look at them with a rush of love and pride.
2	You have had an unproductive day and decide to go to bed. You easily fall asleep and feel well rested in the morning.	You have had a unproductive day and decide to go to bed. You have difficulty falling asleep and do not feel rested in the morning.
2	You look around at where you live and at your possessions in your home. You realise how terribly lucky you are.	You look around at where you live and at your possessions in your home. You realise how terribly doomed you are.
2	You have been spending a long time in a shop deliberating which of two tops to buy. Having made your choice you try it on to show a friend. They say it looks wonderful.	You have been spending a long time in a shop deliberating which of two tops to buy. Having made your choice you try it on to show a friend. They say it looks terrible.
2	You have decided to try and pay a bill online. There are a lot of steps to go through, and you find you have no trouble and do it with ease.	You have decided to try and pay a bill online. There are a lot of steps to go through, and you find you have lots of trouble and do it with difficulty.
2	You turn up late to a party. As you walk in it looks like everyone's busily engaged in conversation. As you walk around a group of friends notices you and invites you to join them.	You turn up late to a party. As you walk in it looks like everyone's busily engaged in conversation. As you walk around a group of friends notices you and invites you to join them.
2	You are at a restaurant and have been offered the wine to try. When you take a sip you realise it has gone off. When you tell this to the waiter he is very helpful, and you are very happy as he offers to bring another bottle.	You are at a restaurant and have been offered the wine to try. When you take a sip you realise it has gone off. When you tell this to the waiter he is very rude, and you are very annoyed as he doesn't offer to bring another bottle.
2	You are getting the bus. When you come to pay you discover that you only have notes, and no small change. The bus driver smiles and says that's	You are getting the bus. When you come to pay you discover that you only have notes, and no small change. The bus driver smiles and says that's completely

	completely fine.	fine.
2	When trying on some clothes in an expensive clothes shop, you realise that the item you selected is torn. When you approach the sales girl about it, she thanks you for pointing it out and offers you a discount.	When trying on some clothes in an expensive clothes shop, you realise that the item you selected is torn. When you approach the sales girl about it, she thanks you for pointing it out and offers you a discount.
3	You have a lot of shopping to do in town, but limited time to do it in. Thinking about how you are going to manage it, you feel full of confidence that you will manage it with ease.	You have a lot of shopping to do in town, but limited time to do it in. Thinking about how you are going to manage it, you feel full of doubt that you will manage it.
3	You need to go into town and decide to walk. Thinking about your route you look forward with enthusiasm to the walk ahead.	You need to go into town and decide to walk. Thinking about your route you look forward with enthusiasm to the walk ahead.
3	You are sitting in front of a fire with your partner. You gaze fondly at the fire and feel happy and warm.	You are sitting in front of a fire with your partner. You stare blankly at the fire and feel low and numb.
3	You wake up in the night, and lying in your bed you wonder if you will be able to get back to sleep again. You wake up the next morning feeling refreshed and alert.	You wake up in the night, and lying in your bed you wonder if you will be able to get back to sleep again. You wake up the next morning feeling exhausted and weary.
3	A friend has asked you to mind her children for an afternoon. When you tell them that you're going to the park, their faces show how they're obviously very excited by the prospect.	A friend has asked you to mind her children for an afternoon. When you tell them that you're going to the park, their faces show how they're obviously very excited by the prospect.
3	Your club asks you to swim in a competition as they are short of swimmers. You come third in your first race and, as you get out of the pool, your team-mates are ready to talk with you. They say your efforts were fantastic.	Your club asks you to swim in a competition as they are short of swimmers. You come third in your first race and, as you get out of the pool, your team-mates are ready to talk with you. They say your efforts were fantastic.
3	You receive a phone call from a friend who you have just had an argument with. She says she's been thinking about	You receive a phone call from a friend who you have just had an argument with. She says she's been thinking about it and

	it and realises that she was in the wrong. You are very happy as she says she would like to make up.	realises that she was in the wrong. You are very happy as she says she would like to make up.
3	You wake up with a headache. Thinking back over the previous evening spent out with friends you are filled with pleasure and amusement and feel full of life.	You wake up with a headache. Thinking back over the previous evening spent out with friends you are filled with anger and disappointment and feel sick of life.

Day 2

Block	Positive condition scenarios	Neutral condition scenarios
1	You are at home thinking about the course your career has taken. Thinking back over the decisions you have made over the years you feel pleased and content.	You are at home thinking about the course your career has taken. Thinking back over the decisions you have made over the years you feel frustrated and annoyed.
1	You are helping a friend tidy up, and you accidentally knock a vase off a side table. When you tell your friend about the mishap, they laugh and say they hated that vase and are glad to no longer need to display it.	You are helping a friend tidy up, and you accidentally knock a vase off a side table. When you tell your friend about the mishap, they cry and say they loved that vase and are upset to no longer get to display it.
1	You give a speech at your friend's wedding. When you have finished the audience respond with a great round of applause.	You give a speech at your friend's wedding. When you have finished the audience respond with a great round of applause.
1	You are talking to a friend about plans for the weekend and become aware that you have nothing to do. Your friend says that's fantastic as she's needing someone to accompany her on a weekend away and invites you to come with her.	You are talking to a friend about plans for the weekend and become aware that you have nothing to do. Your friend says that's fantastic as she's needing someone to accompany her on a weekend away and invites you to come with her.
1	Your partner asks you to go to their company dinner. You have not met any of their work colleagues before and worry you will have nothing in common. Once you are there you find that the conversation is animated.	Your partner asks you to go to their company dinner. You have not met any of their work colleagues before and worry you will have nothing in common. Once you are there you find that the conversation is boring.

1	You are reading a complicated article in the newspaper on politics. You are delighted when you realise that you understand the main points the journalist is suggesting.	You are reading a complicated article in the newspaper on politics. You are frustrated when you realise that you don't understand the main points the journalist is suggesting.
1	It's your birthday but you haven't got any plans. As you are about to leave the house you get a call from a friend who tells you they have planned a party for you.	It's your birthday but you haven't got any plans. As you are about to leave the house you get a call from a friend who tells you they have planned a party for you.
1	You are running late for work and have to get ready in a hurry. When you arrive at work, you find yourself much earlier than you had thought and are extremely productive.	You are running late for work and have to get ready in a hurry. When you arrive at work, you find yourself much later than you had thought and are not extremely productive.
2	As you walk into the interview room the panel of interviewers welcomes you and proceeds to ask some tough questions. As the interview progresses you feel you are avoiding any mistakes and performing really well.	As you walk into the interview room the panel of interviewers welcomes you and proceeds to ask some tough questions. As the interview progresses you feel you are avoiding any mistakes and performing really well.
2	Your firm is raising money for a local hospital. You're put in charge of your department's efforts. You arrange a meeting to discuss it and afterwards, feel how very motivated and positive everyone is.	Your firm is raising money for a local hospital. You're put in charge of your department's efforts. You arrange a meeting to discuss it and afterwards, feel how very motivated and positive everyone is.
2	You bump into a friend on the street. They are with someone you don't recognise. Your friend introduces them as a friend of theirs. You can see that they are delighted to introduce you.	You bump into a friend on the street. They are with someone you don't recognise. Your friend introduces them as a friend of theirs. You can see that they are not comfortable introducing you.
2	Walking down the street, you see a stranger staring at you but don't know why. They approach you and ask where you bought your jacket from- they think it looks extremely smart.	Walking down the street, you see a stranger staring at you but don't know why. They approach you and ask where you bought your jacket from- they think it looks extremely smart.
2	You are having an early start at work and have set your alarm an hour earlier than usual. When it goes off in the	You are having an early start at work and have set your alarm an hour earlier than usual. When it goes off in the morning

	morning you feel wide awake and look forward to the day ahead.	you feel so tired and dread the day ahead.
2	Your partner asks you to buy a present for their sister's birthday, as they are busy. You dash into town and pick up some perfume. When the sister opens it she doesn't say anything. Knowing her as you do, you realise the choice was perfect.	Your partner asks you to buy a present for their sister's birthday, as they are busy. You dash into town and pick up some perfume. When the sister opens it she doesn't say anything. Knowing her as you do, you realise the choice was wrong.
2	It is early morning and you wake up and see the sun shining through your window. You find the sunshine soothing.	It is early morning and you wake up and see the sun shining through your window. You find the sunshine uncomfortable.
2	You have being doing some local charity work. You go to the charity to give them a cheque. Your efforts are greatly appreciated.	You have being doing some local charity work. You go to the charity to give them a cheque. Your efforts are greatly unappreciated.
3	It is a busy time at work, but a friend has asked you to go with them on a last minute holiday. You ask your manager if you can take next week off and are delighted when he says that will be fine.	It is a busy time at work, but a friend has asked you to go with them on a last minute holiday. You ask your manager if you can take next week off and are upset when he says that will not be acceptable.
3	You are stopped at a roundabout when you hear a car behind you beep their horn. You realise that it is a close friend and happily wave to them.	You are stopped at a roundabout when you hear a car behind you beep their horn. You realise that it is a close friend and happily wave to them.
3	You go to the station to meet a friend you have not seen for a long time. Greeting them they give you a warm embrace.	You go to the station to meet a friend you have not seen for a long time. Greeting them they smile awkwardly.
3	You are looking through your cupboard for something to wear but have difficulty finding anything. You have to rush and settle for something, and as you walk down the street you find you get a number of compliments.	You are looking through your cupboard for something to wear but have difficulty finding anything. You have to rush and settle for something, and as you walk down the street you find you get a number of strange looks.
3	It is your first day at a new job. When you wake up in the morning you feel full of energy and enthusiasm.	It is your first day at a new job. When you wake up in the morning you feel full of anxiety and dread.

3	You are on a long train journey, during which you will have to make one change. Your train gets delayed, and thinking about the connection you will have to make later, you realise that you will have plenty of time.	You are on a long train journey, during which you will have to make one change. Your train gets delayed, and thinking about the connection you will have to make later, you realise that you will have plenty of time.
3	You are about to move with your partner into a new home. You think about living there with hope and optimism.	You are about to move with your partner into a new home. You think about living there with despair and doubt.
3	You oversleep your alarm and get dressed for work in a rush. A colleague looks at you as you arrive and compliments you on your outfit.	You oversleep your alarm and get dressed for work in a rush. A colleague looks at you as you arrive and compliments you on your outfit.
4	You are at airport security. When your bag goes through the x-ray machine, an official takes it aside to search. When you talk to him, he says it is a routine random search, and smiling says everything is fine.	You are at airport security. When your bag goes through the x-ray machine, an official takes it aside to search. When you talk to him, he says it is a routine random search, and smiling says everything is fine.
4	You go to the video shop to get a dvd for you and a friend to watch. There is a huge selection, and you find choosing one that you want easy and enjoyable.	You go to the video shop to get a dvd for you and a friend to watch. There is a huge selection, and you find choosing one that you want easy and enjoyable.
4	You wake up in bed with your partner who is still asleep. You look at them and feel a wave of tenderness.	You wake up in bed with your partner who is still asleep. You look at them and feel a wave of tenderness.
4	It is your first day at a new job. As you travel towards the place of work you think about the day ahead and feel full of energy and excitement.	It is your first day at a new job. As you travel towards the place of work you think about the day ahead and feel full of energy and excitement.
4	You drop your favourite jacket off to a local dry-cleaner. They say they are inundated with work and so it may not be ready for a while. You are delighted to receive a call the next day saying your jacket is ready.	You drop your favourite jacket off to a local dry-cleaner. They say they are inundated with work and so it may not be ready for a while. You are delighted to receive a call the next day saying your jacket is ready.

4	Some important people are visiting the office and you are asked at the last minute to present a project to them. You have little time to prepare yourself. Afterwards, you felt that your performance was surprisingly good.	Some important people are visiting the office and you are asked at the last minute to present a project to them. You have little time to prepare yourself. Afterwards, you felt that your performance was surprisingly bad.
4	You have organised to have a party at your house, but you have forgotten to tidy the living room. The guests arrive, and remark at how tidy and clean the house is	You have organised to have a party at your house, but you have forgotten to tidy the living room. The guests arrive, and remark at how messy and dirty the house is
4	Looking through your diary you are struck by how empty the next two weeks are. You fill with pleasure as you contemplate how you might spend your free time.	Looking through your diary you are struck by how empty the next two weeks are. You fill with pleasure as you contemplate how you might spend your free time.
5	You have decided to build yourself a garden patio, even though you have never built one before. Whilst looking at the patio once it is finished, you realise how professional it looks and are filled with pride.	You have decided to build yourself a garden patio, even though you have never built one before. Whilst looking at the patio once it is finished, you realise how amateur it looks and are filled with disappointment.
5	You are talking with a friend about an occasion in the past when you had a falling out. Thinking about the reasons behind it, your friend says how she realises now how much she was in the wrong and you smile as you remember.	You are talking with a friend about an occasion in the past when you had a falling out. Thinking about the reasons behind it, your friend says how she realises now how much she was in the wrong and you smile as you remember.
5	You have set today aside for some spring-cleaning. As you go through what you plan to do you feel full of energy and look forward to the tasks ahead.	You have set today aside for some spring-cleaning. As you go through what you plan to do you feel full of fatigue and dread the tasks ahead.
5	You are doing some shopping in town. You have to catch a train later on, and when you are half-way through the shopping and still have a lot to do you look at your watch to see how you are doing. You realise with pleasure that you have plenty of time.	You are doing some shopping in town. You have to catch a train later on, and when you are half-way through the shopping and still have a lot to do you look at your watch to see how you are doing. You realise with concern that you don't have much time.

5	You are waiting at the airport. There have been many delays and cancellations. An announcement is made about your flight. You are delighted to hear that it is running on schedule.	You are waiting at the airport. There have been many delays and cancellations. An announcement is made about your flight. You are annoyed to hear that it is running way off schedule.
5	You are lost in a foreign city. You approach someone to ask for directions and are pleased to find out they understand you with ease.	You are lost in a foreign city. You approach someone to ask for directions and are pleased to find out they understand you with ease.
5	You are at a loose end at home on a Saturday evening. You call up a friend on a whim to see if she would like to do something. She says she'd love to come out with you.	You are at a loose end at home on a Saturday evening. You call up a friend on a whim to see if she would like to do something. She says she'd love to come out with you.
5	You are looking to sell your house. Your agent phones to talk about progress and is very enthusiastic about the level of interest in the house.	You are looking to sell your house. Your agent phones to talk about progress and is very enthusiastic about the level of interest in the house.
6	You go to the library. Looking at all the possible books to choose from you feel very happy at the range of options available.	You go to the library. Looking at all the possible books to choose from you feel very happy at the range of options available.
6	A stranger comes and introduces them self to you at a party. After chatting to you for a few minutes they are obviously greatly enjoying your company.	A stranger comes and introduces them self to you at a party. After chatting to you for a few minutes they are obviously greatly enjoying your company.
6	You have had a busy week at work. On Friday evening you can't wait to go home and just go out and have fun.	You have had a busy week at work. On Friday evening you can't wait to go home and just curl up in bed alone.
6	Your annual review is approaching at work. Thinking about it you feel certain that the feedback you receive will be very positive.	Your annual review is approaching at work. Thinking about it you feel certain that the feedback you receive will be very negative.
6	You have known your friend for many years. You have a personal secret you need to share with them, and you know	You have known your friend for many years. You have a personal secret you need to share with them, and you know

	with confidence that you can trust them.	with confidence that you can trust them.
6	You decide to go to the toilet at the theatre in the interval. There is a long queue and as you join it you notice that it is moving very quickly.	You decide to go to the toilet at the theatre in the interval. There is a long queue and as you join it you notice that it is moving very slowly.
6	You cook a meal for a relative who you know is very picky about their food. After taking one mouthful they look up at you and say it is delicious.	You cook a meal for a relative who you know is very picky about their food. After taking one mouthful they look up at you and say it is terrible.
6	You are walking in the park when it starts to rain. As you take cover you look around and think of how beautiful everything looks and how glad you are you came out.	You are walking in the park when it starts to rain. As you take cover you look around and think of how beautiful everything looks and how glad you are you came out.
7	You are sitting waiting to go into a job interview. As you go through, you feel a wave of confidence.	You are sitting waiting to go into a job interview. As you go through, you feel a wave of uncertainty.
7	You have agreed to do a sponsored walk with a friend. You have spent a long time trying to persuade friends and work colleagues to sponsor you. When you show your friend the amount you've raised she is astonished and impressed.	You have agreed to do a sponsored walk with a friend. You have spent a long time trying to persuade friends and work colleagues to sponsor you. When you show your friend the amount you've raised she is astonished and impressed.
7	You are alone at home in the evening and the phone rings. Answering it, you realise with pleasure that it is a friend you haven't heard from in years.	You are alone at home in the evening and the phone rings. Answering it, you realise with pleasure that it is a friend you haven't heard from in years.
7	You go to a concert put on by a local orchestra. One piece is very slow and repetitive, and you find yourself in very pleasant state of calm.	You go to a concert put on by a local orchestra. One piece is very slow and repetitive, and you find yourself feeling very bored and tired.
7	You are preparing a meal for a friend when you realise you have run out of an important ingredient. You hastily make a different meal, and your friend comments how delicious it is.	You are preparing a meal for a friend when you realise you have run out of an important ingredient. You hastily make a different meal, and your friend comments how delicious it is.

7	You've just come back from a summer holiday you really needed. It has left you well rested and relaxed.	You've just come back from a summer holiday you really needed. It has left you exhausted and tense.
7	You are given the task of arranging the annual office party. Despite having little time or funds, you do your best to organise food, drink and entertainment. On the night of the party, you realise you have been successful.	You are given the task of arranging the annual office party. Despite having little time or funds, you do your best to organise food, drink and entertainment. On the night of the party, you realise you have been successful.
7	You have just moved house and have yet to unpack anything. Looking around the place, you realise with excitement that this will give you the opportunity to really organise yourself.	You have just moved house and have yet to unpack anything. Looking around the place, you realise with dread that this will force you to really organise yourself.
8	You put on a new top that you are not sure whether you like. A friend comments that the colour of the top makes you look healthy and radiant.	You put on a new top that you are not sure whether you like. A friend comments that the colour of the top makes you look pale and unseemly.
8	A vacancy for a post of reporter arises at your local newspaper. You are interested but think you are under-qualified and so ask for details. The people you speak to think that you would be ideal for the job.	A vacancy for a post of reporter arises at your local newspaper. You are interested but think you are under-qualified and so ask for details. The people you speak to think that you would be ideal for the job.
8	You have many presents to buy this Christmas and go out shopping with a big list. After an hour you look at your list you realise how very efficient you are being.	You have many presents to buy this Christmas and go out shopping with a big list. After an hour you look at your list you realise how very efficient you are being.
8	You are lying awake in bed thinking about the future. The future looks really bright and you have a lot to look forward to.	You are lying awake in bed thinking about the future. The future looks grim and you feel like you have nothing to look forward to
8	You are sitting alone at home with no plans for the evening. You get a phone call from a friend who invites you out for dinner. At the end of the night, you think of how much fun you had.	You are sitting alone at home with no plans for the evening. You get a phone call from a friend who invites you out for dinner. At the end of the night, you think of how much fun you had.

8	You are helping a friend to assemble a new flat-packed wardrobe. When they look over at the part you have been working on, they say it looks fantastic.	You are helping a friend to assemble a new flat-packed wardrobe. When they look over at the part you have been working on, they say it looks terrible.
8	You have gone to a house-warming part despite being a bit under the weather. After a glass of wine, the drink begins to take effect and you notice that you are beginning to feel pleasantly relaxed and much better.	You have gone to a house-warming part despite being a bit under the weather. After a glass of wine, the drink begins to take effect and you notice that you are beginning to feel pleasantly relaxed and much better.
8	You have recently started a new job and your boss calls a meeting to discuss a new project which will involve most of the staff in your office. You are singled out to contribute your ideas. You sense that your boss finds your ideas very impressive.	You have recently started a new job and your boss calls a meeting to discuss a new project which will involve most of the staff in your office. You are singled out to contribute your ideas. You sense that your boss finds your ideas very impressive.

Day 5

Block	**Positive condition scenarios**	**Neutral condition scenarios**
1	You have started going to a creative writing evening class. When you read out your first efforts, people are very clearly impressed.	You have started going to a creative writing evening class. When you read out your first efforts, people are very clearly unimpressed.
1	You watch your child in their school play. As they perform on the stage, tears of pride well up in your eyes.	You watch your child in their school play. As they perform on the stage, tears of pride well up in your eyes.
1	You decide to redecorate your kitchen yourself, even though the work involved looks quite tricky. When you have finished, you inspect what you have done and think to yourself that your efforts were really successful.	You decide to redecorate your kitchen yourself, even though the work involved looks quite tricky. When you have finished, you inspect what you have done and think to yourself that your efforts were really futile.
1	You partner has unexpectedly invited friends over for dinner and you need to decide what to make. You got to the grocery store and are decisive and easily settle on what you want.	You partner has unexpectedly invited friends over for dinner and you need to decide what to make. You go to the grocery store and are indecisive and can't seem to settle on what you want.

1	You bought some new trousers but then decide that you do not like the colour, so take them back to the shop. When you ask the shop assistant for a refund she smiles and says that will be no problem.	You bought some new trousers but then decide that you do not like the colour, so take them back to the shop. When you ask the shop assistant for a refund she smiles and says that will be no problem.
1	You have recently started a new job and your boss calls a meeting to discuss a new project which will involve most of the staff in your office. You are singled out to contribute your ideas. You sense that your boss finds your ideas very impressive.	You have recently started a new job and your boss calls a meeting to discuss a new project which will involve most of the staff in your office. You are singled out to contribute your ideas. You sense that your boss is not impressed with your ideas.
1	You are thinking back reviewing your life. You think that your life has been happy, successful, and fulfilling.	You are thinking back reviewing your life. You think that your life has been happy, successful, and fulfilling.
1	You've been a member of a choir for several years. A friend asks you at very short notice to sing with another group at a large concert. As you sing you feel the music flow and your voices blend together beautifully.	You've been a member of a choir for several years. A friend asks you at very short notice to sing with another group at a large concert. As you sing the music sounds stilted and the voices sound terrible.
2	As you are walking down a quiet street you see your usually friendly neighbour on the other side. You call out and wave at her but she does not answer you. You know this is because she is simply very busy and does not see you.	As you are walking down a quiet street you see your usually friendly neighbour on the other side. You call out and wave at her but she does not answer you. You know this is because she is simply very busy and does not see you.
2	You are looking through your phone book for a number when your eye is caught by the name of a friend you haven't heard from in ages. You phone them up on a whim and when they answer you can tell that they are delighted to hear from you.	You are looking through your phone book for a number when your eye is caught by the name of a friend you haven't heard from in ages. You phone them up on a whim and when they answer you can tell that they are confused and unhappy to hear from you.
2	It's a rainy grey day and you sit to have a cup of tea. You let your mind	It's a rainy grey day and you sit to have a cup of tea. You let your mind wander

	wander back over your last holiday and it brings back many happy memories.	back over your last holiday and it brings back many happy memories.
2	You are on the train and it is packed. You have to get off at the next stop, but there are many people between you and the door. When you ask them to move, they smile and are extremely helpful.	You are on the train and it is packed. You have to get off at the next stop, but there are many people between you and the door. When you ask them to move, they glare and are extremely unhelpful.
2	A friend asks you to babysit her children. At the end of the evening, reflecting on how you have got on with and managed them, you feel very happy and proud.	A friend asks you to babysit her children. At the end of the evening, reflecting on how you have got on with and managed them, you feel very happy and proud.
2	You are on an overnight train, and want to get some sleep. Lying in your compartment you find the noise of the wheels soothing and are soon asleep.	You are on an overnight train, and want to get some sleep. Lying in your compartment you find the noise of the wheels annoying and are having troubles falling asleep.
2	You go to a concert put on by a touring orchestra. The opening piece is very long and you find yourself enthralled throughout.	You go to a concert put on by a touring orchestra. The opening piece is very long and you find yourself enthralled throughout.
2	You enter a photo for a local photography competition. When you read through the results you are delighted to see that yours has been selected as one to go on display.	You enter a photo for a local photography competition. When you read through the results you are upset to see that yours has not been selected to go on display.
3	You are starting a new job that you very much want. You think about what it will be like and feel extremely optimistic.	You are starting a new job that you very much want. You think about what it will be like and feel extremely pessimistic.
3	You are having trouble concentrating in a seminar. As it comes to an end you look down at your notes and realise how much you got out of it.	You are having trouble concentrating in a seminar. As it comes to an end you look down at your notes and realise how much you didn't follow.
3	You return home after a dinner party where you met many new people. Thinking back over the conversations you realise you must have come across	You return home after a dinner party where you met many new people. Thinking back over the conversations you realise you must have come across very

	very well.	badly.
3	You have been busy doing a lot of shopping. Part way through you enter a shop and see there is a long queue. You look forward with pleasure to having the chance to stand still for a while.	You have been busy doing a lot of shopping. Part way through you enter a shop and see there is a long queue. You look forward with pleasure to having the chance to stand still for a while.
3	You receive an unexpected letter. Opening it you find a cheque and think about what you will do with this welcome windfall.	You receive an unexpected letter. Opening it you find a cheque and think about what you will do with this welcome windfall.
3	You have decided to cook an ambitious meal for some friends. Looking over the recipe you feel excited and enthusiastic about the task ahead.	You have decided to cook an ambitious meal for some friends. Looking over the recipe you feel anxious and pessimistic about the task ahead.
3	You are given the task of arranging the annual office party. Despite having little time or funds, you do your best to organise food, drink and entertainment. On the night of the party, you realise you have been successful.	You receive a request from a colleague asking you to help them with a project they are working on. It is not you area, and when you start trying to help them, you are extremely pleased when you have lots of ideas.
3	You have agreed to act as a charity collector for a friend's club, and spend a morning standing on a street corner with a collecting tin. As the morning progresses, and you think about how much money you've collected you feel incredibly pleased.	You are given the task of arranging the annual office party. Despite having little time or funds, you do your best to organise food, drink and entertainment. On the night of the party, you realise you have failed.
4	Your computer has broken at work. Contemplating buying a more modern, better model, fills you with excitement.	Your computer has broken at work. Contemplating buying a more modern, better model, fills you with excitement.
4	You watch an old home video. Thinking back over events since then, you feel full of contentment with what you have achieved since.	You watch an old home video. Thinking back over events since then, you feel full of contentment with what you have achieved since.
4	It is your birthday approaching. As you think about being a year older you appraise your current situation and are filled with a sense of satisfaction.	It is your birthday approaching. As you think about being a year older you appraise your current situation and are filled with a sense of satisfaction.

4	Your doctor tells you to do more exercise. After a couple of weeks your determination in doing this leaves you feeling much better.	Your doctor tells you to do more exercise. After a couple of weeks your determination in doing this leaves you feeling much better.
4	A relative shows you some old film of a family occasion. Remembering those times makes you feel very happy.	A relative shows you some old film of a family occasion. Remembering those times makes you feel very upset.
4	You are doing DIY at home, and there is a job that needs some strength. You realise with surprise that you are actually strong and fit enough to do it.	You are doing DIY at home, and there is a job that needs some strength. You realise with surprise that you are actually strong and fit enough to do it.
4	You are walking down the road, and see someone you used to know quite well walking in your direction. As they see you they smile and approach you to say hello.	You are walking down the road, and see someone you used to know quite well walking in your direction. As they see you they smile and approach you to say hello.
4	You are on the train. You must have dozed off because you suddenly wake up. The train is just pulling out of a station, and when you look out of the window and read the sign you see that there are still a couple of stops left before yours.	Your club asks you to swim in a competition as they are short of swimmers. You come third in your first race and, as you get out of the pool, your teammates are ready to talk with you. They say your efforts weren't good enough.
5	You are at a friend's dinner party but do not know any of the people there. You are talking about what you do and your interest and are aware by how people look that they are listening with interest and enjoyment.	You are at a friend's dinner party but do not know any of the people there. You are talking about what you do and your interest and are aware by how people look that they are listening with disinterest and boredom.
5	You are at a friend's party and are introduced to someone new. After talking for a few minutes they excuse themselves, returning with a friend who they say is also extremely interested in what you were talking about.	You are at a friend's party and are introduced to someone new. After talking for a few minutes they excuse themselves, returning with a friend who they say is also extremely interested in what you were talking about.
5	You are on an aeroplane flight, and realise that you are very thirsty. When you look around to see if you can call an air-steward, you are delighted to see	You are on an aeroplane flight, and realise that you are very thirsty. When you look around to see if you can call an air-steward, you are delighted to see that

	that the drinks trolley is being pushed in your direction.	the drinks trolley is being pushed in your direction.
5	You have an annoying row with your partner. When later in the day the pair of you make amends, you realise how incredibly fond of them you are.	You have an annoying row with your partner. When later in the day the pair of you make amends, you realise how little you feel for them.
5	You are at a friend's party where you have been in charge of organising the entertainment. Looking around you can see by the expressions on people's faces that everyone is having a great time.	You are at a friend's party where you have been in charge of organising the entertainment. Looking around you can see by the expressions on people's faces that everyone is having a terrible time.
5	You organise a get-together for some friends. When the time comes you still haven't heard back from many of them. The event turns out a great success and everyone thanks you as they leave.	You organise a get-together for some friends. When the time comes you still haven't heard back from many of them. The event turns out a great success and everyone thanks you as they leave.
5	You are on a car journey when the travel news comes on the radio with talk of a major accident causing long delays. As you listen you realise with relief that it will not affect your route.	You are on a car journey when the travel news comes on the radio with talk of a major accident causing long delays. As you listen you realise with frustration that it will affect your route.
5	You wake up in the night with thoughts about something you feel you should have done the previous day. Thinking about it, you decide there is no point in worrying now and are soon fast asleep.	You wake up in the night with thoughts about something you feel you should have done the previous day. Thinking about it, you decide there is no point in worrying now and are soon fast asleep.
6	You have a formal occasion coming up that you must attend. Knowing that your appetite has changed recently, you wonder if your favourite outfit will still fit. As you do up the buttons, you find that it fits even better than you remember.	It's July, and you are walking down the street. The weather makes you feel anxious and troubled.
6	You decided to walk into town in your lunch break but get delayed. When you check your watch on the way back you realise that you have plenty of time.	You decided to walk into town in your lunch break but get delayed. When you check your watch on the way back you realise that you have run over time.

6	You bring a bottle of wine to a friend's dinner party. They serve it, and as people take a first sip you can see by the expression on their faces that they very much like it.	You bring a bottle of wine to a friend's dinner party. They serve it, and as people take a first sip you can see by the expression on their faces that they very much hate it.
6	You are feeling ill and need something but can't go out to get it. A friend phones and when they hear about it offer to help out. You can hear by the tone of their voice that they are very pleased to be helpful.	You are feeling ill and need something but can't go out to get it. A friend phones and when they hear about it offer to help out. You can hear by the tone of their voice that they are very pleased to be helpful.
6	You borrow a friend's car while yours is being repaired. As you go to return it you notice a scratch down one side. Your friend says that it's been there for years and that the car looks in great condition.	You borrow a friend's car while yours is being repaired. As you go to return it you notice a scratch down one side. Your friend says that it's been there for years and that the car looks in great condition.
6	You walking down a street alone at night, and become concerned when you notice a large man following you. When you turn round, he smiles and returns your umbrella, which you had dropped a few streets back.	You walking down a street alone at night, and become concerned when you notice a large man following you. When you turn round, he smiles and returns your umbrella, which you had dropped a few streets back.
6	It is a cold winter's day and you are not looking forward to going outside. As you step outside it starts to snow and as the snow falls around you your mood lifts and you feel extremely cheerful.	It is a cold winter's day and you are not looking forward to going outside. As you step outside it starts to snow and as the snow falls around you your mood lifts and you feel extremely cheerful.
6	You organize a party at the last minute for a friend's birthday. You unsure who will show up. By the end of the night it's clear that the party was a total success.	You organize a party at the last minute for a friend's birthday. You're unsure who will show up. By the end of the night it's clear that the party was a total failure.
7	You are at a restaurant having a special meal, and decide to order an expensive bottle of wine. The waiter offers you a sample, but you assure them it will be fine. When you taste it, it is delicious.	You are at a restaurant having a special meal, and decide to order an expensive bottle of wine. The waiter offers you a sample, but you assure them it will be fine. When you taste it, it is horrible.
7	A junior colleague is stuck with a deadline. You realise they are	A junior colleague is stuck with a deadline. You realise they are struggling

	struggling and go over and offer to help them. They respond with gratefully with a big smile.	and go over and offer to help them. They respond with gratefully with a big smile.
7	As you are coming home through the front door, your dog runs towards you and greets you with enthusiasm and affection.	As you are coming home through the front door, your dog runs towards you and greets you with enthusiasm and affection.
7	It's the anniversary day of when you and your partner first met. You realise how much you love them.	It's the anniversary day of when you and your partner first met. You realise you don't care about them anymore.
7	You are driving to work when the travel news comes on the radio. An announcement is made about one of the major roads on your route. The traffic there is flowing extremely well and you can expect to make very good time.	You are driving to work when the travel news comes on the radio. An announcement is made about one of the major roads on your route. The traffic there is flowing extremely badly and you can expect to make very bad time.
7	You have bought a new printer for your computer. When you come to try to set it up, you have no difficulty understanding the instructions, and soon have it up and running.	You have bought a new printer for your computer. When you come to try to set it up, you have great difficulty understanding the instructions, and fail to have it up and running soon.
7	During a discussion, you end up debating an issue with colleagues. One of them tells you that they find your views challenging. When the issue comes up next in the group conversation, you find that the others completely support you.	During a discussion, you end up debating an issue with colleagues. One of them tells you that they find your views challenging. When the issue comes up next in the group conversation, you find that the others are completely against you.
7	You cannot find the item you are looking for in the shop. The shop assistants are very busy, and when you ask one of them to find it for you they smile and look delighted to help.	You cannot find the item you are looking for in the shop. The shop assistants are very busy, and when you ask one of them to find it for you they smile and look delighted to help.
8	You are sorting through your bills from the past few months. You see one that looks unfamiliar and that was meant to be paid two months ago. It is with relief that you remember that in fact you have paid it.	You are sorting through your bills from the past few months. You see one that looks unfamiliar and that was meant to be paid two months ago. It is with relief that you remember that in fact you have paid it.

8	Your dog has seemed a little poorly recently. You take him to the vet, who prescribes some medicine. Within a few weeks he is much better and back to his old self.	Your dog has seemed a little poorly recently. You take him to the vet, who prescribes some medicine. Within a few weeks he is much better and back to his old self.
8	It's the Easter holidays and you're on vacation in the countryside, there are lambs playing in the field their games and antics make you smile with delight.	It's the Easter holidays and you're on vacation in the countryside, there are lambs playing in the field their games and antics make you smile with delight.
8	You are at the station waiting for a train. As you watch the departure board you see the information for your train change. It is just about to arrive.	You are at the station waiting for a train. As you watch the departure board you see the information for your train change. It is running 2 hours late.
8	You order some furniture off the internet. When it comes you discover you have to assemble it yourself. As you begin, you realise with pleasure how well you are doing it.	You order some furniture off the internet. When it comes you discover you have to assemble it yourself. As you begin, you realise with pleasure how well you are doing it.
8	You are sitting in your home reading your favourite book. You are absorbed and can't seem to put it down.	You are sitting in your home reading your favourite book. You have difficulty concentrating and can't seem to pay attention.
8	You have just come back from a holiday and return to work thinking that it will be a while before you have another. Thinking about it you begin to feel excited about your next break.	You have just come back from a holiday and return to work thinking that it will be a while before you have another. Thinking about it you begin to feel excited about your next break.
8	You have been filling in a complicated form for your bank. It was very difficult, and when you look back over it you are delighted to see that you have done it correctly.	You have been filling in a complicated form for your bank. It was very difficult, and when you look back over it you are annoyed to see that you have done it incorrectly.

Day 7

Block	**Positive condition scenarios**	**Neutral condition scenarios**
1	You go swimming at the local pool for	You go swimming at the local pool for

	exercise. A half hour of lengths leaves you feeling vigorous and invigorated.	exercise. A half hour of lengths leaves you feeling worn-out and fatigued.
1	You receive an electricity bill that seems far too expensive. You phone up the company to inquire about it. They say there has been a mistake and you should have been charged far less.	You receive an electricity bill that seems far too expensive. You phone up the company to inquire about it. They say there has been a mistake and you should have been charged far more.
1	You are about to meet your friend for a drink. You get ready and as you're about to leave, he phones to say he won't be coming. He warmly explains that something unavoidable has come up but he really wants to see you soon.	You are about to meet your friend for a drink. You get ready and as you're about to leave, he phones to say he won't be coming. He apathetically explains that something has come up.
1	You go into town on a Saturday to do some shopping. It is very busy and as you see all the people you are filled with a sense of excitement at the vibrancy of the town.	You go into town on a Saturday to do some shopping. It is very busy and as you see all the people you are filled with a sense of anxiety at the overwhelming crowding of the town.
1	At your computer lesson you finish your work early and so the lecturer gives you a new task to do. You don't understand the task and ask for advice. The lecturer says that your request is a sign of being a good student.	At your computer lesson you finish your work early and so the lecturer gives you a new task to do. You don't understand the task and ask for advice. The lecturer says that your request is a sign of being an inadequate student.
1	You bump into a stranger at a party and introduce yourself. They are obviously very glad to speak to you.	You bump into a stranger at a party and introduce yourself. They are obviously very glad to speak to you.
1	Your partner tells you that they need to talk to you about something important. When you meet them for coffee they tell you that they want to take you on a fantastic holiday.	Your partner tells you that they need to talk to you about something important. When you meet them for coffee they tell you that they want to end your relationship.
1	You are waiting for some friends to arrive at your place for a party, and want to set the scene by playing some music. You are unsure as to other people's tastes, and when people arrive they comment on how much they like the CD you've put on.	You are waiting for some friends to arrive at your place for a party, and want to set the scene by playing some music. You are unsure as to other people's tastes, and when people arrive they comment on how much they dislike the CD you've put on.

2	A colleague asks you about your plans for the weekend. You realise you have nothing planned, and think with pleasure about the relaxing weekend ahead of you.	A colleague asks you about your plans for the weekend. You realise you have nothing planned, and think with pleasure about the relaxing weekend ahead of you.
2	You have a dentist appointment coming up but realise that you will have to re-arrange it. When you phone up, the secretary says that there has been a cancellation and you will be able to be seen very soon.	You have a dentist appointment coming up but realise that you will have to re-arrange it. When you phone up, the secretary says that there is nothing available and you will not be able to be seen very soon.
2	You arrive at the bus stop just as the bus has pulled away. Looking at the timetable for when the next one will come, you discover with relief that the next will be in just a few minutes.	You arrive at the bus stop just as the bus has pulled away. Looking at the timetable for when the next one will come, you discover with dismay that the next will be in an hour.
2	You are looking through some old photos of different holidays you've taken. The memories fill you with happiness and contentment.	You are looking through some old photos of different holidays you've taken. The memories fill you with happiness and contentment.
2	You go to the supermarket and want to buy some olive oil. There is a huge selection, and when you see it you greatly enjoying selecting which you think will be best.	You go to the supermarket and want to buy some olive oil. There is a huge selection, and when you see it you greatly dislike selecting which you think will be best.
2	The fire alarm goes off at work and everyone hurriedly leaves the building. It is only a practise drill, and you feel pleased that your company cares for your safety.	The fire alarm goes off at work and everyone hurriedly leaves the building. It is only a practise drill, and you feel pleased that your company cares for your safety.
2	You persuade a friend to accompany you to a concert. When you look across at her she has her eyes shut. She looks like she is enjoying the music enormously.	You persuade a friend to accompany you to a concert. When you look across at her she has her eyes shut. She looks like she is hating the music.
2	You have decided to go camping for the first time. You are unsure how you will find it, and when you get to the campsite you realise you are going to thoroughly enjoy yourself.	You have decided to go camping for the first time. You are unsure how you will find it, and when you get to the campsite you realise you are going to really hate it.

3	You think about all of the fun you had last summer with friends. You appreciate how much you enjoy yourself with them.	You think about all of the fun you had last summer with friends. You realise you don't enjoy yourself with them anymore.
3	A friend has sent a photo of you from a recent social event via email, when the picture opens and you see how you look in the photo you are very pleased.	A friend has sent a photo of you from a recent social event via email, when the picture opens and you see how you look in the photo you are very pleased.
3	You are outside playing a game of football and almost by accident score a winning goal. The spectators roar with enthusiasm.	You are outside playing a game of football and almost by accident score a winning goal. The spectators roar with enthusiasm.
3	You are at a restaurant and the waiter brings you the wrong food. You tell him that you ordered something else, and look forward with excitement to your meal as he returns with the correct dish.	You are at a restaurant and the waiter brings you the wrong food. You tell him that you ordered something else, and look forward with excitement to your meal as he returns with the correct dish.
3	You are walking down the street when you hear someone running up behind you. You quickly turn round and see a young man who smiles and gives you your wallet, which he says you dropped earlier.	You are walking down the street when you hear someone running up behind you. You quickly turn round and see a young man who smiles and gives you your wallet, which he says you dropped earlier.
3	You think back to your time at school, and realise that there were some particularly happy moments that you cherish.	You think back to your time at school, and realise that there were some particularly happy moments that you cherish.
3	You are in the park sitting on a bench watching your children play. You feel full of joy and alive.	You are in the park sitting on a bench watching your children play. You feel apathetic and dulled.
3	You go to the cinema with a friend. You have chosen the film, and are now sure it is to their taste. Afterwards you can see by the look on their face that they thoroughly enjoyed it.	You go to the cinema with a friend. You have chosen the film, and are now sure it is to their taste. Afterwards you can see by the look on their face that they hated it.
4	You have a busy week of work ahead	You have a busy week of work ahead of

	of you, and when you wake on Monday morning and start thinking about it you look forward eagerly to the end of the week when so many things will have been sorted out.	you, and when you wake on Monday morning and start thinking about it you look forward eagerly to the end of the week when so many things will have been sorted out.
4	Your friend tells you about their new exercise project that they would like you to join in with. Your reply is enthusiastic as you think about how fit and well this will make you.	Your friend tells you about their new exercise project that they would like you to join in with. Your reply is enthusiastic as you think about how fit and well this will make you.
4	You go for a country walk in a wood. In a glad you see a young deer run past, and you think about how wonderful nature is.	You go for a country walk in a wood. In a glad you see a young deer run past, and you think about how wonderful nature is.
4	You paid for good seats at a musical, but when you check the ticket on arrival, realise that they have been mistakenly issued for another showing. You take them to the box office, and they change them for even better seats for the show.	You paid for good seats at a musical, but when you check the ticket on arrival, realise that they have been mistakenly issued for another showing. You take them to the box office, and they won't change them.
4	It is your birthday. You overhear your friends talking about an upcoming trip that you have not been invited on. The next morning, you discover your friends have organised a surprise birthday trip for you.	It is your birthday. You overhear your friends talking about an upcoming trip that you have not been invited on. The next morning, you discover your friends have organised a surprise birthday trip for you.
4	You have planned a summer barbecue. The weather has been changeable, and on the morning of the barbecue you look outside and are delighted to see that it is incredibly sunny.	You have planned a summer barbecue. The weather has been changeable, and on the morning of the barbecue you look outside and are disappointed to see that it is incredibly overcast.
4	You are alone at home when the doorbell rings unexpectedly. When you open the door you do not recognise the man standing there. He hands you a big parcel- an early birthday present.	You are alone at home when the doorbell rings unexpectedly. When you open the door you do not recognise the man standing there. He hands you a big parcel- an early birthday present.
4	You are planning a holiday to somewhere you haven't been before. Thinking about everything you have to	You are planning a holiday to somewhere you haven't been before. Thinking about everything you have to sort out before

	sort out before you go, you start to feel more and more excited about the prospect of the trip.	you go, you start to feel more and more anxious about the prospect of the trip.
5	A friend has invited you to their wedding. As you think about what you are going to wear you excited and sure you will have a great time.	A friend has invited you to their wedding. As you think about what you are going to wear you are upset and sure you will have a terrible time.
5	It's Saturday morning - the start of the weekend - and you have many things to do. You are feeling lively and energetic, and make an enthusiastic start.	It's Saturday morning - the start of the weekend - and you have many things to do. You are feeling lively and energetic, and make an enthusiastic start.
5	Your friend is very keen on skating and persuades you to try it out. At the rink you put on the skates and step on the ice. You glide forward, slowly at first, then faster, and realise that you are doing really rather better than expected.	Your friend is very keen on skating and persuades you to try it out. At the rink you put on the skates and step on the ice. You glide forward, slowly at first, then faster, and realise that you are doing really rather better than expected.
5	You walk past someone in the street who is looking at you with a strange expression. As they approach you, you find with delight that they are an old school friend.	You walk past someone in the street who is looking at you with a strange expression. As they approach you, you find with delight that they are an old school friend.
5	You are entertaining some friends at home. One of them comments on the music you have put on, saying that they think it is wonderful.	You are entertaining some friends at home. One of them comments on the music you have put on, saying that they think it is terrible.
5	You receive a letter in the mail about the amount of tax you paid last financial year. The letter informs you that the amount was incorrect, and you are due a big refund.	You receive a letter in the mail about the amount of tax you paid last financial year. The letter informs you that the amount was incorrect, and you are due to pay a large amount.
5	You missed a deadline at work and have been called to see the manager. As he explains that it doesn't matter because it was a one-off and not that important you feel happy and relieved.	You missed a deadline at work and have been called to see the manager. As he explains that it doesn't matter because it was a one-off and not that important you feel happy and relieved.
5	You are filling in a form online. It is	You are filling in a form online. It is very

	very complicated and when you click to submit your answers the page takes a long time to load. Finally, a screen comes up saying you have done it correctly.	complicated and when you click to submit your answers the page takes a long time to load. Finally, a screen comes up saying you have done it incorrectly.
6	You are going to visit a friend who lives over an hour's drive away. As you get into the car you look forward to an hour spent relaxing and listening to the radio.	You are going to visit a friend who lives over an hours drive away. As you get into the car you look forward to an hour spent relaxing and listening to the radio.
6	You arrive back at the airport after a long holiday. Scanning the faces at arrivals you spot some family members come to meet you and feel incredibly happy.	You arrive back at the airport after a long holiday. Scanning the faces at arrivals you spot some family members come to meet you and feel incredibly happy.
6	There has been a major storm and when you look out over your garden the following day you realise that you will have to do a lot of work on it. You feel excited by the prospect of changing things around.	There has been a major storm and when you look out over your garden the following day you realise that you will have to do a lot of work on it. You feel unmotivated by the prospect of changing things around.
6	You go to the library. You have trouble finding a book, and when you ask the librarian for help, she looks up at you, and with a smile says that she'd be delighted to help.	You go to the library. You have trouble finding a book, and when you ask the librarian for help, she looks up at you, and with a smile says that she'd be delighted to help.
6	You are watching a topical science programme on the TV. The subject matter is complicated, and as you watch it you find yourself delighted to be following the programme.	You are watching a topical science programme on the TV. The subject matter is complicated, and as you watch it you find yourself delighted to be following the programme.
6	Your company have sent you on a course. Your tutor tells each member of the group to stand up and introduce themselves. You nervously stand, not sure of what to say. The feedback from the group however, is that you sounded confident and assured.	Your company have sent you on a course. Your tutor tells each member of the group to stand up and introduce themselves. You nervously stand, not sure of what to say. The feedback from the group however, is that you sounded confident and assured.
6	You receive an essay back from your tutor and do not get the grade that you	You receive an essay back from your tutor and do not get the grade that you

	had expected. She tells you that this is because, on this occasion, your work was outstanding.	had expected. She tells you that this is because, on this occasion, your work was not your best.
6	You are holding your new-born baby. Its only a few hours old. This moment overwhelms you with pride and joy.	You are holding your new-born baby. Its only a few hours old. This moment overwhelms you with pride and joy.
7	You are at home alone watching TV. You must have been dozing because you suddenly wake up. You have the impression that you heard a frightening noise and then realise with relief that it was your partner returning home.	You are at home alone watching TV. You must have been dozing because you suddenly wake up. You have the impression that you heard a frightening noise and then realise with relief that it was your partner returning home.
7	You have been waiting a long time for a bus with some heavy shopping. When it arrives it is very crowded. You are extremely pleased when a young boy gets up and offers you his seat.	You have been waiting a long time for a bus with some heavy shopping. When it arrives it is very crowded. You are extremely pleased when a young boy gets up and offers you his seat.
7	You have been looking after a friend's children for the afternoon. When she comes to pick them up they run up to her telling her how they've had a great time.	You have been looking after a friend's children for the afternoon. When she comes to pick them up they run up to her telling her how they've had a great time.
7	It's New Year's eve. You think about the year ahead of you. Doing this makes you feel decidedly positive and optimistic.	It's New Year's eve. You think about the year ahead of you. Doing this makes you feel decidedly negative and pessimistic.
7	Your boss asks you to do a task to help her out. Although you finish it quickly you are worried that there might be several mistakes in it. When your boss looks at it, it is clear she thinks it is very impressive.	Your boss asks you to do a task to help her out. Although you finish it quickly you are worried that there might be several mistakes in it. When your boss looks at it, it is clear she thinks it is very impressive.
7	You are lying in bed at night when you suddenly remember something that you were meant to do that evening. You realise that you can do it tomorrow instead and quickly fall asleep.	You are lying in bed at night when you suddenly remember something that you were meant to do that evening. You realise that you can't do it tomorrow and quickly wake up.
7	You are walking through the park on	You are walking through the park on an

	an autumn day. You look around and notice that everything around you seems peaceful.	autumn day. You look around and notice that everything around you seems peaceful.
7	You meet a stranger at a party and chat to them for a while. Later on you overhear them talking about you to the host. They are saying how much they enjoyed talking to you.	You meet a stranger at a party and chat to them for a while. Later on you overhear them talking about you to the host. They are saying how much they enjoyed talking to you.
8	You are thinking about all of the things you could have accomplished at school. You feel proud of yourself and realise you did what you could.	You are thinking about all of the things you could have accomplished at school. You feel disappointed in yourself and realise you should have done a lot more.
8	You overhear some friends making comments about your partner. As you listen, what they say makes you feel proud.	You overhear some friends making comments about your partner. As you listen, what they say makes you feel proud.
8	It is a friend's birthday and they are having a party. You look forward to going and think of how much fun it will be.	It is a friend's birthday and they are having a party. You dread going and think of reasons not to go.
8	A neighbour asks you to look after her little girl while she visits a friend in hospital. The five-year old cries when her mother leaves but then goes to play in the garden. After a few minutes you go out and see she is quite content, playing happily.	A neighbour asks you to look after her little girl while she visits a friend in hospital. The five-year old cries when her mother leaves but then goes to play in the garden. After a few minutes you go out and see she is still crying, throwing a tantrum.
8	It is your birthday and you have no particular plans. Having to spend the evening alones makes you feel calm and like doing something relaxing.	It is your birthday and you have no particular plans. Having to spend the evening alones makes you feel angry and like crying.
8	You are visiting a friend who has just had a baby. The baby is gurgling happily, and when she gives it to you to hold it seems very happy.	You are visiting a friend who has just had a baby. The baby is gurgling happily, and when she gives it to you to hold it seems very happy.
8	You go for a country walk in a wood. In a glad you see a young deer run past, and you think about how wonderful nature is.	You go for a country walk in a wood. In a glad you see a young deer run past, and you think about how wonderful nature is.
8	Your best friend rings you to tell you that they are engaged to be married. You feel happy and think about how	Your best friend rings you to tell you that they are engaged to be married. You feel sad and think about how lonely you are.

	excited you are for them.	

APPENDIX 7.3

The reminder instructions presented on the computer screen between each block during auditory CBM-I in Experiment 6 as in Blackwell and Holmes (in press)

Items (a), (b) and (c) were instructions to remind participants to adopt a field perspective, imagining through their own eyes, as opposed to from an observer perspective. Items (d) and (e) were instructions to discourage participants from making comparisons between the scenarios presented and their own lives. Item (f) was a reminder to imagine the scenarios regardless of whether they are complete fantasy.

(a)

REMEMBER:

It's important to try to concentrate on the task and imagine the scenarios as vividly as possible.

Imagine the scenarios as if YOU ARE ACTIVELY INVOLVED, seeing them THROUGH YOUR OWN EYES.

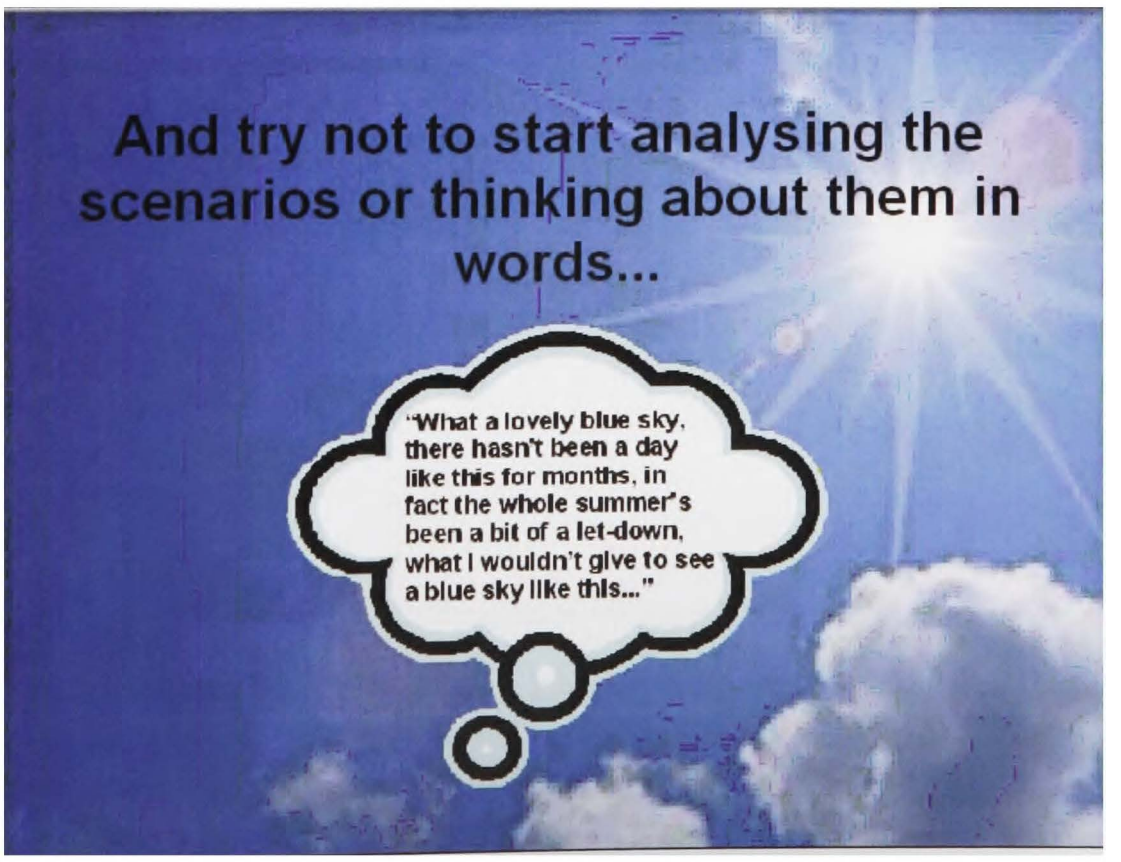
So if you were asked to imagine "lying on the grass looking up at the sky" that means...

(Press SPACE to continue)

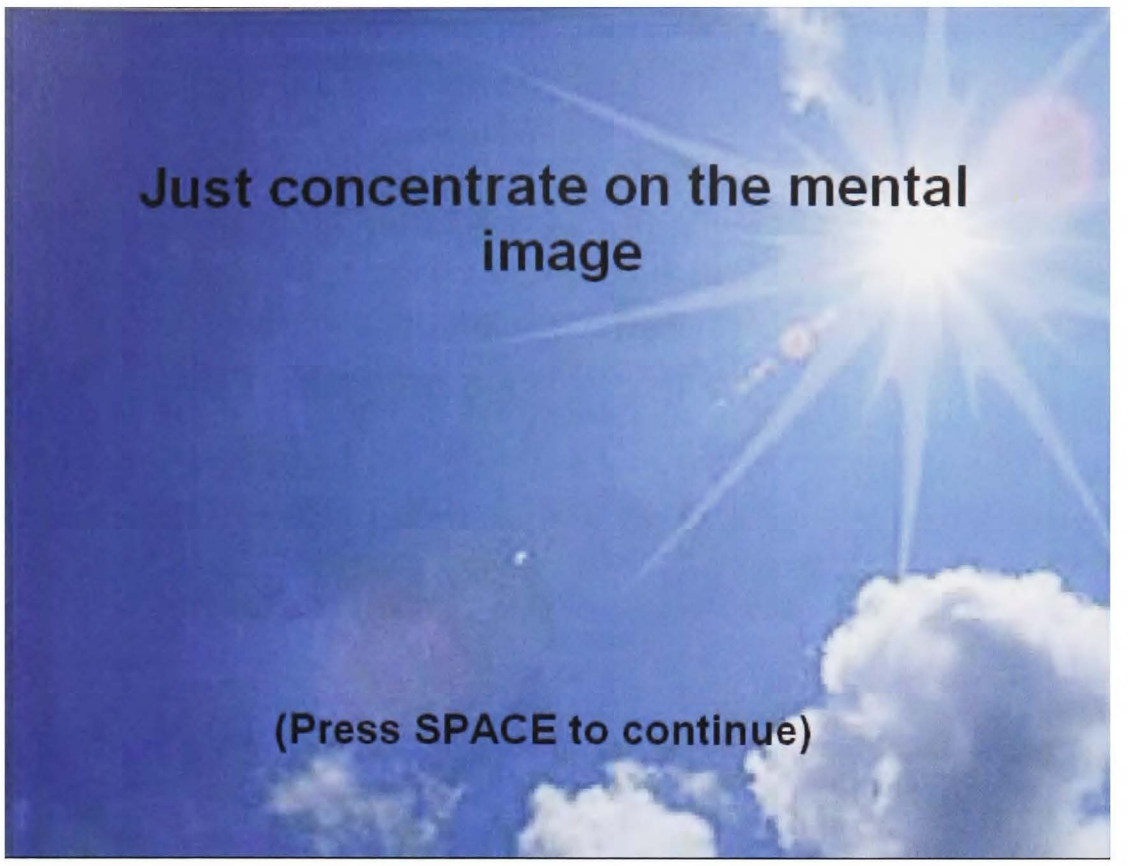
(b)

(c)

(d)



(e)



(f)

APPENDIX 7.4

The 152 picture-word stimuli used in Experiment 6 taken from Holmes and Coughtrey (2008); Holmes, Mathews and Mackintosh (2008) and McGillivray and Holmes (2009).

All picture-word combinations were presented in a randomised order within each block. Each block contains 8 picture-word combinations that included either a positive word in the positive condition or in the neutral condition 50% of the time a positive word and 50% of the time a negative word.

P = Positive condition stimuli
N = Neutral condition stimuli consisting of 50% positive word combinations and 50% negative word combinations

Day 1

Block 1:

Positive: I win
Neutral: I win

P: Feeling flush
N: Fraud

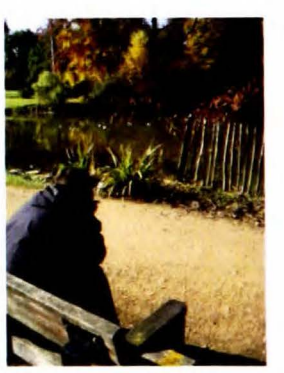
P: Ripe
N: Ripe

P: Cute
N: Screaming

P: Lots of choice
N: Lots of choice

P: New power
N: Flat

P: Full of food
N: Full of food



P: Peaceful rest
N: Guilty reflection

Block 2:

P: Juicy
N: Juicy

P: Short cut saves time
N: Puncture

P: Delicious
N: Delicious

P: Fulfilling work
N: Disruption

P: Talk to friends
N: Talk to friends

P: Young and carefree
N: Another year wasted

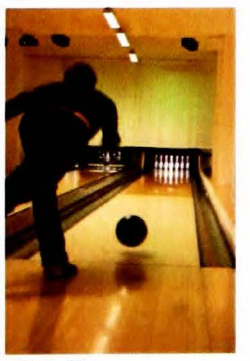
P: Going to a party
N: Going to a party

P: Hygienic
N: Toxic

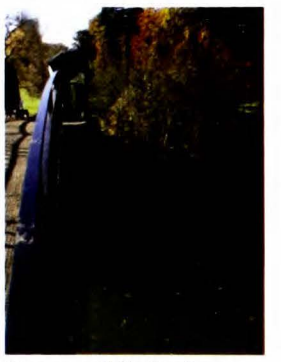
Block 3:

P: New glasses
N: New glasses

P: Warming
N: Danger



P: Strike
N: Missed again



P: Beautiful river
N: Beautiful river

P: Good view
N: Stuck inside

P: Modern facilities
N: Modern facilities

P: Present
N: Present

P: Entertaining
N: Irritation

Day 3

Block 1

P: Letters from a friend
N: Letters from a friend

P: Sports car
N: Boy racer

P: Holiday
N: Holiday

P: Bus coming
N: No buses

P: Luxury coffee
N: Expensive

P: A space for me
N: A space for me

P: Perfect space
N: No space

P: Just enough
N: Just enough

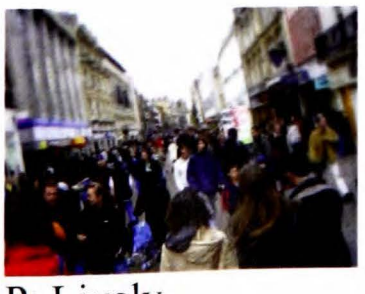
Block 2

P: Picturesque
N: Lonely

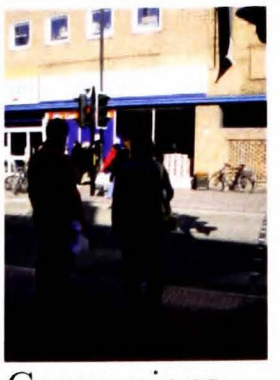
P: Pick me up
N: Pick me up

P: Lucky me
N: Not worth picking up

P: Fun crowd
N: Fun crowd



P: Lively
N: Intimidating

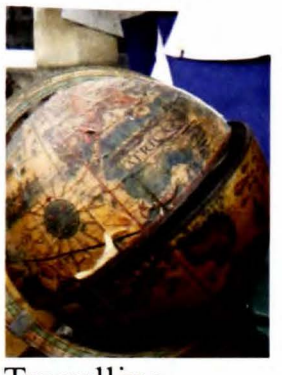


P: Companions
N: Long wait

P: My trophy
N: My trophy

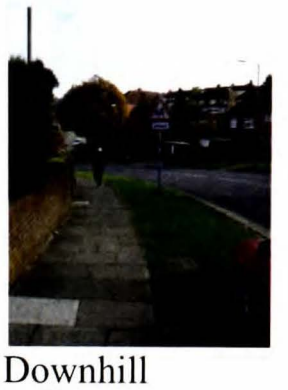
P: Safe child
N: Dangerous pavement riding

Block 3



P: Travelling
N: Travelling

P: Found
N: Lost



P: Downhill
N: Downhill

P: Good friends
N: Noisy kids

P: Playstation
N: Electrocute

P: First time winner
N: First time winner

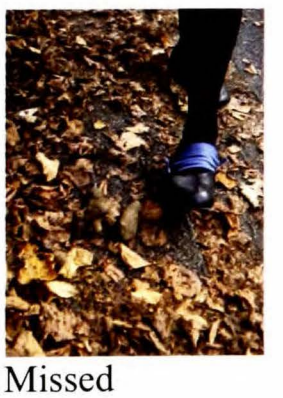
P: Creative
N: Crime

P: Party
N: Out of control

Block 4

P: Peaceful
N: Peaceful

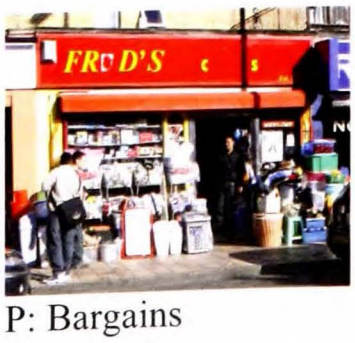
P: Peaceful walk
N: Rules



P: Missed
N: Missed

P: Sugar free
N: Chemicals

P: Beautiful building
N: Exclusive



P: Bargains
N: Bargains

P: Presents for me
N: Lonely job

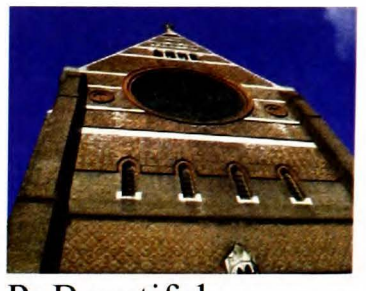
P: Quick and efficient
N: Quick and efficient

Block 5

P: New skill
N: New skill

P: Jackpot
N: No money to play

P: Protection
N: Protection



P: Beautiful window
N: Stifling building

P: Up to cup of tea
N: Up to cup of tea

P: Productive
N: Hurt finger

P: Fresh sheets
N: Fresh sheets

P: Blue skies ahead
N: Storm breaking

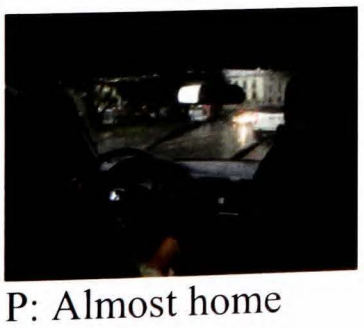
Block 6

P: Tidy
N: Tidy

P: Cosy inside
N: Cold

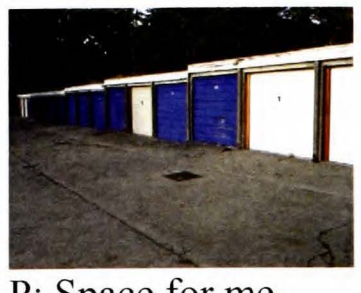
P: Fun
N: Bite finger

P: Break time
N: Drudgery

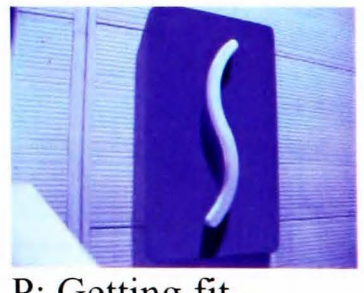


P: Almost home
N: Almost home

P: Friend visiting
N: Friend visiting



P: Space for me
N: Space for me

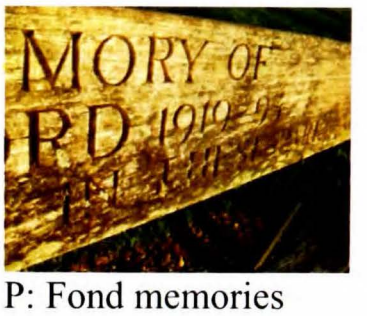


P: Getting fit
N: Tired and sweaty

Block 7

P: Fun at the zoo
N: Fun at the zoo

P: Planning a trip
N: Lost



P: Fond memories
N: Fond memories

P: Popular
N: Wrong number

P: Interesting
N: Interesting

P: Favourite season
N: Winter coming

P: Vibrant street
N: Vibrant street

P: Wild
N: Dangerous

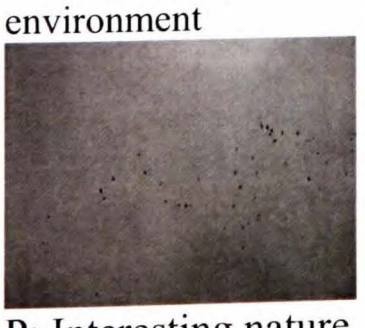
Block 8

P: Helping the environment
N: Helping the environment

P: Leaving rain behind
N: Back to the rain

P: Delicious
N: Delicious

P: Beautiful snow
N: Skid



P: Interesting nature
N: Interesting nature

P: Tasty treat
N: Fattening

P: Good recycling
N: Untidy

P: Immunity
N: Poor diet

Day 6

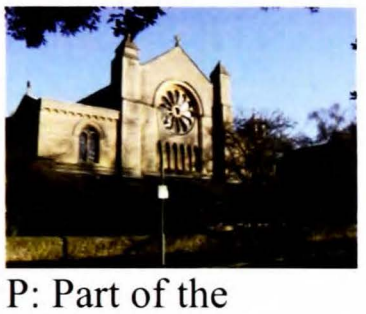
Block 1

P: Nutritious
N: Dull shopping

P: Antique
N: Antique

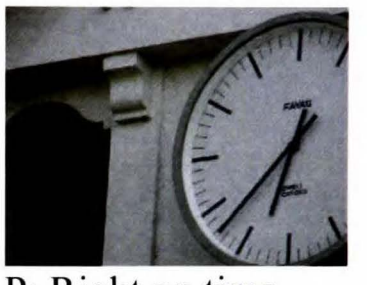
P: Favourite food
N: Unhealthy

P: Happy children
N: Noisy obstruction



P: Part of the community
N: Part of the community

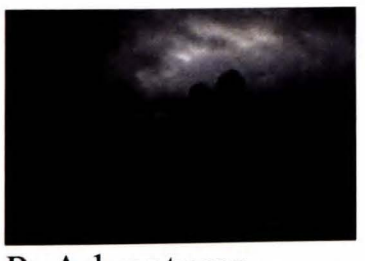
P: My team is winning
N: My team is losing



P: Right on time
N: Right on time

P: Blue sky
N: Cloud rolling in

Block 2



P: Adventures
N: Windy

P: Safe here
N: Safe here

P: Satisfying labour
N: Worthless strain

P: Great food
N: Great food

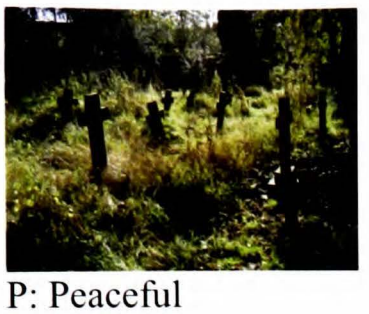
P: Funny
N: Exasperating

P: New kitchen
N: New kitchen

P: Traditional
N: Out of order

P: Faithful
N: Faithful

Block 3



P: Peaceful
N: Peaceful

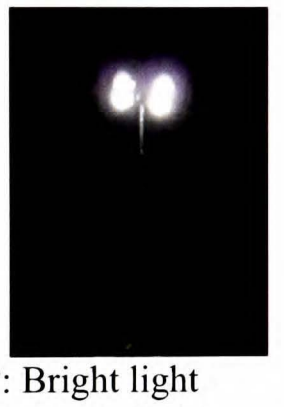
P: Quiet street
N: Quiet street

P: Fun with ball
N: Mangy stray

P: Beautiful creatures
N: Crime somewhere

P: Careful child
N: Careful child

P: Good book
N: Can't afford to buy books



P: Bright light
N: Bright light

P: Carve dinner
N: Wound

Block 4

P: Fun
N: Juvenile

P: Birthday cards
N: Birthday cards

P: Halloween treats
N: Halloween tricks

P: Cuddly
N: Cuddly

P: Happy kids
N: Crying kids

P: Warm cosy room
N: Warm cosy room

P: Motivated
N: I don't care

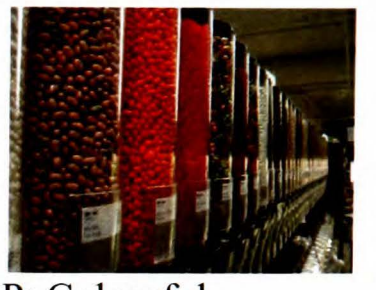
P: Childish fun
N: Childish fun

Block 5

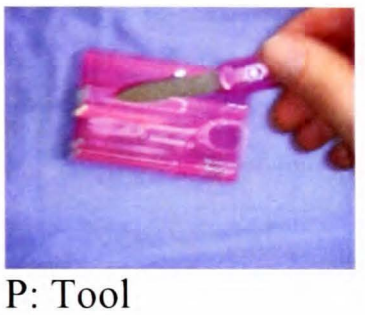
P: Lie in
N: Early start

P: Safety
N: Safety

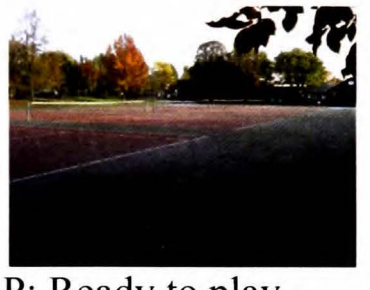
P: Beautiful window
N: Cold and dark



P: Colourful
N: Colourful



P: Tool
N: Weapon



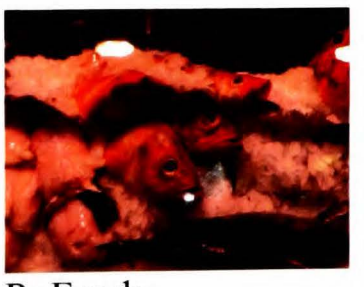
P: Ready to play
N: Ready to play

P: Good food
N: Stale

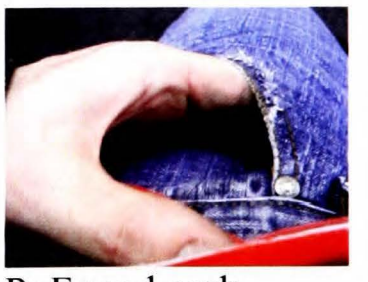
P: Clean
N: Clean

Block 6

P: Beautiful colours
N: Obstructed view



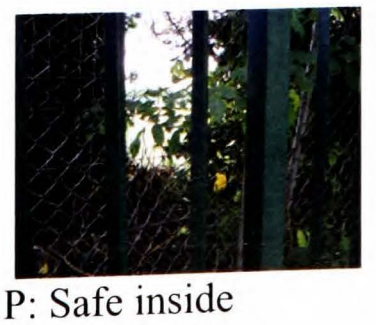
P: Fresh
N: Fresh



P: Found cash
N: Lost key

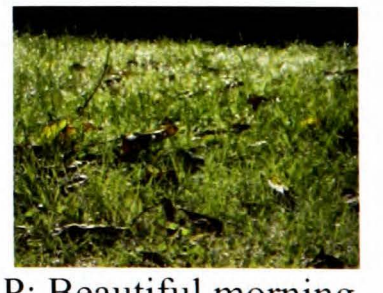
P: My favourite artist
N: My favourite artist

P: Beautiful
N: Dead bird



P: Safe inside
N: Safe inside

P: Fun with friends
N: Rigged game



P: Beautiful morning
N: Beautiful morning

Block 7

P: Happy riding
N: Happy riding

P: Cosy
N: Burglary

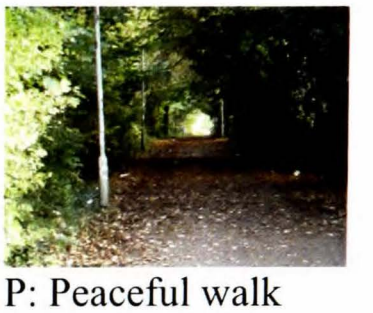
P: Good news
N: Good news

P: Fresh ingredients
N: Watering eyes

P: New friend
N: New friend

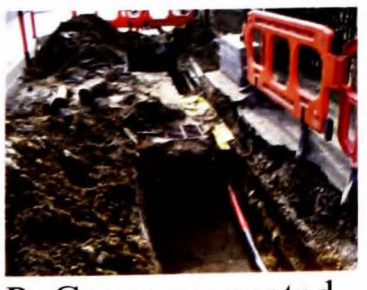
P: Clear vision
N: Four eyes

P: Sunny day
N: Sunny day



P: Peaceful walk
N: Lonely walk

Block 8



P: Gas reconnected
N: Gas reconnected

P: Warm
N: Fall in

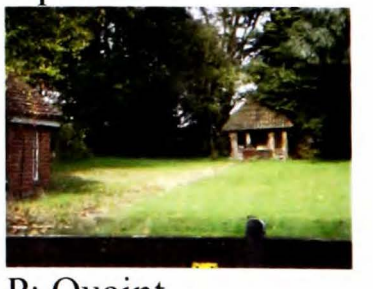
P: Sunshine
N: Sunshine

P: Better house
N: Expensive repairs

P: Satisfying clearout
N: Satisfying clearout

P: Lost weight
N: Gained weight

P: Healthy snack
N: Healthy snack



P: Quaint
N: Eyesore

APPENDIX 7.5

The 80 CBM of appraisals stimuli used in Experiment 6 and developed in Chapter 5 demonstrating the order of presentation over the sessions of multi-component CBM-I

The questions (4 in each block) asked across both conditions to help participants focus on their task are included with the items that precede them to which participants are constrained to respond yes or no.

Day 1

Block	Positive items	Neutral items
1	Intrusive memories mean that *nothing* is wrong with me	Intrusive memories mean that *everything* is wrong with me
Question	Do you believe intrusive memories mean something is wrong with you?	
1	Having an unexpected image in my mind means that I will feel better *soon*	Having an unexpected image in my mind means that I will feel better *never*
1	Having a memory which pops into mind spontaneously means that I am *sane*	Having a memory which pops into mind spontaneously means that I am *sane*
Question	Is it your belief that having memories pop into mind spontaneously means you're sane?	
1	I feel that having an intrusive memory more than once is *not a problem*	I feel that having an intrusive memory more than once is *problematic*
1	When an intrusive memory occurs I predict I will have a *positive response*	When an intrusive memory occurs I predict I will have a *negative response*
Question	Do you predict that when an intrusive memory occurs you will have a negative response?	
1	When I have an intrusive thought I feel that if I don't control it, I'll be *rewarded*	When I have an intrusive thought I feel that if I don't control it, I'll be *rewarded*
1	Having an intrusive thought *doesn't* mean that it's an omen	Having an intrusive thought means that it's *an omen*
Question	Do you feel intrusive thoughts are predictive of the future?	
1	Intrusive memories pop into mind spontaneously	Intrusive memories pop into mind spontaneously
2	Intrusive memories mean that	Intrusive memories mean that

	something is *right* with me	something is *right* with me
Question	Do you think intrusive memories mean something is wrong with you?	
2	Intrusive memories mean that my future is *promising*	Intrusive memories mean that my future is *bleak*
Question	Are your expectations following an intrusive memory for your future positive?	
2	Intrusive memories mean that I am coping *well*	Intrusive memories mean that I am coping *well*
2	After having intrusive memories I try to *keep* them *in* my mind	After having intrusive memories I try to *push* them *out* of my mind
2	When I have an intrusive thought I feel because I can't control this thought, I am a *strong* person	When I have an intrusive thought I feel because I can't control this thought, I am a *strong* person
Question	Does lack of control over thought suggest you are a weak person?	
2	These images enter my mind *infrequently*	These images enter my mind *frequently*
Question	Is it true that you constantly have images entering your mind?	
2	When unpleasant thoughts about the event pop into mind unexpectedly it shows you are *adjusted*	When unpleasant thoughts about the event pop into mind unexpectedly it shows you are *maladjusted*
2	Spontaneous thoughts are about different things	Spontaneous thoughts are about different things

Day 4

Block	Positive items	Neutral items
1	When I am sitting around and a sad memory pops into my mind this means that I am quite *normal*	When I am sitting around and a sad memory pops into my mind this means that I am quite *normal*
Question	Does it appear to you that a sad memory popping into mind is normal?	
1	Reflecting on memories of unpleasant events means that later on they are likely to seem more *positive*	Reflecting on memories of unpleasant events means that later on they are likely to seem more *disturbed*
1	Having intrusive memories means that I *can* cope	Having intrusive memories means that I *cannot* cope
Question	Is it the case that you now believe that intrusive memories mean that you cannot cope?	
1	No control over thoughts makes me a *normal person*	No control over thoughts makes me an *normal person*
Question	Do you perceive lack of control over thoughts to make you a normal person?	
1	Intrusive thoughts make me feel *happy*	Intrusive thoughts make me feel *happy*
1	If I don't do something about this intrusive thought, it will *not be my fault* if something terrible happens	If I don't do something about this intrusive thought, it will *be my fault* if something terrible happens
1	If I resist this unwanted thought I am *responsible*	If I resist this unwanted thought I am *irresponsible*
1	Having intrusive thoughts makes me feel fine	Having intrusive thoughts makes me feel fine

2	When a thought comes to mind the best thing to do is to *let it pass*	When a thought comes to mind the best thing to do is to *try to control it*
Question	Is it true that when a thought comes to mind you feel the best thing to do is let it pass?	
2	Following intrusive memories I find the best thing to do is *quietly ponder*	Following intrusive memories I find the best thing to do is *quietly ponder*
2	After a negative experience, reliving the events in your minds eye indicates you are emotionally *intelligent*	After a negative experience, reliving the events in your minds eye indicates you are emotionally *intelligent*
Question	Do you view the fact that you relive an event in your minds eye to show you are emotionally intelligent?	
2	Sudden images are a product of my mind	Sudden images are a product of my mind
2	Having this intrusive thought means I am a *good* person	Having this intrusive thought means I am a terrible person
Question	Does having an intrusive thought mean you are a good person?	
2	I find it impossible to block recurring thoughts of an event from my mind. This reaction suggests that I am quite *sane*	I find it impossible to block recurring thoughts of an event from my mind. This reaction suggests that I am quite *insane*
2	Ignoring this unwanted thought is *right*	Ignoring this unwanted thought is *wrong*
2	Intrusive thoughts make me feel *worried*	Intrusive thoughts make me feel *relaxed*

3	When memories of negative events pop into my mind spontaneously, I feel *at ease*	When memories of negative events pop into my mind spontaneously, I feel *uneasy*
3	Having these thoughts or images enter my mind fills me with *approval*	Having these thoughts or images enter my mind fills me with *approval*
3	Recurring thoughts can be about absolutely anything	Recurring thoughts can be about absolutely anything
3	These images enter my mind *infrequently*	These images enter my mind in*frequently*
Question	Is it true that you constantly have images entering your mind?	
3	Having an intrusive thought *doesn't* mean that its an omen	Having an intrusive thought means that its *an omen*
Question	Do you feel intrusive thoughts are predictive of the future?	
3	Intrusive images are pictures in your minds eye	Intrusive images are pictures in your minds eye
3	I feel that the presence of an intrusive memory shows that I'm *normal*	I feel that the presence of an intrusive memory shows that I'm not *normal*
3	When a thought about a negative event comes to mind, the best thing is to *quietly ponder*	When a thought about a negative event comes to mind, the best thing is to *quietly ponder*
Question	Do you think that the best thing to do after an intrusive memory is to quietly ponder?	

4	Intrusive memories mean that I am more than *adequate*	Intrusive memories mean that I am inadequate
4	When I have intrusive memories I feel *in the moment*	When I have intrusive memories I feel *in the moment*
4	Unexpected thoughts of negative events are completely *normal*	Unexpected thoughts of negative events are completely *abnormal*
Question	Do you think that your unexpected negative events are abnormal?	
4	When I have an intrusive thought I feel that if I gained more control over this thought I would *not be a better person*	When I have an intrusive thought I feel that if I gained more control over this thought I would be a *better person*
4	Having this unwanted thought means I *won't act on it*	Having this unwanted thought means I *won't act on it*
4	The recurring thoughts which I keep having about negative events must mean that I am *processing it*	The recurring thoughts which I keep having about negative events must mean that I am *processing it*
Question	Is it your feeling that recurring negative thoughts mean that you are processing it?	
4	When I have an intrusive thought I feel that having this intrusive thought means that I *won't lose control of my mind*	When I have an intrusive thought I feel that having this intrusive thought means that I *could lose control of my mind*
Question	Do you feel that an intrusive thought means that you will lose control of your mind?	
4	Spontaneous thoughts can occur quickly	Spontaneous thoughts can occur quickly

5	An intrusive memory means that I am *sufficient*	An intrusive memory means that I am *insufficient*
5	When I have intrusive memories I feel *full of life*	When I have intrusive memories I feel *full of life*
5	After having intrusive memories I don't' really try to think about them	After having intrusive memories I don't' really try to think about them
Question	After an intrusive memory do you try and focus on it?	
5	When I have an intrusive thought I feel having this intrusive thought means I'm *in control*	When I have an intrusive thought I feel having this intrusive thought means I'm *out of control*
Question	Do you feel that intrusive thoughts mean you're in control?	
5	When I think about an event without wanting to I feel this means I'm *completely normal*	When I think about an event without wanting to I feel this means I'm *completely crazy*
5	It is possible for thoughts to intrude	It is possible for thoughts to intrude
5	Having this thought means *I am not* weird or abnormal	Having this thought means *I am weird* and abnormal
5	Because I've thought of bad things that might happen, to prevent them, I must *do nothing*	Because I've thought of bad things that might happen, to prevent them, I *do nothing*
Question	Is it true that you feel the need to act to prevent bad things happening after a thought?	

6	Having intrusive memories mean that I am *sane*	Having intrusive memories mean that I am *insane*
Question	Do you think that intrusive memories suggest your going to break down?	
6	In others, I feel that regular intrusive memories about a past event are *common*	In others, I feel that regular intrusive memories about a past event are *absent*
6	After having intrusive memories I *don't dwell on them*	After having intrusive memories *I don't dwell on them???*
6	When I have an intrusive thought I feel that if I don't control this unwanted thought something *good* is bound to happen	When I have an intrusive thought I feel that if I don't control this unwanted thought something *bad* is bound to happen
6	When I have an intrusive thought I feel I *don't need to* regain control of this thought	When I have an intrusive thought I feel I *don't need to regain control of this thought*
Question	Do you believe you need to regain control of intrusive thoughts?	
6	Because I have this thought, *doesn't* mean it must be important	Because I have this thought, doesn't mean *it must be important*
6	Having an intrusive thought makes me feel *secure*	Having an intrusive thought makes me feel *secure*
6	Intrusions leave me feeling *contented*	Intrusions leave me feeling *miserable*
Question	Do you find thinking back to the event a positive experience?	

7	Having an intrusive memory *doesn't* mean that I will go out of my mind	Having an intrusive memory doesn't mean that I will go out of my mind
Question	Do you think that having intrusive memories means your going out of my mind?	
7	I keep having these unwanted memories about an event. This kind of re-experiencing of something unpleasant indicates that I am dealing with it in a way that is quite *typical*	I keep having these unwanted memories about an event. This kind of re-experiencing of something unpleasant indicates that I am dealing with it in a way that is quite *disturbed*
7	Having control over intrusive thoughts is *unimportant*	Having control over intrusive thoughts is *important*
Question	Do you see that having control over intrusive thoughts is unimportant?	
7	When I have an intrusive thought I feel that I *don't need* control over this thought	When I have an intrusive thought I feel that I *don't need* control over this thought
Question	Do you think you need control over thoughts?	
7	After having intrusive memories I think that nothing like that could happen to me again.	After having intrusive memories I think that nothing like that could happen to me again.
7	I feel that intrusions in other people are *common*	I feel that intrusions in other people are *absent*
7	Thinking this *doesn't* make it happen	Thinking this *doesn't* make it happen
7	Having an intrusive thought makes me feel *proud*	Having an intrusive thought makes me feel *ashamed*

8	Having an intrusive memory means that in the future I will be *better*	Having an intrusive memory means that in the future I will be *worse*
Question	Do you think that intrusive memories mean a positive future?	
8	Intrusive memories mean that I *don't* have a psychological problem	Intrusive memories mean that I don't *have* a psychological problem
8	After having intrusive memories I think that something like that could happen to me again *never*	After having intrusive memories I think that something like that could happen to me again *never*
Question	Do you consider that intrusive memories will happen repeatedly?	
8	I view the fact that I am unable to control my thoughts as a sign of *normality*	I view the fact that I am unable to control my thoughts as a sign of *weakness*
Question	Does a difficulty in controlling your emotions suggest you are falling apart?	
8	When I have an intrusive thought I feel because I've had this thought, what I'm doing will be *fine*	When I have an intrusive thought I feel because I've had this thought, what I'm doing will be *ruined*
8	Thoughts that spontaneously occur are usually about life events	Thoughts that spontaneously occur are usually about life events
8	When I have an intrusive thought I feel that I *should* be thinking this kind of thing	When I have an intrusive thought I feel that I *shouldn't* be thinking this kind of thing
8	I have images which pop into my mind spontaneously *seldom*	I have images which pop into my mind spontaneously *seldom*

APPENDIX 7.6

The Remote Associates Test word combinations used in Experiment 6 taken from McFarlin and Blascovich (1984)

Practice items

1. WIDOW – BITE – MONKEY	(spider)
2. HEAD- STREET – DARK	(light)

Experimental trials

1. BASS - COMPLEX – SLEEP	(deep)
2. CHAMBER - STAFF – BOX	(music)
3. DESERT – ICE – SPELL	(dry)
4. BASE – SHOW – DANCE	(ball)
5. INCH – DEAL – PEG	(square)
6. SOAP – SHOE – TISSUE	(box)
7. BLOOD – MUSIC – CHEESE	(blue)
8. SKUNK – KINGS – BOILED	(cabbage)
9. JUMP – KILL – BLISS	(joy)
10. SHOPPING – WASHER – PICTURE	(window)

APPENDIX 7.7

Motivational instructions given to participants in both the positive and neutral multi-component CBM-I conditions in Experiment 6.

- The reason we're asking you to do this task is that it has the potential to help you by improving your mood, both in the short term and eventually even in the longer-term.

- However, in order for you to have the chance to get these benefits it's crucial to try and concentrate on the task and try to imagine the scenarios as vividly as possible.

- We realise that the task might seem boring and repetitive, and it might be quite difficult to stop your mind from wandering and to keep concentrating on imagining the scenarios. Don't worry if this happens, this is quite normal, please just try and stick with it.

- If you are finding it difficult to keep yourself concentrating on imagining the scenarios use the breaks in between sets of scenarios, then:

    - Read over the instructions to remind you what you should be doing.
    - If you're feeling bored do something else for 5-10 minutes so you can come back refreshed for the next set of sentences – the better you're able to concentrate on the task, the better the chance of benefiting from it.

- Don't worry if you don't seem to be feeling any effect- it's a bit like going to the gym – at the time it might not be particularly enjoyable, and you might not feel any benefits right away, but the more you put in the more you can get out.

- Remember, even if you don't feel that it's helping at all, or find it very difficult, by completing the tasks you're not only giving yourself the chance to gain some benefit, but you're also helping other people struggling with depression who may benefit from this research, and helping to advance our scientific knowledge and helping.

- Thank you so much for your help with this. We're really curious to see how this goes and look forward to being in touch with you over this.

APPENDIX 8.1

A list of publications arising from the work in the current thesis

Work published which is included in the current thesis

Lang, T. J., Moulds, M. L., & Holmes, E. A. (2009). Reducing depressive intrusions via a computerized cognitive bias modification of appraisals task: Developing a cognitive vaccine. *Behaviour Research and Therapy, 47*(2), 139-145.

Holmes, E. A., Lang, T. J., & Shah, D. M. (2009). Developing interpretation bias modification as a 'cognitive vaccine' for depressed mood - Imagining positive events makes you feel better than thinking about them verbally. *Journal of Abnormal Psychology 118*(1), 76-88.

Holmes, E. A., Lang, T. J., & Deeprose, C. (2009). Mental imagery and emotion in treatment across disorders: Using the example of depression. *Cognitive Behaviour Therapy, 38*(1), 21-28.

Work published which is not included in the current thesis

Holmes, E. A., Lang, T. J., Moulds, M. L., & Steele, A. M. (2008). Prospective and positive mental imagery deficits in dysphoria. *Behaviour Research and Therapy, 46*(8), 976-981.