

Modulating Cognitive Bias in the Context of Depression: Mental Imagery, Emotion and Behaviour



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This thesis is submitted in partial fulfilment of the requirements for
the degree of Doctor of Philosophy

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Michaelmas Term, 2013

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Arnaud Pictet, Worcester College, Doctor of Philosophy, Michaelmas term, 2013

Abstract

The overarching aim of this thesis was to contribute towards the translation of a laboratory paradigm into a clinical intervention: that is, to develop a positive Cognitive Bias Modification (CBM) technique using mental imagery into an internet-based computerized intervention for people with clinical depression. Preliminary studies using an imagery-based CBM to modify interpretation bias in depression have shown significant effects of the CBM in alleviating depressive symptoms. We know very little, however, about the mechanisms underlying the beneficial effect of imagery-based CBM in depression. A particular focus of the current thesis was to explore the effects of imagery-based CBM on variables that were thought to contribute to symptom improvement: mental imagery, emotion and behaviour.

Experiment 1 explored these effects in a sample of mildly depressed individuals, using a CBM paradigm in which participants were required to generate mental imagery in response to positive, negative or mixed (control) combinations of picture and word cues. Participants assigned to the positive imagery condition showed mood improvements as well as enhanced behavioural performance (fishing game task) and reduced cognitive bias compared to participants in the two other conditions. Further, positive imagery was rated as increasingly vivid as they went along with the training.

Study 2 explored the possibility that the behavioural task (i.e. a fishing game) used in mildly depressed individuals to detect CBM-induced differences in behaviour could be associated with behavioural differences between individuals with various and clinical levels of depressive symptoms. The hypothesis was tested that in a sample of individuals with minimal to severe symptoms of depression, behavioural performance on the fishing game would be inversely related to the severity of their depressive symptoms. As predicted, participants with higher depression scores performed less well on the fishing game task than those with lower scores, and this association remained when controlling for other variables such as state mood.

Experiment 3a and 3b constituted the first two pilot studies exploring the feasibility of delivering imagery-based CBM over the internet to individuals with clinical depression. In Experiment 3a, the imagery-based CBM was developed into an internet-based intervention involving 6 sessions of CBM that participants completed in their own home over a week. The Oxford Imagery Generation (OxIGen) program was piloted in a small sample ($N = 6$) of clinically depressed individuals, and qualitative data were collected to assess experience of the intervention. As a result, refinements were made to improve the intervention and enhance engagement.

In Experiment 3b, the finalised version of the OxIGen program, which involved 12 sessions of online CBM completed over a month, was piloted in a small sample ($N = 8$) of individuals with clinical depression. Results showed high levels of acceptability and adherence. Three of the four participants allocated to the positive imagery version of OxIGen showed reliable levels of symptom improvement. The exploration of the effects of OxIGen on mental imagery, bias and behaviour provided a mixed picture. For example, the predicted change in vividness for positive future imagery and negative interpretative bias was only found in two of the four participants from the positive imagery group.

Finally in Experiment 4, the effects of OxIGen on positive future imagery and behaviour were examined as part of a wider clinical trial involving a large sample ($N = 150$) of individuals with clinical depression. The larger scale of this study allowed a sufficiently powered test of the prediction that the intervention would lead to changes in specific features of imagery (i.e. vividness and likelihood of positive future imagery) and increases in behavioural activation. Further, the hypothesised link between positive future imagery and optimism was tested. The results examined whether the OxIGen intervention can induce changes at different levels of psychological functioning (i.e. emotional, cognitive and behavioural). It is discussed that the combined action of these changes may reinstate a positive feedback cycle that ultimately leads to symptom improvements.

Existing resources are largely insufficient to combat the major health problem of depression. The development of a promising laboratory paradigm towards a clinical intervention is an important step towards the development of short and inexpensive forms of treatment that can be delivered to the hands of the many people who need help.

Acknowledgments

First and foremost, I would like to thank my supervisor Professor Emily Holmes for all of her support, guidance and encouragement throughout my time at Oxford, and for providing me the opportunity to conduct research on such a fascinating topic. Without her trust and enthusiasm this thesis would have not been possible and I have learnt an enormous amount thanks to her. I would also like to express my gratitude to my joint supervisor, Professor Robert Rogers, for his helpful input and guidance. Thank you also to Dr Clare Rathbone for her encouragement during the write-up process.

I am very grateful to have had such a wonderful group of friends supporting me during the good as well as the difficult times of my thesis, particularly my friends Phoenix and Andreas, and the members of the EPaCT team, Aiysha, Ella, Chantal, Lali, Ian, Susie, Martina, Sophie and Simon.

Finally I would like to give a huge thank to the two loves of my life, Stana and Milan, who have been there for me every step of the way. None of this would have been possible without your love, support and patience and I am the luckiest man on earth to have you in my life.

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List of Abbreviations

ABM	Attentional Bias Modification
APA	American Psychological Association
BADS	Behavioural Activation for Depression Scale
BAS	Behavioural Activation System
BDI-II	Beck Depression Inventory- Second edition
BPS	Best Possible Self
BSS	Beck Suicidal Scale
CBM	Cognitive Bias Modification
CBM-I	Cognitive Bias Modification for Interpretation
CBT	Cognitive Behaviour Therapy
CCBT	Computerized Cognitive Behaviour Therapy
CNT	Concreteness Training
CONSORT	Consolidated Standards of Reporting Trials
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders – 4 th edition
HRSD	Hamilton Rating Scale for Depression
IGT	Imagery Generation Task
LOT-R	Life Orientation Test- Revised
MDE	Major Depressive Episode
MDQ	Mood Disorder Questionnaire
MEST	Memory Specificity Training
OXIGEN	Oxford Imagery Generation
PANAS	Positive and Negative Affect Schedule
PIT	Prospective Imagery Task
PPI	Positive Psychology Interventions
PTSD	Post Traumatic Stress Disorder
RCI	Reliable Change Index
SCID	Structured Clinical Interview for DSM-IV
SST	Scrambled Sentences Test
STAI-T	State-Trait Anxiety Inventory- Trait Scale
SUIS	Spontaneous Use of Imagery Scale
TGT	Three Good Things
VAS	Visual Analogue Scale

CHAPTER 1

Literature Review: Modulating Cognitive Bias in the Context of Depression: Mental imagery, Emotion and Behaviour

Aim and Background

Major depressive disorder imposes a considerable burden on the individual and the society. It affects over 120 million people worldwide and is projected to be the leading cause of disability of all diseases by 2030 (World Health Organization, 2008). Despite the scope and severity of depression, the vast majority of people do not access effective treatment. Estimated rates of access to mental health indicate that only between 10% and 25% of individuals who suffer from depression receive treatment (Collins, Westra, Dozois, & Burns, 2004). Barriers to treatment are multiple and include the lack of suitably qualified therapist and the costs of treatment, and also fear of stigma and reluctance to disclose problems. Further, existing psychological treatments for depression have limited efficacy, with approximately 50% of patients not responding to evidence based interventions (Hollon, Thase, & Markowitz, 2002). In this context, the development of innovative treatments that are effective and widely accessible is warranted.

Recently developed interventions called “cognitive bias modification” represent promising candidates to address these challenges, as their computerized format allows greater accessibility and minimal human support (MacLeod, Koster, & Fox, 2009). CBM refers to a range of computerized training interventions designed to correct information processing biases in attention, interpretation or memory that are thought to contribute to emotional disorders. A causal link between information processing biases and vulnerability to anxiety and depression has been established in previous research (Fox, Cahill, & Zougkou, 2010; Mathews & MacLeod, 2005; Raes et al., 2006). CBM procedures are being applied to an increasingly wide range of cognitive biases associated with depression, such as emotion

recognition, attributional style and overgeneral memory (Adams, Penton-Voak, Harmer, Holmes, & Munafo, 2013; Peters, Constans, & Mathews, 2011; Raes, Williams, & Hermans, 2009). Yet, the majority of CBM research in depression to date has focussed on targeting biases in attention and interpretation (Hallion & Meron Ruscio, 2011). In attentional bias modification procedures (referred to as ABM in the current thesis), a dot-probe task can be used to train individuals to shift their attention away from negative information, (C. MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). Most ABM studies have focussed on reducing bias for threatening information in anxious individuals, but a few attempts have also been made to apply ABM to depression using mood-incongruent stimuli, e.g. happy faces (e.g. Browning et al., 2012).

Interpretation bias modification procedures (referred to as CBM-I in the current thesis) are designed to alter interpretation bias by training individuals to systematically interpret emotional ambiguity in a positive or negative way. CBM-I typically involves presenting participants with a series of ambiguous sentences in which the last word, which determines the valence, is presented as a word fragment that participants must solve (Mathews & Mackintosh, 2000). The current thesis will focus on exploring the effects of a particular CBM-I intervention in which participants are trained to generate positive future imagery in response to ambiguous scenarios. The potential benefit of this “imagery-based CBM-I” for depressed mood will be tested, and the laboratory paradigm will be developed into an internet-delivered, self-administered intervention for people with clinical depression. The present chapter will start with a review of recent CBM interventions with relevance for depression.

CBM in Depression

In the last few years there has been a surge of interest into the potential of CBM as a new approach for treating various psychological disorders (Carey, 2012; Gee, 2011). Despite the growing number of clinical applications of CBM however, most studies have focussed on anxiety and only a few have examined the potential benefit of CBM in depression. One of the first tests of CBM in a sample of mild to moderately depressed individuals was carried out by Wells and Beevers (2010) using a 4-session ABM program. Although no effects were observed immediately following training, depressive symptoms were reduced in the ABM group at a 2-week follow-up assessment. In support of the hypothesised mediation of bias modification in CBM effects on clinical symptoms, improvements in depressive symptoms were shown to be mediated by reductions in attentional bias. Using a similar ABM paradigm, Baert and colleagues (2010) tested the effects of a 10-session intervention in two samples of dysphoric and depressed individuals. Only small improvements in depressive symptoms were found, and only in participants from the dysphoric sample who had mild levels of depressive symptoms. Those who had more severe depressive symptoms did not gain any benefit from the CBM intervention.

More recent studies have found more encouraging results. In Haeffel, Rozek and colleagues (2012) for example, a single session of ABM was shown to result in fewer depressive symptoms and greater persistence on a difficult laboratory task (i.e. difficult and unsolvable anagrams) compared to a control intervention. In Browning, Holmes and colleagues (2012), a 2-week ABM intervention involving 28 sessions was shown to reduce risk of depression recurrence in remitted patients. Despite these two exceptions however, applications of ABM to depression have to date proved to be of limited efficacy, leading some researchers to suggest that ABM procedures may be more suitably applied to anxiety than

depression (Hallion & Meron Ruscio, 2011). Researchers have explored other forms of CBM in the context of depression, with often more encouraging results.

In Watkins, Baeyens and colleagues (2009) for example, a CBM intervention called “concreteness training” (CNT) was developed with the aim of reducing rumination and overgeneralization in depression through repeated practice in adopting a concrete style of thinking. Results showed that compared to a control condition, CNT led to significant reductions in depressive symptoms as well as reduced rumination and overgeneralization in a sample of dysphoric individuals. These findings were recently replicated in a large-scale controlled study, in which CNT was found to produce significant and durable symptom improvements in a sample of clinically depressed individuals (Watkins et al., 2012).

A similar intervention called “Memory Specificity Training” (MEST) was developed by Raes and colleagues (2009). The aim of MEST was to increase memory specificity in depression through repeated practice in recalling autobiographical memories with as much sensory and contextual details as possible. Findings from a recent clinical study indicated that MEST produced greater reductions in depressive symptoms and increases in memory specificity relative to a control condition (Neshat-Doost et al., 2013)

The positive findings from the two interventions reported above suggested that training depressed participants to adopt a more healthy thinking style (i.e. concrete or specific) via repeated practice could be an efficient target for the treatment of depression. However, the development of CBM interventions for depression was still at an embryonic stage and more research was needed to identify the most efficient ways of enhancing the efficacy of CBM. With the exceptions of the last two studies reported above, CBM had to date shown very limited efficacy in reducing depressive symptoms, both in depressed or anxious samples (Hallion & Meron Ruscio, 2011). Even though comparison of the effects of

CBM on bias indicated that CBM paradigms targeting interpretation bias (CBM-I) produced greater effect on bias than those targeting attentional bias, their effects on symptoms were equivalent and small-to null (Hallion & Meron Ruscio, 2011).

One possible explanation for the limited efficacy of CBM in depression was that the procedures used had produced insufficient changes in cognitive bias to substantially influence symptoms. Despite the growing number of studies investigating the clinical potential of CBM, little was known about the key ingredients that were needed in CBM to maximise its efficacy. The approach in our lab has been to explore the possibility that mental imagery might be a key ingredient in a CBM procedure targeting negative interpretation bias (imagery-based CBM-I) in depression. People with depression have been shown to experience difficulties with vividly imagining positive events in the future (Morina, Deeprose, Pusowski, Schmid, & Holmes, 2011), thus practising such imagery may produce benefit over and above that produced by the interpretation bias modification alone. Consistent with this proposal, recent research has shown that depression is characterized by multiple cognitive biases that may produce an interactive or additive effects on symptom improvements (Everaert et al., 2012). Hence, targeting both negative interpretation bias and deficits in positive imagery may augment the therapeutic effect of CBM.

A series of experimental studies which are reported below have demonstrated that mental imagery has a more powerful effects on emotion and cognitive bias than verbal language in a CBM-I paradigm (see Holmes & Mathews, 2010 for a review). This line of experimental research has culminated in two recent tests of imagery-based CBM in clinical samples, which have provided preliminary evidence the intervention could hold benefit in depression (Blackwell & Holmes, 2010; Lang, Blackwell, Harmer, Davison, & Holmes, 2012). These studies will be described below, preceded by an introductory section on mental imagery.

Mental Imagery

Mental images inhabit our everyday mental life. They can take a range of forms, from the sudden recollection of past events popping to mind unexpectedly, to deliberately imagining the future. Images can be fuzzy and fragmented, and vanish in the blink of an eye. But they can also be vivid and detailed, and seem clear like actual vision. Mental images are sensory-like experiences in the absence of direct perceptual stimulation. They can occur in any sensory modality and have therefore been described as “seeing with the mind’s eye”, “hearing with the mind’s ear” and so on (Kosslyn, Ganis, & Thompson, 2001). The hallmark clinical examples of mental images are the flashbacks associated with Posttraumatic Stress Disorder (PTSD). Flashbacks comprise vivid and distressing images of a traumatic event which intrude into mind unbidden. In social phobia, distorted images of the self (e.g. blushing badly in a social situation) can be mistaken as an accurate reflection of reality. People with depression may have insufficient positive imagery, or those with bipolar disorder an excess of imagined goals when in mania. This led to the suggestion that imagery might act as an “emotional amplifier” in psychopathology, amplifying both negative and positive emotional states (Holmes, Geddes, Colom, & Goodwin, 2008).

Evidence for the powerful impact of mental imagery on changing emotion and bias in a cognitive bias modification

It has long been assumed that mental imagery has a strong impact on emotion. However, in the absence of experiments to test this effect such claims were dismissed as “clinical anecdote” (Watts, 1997). A series of recent experiments have tested the hypothesis that mental imagery has a more powerful emotional impact than verbal processing of the same material in a CBM-I paradigm.

In CBM-I, participants were encouraged to generate mental images of auditory scenarios that were initially ambiguous but then ended up being resolved in either a negative

or benign way. The sentence was ambiguous until the final word was provided (Mathews & Mackintosh, 2000). An example was: *You have gone to Australia. You are swimming in the sea and see a fin snaking toward you and realise it is a* A negative resolution would be the word *shark*, or a benign resolution *dolphin*. In an imagery CBM-I condition, participants were given general training in using mental imagery, for example via a lemon exercise. In this exercise, participants imagined holding a lemon, looking at it skin, cutting it and having the juice squirting into their eye. Then, in the CBM phase, they imagined approximately 100 scenarios unfold to the outcome. A typical trial consisted of 10 to 13 sec. of auditory scenario followed by an additional 2-sec. gap, and then participants were asked to rate the vividness of their mental image.

Emotional Impact of Imagery versus Verbal Language

In order to test whether using imagery would have a more powerful impact on negative imagery than verbal language, Holmes and Mathews (2005) randomly assigned participants to one of the following two negative conditions: In the imagery condition they were asked to imagine the CBM-I scenarios through their own eyes, as if they were actively involved in the situation. In the verbal condition they listened to the same scenarios while thinking about the words and meaning. Results from two experiments showed greater increases in anxiety in the imagery compared to the verbal condition.

The finding that negative imagery produced strong effects on anxiety suggested that generating positive imagery might inversely increase positive affect. Holmes, Mathews, Dalgleish and Mackintosh (2006) developed CBM-I scenarios resolved with overtly positive outcomes. An example was: *It's your birthday, and your partner reaches over to you with a present. You open it and feel incredibly happy.* As before, participants were allocated to imagery or verbal conditions. Results confirmed that using positive imagery led to greater increases in positive affect than verbal language. In order to provide a measure of

interpretation bias, Holmes et al. (2006) used a series of positively and negatively resolvable ambiguous descriptions that participants were asked to rate both before and after the training phase. Results did not confirm the hypothesis that emotionality ratings of positively resolvable scenarios (i.e. positive interpretation bias) would increase over training, although the results were in the expected direction. A surprising finding was that emotionality ratings of positively resolvable scenarios decreased significantly in the verbal condition (i.e. became more negative), and that mood deteriorated following the CBM-I. While the effects of verbal language had been predicted to be “weaker” than those of mental imagery, Holmes et al. (2006) found that mood and bias deteriorated in participants assigned to the verbal condition.

One potential explanation for this unexpected finding was that verbal instructions may have prompted participants to make unfavourable verbal comparisons between themselves and the overtly positive CBM scenarios. By contrast, mental images can take longer to generate and thus making comparisons may have been more effortful. To test this hypothesis, Holmes et al.(2009) created two new verbal conditions which aimed to either increase or decrease the amount of comparisons being made. In the “verbal comparisons condition”, the original verbal instructions were supplemented with the request to actively compare each scenario with how things were in reality for the participant. In the “verbal reduced comparisons condition”, the instruction to “focus on the meaning” was removed and the time available to make comparisons reduced. As predicted, the “verbal comparisons condition” led to greater increases in anxiety than those in the two other conditions. This supported the hypothesis that unfavourable self-comparisons may have contributed to findings of mood deterioration in the original verbal condition.

Beyond the immediate effects of imagery on state emotion an important question was whether the impact of mental imagery could protect people from a later mood stressor. This question held relevance for depression, as depressive relapse had been associated with greater

reactivity to even small negative mood challenges. Holmes, Lang and Shah (2009) used a positive CBM-I procedure with imagery versus verbal conditions. They added a negative mood induction at the end of the experiment, which involved reading negative statements (e.g. *I'm discouraged and unhappy about myself*) while listening to depressing music. Holmes et al (2006) findings were replicated, in that mental imagery led to greater mood improvement than verbal instructions. Following the negative mood induction, mood worsened to a lesser extent in the imagery than the verbal group. This suggested that positive mental imagery was relatively protective against the mood deteriorating effect of a mood stressor.

Further Experimental Evidence for the Impact of Imagery on Emotion: using a Picture-Word Cue Paradigm

To date, our overarching conclusion about the emotional power of mental imagery might be challenged by the fact that the CBM-I stimuli used were all verbally based. As all participants had to listen to the event descriptions before going on to produce a mental image or to focus on their verbal meaning, it could be argued that the differences observed may merely have resulted from the recruitment of an additional representational system in the imagery condition. In other words, the greater emotional impact of the imagery condition relative to the verbal condition could have been due to more processing resources being engaged rather than to the effect of imagery per se.

Holmes et al (2008) therefore developed an experimental paradigm drawing on the evaluative learning literature that combined both perceptual (pictures) and verbal (words) cues. In this picture-word paradigm, participants were asked to combine pictures with an associated caption using either an image (i.e. “imagine the combination of the next picture and word”) or a verbal statement (i.e. “make a sentence combining the next picture and the word”), within alternating experimental blocks of negative or positive combinations. An

example included a picture showing the view from a high bridge, with the word “leap” in the negative and “view” in the positive condition.

Imagery had a mood amplifying effect relative to verbal condition for both the negative and positive stimuli. A similar pattern was shown on liking ratings for a subsample of pictures that were displayed alone before and after the picture-word combination task (akin to an evaluative conditioning effect). Overall, findings provided convergent evidence to the CBM-I studies for the greater impact of imagery compared to verbal processing on emotion.

The impact of mental imagery perspective on emotion

A caveat in the broad conclusion about imagery and emotions on which we are converging, is that not all images have an equal impact. Mental images can be viewed either from a “field” perspective, whereby one visualises the event through one’s own eyes as if actively involved, or an “observer” perspective, whereby one is watching oneself from the outside and experiencing the event as a bystander. Observer perspective images are thought to be less emotional (Bernsten & Rubin, 2006). In line with this, previous CBM-I studies have used field perspective instructions to maximise the emotional effects. Holmes, Coughtrey and Connor (2008) used a positive CBM-I paradigm contrasting field perspective, observer perspective or verbal instructions. As predicted, field perspective enhanced positive affect more than imagining them from an observer perspective or thinking verbally. This suggested that field perspective imagery needed to be harnessed in order to enhance positive affect.

A heuristic model for the powerful impact of mental imagery versus verbal representations on emotion

Potential explanations about why mental imagery has a particularly powerful impact on emotion have been discussed by Holmes and Mathews (2010). As illustrated in Figure 1, one compelling hypothesis is that mental imagery has direct access to emotional systems in

the brain because of its similarity with actual perception (see also De Houwer & Hermans, 1994). Compared to real perception, imagining emotional stimuli has been found to activate similar neural activity and to produce a similar physiological response. Sensory stimuli and thus images may have privileged access to emotional systems. This is thought to apply to both involuntary mental images (e.g. PTSD flashbacks) and deliberately generated images (e.g. voluntarily imagining a snake). While intrusive imagery is automatically elicited (bottom up) when a sensory cue partially matches a representation in episodic memory, voluntary imagery is generated via top-down control processes. In contrast to imagery (whether involuntary or deliberately generated) verbal language may link to other knowledge in semantic memory but shows little overlap with actual perception (for further detail see Holmes & Mathews, 2010)

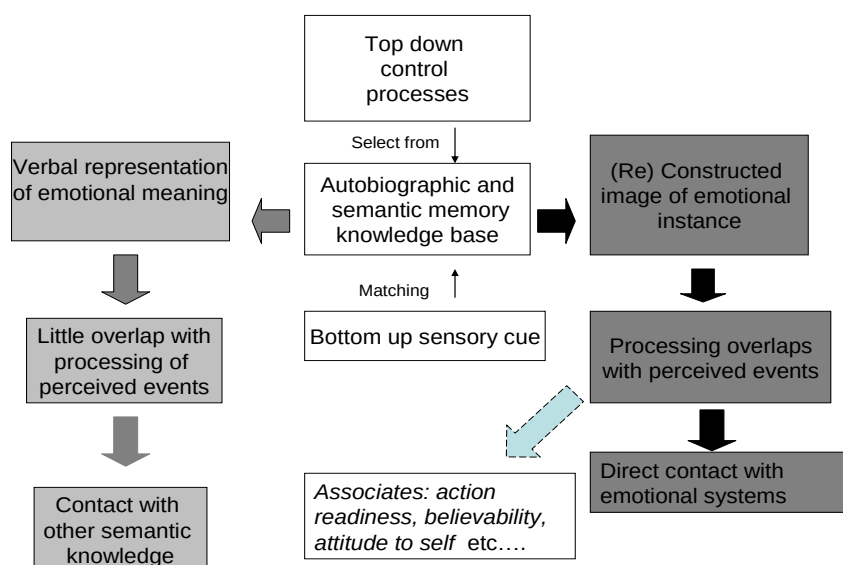


Figure 1.1 The construction of imagery versus verbal representations, related to their relative impact on emotion (taken from Holmes & Mathews, 2010).

Steps from the lab towards clinical translation about positive imagery: Clinical case series and a small clinical study

Depressed mood has been associated with a reduced ability to vividly imagine positive events happening in the future (Holmes, Lang, Moulds, & Steele, 2008; Morina et al., 2011) and a tendency to recall positive autobiographical memories from an observer perspective (Bergouignan et al., 2008; Nelis, Debeer, Holmes, & Raes, 2013). The “vividness” of imagery can be described as the extent to which individuals can mentally create images and experiences them as clear, sharp, and detailed (Quilter, Band, & Miller, 1999). Vividness and use of field perspective have been associated with increased emotionality for both positive and negative imagery, thus a combination of impoverished and distorted positive imagery with compelling, vivid negative imagery could play an important role in maintaining mood disturbance in depression. This suggested that a repeated practice in generating first-person, vivid positive future imagery in a CBM-I program could be of benefit for people with depression. This possibility has been tested in two recent studies.

Blackwell and Holmes (2010) used a single case series approach with 7 patients with major depressive disorder. Each received 7 sessions of positive imagery CBM-I administered once daily. Overall, there were large effect sizes for improvement in depressive symptoms and cognitive biases. Improvements extended to a two weeks follow-up. An interesting observation in Blackwell and Holmes (2010) was that some participants reported experiencing intrusive imagery of the positive scenarios and increased approach behaviour over the course of a week of positive imagery-based CBM. These findings suggested that changes in imagery and behaviour might be important mediators of symptom improvement, but this hypothesis remained to be tested using objective measures and within a controlled laboratory setting. Blackwell et al. (2010) provided initial support for the potential of promoting a habit to generate positive imagery in improving depressed mood. In the absence of a comparison

condition however, it was not possible to rule out “non-specific” factors as well as spontaneous recovery.

Lang, Blackwell and colleagues (2012) addressed this by exploring the impact of repeated sessions of positive imagery CBM-I compared with a control condition in a sample of currently depressed patients. The positive condition again led to improvement in depressive symptoms and cognitive bias from pre to post-treatment compared to the control condition, maintained at the 2-weeks follow-up. Interestingly, participants who gained a benefit from positive imagery CBM-I presented higher levels of general use of mental imagery of positive future imagery at baseline compared to those who did not gain any benefit. This finding reinforced the hypothesis that mental imagery might be important to bring about symptom improvements in imagery-based CBM-I.

Conclusion and Next Steps

This chapter has presented a brief review of the literature relevant to mental imagery and CBM in depression. To date, the clinical utility of CBM for depression has been relatively unexplored and current evidence suggests that paradigms such as CBM-A are of limited efficacy at reducing symptoms. In this context, the experimental studies described above converged on the suggestion that incorporating positive future imagery in a CBM-I intervention might be beneficial for depression. In support of this hypothesis, preliminary tests of imagery-based CBM in clinical depression have provided encouraging findings, but their interpretation was limited by the small samples used. Further, the indication that variables such as positive future imagery and approach behaviour may be important components of imagery-based CBM relied exclusively on correlational or observational data. No evidence had yet been provided that imagery-based CBM-I could produce measurable change in positive future imagery and approach behaviour.

The current thesis aimed to explore the putative mechanisms underlying imagery-based CBM, with a focus on mental imagery and behaviour. Research described in this thesis investigated change in positive future imagery and approach behaviour in large sample studies, and using valid and independent measures. A second aim of the thesis was to take a further step in translating a laboratory-based CBM-I paradigm into a larger-scale, internet-delivered intervention for clinical depression.

The starting point of the thesis was the general conclusion drawn from the studies reviewed above that incorporating positive imagery might be a useful way of enhancing the positive effects of CBM-I in depression. The first experiment of this thesis aimed to test this hypothesis using a recently developed CBM paradigm involving picture and word cues (i.e. Picture-Word CBM). A primary aim of Experiment 1 was to explore whether the impact of CBM could transfer to subsequent behaviour in a sample of mildly depressed individuals. This hypothesis was based on previous evidence (reviewed in the next chapter of the thesis) showing that mentally imagining a future behaviour can make people more likely to actually engage in this behaviour later on (e.g. Gregory, Cialdini, & Carpenter, 1982). Thus, exploring the impact of positive imagery CBM on approach behaviour had clinical relevance given the deficits in motivation and approach behaviour associated with depression. Consistent with the hypothesized link between imagery and behaviour, participants in Blackwell et al. (2010) reported experiencing increased behavioural activation over the course of positive imagery-based CBM. However, these findings relied on qualitative data collected in a very small sample of participants, and thus a larger-sample study using a more objective measure of behaviour was needed to establish the effects of imagery-based CBM on approach behaviour. This will be the focus of Experiment 1.

CHAPTER 2

Experiment 1: An Experiment to Test the Impact of Positive Imagery on Emotion and Behaviour, using a Fishing Game Task in an Imagery-Based Cognitive Bias Modification Paradigm

Aim and Background

Experimental evidence reviewed in the preceding chapter of the current thesis has shown that generating mental imagery in the context of a CBM paradigm involving picture-word cues had a causal impact on emotion, at least for images prompted by negative or benign stimuli. It remained unclear whether this finding extended to overtly positive stimuli and whether generating positive imagery in a picture-word CBM could have positive effects on mood and cognitive bias. Experiment 1 of the current thesis aimed to test the hypothesis that compared to mixed or negative imagery CBM, positive CBM would lead to greater increases in positive affect and lower levels of negative interpretation bias in a sample of mildly depressed participants.

A second aim of the study was to explore whether the effects of positive imagery CBM would transfer to subsequent behaviour and cognitive bias. In support of the hypothesized influence of positive imagery on behaviour, Blackwell et al. (2010) reported that some participants had experienced increased behavioural activation over the course of an imagery-based CBM intervention. This finding had relevance for depression given the well-demonstrated deficits in approach behaviour and persistence associated with the condition. The current experiment thus sought to test the hypothesis that compared to participants assigned to a neutral and negative imagery CBM, participants assigned to a positive imagery condition would show higher levels of behavioural performance on a laboratory task assessing approach motivation.

The Use of Positive Imagery to Increase Positive Affect in Depression

Can we engage imagination to promote more positive mood? Recent evidence using picture-word cues suggested that evoking mental imagery had a more powerful impact on emotion than using verbal language (Holmes, Mathews, Mackintosh, & Dalgleish, 2008), at least for negative and benign stimuli. This was consistent with a line of research suggesting that mental imagery had a special impact on emotion (Arntz, de Groot, & Kindt, 2005; Holmes & Mathews, 2005, 2010; Holmes, Mathews, Dalgleish, & Mackintosh, 2006). However, the impact of generating mental imagery from overtly positive picture-word stimuli remained to be explored. We knew little about the promotion of overtly positive imagery, particularly when this is most needed as in depressed mood.

Research suggested that individuals with depression failed to benefit from the emotional lift provided by evoking past and future positive personal events (Joorman, Siemer, & Gotlib, 2007; Joormann & Siemer, 2004). Several mechanisms might contribute to this effect. With respect to mental imagery, this lack of congruent emotional response might be explained by three characteristic features of depressive thinking: First, depression has been shown to be associated with a deficit in generating positive imagery about the future (Holmes, Lang, Moulds, & Steele, 2008; Stöber, 2000; Williams et al., 1996). Second, depression is characterized by rumination which is predominantly verbal in nature (Fresco, Frankel, Mennin, Turk, & Heimberg, 2002). The verbal processing of positive information can have the paradoxical effect of worsening mood rather than improving it (Holmes, Lang, & Shah, 2009). Finally, depressed individuals tend to recall positive autobiographical events from an observer rather than a field perspective (Lemogne et al., 2006). Imagining positive scenarios from an observer perspective has been shown to lower mood, possibly due to unfavorable comparisons with perceived reality (Holmes, Coughtrey, & Connor, 2008). For all these reasons, we have suggested the utility of promoting positive future-oriented, field

perspective mental imagery for improving depressed mood (Blackwell & Holmes, 2010; Holmes, Lang, & Shah, 2009).

The Use of Positive Imagery to Boost Behaviour in Depression

The benefit of generating images about positive future outcomes may not be limited to mood and cognitive bias improvement but extend to subsequent behaviour. Indeed, a body of evidence suggests that imagining one's own future behaviour can increase the likelihood of that behaviour being enacted in reality (Carroll, 1978; Gregory, Cialdini, & Carpenter, 1982; Pham & Taylor, 1999). Imagining a possible event outcome has been shown to increase subjective probability that the same outcome will actually occur (Carroll, 1978). Depressed individuals' attitudes towards the future is marked with reduced expectancies for positive events (MacLeod, Rose, & Williams, 1993; Pyszczynski & Greenberg, 1987) and a lack of approach motivation towards future goals (Dickson & MacLeod, 2004). Moreover, a clinical feature of depression is a lack of interest in almost all everyday activities that were previously perceived as rewarding and enjoyable (American Psychiatric Association, 2000). Consequently, individuals with depression are less persistent and tend to engage less time in goal-directed behaviours than do healthy individuals (Hopko, Armento, Cantu, Chambers, & Lejuez, 2003; Hopko & Mullane, 2008). Enhancing positive future imagery may provide one avenue for ameliorating this behavioural deficit in depression.

Exploring the transfer of positive mental imagery to behaviour is of both clinical and theoretical relevance (Kavanagh, Andrade, & May, 2005). The deficit in motivated behaviour is one of the most pernicious symptoms in depression because it cuts the individual off from pleasant and rewarding experiences. This behavioural component of depression has long been targeted in Cognitive Behavioural Therapy (CBT) and has also given rise to the development of successful interventions known as "behavioral activation" (Jacobson, Martell, & Dimidjian, 2001). The aim of behavioural activation is to increase the likelihood of engaging

in rewarding behaviours. Therefore, the clinical relevance of using an experimental task designed to encourage positive mental imagery to alleviate depressed mood would be further supported if a behaviour-enhancing effect followed training. A fishing game task was chosen as a simple behavioural performance measure assumed to tap behaviour negatively associated with dysphoria, such as approach motivation and persistence, while being clearly different in nature from the picture-word task.

In the current experiment, dysphoric participants were given training and instructions to evoke mental imagery in line with our previous work on mental imagery generation (Holmes, Mathews, et al., 2008). Participants were then asked to imagine and rate the vividness of imagery in response to viewing 200 picture-word combinations within one of three conditions: In the positive condition pictures were presented with a caption that created a positive resolution (for examples, see Method section), in the negative condition the same pictures were combined with a caption yielding a negative resolution, while in the control condition half of the pictures were associated with positive and the other half with negative resolutions (similar to the approach of Hirsch, Hayes, & Mathews, 2009). Measures of mood were taken before and after all combinations had been presented and again after a 10-min filler task, intended to equalize mood before completion of the behavioural task (a fishing game). To assess the durability of effects, a measure based on the perceived meaning of emotionally ambiguous homophones (Mathews, Richards, & Eysenck, 1989) was completed over the telephone (for convenience) 24 hours later.

Hypotheses

The present experiment aimed to test the hypotheses that within a sample of individuals with mild levels of depressed mood

1. Compared to participants completing a control or negative version of imagery-based CBM, participants completing a positive imagery version will show greater increases pre to post-CBM in positive affect (PANAS)

2. At post-CBM, participants in the positive imagery group will show lower levels of negative interpretation bias (as assessed by the homophone task) than participants in the control or negative imagery group.

3. At post-CBM, participants in the positive imagery group will show greater levels of behavioural performance (on the fishing game task) than participants in the control or negative imagery group.

Method

Participants

Eighty-seven individuals (50 women; mean age = 27.96, $SD = 11.33$) with scores in the dysphoric range on the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) were recruited via advertisements in the local University town. When defining dysphoric samples it is generally recommended to use a multistage process (Kendall, Hollon, Beck, Hammen, & Ingram, 1987; Wenzlaff & Bates, 1998) to ensure that negative mood is not merely elevated at the start of the experimental session. In this study we defined dysphoric mood as a Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) score of 10 or above, at two time points, separated by at least 5 days, following Aarts, Wegner and Dijksterhuis (2006), Dalgleish and Yiend (2006) and Sedek & von Hecker (2004). Thus, of the 87 participants meeting criteria at recruitment, 81 still met criteria at the beginning of the

experimental session and were therefore included. The 6 people that no longer had a BDI-II score of 10 or above at the beginning of the experimental session ($M = 8.00$, $SD = 1.55$) did not differ from the sample in terms of age, $t = 1.06$, $p = .29$, or gender $\chi^2(2, N = 87) = 3.57$, $p = 0.60$. The mean BDI-II score for the final sample of 81 participants was 17.63 ($SD = 7.56$) at recruitment, and 16.52 ($SD = 7.21$) at the beginning of the experimental session (henceforth referred to as time 1 in Table 2.1).

Table 2.1

Characteristics of Participants at Baseline per Condition

Characteristic	Positive (n = 27)		Negative (n = 27)		Control (n = 27)	
	M	SD	M	SD	M	SD
Age (years)	29.78	12.37	28	12	26	9.50
Gender (%)						
Female	59		67		59	
Male	41		33		41	
BDI-II						
At recruitment	18.15	7.96	17.00	6.98	17.74	7.94
At baseline (time 1)	16.67	6.85	16.30	7.14	16.59	7.87
BHS	6.04	4.59	6.00	5.43	6.89	5.10
STAI-T	46.33	11.23	46.41	11.93	48.96	10.38
SUIS	41.15	6.52	38.63	8.39	39.85	9.10

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

Materials

Picture-word cues to generate mental images

Participants were required to generate mental images in response to picture-word cues as in earlier research (Holmes, Mathews, et al., 2008), for more details see the Procedure. Presentation of the picture-word cue stimuli was controlled using E-Prime software, version 1.1 (Schneider, Eschman, & Zuccolotto, 2002) running on a Dell PC (P791). The set of 200 digital pictures used were photographed for the study by local art students given the remit of producing ambiguous pictures, or by the authors using a Sony digital camera, or downloaded from the internet. The pictures were 640 x 480 pixels saved as Bitmap files. They were displayed, centered on the 17" VDU such that their height took up 85% of the VDU height.

Each picture was of common everyday objects and scenes from the local area that a student might typically encounter (e.g. students attending a lecture, partying with friends, sporting activities). Each picture was paired with a word or short phrase intended, when paired with the relevant picture, to create a positive emotional resolution (e.g. a picture of students attending a lecture, and the word "understanding") or negative emotional resolution (e.g. the same picture with the word "struggling"). In the control condition, half of the pictures were paired with captions from the negative condition, and the remaining 50% were captions from the positive condition. All participants saw the same pictures, but the captions accompanying them differed accordingly to their assigned condition. During the imagery generation phase, each word was displayed in white against a black background, centrally beneath the relevant picture, using type font Arial at point size 30, for 3500 ms. During the liking ratings (see below), the pictures were displayed without words against a black background.

Filler task to equalize mood

An unrelated task of listening to a series of 40 s classical music extracts was administered during a 10-min interval after the imagery generation phase. This task has been successfully used in previous studies (Holmes, Lang, & Shah, 2009; Holmes et al., 2006) to minimize the influence of mood differences across groups before post-training assessment tasks. Participants rated how pleasant they found each musical extract on a scale of 1 (*extremely unpleasant*) to 9 (*extremely pleasant*).

Homophone task

A list of 14 homophones (e.g. dye/die) and 14 unambiguous neutral words of similar word frequency was used (based on Mathews et al., 1989; Mogg, Bradbury, & Bradley, 2006) (See Appendix 2.3). The task was chosen for reasons of convenience since it could be delivered by telephone 24 hours after the experimental session. The experimenter read the homophones over the phone one word at a time. Participants were required to report the spelling of each word in turn. The total number of negative spellings (i.e. die rather than dye) was then calculated, and converted into a percentage of the number of all correctly spelled homophones.

Questionnaire measures

The trait tendency to use mental imagery was measured using the 12-item Spontaneous Use of Imagery Scale (SUIS: Reisberg, Pearson, & Kosslyn, 2003). Each item was rated on a 5-point scale (never appropriate to always completely appropriate).

Depressive symptoms were measured using the 21-item Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) in which participants responded to a series of questions on a scale from 0 to 3. Possible scores range from 0 to 63, with 0 to 13 classified as minimal depression and 14 to 19 as mild depression. 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). In addition, hopelessness was measured using the 20-item Beck Hopelessness Scale (BHS; Beck & Steer, 1993) rated on a dichotomous scale (*true-false*).

Positive affective state was measured using the combined positive affect subscales (21-items) of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) as in previous work (e.g. Holmes, Mathews, et al., 2008). Each word was rated on a 5-point scale (*very slightly or not at all* to *extremely*), using the short-term time instructions (“Indicate to what extent you feel this way now / in the past few minutes”).

Behavioural task: The fishing game.

This simple task employed a toy measuring 1500 mm x 900 mm x 250 mm, in which 12 brightly colored plastic fish moved round in a circle, opening and closing their mouths to reveal a magnet. Participants were required to catch as many fish as they could in 2.5 min by “hooking” them using a magnet on the end of a 900 mm plastic fishing rod. The authors used 2 different sets of fishing games of identical make and model.

Valence ratings

Valence ratings for 50 pictures (in the absence of words) were obtained before and after the imagery generation task (as in Holmes, Mathews, et al., 2008). To sample across the 200 trials, the 50 pictures consisted of a sub-selection of approximately 10 taken from each of the 5 picture-word training blocks, presented in a randomized order. Participants rated the emotional valence of each picture from 1 extremely unpleasant to 9 extremely pleasant using a standard keyboard.

Subjective experience questions

As a further manipulation check, participants were asked a series of questions about their subjective experience of performing the picture-word task. Questions assessed task difficulty (“How difficult or easy did you find your task of combining the picture and the

word”), use of verbal processing and imagery during the training phase (“How much were you verbally analyzing/ imagining the picture-word combinations?”) and use of field perspective (“How much were you imagining the picture-word through your own eyes”). Questions were rated on 9-point scales, ranging from 1 (not at all) to 9 (extremely/all the time).

Procedure

Participants gave their written informed consent and were randomly assigned to positive, negative or control conditions ($N = 27$ per condition). They completed the BDI-II (for the second time to confirm dysphoric status), trait STAI, SUIIS, BHS and PANAS (time 1). Then participants completed the valence ratings of 50 pictures presented on the computer.

The mental imagery generation instructions, similar to those used in Holmes et al. (2008) were then read out: In all conditions, mental imagery was described as “the experience of seeing with the mind’s eye, hearing with the mind’s ear, and so on....”, using Kosslyn et al.’s definition (2001), i.e. in any sensory modality. All participants were given an imagery generation practice task of imagining cutting a lemon. The difference between field (first person) and observer (third person) imagery was explained using two photographs of a person in the laboratory taken from either a field or observer perspective (as in Holmes, Coughtry, et al., 2008). Participants were asked to imagine the combination of each picture and word from a field perspective (i.e. seeing the situation through their own eyes, as if they were actively involved). The experimenter also explained how it was possible to imagine anything, even if it did not immediately seem believable, using a picture of a flying elephant as an example.

In the next stage, practice was given in generating mental imagery in response to picture-word cues. Two picture-word combinations (one positive and one negative) were given on paper as practice examples by the experimenter. Next, four picture-word items,

consistent with condition assignment were presented on the computer as full practice examples (as in Holmes, Mathews, et al., 2008). Participants were told that they were to produce a field perspective mental image combining the picture with the word. Instructions on the computer screen for 1000 ms stated “imagine the combination of the next picture and word as if you were actively involved”. The picture and word then appeared for 3500 ms, followed by a 1000 ms beep. Participants were asked to shut their eyes and imagine, and to describe their practice images aloud while the experimenter checked that the description of the mental image included reference to both picture and word. To promote compliance with the imagery task instructions, after each picture-word trial, participants had 10 sec in which they made a rating of mental image vividness on a 5-point scale from *not at all vivid* to *extremely vivid*. Participants then continued to the remaining practice items.

Main experimental task

Participants were asked to generate mental images (as defined and practiced above) in response to each of a series of picture-word cues. Two hundred picture-word cues were presented in 5 randomized blocks of 40 according to condition. As in the practice trials, instructions, presented on the computer screen for 1000 ms, stated “imagine the combination of the next picture and word as if you were actively involved.” The picture-word cue was displayed for 3500 ms, followed by a 1000 ms beep. Participants could shut their eyes and imagine once they saw the stimulus, but in the experimental phase were not asked to describe their ensuing mental imagery aloud. To promote task compliance in generating imagery, after each picture-word trial participants had 10 sec in which they could continue to imagine and then made a rating of image vividness on a 5-point scale from *not at all vivid* to *extremely vivid*. Instruction reminders were given in between blocks.

The PANAS was re-administered at the end of the imagery generation phase (time 2). Following this there was a 10 min filler task before the PANAS was re-administered (time 3).

Participants then completed valence ratings for 50 pictures each displayed alone for 1500 milliseconds, in a separate random order for each participant, followed by the behavioural task in which they were given the fishing game and asked to catch as many fish as they could in 2.5 min. Finally participants completed the manipulation check ratings and left the laboratory. At 24 hours after the experimental session, the experimenter telephoned each participant and administered the homophone task. Finally, all participants were debriefed and thanked.

Results¹

An alpha level of 0.05 was used for all statistical tests (see statistical output in Appendix 2.2)

Randomization checks

Comparisons of participant characteristics between groups assigned to each condition revealed no significant differences in terms of gender (11 men in the positive condition, 9 men in the negative condition, and 11 men in the benign condition); age, $F(2,78) = 0.72$, $p = .49$; BDI-II at recruitment, $F(2,78) = 0.16$, $p = .86$; BDI-II at baseline Time 1, $F(2,78) = 0.19$, $p = .98$; BHS, $F(2,78) = 0.27$, $p = .77$; SUIIS, $F(2,78) = 0.66$, $p = .52$; STAI-trait, $F(2,78) = 0.48$, $p = .62$ (see Table 1); Time 1 PANAS, $F(2,78) = 0.10$, $p = .91$; or baseline liking ratings for the pictures, $F(2,78) = 2.32$, $p = .11$ (for mean PANAS scores and liking ratings see Table 2).

¹ 45 of the 81 participants were tested by another researcher

Table 2.2

Means and standard deviations for Positive Affect (PANAS), Picture Valence Ratings, Vividness Ratings, Behavioural Task (Fishing Game) and Interpretation Bias (Homophone Task) per Condition

Measure	Positive		Negative		Control	
	(n = 27)		(n = 27)		(n = 27)	
	M	SD	M	SD	M	SD
Positive affect: PANAS						
Time 1	57.93	15.42	58.15	14.59	56.48	14.95
Time 2	65.96	16.65	51.30	12.02	56.81	15.34
Time 3	61.00	19.91	59.56	14.55	58.63	19.28
Picture valence ratings						
Time 1	5.84	0.43	5.66	0.46	5.95	0.63
Time 3	6.26	0.80	5.26	0.78	5.89	0.71
Vividness ratings						
Training block 1	3.48	0.59	3.45	0.64	3.40	0.47
Training block 5	3.70	0.67	3.41	0.73	3.43	0.56
Behavioural task						
Total number of fish caught	32.41	4.19	26.63	4.19	29.26	4.19
(adjusted means)						
Homophone task						
% negative interpretations	58.47	13.45	68.79	12.24	62.70	9.37

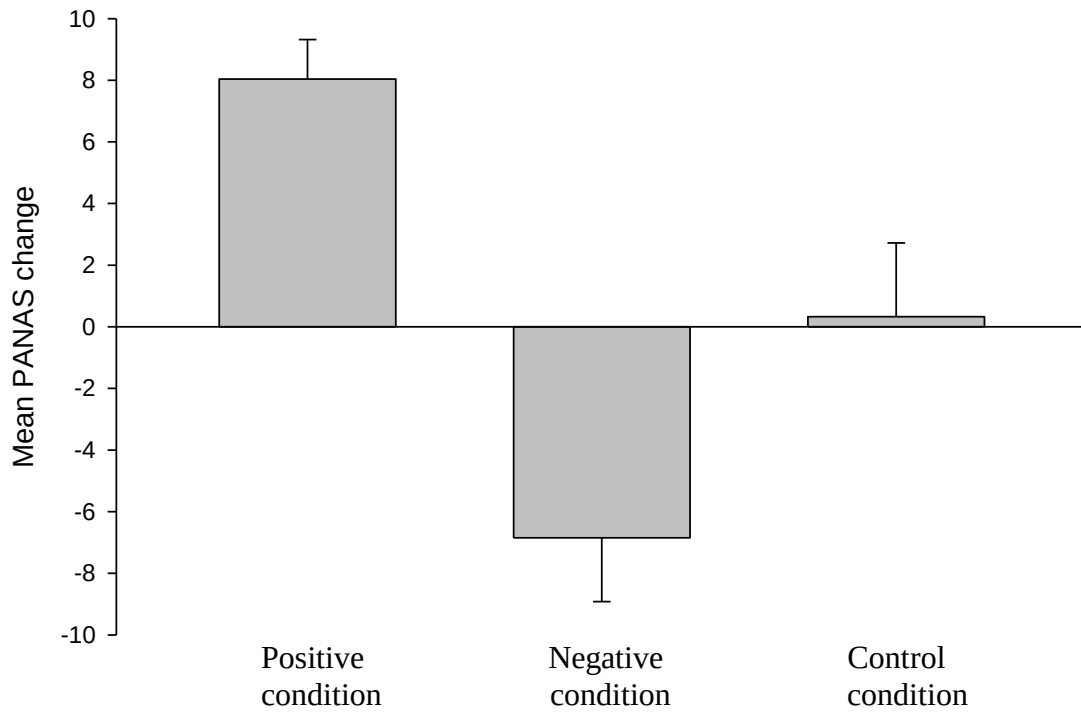
Note: Time 1 = pre-training, time 2 = immediately post-training, time 3 = after 10-min filler task post-training, PANAS = Positive and Negative Affect Scale - total positive affect score, Pictures liking ratings were anchored 1 = *extremely unpleasant* to 9 = *extremely pleasant*.

Positive Affect Change over the Training Phase

PANAS scores were analyzed in a mixed model ANOVA with a within-subjects factor of time (pre vs. post training) and a between-subjects factor of condition (positive vs. negative vs. control), for mean scores see Table 2. As predicted, there was a significant interaction of time with condition, $F(2,78) = 14.31, p < .001, \eta^2 = .27$. There was no main effect of time $F(2,78) < 1$ or condition $F(2,78) = 1.93, p = .15$.

To facilitate interpretation, we computed change scores for each condition, and decomposed the interaction between time and condition using independent samples t tests, comparing change scores for each training group with the control condition. As predicted, there was a greater increase in positive affect for the positive than the control condition ($M = 8.04, SD = 6.65$ vs. $M = 0.33, SD = 12.42$), $t(52) = 2.84, p = .006, d = 0.77$. Conversely, there was a greater *decrease* in positive affect for the negative than the control condition ($M = -6.85, SD = 10.74$ vs. $M = 0.33, SD = 12.42$), $t(52) = 2.27, p = .027, d = 0.62$ (Figure 2.1 illustrates the PANAS changes within each condition).

Figure 2.1. Mean changes in positive affect (PANAS) from pre to post-training in the each condition. Error bars show one standard error of the mean.



Vividness ratings

Vividness rating scores were analyzed in a mixed model ANOVA with a within-subjects factor of time (pre vs. post training) and a between-subjects factor of condition (positive vs. negative vs. control), for mean scores see Table 2. There was no main effect of time $F(2,78) = 2.83, p = .096, \eta^2 = .03$ or condition $F(2,78) < 1$, but there was a significant interaction of time with condition, $F(2,78) = 3.45, p = .037, \eta^2 = .08$. This interaction was decomposed by comparing the vividness means over time separately for each group using paired sample t-tests. Participants in the positive condition showed significant increases in vividness ratings $t(26) = 2.87, p = .008, d = .35$ but there were no significant changes in vividness ratings in either the negative, $t(26) = 0.60, p = .55, d = .06$ or the control condition.

Affect after the filler task

For the PANAS administered after the filler task, a one-way ANOVA revealed no significant difference between conditions $F(2, 78) = 0.12, p = .89$ (for mean scores see Table 2.2), thus indicating equivalence prior to administration of the behavioural task.

Behavioural task

As described above, there were two different sets of the fishing game, with equal numbers of participants in each condition using the two sets (15 participants in each condition used the first set and 12 used the second set). Unfortunately, there were unanticipated differences between scores achieved with the two sets ($M = 39.19, SD = 4.06$ vs. $M = 21.62, SD = 5.29$), $t(79) = 16.44, p < .001, d = 3.73$, presumably due to physical differences between the two sets, such as a stronger fishing rod magnet in one set. After running an ANOVA to check that game set did not interact with training condition $F(2) = 1.91, p = .16, \eta^2 = .05$, the game set was entered as a covariate in an ANCOVA.

The total number of fish caught between the three conditions was compared using an ANCOVA with the game set entered as a covariate. There was a significant effect of training condition, $F(2, 77) = 12.85, p < .001, \eta^2 = .25$. Independent t tests were used to run planned comparisons between the individual conditions, calculated using the estimated means and degrees of freedom adjusted appropriately for an ANCOVA (p. 347, Tabachnick & Fidell, 1996). As predicted, participants in the positive training condition caught significantly more fish than participants in the control condition ($M_{adj} = 32.41, SD = 4.19$ vs. $M_{adj} = 29.26, SD = 4.19$), $t(77) = 2.76, p = .007, d = .75$. Significantly more fish were caught in the positive than in the negative condition ($M = 26.63, SD = 4.19$), $t(77) = 5.06, p < .001, d = 1.38$. In line with predictions, participants in the negative condition caught significantly less fish than those in the control condition, $t(77) = 2.30, p = .02, d = .63$.

Homophone task

A one-way ANOVA revealed a significant difference in the percentage of negative spellings made between groups, $F(2, 78) = 5.21, p = .008, \eta^2 = .12$. Independent sample t -tests did not show the predicted difference between positive and control conditions $t(52) = 1.34, p = .19, d = 0.36$, although participants in the negative condition were significantly more negative than those in the control condition ($M = 68.79, SD = 12.24$ vs. $M = 62.70, SD = 9.37$), $t(52) = 2.05, p = .045, d = .56$. Furthermore, as predicted, participants in the positive condition perceived fewer negative meanings than participants in the negative condition ($M = 58.47, SD = 13.48$ vs. $M = 68.79, SD = 12.24$), $t(52) = 2.95, p = .005, d = .80$.

Valence ratings

Valence ratings of the pictures before and after training were analyzed in a mixed model ANOVA that revealed a significant interaction of time with condition $F(2, 78) = 9.69, p < .001, \eta^2 = .19$. There was no main effect of time, $F(2, 78) < 1$, but a main effect of condition, $F(2, 78) = 8.42, p < .001, \eta^2 = .18$. Change scores were computed for each condition and the interaction between time and condition was decomposed using independent samples t tests. In line with expectations, there was a greater increase in valence ratings in the positive compared to the control condition ($M = 0.43, SD = 0.73$ vs. $M = -0.07, SD = 0.51$), $t(52) = 2.89, p = .006, d = .79$, and compared to the negative condition ($M = -0.37, SD = 0.80$), $t(52) = 3.83, p < .001, d = 1.04$. Any difference between the negative and the control conditions did not reach significance, $t(52) = 1.68, p = .10, d = 0.45$, see Table 2 for mean scores.

Subjective experience questions

Responses were compared between conditions using one-way ANOVAs. There was no difference between groups in ratings for use of imagery, $M = 7.60, SD = 1.27, F(2, 78) < 1$; or use of field imagery, $M = 7.63, SD = 1.40, F(2, 78) < 1$. The ease of the task, $M = 5.84, SD$

= 1.73, $F(2, 78) < 1$ and low use of verbal processing, $M = 3.33$, $SD = 1.92$, $F(2, 78) < 1$ was also comparable.

Discussion

The present results suggested that systematic practice in generating overtly positive mental imagery from picture-word cues could help improve positive mood in a dysphoric sample. This finding was relevant to the suggestion that a deficit in positive future-oriented imagery in depression might impede recovery from depressed mood (Holmes, Lang, & Deerprouse, 2009). Mood improved in the positive condition, deteriorated in the negative condition and remained stable in the control condition. These differences could not be attributed to pre-training mood differences, as mood scores were equivalent between groups at baseline. Further, the impact of the imagery conditions was corroborated on a task in which participants rated valence for associated pictures presented without captions, perhaps due to effects akin to evaluative conditioning (cf. Holmes, Mathews, et al., 2008; Standage, Ashwin, & Fox, 2009).

In addition, participants in the positive imagery condition performed better on a behavioral task (a fishing game) than did those in the two other conditions. Differences in performance were unlikely to be due to variations in state mood, since this was successfully equalized after the 10-min filler task. Further, as predicted there were indications that the procedure influenced vividness of positive future imagery, with vividness ratings increasing significantly from the beginning to the end of the CBM training in participants assigned to the positive imagery group. Finally, the CBM procedure was found to influence subsequent emotional interpretation. The pictures alone can be considered a form of ambiguous stimuli, in that the word captions steer their interpretation as positive or negative. Forming mental images in response to positive picture-word cues led to congruent effects on interpretations of homophones made after a 24 hour time delay, with participants in the positive condition

perceiving fewer negative meanings than those in the negative condition. However, it should be noted that the difference between positive and control conditions did not reach significance.

As highlighted by MacLeod, Koster and Fox (2009) in a recent commentary on cognitive bias modification research (CBM), the consequences of most CBM studies have been assessed via self-report measures of state and trait mood, which may be prone to experimenter demand effects and contamination via priming of congruent mood descriptors. The present study to some extent addressed this methodological limitation. First, affect change following our procedure was accompanied by parallel changes on an indirect measure used as a manipulation check (e.g. valence ratings for associated stimuli). Second, we showed transfer of effects to performance on a behavioral task completed within a controlled experimental setting. Here again, demand effects remained possible but seemed unlikely given the lack of any obvious similarity between mental imagery generation and the fishing game task. Finally, there was evidence of some transfer of training to a completely new task (i.e. interpretation of homophones) that was quite different from the format of the experimental procedure.

A concern that might be raised about these results is that the average scores on the fishing game were unexpectedly found to differ depending on which set was used, probably due to one set having a more powerful magnet than the other. However, equal numbers of participants in each condition were assigned to each set, and this factor did not interact significantly with condition, so it seems that set assignment did not influence the main finding of differences between conditions.

The current study had a number of limitations that need to be acknowledged: One important limitation was that participants were only mildly depressed and (beyond the limited data on the homophone task) only relatively immediate effects of imagery were

assessed. Thus, we cannot be certain that more severely depressed individuals would respond positively, nor how long any effects would persist. Also, in the absence of any comparison between imagery and alternative forms of positive representation we could not be certain that the present method was the best method of achieving mood, bias and performance improvements: for example, other tasks involving “deep” levels of processing might have similar effects. Although this work followed on other studies using the same imagery generation task in comparison to a verbal procedure (e.g. Holmes, Mathews et al., 2008), the absence of such a comparison with a non-imagery condition in the current study did not allow us to conclude that mental imagery per se was responsible for the obtained effects. However, several prior comparisons of imagery with verbal representations have consistently found imagery to have stronger effects on emotional outcomes, with verbal methods sometimes having paradoxical negative effects (Holmes, Lang, & Shah, 2009; Holmes et al., 2006).

A further limitation is that we used a measure of lasting effects (the homophone task) that was potentially susceptible to response bias effects (Mogg et al., 2006). This task was selected in part because it could be delivered over the telephone, but other measures such as the Scrambled Sentence Test (Rude, Valdez, Odom, & Ebrahimi, 2003) might have provided a more valid test of interpretation bias. Further, our finding about increased imagery vividness in the positive imagery group was based on a manipulation check measure that was likely to be susceptible to demand effects. Thus a more independent and valid measure of mental imagery was required (e.g. the Prospective Imagery Task; Holmes, Lang, et al., 2008) to establish that positive imagery-based CBM induced change in mental imagery.

Despite these reservations, the finding of enhanced performance in the positive mental imagery group may hold clinical relevance. One of the core symptoms of depression is anhedonia (American Psychiatric Association, 2000), which refers to both a diminished ability to experience pleasure and reduced motivation to seek reward. Our findings suggest

that practice in generating positive mental imagery may be used not only to increase emotional responding to positive and rewarding stimuli, but could also increase the likelihood of achieving these goals. A limitation of the behavioral finding was that since the study involved an experimental manipulation, the hypothesized link between behavior and depressed mood could not be examined.

In the next chapter, Study 2 will address this limitation by exploring the direct association between depressed mood and behavioral performance on the fishing game task. Whilst Experiment 1 used a mildly depressed sample with restricted range of BDI-II scores, Study 1 will examine the link between depressed mood and behavior in a large sample of individuals with varying levels of depressed mood, including clinical ones.

CHAPTER 3

Study 2: Comparing Performance on the Fishing Game Task in Varying Levels of Depressed Mood

Aim and Background

In the preceding chapter of the current thesis, it was shown that in a sample of mildly depressed individuals, performance on a behavioural task, i.e. the fishing game task, could be modulated by the completion of a single laboratory session of positive imagery-based picture-word CBM (Pictet, Coughtrey, Mathews, & Holmes, 2011). Reduced engagement in approach-related behaviour and attenuated response to cues of reward are hallmark features of depression (Dillon & Pizzagalli, 2010; Shankman, Klein, Tenke, & Bruder, 2007). Approach motivation was defined as the “energisation of behaviour by, or the direction of behaviour toward, positive stimuli such as objects, events and possibilities” (Elliot, 2006). Within this conceptual framework, the present study aimed to explore the hypothesis that higher scores of depression would be associated with poorer performance on a behavioural task assessing approach motivation and persistence, i.e. the fishing game task. Results from experiment 1 provided initial evidence of a transfer of the effects of the CBM to a behavioural task, with participants in the positive imagery group performing significantly better than those in the two other groups.

Further observation of the data collected in experiment 1 indicated that performance on the fishing game was significantly correlated with the amplitude of bias change following imagery-based CBM and with bias scores at post-CBM. This finding opened up the possibility that given the well-established presence of negative interpretation bias in depression (e.g. Rude, Valdez, Odom, & Ebrahimi, 2003), a direct association could be found between depressive symptoms and behavioural performance on the fishing game. This was further supported by the large body of evidence showing that people with depression show

reduced approach motivation towards potentially rewarding goals (e.g. Henriques & Davidson, 2000). Results from experiment 1 did not support this hypothesis. No significant association was found within the control group between depression levels and performance on the fishing game task, $r(27) = -.258, p = .195$. However, the interpretation of this null finding was limited by the fact that both measures were temporally separated in the experiment by a session of imagery-based picture word CBM, thus introducing an important confounding variable in the relationship between depression and behavioural performance. A further limitation was that the sample showed a restricted range of BDI-II scores and low average levels of depressed mood. Thus, the possibility remained that approach-motivation deficits would only appear in more severely depressed individuals, and not in a dysphoric sample such as the one tested in experiment 1.

The current study aimed to test explore this possibility by examining the relationship between performance on the fishing game task and depressive symptoms in a sample of individuals with various levels of depressed mood, including severe ones (i.e. BDI-II scores ≥ 29). In experiment 1 the suggestion was made that the task could potentially be used in the laboratory to assess approach-motivated behaviour in depression (Pictet et al., 2011; Reinecke, Deeproose, & Holmes, 2011). Before elaborating more on this hypothesis, previous evidence for approach-motivation deficits in depression will be now reviewed.

Empirical Evidence for Deficits in Approach-Motivated Behaviour in Depression

Deficits in approach motivation are recognised to be a key component of clinical depression (Beck & Alford, 2010). Indeed, recent research underlines the pivotal role of “motivational anhedonia” in depression, which refers to the lack of motivation to engage in (and not only to derive pleasure from) activities that were usually perceived as enjoyable by the individual (Sherdell, Waugh, & Gotlib, 2012; Treadway & Zald, 2010). On a theoretical level, a number of researchers have proposed that motivational deficits in depression are in

part due to a diminished activity of the behavioural activation system (BAS), which regulates approach toward reward-relevant stimuli and positive affective experience (Davidson, 1998; Depue & Iacono, 1989; Jones & Day, 2008). In support of this hypothesis, lower scores on a questionnaire assessing behavioural activation (BAS scale: Carver & White, 1994) have been found to predict later increases in depressive symptoms in clinical and non-clinical samples (Jones & Day, 2008; Kash, Rottenberg, Arnow, & Gotlib, 2002; McFarland, Shankman, Tenke, Bruder, & Klein, 2006). Approach deficits in depression are also visible when everyday goal-oriented behaviours are examined. Indeed, individuals with mild levels of depressed mood have been shown to engage less frequently than controls in positive and rewarding experiences such as social, physical and educational activities (Hopko & Mullane, 2008).

Several experimental studies have shown that depressed and dysphoric individuals exhibit behavioural patterns on various laboratory tasks that indicate decreased responsiveness to reward (Henriques & Davidson, 2000; Pizzagalli, Iosifescu, Hallett, Ratner, & Fava, 2008; Treadway, Buckholtz, Schwartzman, Lambert, & Zald, 2009). As a result of being relatively indifferent to reward, depressed individuals may be less likely to adjust their behaviour to ensure positive outcomes to potentially rewarding situations. In two recent studies, participants were required to complete behavioural tasks with various levels of reward and effort (as assessed by clicking-tasks) and it was found that those with high levels of anhedonia were less willing to exert greater effort in exchange for greater reward (Sherdell et al., 2012; Treadway et al., 2009).

Behavioural deficits have also been demonstrated in laboratory tasks using non-rewarding stimuli. In Miller and Seligman (1975) for example, it was shown that participants who had been subjected to a learned helplessness induction (i.e. an inescapable noise) went on to perform poorer on an anagram task than those assigned to either of two control conditions

(i.e. escapable noise or no noise). Interestingly, comparison of depressed and non-depressed participants within the same group (i.e. no noise group) indicated that the former exhibited poorer performance on the anagram than their non-depressed counterparts. In addition, it was found within another group (i.e. the inescapable noise group) that the more depressed participants were the poorer was their performance on the anagrams. Closer examination by the authors indicated that this pattern of results was partly explained by the fact that depressed participants (as well as those subjected to the learned helplessness induction) were more inclined to give up after failing at solving the first few anagrams, compared to non-depressed participants who exhibited greater persistence. These findings suggested that differences in behavioural performance could be observed both in participants subjected to a depression-related induction procedure and in individuals with various degrees of depression severity.

The Fishing Game Task

A practical issue with the behavioural tasks used in the studies reported above is that they were too lengthy (over 20 minutes) to fit in with the time constraints of a short laboratory session like the one described in experiment 1 of the thesis. In contrast, the fishing game task had potential as a brief (approx. 3 minutes) and simple laboratory tool to assess behaviours believed to be associated with depression-related deficits, such as approach motivation and persistence. While most behavioural tasks assessing reward motivation had used money as an incentive, the reward participants got from playing the fishing game was the fun and motivation to achieve a high score. Unlike money, fun does not have an inherently anticipatory component to its reward value, which suggests that performance on the fishing game may be partly driven by the pleasure participants derived from playing the game (conceptualized as “consummatory” reward in recent research, see Treadway & Zald, 2010). However, the motivation to perform well on the task (further prompted by the task

instructions requiring participants to perform as best as possible in a limited amount of time) represented a more “anticipatory” form of reward.

There is renewed interest in the study of behavioural and motivational deficits in depression (Sherdell et al., 2012; Treadway & Zald, 2010) and in psychological interventions aimed at promoting re-engagement in approach-motivated behaviours, such as “behavioural activation” (e.g. Dimidjian et al., 2006). In this context, experiments and future treatments for depression (such as imagery-based CBM) may benefit from a laboratory task to assess levels of “behavioural activation” (i.e. the ability to engage in goal-directed activities despite feeling depressed) at baseline or following an intervention. While Experiment 1 had provided evidence that performance on the fishing game task was sensitive to a bias and imagery manipulation procedure, the present study sought to investigate whether the task could be used to detect differences in behavioural activation within a sample of individuals with various levels of depressed mood. If, as in Miller and Seligman (1975), a linear relationship was found between performance on the task and severity of depressive symptoms, then this would represent a promising first step into validating the fishing game as a potential laboratory task for indexing approach-related deficits in depression.

In addition to exploring the relationship between performance on the fishing game and depressed mood, the present study aimed to control for the potential influence of extraneous variables such as age, risk for bipolar disorder and transient mood states (positive and negative) prior to the task. Age was examined as older participants were anticipated to exhibit poorer performance given the slowing of fine motor hand movements associated with advancing age (Smith et al., 1999). The influence of positive and negative affect states - sadness, happiness, anxiety and calmness - at the time of the task were also examined because of their potential confounding effect on the relationship between depression and behavioural performance. Indeed, high levels of anxiety or sadness have been shown to have detrimental

effects on participants' performance in laboratory tasks such as anagrams (Miller & Seligman, 1975; Zarantonello, Slaymaker, Johnson, & Petzel, 1984), while the contrary seems true for positive affect (Erez & Isen, 2002). Risk for bipolar disorder (as assessed by the Mood Disorder Questionnaire) was controlled for, as individuals with bipolar spectrum disorders or who are prone to (hypo)manic symptoms have been shown to exhibit greater response to reward and increased approach motivation (Alloy & Abramson, 2010; Urošević, Abramson, Harmon-Jones, & Alloy, 2008).

Hypotheses

The aim of Study 1 was to explore the hypotheses that within a sample of individuals with minimal to severe levels of depressive symptoms:

1. Higher levels of depressive symptoms (as assessed by the BDI-II at the eligibility assessment session) would be associated with lower levels of behavioural performance (as assessed by the fishing game task) (hypothesis 1a). This association would remain significant when controlling for age, state mood (i.e. happiness, sadness, anxiety and calmness as assessed by the VAS scales) and risk for bipolar disorder (MDQ) (Hypothesis 1b).
2. Compared to less severely depressed participants (BDI-II < 29), severely depressed participants (BDI > 29) would show lower levels of behavioural performance (as assessed by the fishing game) (Hypothesis 2a). This difference would remain significant when controlling for age, state mood (i.e. VAS scales) and risk for bipolar disorder (MDQ) (Hypothesis 2b).

Method

Sample size estimation

In the absence of previous experimental findings on which to base an estimated effect size for the correlation of interest, a power calculation for a correlational design based on a small-to-medium effect size of $r = .2$ with 80% power to detect the effect and alpha set at 0.05, indicated a sample of approximately 160 participants would be necessary (Cohen, 1982).

Participants

The study sample included 179 participants¹ (121 females) who attended an eligibility assessment session as part of an on-going clinical study which is partly reported in Chapter 5 of the current thesis. Participants 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 an internet-based computer program in depression”. Prior to the eligibility assessment session, participants ($N = 529$) completed screening questionnaires online and those who scored 14 or above on the BDI-II and whose scores on the MDQ suggested no history of mania ($N = 253$) were invited to the eligibility assessment session. At the eligibility assessment session, participants ($N = 179$) were administered a structured clinical interview (SCID) to determine eligibility and then completed the BDI-II, VAS-mood scales and the Fishing Game.

Those who met criteria for a current episode of major depression according to the SCID ($N = 138$) and who did not meet any of the exclusion criteria (i.e. current psychotic disorder, history of mania or hypomania, having started or changed antidepressant medication during the last month, current substance abuse disorder, being involved in other current

¹ For the purpose of this study the database was extracted on 21st December 2012.

treatment trials and currently receiving psychological therapy) were invited for a baseline assessment session (see Chapter 5 for a full description of the clinical study).

Data Cleaning and Treatment of Missing Data

Following data cleaning and treatment of missing data, four participants were identified as presenting missing values for the following reasons: One participant did not complete the Fishing Game and VAS scales due to a medical condition (neurofibromatosis). Another one did not complete any of the 3 measures (BDI-II, VAS-mood scales and Fishing Game) due to their poor level of English, and this resulted in the session being discontinued. A third participant did not complete the VAS scales due to lack of time. A fourth participant did complete the fishing game, but the data was not recorded by the experimenter.

Examination of the missing data using non-parametric Mann-Whitney U tests indicated that values were not missing at random as the missing data mechanism was not related to other variables in the data (Tabachnick & Fidell, 1996), and so were treated as missing completely at random (see Appendix 3.1 for a detailed description of the statistical analysis). Tabachnick and Fidell (2007) further pointed out that if less than 5% was missing completely at random almost any procedure for handling missing values yielded similar results. In line with recommendations to conduct a complete case analysis for cases where there are few missing values and the data are missing completely at random, and because removing for participants would not have any impact on statistical power, it was decided that the four participants with missing values would be withdrawn from the sample. The analysis was therefore based on those cases with a complete set of values, leading to a final sample of 175 participants.

Mean BDI-II scores of the sample ($N = 175$) were 31.67 ($SD = 8.81$) at the online screening assessment and 30.30 ($SD = 9.50$) at the eligibility assessment session, with

possible scores ranging from 8-58. On the basis of BDI-II scores at the eligibility assessment session, participants were divided into severely depressed (BDI-II > 29; N = 82) and less severely depressed groups (BDI-II < 29; N = 84) using median split ($m = 29$). Demographic characteristics and means and standard deviations for the study measures are presented in Table 3.1.

Table 3.1
Characteristics of Participants

	Severely depressed (N = 82)	Less severely depressed (N = 84)	Total Sample (N = 175)
Age, M (SD)	37.32 (12.72)	36.81 (13.23)	37.03 (13.11)
Gender, N (%)			
Female	60 (73)	53 (63)	117 (67)
Male	22 (27)	31 (37)	58 (33)
BDI-II at screening assessment, M (SD)	36.70 (8.19)	26.82 (6.42)	31.67 (8.81)
MDQ at screening assessment, M (SD)	7.26 (3.65)	6.99 (3.84)	7.14 (3.86)
BDI-II at eligibility assessment, M (SD)	38.56 (6.14)	22.38 (4.58)	30.30 (9.50)
Fishing Game scores, M (SD)	29.15 (5.90)	31.25 (5.51)	30.20 (5.77)
Current MDE, N (%)	75 (91)	53 (63)	138 (79)
VAS-mood scales, M (SD)			
happy	3.08 (1.84)	3.91 (1.84)	3.45 (1.88)
sad	5.58 (2.25)	4.35 (2.26)	4.96 (2.31)
anxious	5.67 (2.51)	4.27 (2.56)	4.93 (2.62)
calm	4.02 (2.37)	4.79 (2.31)	4.40 (2.36)

Note: BDI-II = Beck depression Inventory-II; MDQ = Mood disorder questionnaire; MDE = Major depression episode; VAS-mood scales = Visual analogue scales for mood

Measures

Fishing Game Task

The Fishing game task was used to assess approach motivation and persistence as in Experiment 1 of the current thesis (Pictet et al., 2011). This task involved a series of 16 Clockwork Fishing Games (made by Tobar, bought on amazon.co.uk) measuring 1500 mm x 900 mm x 250 mm, in which 12 plastic fish moved around in a circle, opening and closing their mouths to reveal a magnet. Participants were instructed to catch as many fish as they could in 2.5 min by “hooking” them using a magnet on the end of a 900 mm plastic fishing rod. There were not allowed to use the other hand to stabilise the magnet. Participants played successively with 5 to 7 fishing games, each one lasting 20 to 30 s. Each game was wound up by the researcher before being hand over to participants.

Beck Depression Inventory-II

As in Study 2, the BDI-II (Beck, Steer, & Brown, 1996) was used to assess depressive symptoms. Possible scores range from 0 to 63, with 0-13 classified as minimal depression, 14-19 as mild depression, 20-28 moderate depression and 29-63 severe depression.

Structured Clinical Interview

The Structured Clinical Interview for DSM-IV Axis 1 Disorder (SCID-I; First, Spitzer, Gibbon, & Williams, 1996) is a semi-structured interview that assesses current and past diagnosis of axis 1 disorders according to DSM-IV criteria (American Psychiatric Association, 2000). The SCID-I was used in the eligibility assessment session to determine whether participants were eligible for the study, i.e. met criteria for a current episode of major depressive disorder.

Mood Disorder Questionnaire

The Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000) is a short self-report screening instrument assessing symptoms or behaviours related to a manic or hypomanic syndrome. The first question includes 13 items, symptoms or behaviours related to a manic or hypomanic syndrome. The second question asks whether several of the symptoms have been experienced during the same time period, and the third asks about resulting problems, classified as minor, moderate or serious. MDQ scores range from 0 to 15. In line with the cut-off of 7 set by Calabrese et al. (2006) to determine a positive screen, participants who scored below 7 were invited to an eligibility assessment whereas those scoring 7 or above were given a phone call to clarify any suspicion that they might have had a manic episode in the past.

Visual Analogue Scales-mood

Visual Analogue Scales (as in Blackwell & Holmes, 2010) were administered on paper to assess state mood prior to completing the Fishing Game task. Participants were asked to rate how sad, happy, anxious and calm they felt on 10cm continuous scales ranging from “not at all” to “extremely”.

Procedure

During an online screening session participants first provided informed consent to participate in screening and then completed the BDI-II and the MDQ. Those who scored 14 or above on the BDI-II and whose scores on the MDQ suggested no history of mania were invited for an eligibility assessment session.

During the eligibility assessment session, participants first provided written consent and then completed a clinical interview (SCID) conducted by the researcher. They then completed the BDI-II the VAS-mood scales, and then were introduced by the researcher to the Fishing Game task as follows: “we are aware that you will have spent a while answering lots

of questions about feeling low and difficult times in your life, so we thought it would be a good idea to do something a little different before we finish up for today.” Participants then completed the Fishing Game task and were thanked for their participation.

Results²

Preliminary Analyses

First, the normality of the distributions of the two main variables of interest, BDI-II and Fishing Game scores, were examined graphically (see Figure 3.1 and 3.2 for histograms of distributions for the BDI-II and Fishing Game scores) and statistically using the Shapiro-Wilk test. Normality was supported both by visual inspection of the distribution for BDI-II and Fishing Game scores (see Figure 3.1 and 3.2 below) and by the Shapiro-Wilk test of normality, which was non-significant for both the BDI-II ($w = .99, p > 0.5$) and Fishing Game scores ($w = .99, p > 0.5$). Second, BDI-II and Fishing Game scores were examined for univariate defined as any value greater or lower than 3 SD from the mean. Examination of Mahalanobis distance did not indicate any bivariate outliers ($D^2 > 0.001$) (Rousseeuw & van Zomeren, 1990).

² See Appendix 3.2 for the statistical output of Experiment 1

Figure 3.1. Histogram of the distribution for the BDI-II scores

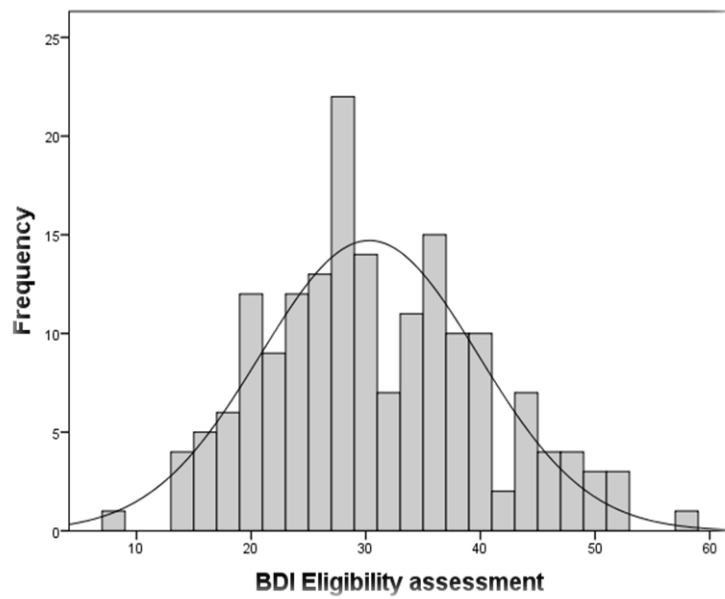
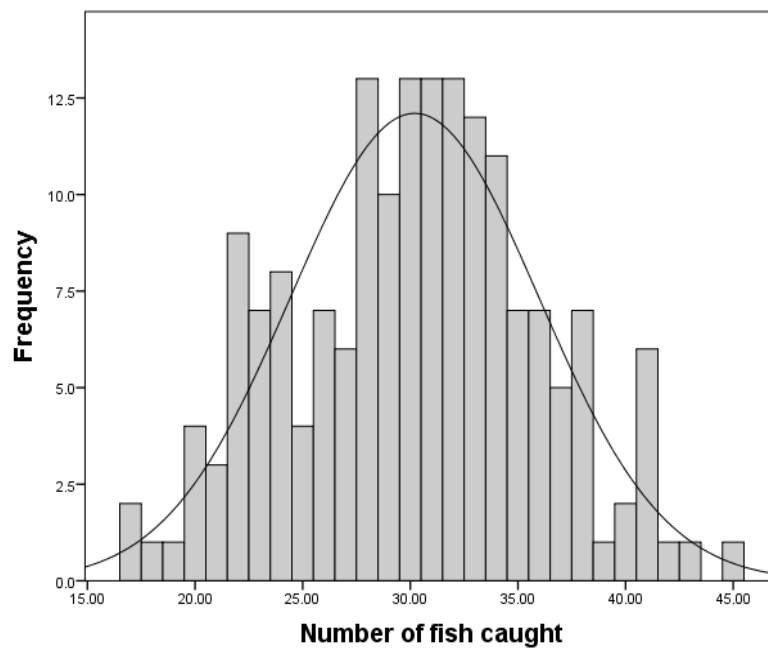


Figure 3.2. Histogram of the distribution for the Fishing Game scores



Main Analysis

Means and standard deviations for self-report measures are presented in Table 3.1. Correlations between scores of depressive symptoms and behavioural performance on the Fishing Game were conducted across the total sample and differences in Fishing Game scores were examined between severely depressed and less severely depressed groups using independent t tests.

Across the total sample, there was a significant negative correlation between scores on the BDI-II and scores on the Fishing Game task, $r(175) = -.19, p = .01$. Thus, higher scores of depression were associated with poorer performance on the Fishing Game task. Partial correlations showed that the correlation remained small although significant when controlling for age, $r(172) = -.20, p = .01$ or risk for Bipolar Disorder, $r(172) = -.19, p = .01$. With regards to state mood, the association between depression and behavioural performance on the Fishing Game remained significant when controlling for happiness, $r(172) = -.19, p = .02$, sadness, $r(172) = -.21, p = .01$, anxiety, $r(172) = -.16, p = .04$ and calmness, $r(172) = -.15, p = .04$.

Comparison of severely versus less severely depressed individuals. The severely and less severely depressed groups did not differ in age, $t(164) = .25, p = .80$, gender, $\chi^2(1, N = 166) = 1.94, p = .16$, or MDQ scores, $t(164) = .46, p = .65$. However, groups were significantly different in the four state mood variables, i.e. happiness, $t(164) = 2.91, p = .004, d = .45$, sadness, $t(164) = 3.52, p = .001, d = .55$, anxiety, $t(164) = 3.54, p = .001, d = .55$, and calmness, $t(164) = 2.10, p = .04, d = .33$ (see table 3.1) A composite score of state mood was created based on these four variables and entered as a covariate in an Analysis of Covariance (ANCOVA).

Results showed a significant effect of depression group on Fishing Game scores, $F(1, 165) = 4.31, p = .04, \eta^2 = .03$. Independent t -tests were used to run planned comparisons

between the two depression groups, calculated using the estimated means and degrees of freedom adjusted appropriately for an ANCOVA (Tabachnick & Fidell, 1996). As predicted, participants in the severely depressed group exhibited a significantly poorer performance on the Fishing Gamed task than those in the less severely depressed group ($M_{adj} = 29.24$, $SD = 8.31$ vs. $M_{adj} = 31.16$, $SD = 8.20$), $t(151) = 1.50$ $p = .04.$, $d = .23$.

Discussion

The present study sought to explore the relationship between depressed mood and behavioural performance on a measure hypothesised to be associated with behaviours relevant to depression, such as approach motivation and persistence. This relationship was examined both across the total sample and between participants with higher (i.e. severely depressed group) and lower BDI-II scores (i.e. less severely depressed group). Results across the total sample confirmed that higher scores of depressive symptoms were associated with poorer performance on the Fishing Game task. This association remained significant when controlling for age, risk for Bipolar Disorder, and state mood variables such as happiness, calmness, sadness and anxiety. Group comparison revealed that participants in the severely depressed group performed significantly less well on the Fishing Game Task than participants in the less severely depressed group. Further, this difference remained significant when controlling for state mood variables.

The study findings should be interpreted within the confines of several limitations. A first important limitation was that the population targeted in the present study included only people suffering from depressed mood, thus limiting the generalizability of the findings. A fuller study would be to include non-depressed participants to explore whether the same relationship between depressed mood and behavioural performance exists in non-depressed individuals.

A second important limitation of the study was that the nature of the behavioural task used did not allow any conclusion to be drawn about the underlying processes involved in participants' performance. While the differences in performance on the Fishing Game task were interpreted in the current study as reflecting differences in approach motivation, a number of additional variables may have influenced participants' performance. An obvious candidate is the speed with which participants executed the hand movements required in the fishing game, as depression has been shown to be associated with a slowing in motor responses (Purcell, Maruff, Kyrios, & Pantelis, 1997). A further variable could be the extent to which participants enjoyed performing the task, given the wealth of evidence showing that depressed people have diminished hedonic response to positive and rewarding stimuli (e.g. Sloan, Strauss, Quirk, & Sajatovic, 1997). Beyond the examination of additional variables, an important step in the process of validating the Fishing Game task as a measure of approach motivation and persistence in depression would be to explore whether scores on the Fishing Game correlate with other measures of approach motivation and persistence such as the Behavioural Activation for Depression Scale (Kanter, Mulick, Busch, Berlin, & Martell, 2006) or recently developed laboratory tasks such as the Effort-Expenditure for Rewards task (Treadway et al., 2009).

A third limitation of the study was that in the absence of any measure assessing cognitive bias, the association found in Experiment 1 between cognitive bias and performance on the Fishing Game task could not be replicated. Experiment 1's finding suggested that cognitive bias could be mediating the relationship between depressed mood and behavioural performance. This hypothesis could be explored in future research using an appropriate measure of cognitive bias.

In summary, the current findings provided preliminary support for a significant association between behavioural performance on the fishing game task and levels of

depressive symptoms. This relationship was demonstrated even in the absence of a full range of BDI-II scores (i.e. no one scoring in the 0-8 range). Further, even though the mean difference in Fishing Game scores was relatively small ($MD = 2.45$) and thus could be said to be of limited value in detecting variations at an individual/clinical level, the Fishing Game task was found to discriminate between different levels of depression severity and therefore could be usefully employed in effectiveness studies exploring behavioural activation in depression. An interesting area for future research would be to examine whether the discriminative power of the Fishing Game Task could be enhanced by modifying some of its parameters, for example by increasing task duration or providing additional incentives. Future work may also involve developing behavioural tasks in the laboratory that are more closely related to people's everyday behaviour. An interesting example in recent CBM literature was the social interaction task used by Taylor and Amir (2012) to assess changes in approach action tendencies over the course of a CBM intervention.

In the next chapter of this thesis (CH 4), the hypothesis will be tested that behavioural activation and imagery in a depressed sample can be boosted through the completion of an imagery-based CBM intervention. In study 2 it was found that CBM-induced changes in cognitive bias correlated with performance on the fishing game task in a sample of dysphoric participants. The present study provided evidence that performance on the task was also associated with depressed mood. These findings supported the hypothesised link between imagery, bias, mood and behaviour. In the context of developing imagery-based CBM into a clinical intervention however, an important question that remained to be answered was whether these hypothesised mediators of treatment effect (i.e. imagery and behaviour) could be modified by means of CBM training. Answering this question could shed more light on the underlying mechanisms of CBM and inform us on how to enhance its efficacy.

While Experiment 1 found group differences in bias 24h after a single session of imagery-based CBM, the possibility remained that negative bias could be more entrenched in clinically depressed participants and thus more resistant to change. A potential way to produce durable bias change in a clinical sample would be to increase the number of CBM sessions and distribute them in short daily sessions. In line with this, learning skills have been found to be more facilitated by frequent, distributed, short sessions of training than by smaller numbers of longer sessions (Bjork & Bjork, 2011). Experiments 3a and 3b will explore this possibility by testing the effects of a multiple-sessions imagery-based CBM program in two small samples of clinically depressed individuals. In the two pilot studies of the next chapter the Fishing Game task will be replaced by a validated clinical scale, the Behavioural Activation for Depression Scale (BADs; Kanter et al., 2006). The BADs has been developed to assess change in depression-related behaviours (e.g. staying in bed for too long, not seeing one's friends) over the course of behavioural activation treatment. Thus, the BADs will be used in the next chapter to assess specific, real-world behaviours and provide a clinical measure of how "activated" behaviourally participants were in their everyday life.

CHAPTER 4

Experiment 3a and 3b: Pilot Studies to Develop an Imagery-based CBM Program for Depressed Mood over the Internet

Aims and Background

In chapter 2 it was shown that a session of positive imagery-based CBM could lead to improvements in positive affect, bias and behaviour in a sample of mildly depressed individuals. These findings added to the positive results found in two preliminary tests of imagery-based CBM in clinically depressed individuals (Blackwell & Holmes, 2010; Lang, Blackwell, Harmer, Davison, & Holmes, 2012). Despite these encouraging results, the imagery-based CBM needed to be further developed to become more compatible with a clinical intervention. First, the time scale used in previous studies needed to be extended to allow more durable change in symptoms and other variables to be explored. Further, as biases in interpretation and imagery were likely to be more deeply entrenched in clinical population, increasing the duration and the dose of CBM training (i.e. the number of sessions) was likely to be necessary to alter these biases.

A second important limitation in the compatibility of imagery-based CBM with a clinical intervention was that the CBM program was delivered via specialised laboratory-based software (E-prime). This limited the usability and accessibility of the intervention. One way to substantially increase the accessibility of the CBM program was to deliver it via the internet. This would allow people to complete the sessions from home at the most convenient time for them and without requiring any specialised software. The current chapter included two small-scale pilot studies assessing 1) the feasibility of delivering a one-week, 6-session CBM program over the internet to depressed people in their own home 2) the feasibility of

delivering an one-month, 12-session online CBM program to people with a current episode of Major Depression.

Experiment 3a

Aim

The primary aim of Experiment 3a was to provide a feasibility test of a computerised CBM program delivered over the Internet in a sample of six individuals with depressed mood. More specifically, the current study focussed on the following aspects as they were likely to impact on the efficacy of the Internet CBM program:

The first aim was to assess the extent to which participants actively used the intervention and complied with the research protocol by analysing adherence rates. In line with recent definitions used in the literature (Cavanagh, 2010; Christensen, Griffiths, & Farrer, 2009), adherence to the intervention was defined as the number of daily sessions of CBM completed across the week of the intervention, and adherence to the research protocol referred to the number of study assessments completed by participants once their eligibility for the study had been established. In addition, qualitative feedback was collected at the end of the intervention to help identify and overcome any additional barriers to adherence.

Adherence is likely to be affected by a range of variables, such as personality, demographic and service delivery factors. In the context of depression, low motivation and low expectations are likely to pose significant challenges to satisfactory adherence (Christensen et al., 2009). In line with this, recent research on computer-based psychological treatments for depression indicates that adherence and dropout are a major cause of concern, with only about half of participants completing all the sessions (Waller & Gilbody, 2009). As clinical improvement would be unlikely to occur without satisfactory adherence, it was

important at this pilot stage to assess whether participants would complete the daily sessions of CBM and attend the study assessments. Any potential barriers to adherence which would be identified in this pilot could then be used to refine the online CBM program.

The second aim was to assess whether the online CBM program was acceptable to individuals with depressed mood. Assessing acceptability or satisfaction with a new intervention is a key component to consider in the early stages of its implementation, as recent research shows that acceptability can be important in predicting treatment response to computerised CBT (CCBT) for depression (Kaltenthaler et al., 2008). Indeed, an experimentally based computerized task such as CBM may be clinically effective but unacceptable to patients for various reasons, such as being too difficult to use, too demanding or too tedious and unappealing (Brosan, Hoppitt, Shelfer, Sillence, & Mackintosh, 2011). In the current study, accessibility was assessed in a different way than it is in CCBT research because the online CBM program was not presented to participants as a *treatment* but rather as a computer-based task in the context of a research study. For this reason, our investigation of acceptability focussed on various indicators related to participants' experience of the CBM sessions (e.g. enjoyability, understandability, length) and their impressions of the program interface (e.g. usability, appearance, clarity of information provided), without directly enquiring about *treatment* satisfaction as such.

The third aim was to examine the extent to which participants' experience of the CBM program was associated with their change scores on the measures assessing symptomatology and putative mechanisms targeted by the intervention. Identifying what in participants' experience may be associated with treatment response could be of interest to improve treatment.

The final aim was to use the quantitative and qualitative information collected above to refine the CBM program and assess an extended version of the CBM program in Experiment 3b with a sample of currently depressed individuals.

Summary of Aims

In summary the aims of Experiment 3a were as follows:

1. To assess whether participants complete the daily sessions of CBM and comply with the research protocol.
2. To assess whether the online CBM is acceptable to individuals with depressed mood.
3. To examine the link between participants' experience of the online CBM and their change scores on measures of symptoms and process with the aim of identifying factors associated with treatment response
4. To use the information collected above to refine the CBM intervention and extend it for a larger scale study (Experiment 3b).

Method and Development

Developing the Internet platform for CBM

The internet platform for the CBM intervention was built in collaboration with a Software Engineer from the University of Oxford's Department of Computer Sciences. Designing the internet platform involved a multi-stage process whereby several versions of the interface were tested by members of the research team, and then refined according to their feedback and suggestions. The internet interface was purposely designed to be easy to use and to provide the required information and guidance for participants to go over the sessions from home.

As the original E-prime based interface used in Lang et al. (2012) had been designed in the context of an experimental study and thus was likely to appear impersonal and unappealing to a clinical population, several modifications were made to enhance the usability of the online CBM program. First, the task instructions were simplified and reduced, by taking out some of the experimental “jargon” and having a greater part of the instructions read out loud by the researcher, allowing the instructions screens to be less wordy and easier to follow. Second, the clarity of instructions was enhanced by highlighting or capitalising the main points to remember. Third, as we expected that people with depression and anxiety would be more likely to feel pessimistic, self-critical and anxious about their performance and as a result more likely to disengage from the task, the original instructions were modified to appear less directive and more supportive. Accordingly, directive sentences or words (e.g. “your task is to..”, “make sure that you follow the instructions”, “respond as quickly as possible without making errors”) were removed or replaced by sentences conveying the message that participants were encouraged to do as best as they could (e.g. “please try to”, “please remember”, “the research will guide you and help answer any queries”). Finally, to reduce the risk of participants disengaging from the CBM task due to concentration difficulties, low mood or time constraints, the interface was designed in such a way that all the sessions could be started, paused and recommenced at any time. Further, the possibility was given in case a session was missed to catch up on the following days. For examples of screen shots of the final version used in the current study, see Appendix 5.1.

Support from the Researcher to Maximise Adherence and Task Engagement

Recent research on internet-based interventions for depression suggest that providing support or tracking session completion increases adherence and prevents dropout (Spek et al., 2007). Further, internet-based treatments delivered with therapist support have been found to

be more effective than unsupported treatments (Andersson, 2006; Andersson & Cuijpers, 2009). In line with this, daily email support was provided by the researchers across the week of the intervention to enhance participants' adherence and engagement with the CBM program. Daily emails were sent to participants to remind them about completing the sessions, reinforce the strategies implemented during the practice session and trouble shoot any technical problems encountered. Session completion was tracked by the researchers via the web interface and participants were thanked for completion or prompted daily in case of non-completion.

Overview

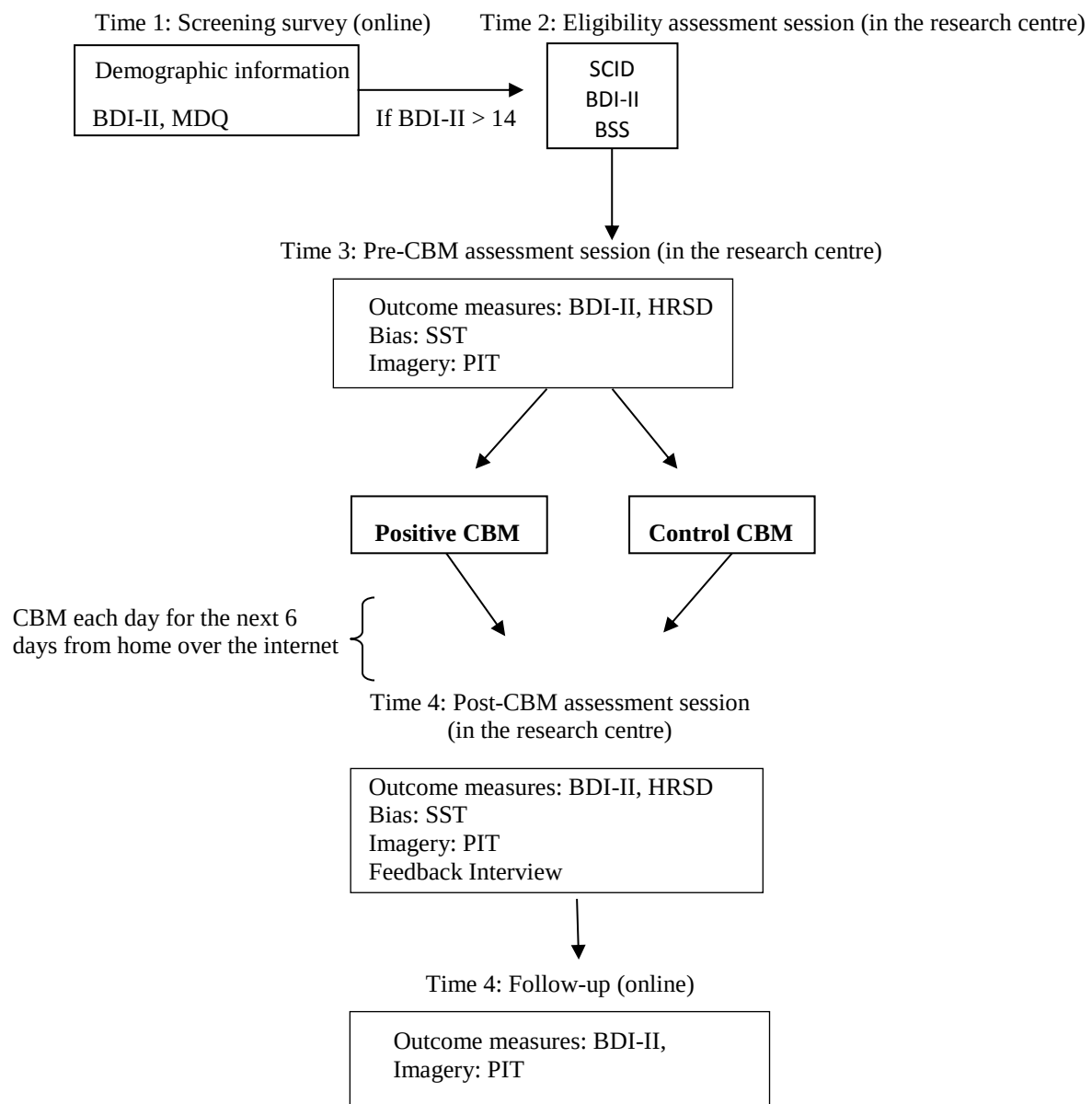
For a diagrammatic of the procedure see Figure 5.1. Following online completion of screening survey, participants who scored higher than 14 on the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) and lower than 7 on the Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000) were invited for an eligibility assessment session. Eligible participants were randomly allocated to either the positive or control condition of the CBM program and invited to return one week after the assessment session for the pre-CBM assessment session.

During the pre-CBM assessment session, participants completed measures of depression, mental imagery and cognitive bias and were guided through a practice session of the online CBM program. Following the pre-CBM session, participants completed 6 sessions of the online CBM program from home every day.

After completing the one-week CBM program, participants returned to the research centre for a post-CBM assessment session during which the measures of depression, cognitive bias and mental imagery were repeated and a feedback interview was carried out by

the researcher to enquire about participants' experience of the CBM program. Two weeks later, participants completed a series of follow-up measures (See the procedure section of the current study for a detailed description of the procedure).

Figure 4.1. Schematic overview of the experimental procedure for Experiment 3a



Note: SCID = Semi-structured clinical interview, BDI-II = Beck Depression Inventory-II, MDQ = Mood Disorders Questionnaire, HRSD = Hamilton's Rating Scale for Depression, SST = Scrambled Sentences Test, PIT = Prospective Imagery Task

Participants

Participants were recruited via advertisements in the local University town. Those who expressed their interest in participating ($N = 55$) were sent an information sheet about the study and then directed to complete the screening survey online via the CBM website. Of the 19 participants who completed the screening questionnaires, 11 scoring above 14 on the BDI-II were then invited for an eligibility assessment session. Participants' eligibility for the study was ascertained through a semi-structured clinical interview (SCID: First, Spitzer, M., & Williams, 2002) conducted by the researchers. Participants were excluded from the study if they 1) met criteria for current psychotic disorder 2) had a history of mania or hypomania or had elsewhere received a diagnosis of Bipolar Disorder 3) begun antidepressant medication or changed in dosage during last month 4) met criteria for current substance abuse disorder 5) were involved in other current treatment trials 6) were currently receiving psychological therapy.

Participants were two men (Participants 1 and 2) and four women (Participants 3, 4, 5 and 6) with a mean age of 28.5 years ($SD = 9.07$). Five of six participants met DSM-IV criteria (American Psychiatric Association, 2000) for a current major depressive episode (MDE), as judged by the SCID-I. Four participants also met criteria for other current Axis-I diagnosis than a major depressive episode. See Table 4.1 for clinical information across each participant.

Table 4.1

Clinical Information for each of the Six Participants

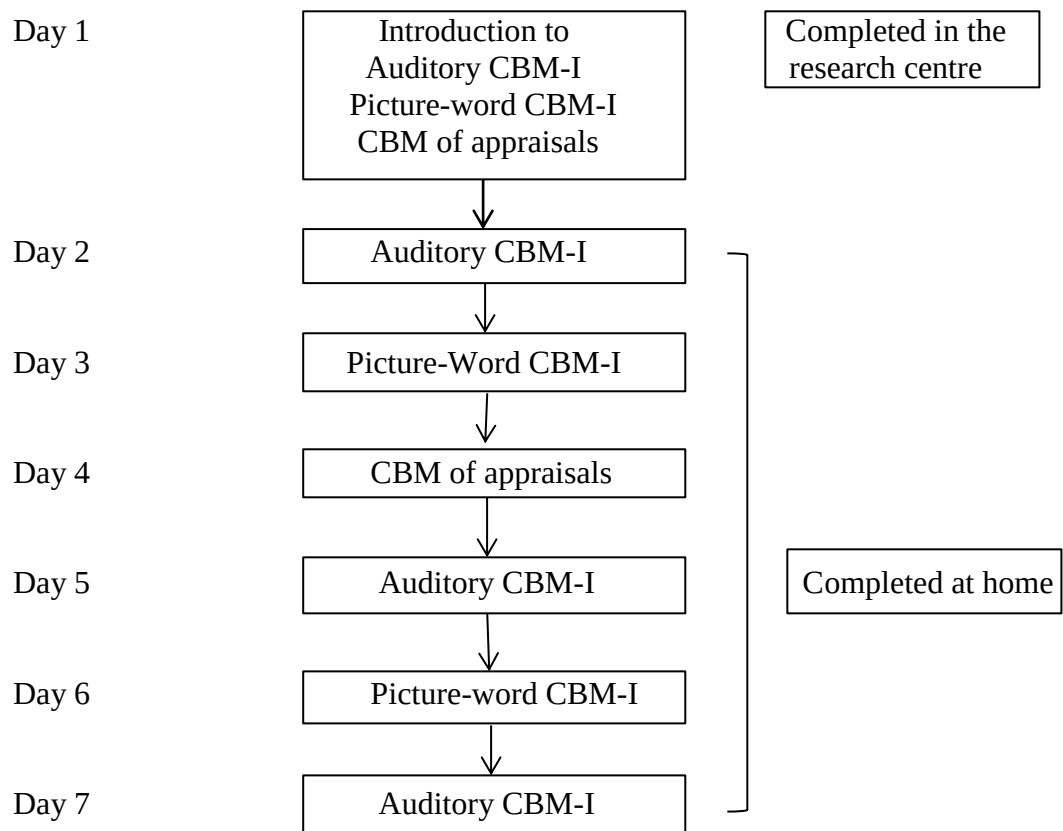
Participant number	1	2	3	4	5	6
BDI-II	24	16	19	22	38	27
HRSD	13	12	12	14	13	11
Current MDE	yes	no	yes	yes	yes	yes
Duration of current MDE (months)	8	N/A	18	2	1	3
Number of Past MDE	5-10	none	2	5-10	0	10-15
Other current Axis 1 Disorders	SP GAD		PTSD	SP Spec	GAD	SP GAD PDA OCD
Current medication			Citalopram 40 mg	Citalopram 40 mg		

Note: BDI-II = Beck depression inventory – Second edition; HRSD = Hamilton rating scale for depression; MDE = major depressive episode; SP = social phobia; GAD = generalized anxiety disorder; Spec = specific phobia; PDA = panic disorder with agoraphobia; OCD = obsessive-compulsive disorder

*Materials**Online CBM program*

A multi-component CBM-I program was used as in Lang et al (2012) and included auditory CBM-I, picture-word CBM-I and CBM of appraisals. The different CBM-I components were presented on alternating days over one week, as shown in Figure 5.2.

Figure 4.2. Overview of the different CBM-I components completed across the week of the intervention.



Auditory CBM-I Materials

The Auditory CBM tasks included 216 scenarios taken from Blackwell and Holmes (2010). A different subset of auditory descriptions as the one used in Lang et al (2012) was selected to increase its suitability for a clinical population. The descriptions were re-recorded digitally using Cool Edit 200 software (Phoenix; Syntrillium Software Corporation). They were read in two different voices, one male (50%) and one female (50%) and lasted 10-13 seconds each. For a full outline of the auditory descriptions see Appendix 5.3. Of the 216 descriptions, 24 were presented at the pre-CBM session to introduce participants to the online CBM program. On the subsequent week of the intervention, each of the three auditory CBM-I sessions included 64 descriptions divided into 8 blocks of 8, and randomly presented within

each block. Examples of the auditory scenarios are presented in Table 4.2. Reminders instructions were presented after each block. Each auditory description was followed by a 2 s gap during which participants had to rate the vividness of their mental image (“how vividly could you imagine the situation that was described?”) on a 5-point scale, from 1 (*not at all vivid*) to 5 (*very vivid*).

Table 4.2

Examples of Four Auditory CBM-I descriptions

Ambiguous scenarios stem	Positive resolution	Neutral resolution (50% positive and 50% negative resolutions)
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.	sadness about the lonely weekend ahead of you. (<i>negative resolution</i>)
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.	easy and enjoyable (<i>positive resolution</i>).
Your manager tells you that, because of your recent work, they would like to change your terms of employment.	They offer you a promotion with a significantly larger salary.	They're not sure you're managing and wonder if you're up to (<i>negative resolution</i>)

Picture-Word CBM Materials

The picture-word CBM component included 152 picture-word stimuli taken from Experiment 1 of this thesis (Pictet, Coughtrey, Mathews, & Holmes, 2011) and Lang et al (2012). As a number of the pictures used in these two studies related to student life and thus

were not suitable for an adult clinical population, a new subset of pictures was selected from both sources. The pictures were 640 x 480 pixels' photographs representing common everyday objects and scenes from the local area. They were typically neutral in isolation, but yielded a positive or negative meaning once combined with a word or short phrase. The same set of pictures was presented to all participants, but in the positive condition they were combined with words which gave a positive meaning and in the control condition, 50% of the combinations were positive and 50% were negative. See Figure 4.3 for examples of picture-word CBM stimuli. A full outline of all picture-word combinations is presented in Appendix 4.4.

Figure 4.3 Examples of Four Picture-Word CBM Combinations for (p) positive and (c) control conditions

(p) Positive condition picture-word combination



Just in time



Beautiful view



Pleasant walk



Plenty of space

(c) Control condition picture-word combinations (*composed of 50% positive and 50% negative resolutions*)



Just in time



Cold and dark



Left behind



Plenty of space

CBM of Appraisals Materials

The 80 scripts used for the CBM of Appraisals were taken from Lang, Moulds et al. (2009). They were divided into 8 blocks of 8 scripts. Randomly selected statements were followed by a comprehension question (4 in each block) to help participants focus on their task. For example, the statement “intrusive memories mean that nothing is wrong with me”

(positive condition) was followed by the question: “Do you believe intrusive memories mean something is wrong with you?”

Measures

Screening survey

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II was used in the online survey to assess levels of depressive symptoms. Participants with BDI-II scores of 14 or above were invited to continue with the study.

Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000). The MDQ is a short self-report screening instrument assessing symptoms or behaviours related to a manic or hypomanic syndrome. In line with the cut-off established by Calabrese et al. (2006), participants whose MDQ scores was 7 or above in the online survey were excluded from the study.

Clinical Assessment

Structured Clinical Interview for DSM-IV Axis 1 Disorder (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-IV criteria (American Psychiatric Association, 2000). The SCID-I was used in the assessment session to determine whether participants were eligible for the study.

Beck Scale for Suicidal Ideation (BSS; Beck & Steer, 1988). The BSS is a 21-item scale used by clinicians to identify and measure the severity of suicidal ideation in adults. The first five items on this measure screen for suicide ideation, with an answer greater than zero on items 4 and 5 indicating active suicidal intention, and a wish to risk death.

Adherence to the Daily Sessions of CBM and to the Study Assessments

Adherence to the daily sessions of online CBM was assessed by computing the number of completed CBM sessions across the week of intervention (from 0 to 6). Adherence to the study assessments referred to the number of assessment sessions participants attended following eligibility assessment. These included the pre-CBM assessment session, the post-CBM assessment session and the online follow-up assessment (from 0 to 3). The number of sessions completed by participants over the internet was automatically recorded on the study internet server.

Acceptability of the online CBM program

Acceptability of the online CBM program was assessed at the post-CBM session via a series of 9-point rating scales related to each of the three CBM tasks and to the internet interface. These questions were taken from both the “Manipulation Check” questionnaires used in Blackwell and Holmes (2010), as well as from criteria generated by patients and caregivers for internet interventions (Kerr, Murray, Stevenson, Gore, & Nazareth, 2006). Questions related to the two CBM tasks (ratings of the CBM of Appraisals task are not reported in the current study for reasons explained above) enquired about their difficulty, enjoyability, understandability, speed and length.

Questions related to the internet interface enquired about the website’s ease of use, appearance, amount and clarity of information provided and the time required to load the CBM sessions. Each rating scale was anchored at the extremes and on the middle point, see Figure 4.5 and 4.6 for a full description of the scales.

Participants were then interviewed and asked in-depth and open questions about their experience of each of the three different tasks in turn (e.g. “how did you find doing the

task?”), and then some general questions about the whole program and their opinion about its potential value as a future clinical intervention (as in Blackwell & Holmes, 2010). Some of their answers to the previous questionnaires were also used by the researcher carrying out the interview to clarify and discuss further relevant aspects of their experience.

Questionnaire Measures of Depressed Symptoms

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

Hamilton Rating Scale for Depression (HRSD; Hamilton, 1960). The 17-item of the HRSD interview is a widely-used interview-based assessment tool to measure severity of depressive symptoms.

Process measures

Scrambled Sentences Test (SST; Rude, Wenzlaff, Gibbs, Vane, & Whitney, 2002). The SST is a measure of cognitive bias, in which participants are presented with a set of 20 scrambled sentences (e.g. “winner born I am loser a”) and instructed to write a number above five of six words in order to construct a grammatically correct sentence, while holding in mind a six digit number (“cognitive load”). This measures the tendency of participants to interpret ambiguous information either positively (“I am a born winner”) or negatively (“I am a born loser”). A “negativity” score is calculated based on the percentage of correctly unscrambled sentences with a negative emotional valence. The SST has recently been shown to be one of the three measures of interpretation bias that produce strong effect sizes in predicting depression (Phillips, Hine, & Thorsteinsson, 2010). The SST has further been found to be sensitive to changes in cognitive bias in studies of imagery-based CBM in depression (Blackwell & Holmes, 2010; Lang et al., 2012). In the current study, two different

sets (A and B) were used at the pre and post-CBM assessment session in a counterbalanced order across the positive and control conditions.

Prospective Imagery Task (PIT; adapted from Holmes, Lang, Moulds, & Steele, 2008; Stöber, 2000). The PIT assesses the ability to generate mental imagery about future events of different emotional valence. Participants are instructed to form a mental image of 10 negative future scenarios and 10 positive future scenarios. These included events such as “you will have a serious disagreement with your friend” and “you will do well on your course”. After each scenario participants are asked to rate on 7-point scales how vivid their image is (from *no image at all* to *more vivid than reality*), how likely they think it is that the scenario will occur in the near future (from *not at all likely* to *extremely likely to occur*) and how much they feel as though they are experiencing the event while imagining it (from *not at all* to *completely*). The PIT was reported to have excellent internal consistency, $\alpha = 0.90$ (Lang et al., 2012).

Procedure

Time 1: Screening survey

Participants who expressed an interest in participating in the study were emailed a password to enable them to log into the CBM web page via a secure connection. On logging in, participants provided informed consent to complete a set of screening questionnaires. Participants scoring higher than 14 on the BDI-II and lower than 7 on the MDQ (i.e. not indicative of any history of mania) were then invited for an eligibility assessment session.

Time 2: Eligibility Assessment Session

After gaining informed consent to participate in the assessment session, the researcher conducted the SCID-I to ascertain eligibility for the study and obtain information about any

comorbid anxiety disorders. Participants were also asked about any current or past treatment for psychological disorders. Eligible participants then provided written consent to take part in the study. They then completed the BDI-II and the BSS and were invited to return to the research center for a pre-CBM assessment session, at a date that was arranged as far as possible within a week of the eligibility assessment.

Time 3: Pre-CBM Assessment Session

Participant started the pre-CBM assessment session by completing the BDI-II and the HRSD, followed by experimental measures of prospective imagery (PIT) and depressive interpretation bias (SST). Participants were then shown an overview of the online CBM program and schedule for the next week.

Positive condition

Participants were guided through an introductory training phase in which they were first explained what is meant by mental imagery, using same instructions as in Experiment 1. Following this, the use of field perspective imagery was emphasised using two photographs illustrating the same situation from a field and an observer perspective. Participants were given the example of “lying on the ground and looking up at the sky” and were prompted to “try to imagine what you would be seeing through your own eyes as you looked up at the sky”, while the researcher held up a picture of a blue sky to illustrate what their mental image could look like. It was then explained that they should try not to imagine from an observer perspective, as shown in a picture of a man looking up at the sky (see Figure 5.4). Participants were reassured that mental imagery is not “like a picture” and it can be difficult to generate images if they are not used to it, and were encouraged to try and get as involved as they could.

Participants were then talked through the “lemon exercise” to illustrate what was meant by generating vivid and multisensory imagery (as in Experiment 1). At the end of the lemon exercise, the researcher enquired about participant’s experience and provided positive feedback and encouragement. Participants who struggled to generate imagery were reassured and encouraged to engage in the task with a sense of curiosity and interest rather than seeing it as performance test. Following the lemon exercise, the use of verbal processing was discouraged by emphasizing that participants should try not to analyze the scenarios or think about them in words. The researcher went back to the previous example of imagining oneself looking at a blue sky and pointed out that while imagining this participants may find thoughts coming into their head such as “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 would really love some weather like that right now”. It was emphasised that although it was natural for the mind to wander and start thinking in words about the scenarios, it could distract them from feeling involved in the image. Participants were further encouraged not to worry if they noticed verbal thoughts starting up, but they were prompted to leave them alone and to re-focus on the image.

Lastly, participants were encouraged not to be put off if their images weren’t realistic as it was possible to imagine anything, even if it is “complete fantasy”. To illustrate this, participants were shown a picture of a flying elephant (see Figure 4.4) and invited to imagine “seeing an elephant flying past through the clouds”. As a further example, they were asked to imagine “watching the lottery draw on television, and as the last ball drops in, you realise you’ve got the perfect match.” Participants were then asked to describe how imagining this last scenario made them feel and what they would do with the money to reinforce the notion that it was possible to imagine anything even if it was not realistic.

Figure 4.4. Pictures presented during imagery instructions to illustrate (a) field perspective imagery, (b) observer perspective imagery, (c) the possibility to imagine unrealistic scenarios

(a) Illustration of field perspective imagery (b) Illustration of observer perspective imagery



(c) Illustration of unrealistic imagery



Participants then completed four practice examples of auditory scenarios with the researcher. They were instructed to shut their eyes and imagine each scenario as it went along, and to focus particularly on the outcome (i.e. the positive resolution of the scenario). Participants were further asked to imagine the event “really happening to you, as if you were

experiencing it through your own eyes”. To prevent participants from being concerned about not performing well on the task, it was emphasised that some of the scenarios would be easier to imagine than others and thus they shouldn’t worry about not being able to imagine them all very vividly. Then the researcher read out each scenario in turn (see Table 4.3) and asked participants to describe their images and to rate how vividly they could imagine the situation that was described (from *not at all vivid* to *extremely vividly*). Imagery and emotion-related aspects reported by participants were summarized back and the researcher provided positive feedback and encouragement. If participants were unable to focus on the positive emotional outcome of the scenarios they were invited to practice imagining the outcome again. Those who seemed unable to generate mental imagery in response to the scenarios were guided through a series of simple imagery tasks that were designed to avoid performance anxiety and provide a way of getting engaged, even at a lower level, in the imagery task.

Table 4.3

Practice Examples of Auditory Scenarios during the Introductory Training Phase

Ambiguous scenarios stem	Positive resolution
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	as you realise that you’ve won first prize
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
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 you then drive on safely
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 there is not a cloud in the sky

Control condition

Participants were guided through a similar introductory training phase but unlike participants in the positive condition, they were not given any practice at generating mental imagery. After being explained what was meant by mental imagery, they were guided through a verbal version of the lemon exercise in which they were read out a series of descriptions and were instructed to focus on the words in the sentence and their meanings (see Appendix 5.5 for a full description of the verbal version of the lemon exercise). Each description was devised to involve a certain degree of ambiguity in that it could be understood in more than one way: for example, the first description stated: “you have bought a yellow citrus fruit”, after which participants were asked how difficult it was for them to understand the description (from *not at all difficult* to *extremely difficult*). The researcher then asked “what fruit did you buy” to reinforce the notion that although the description was easy to understand it entailed some ambiguity in that both a lemon and a grapefruit could refer to this description.

Following the lemon exercise, participants were given identical instructions (i.e. avoiding verbal analysis, using field perspective and allowing unrealistic imagery) to those in the positive condition and then were talked through four practice scenarios. The four practice scenarios were the same as the one used in the positive condition but their ambiguity was

retained until the end instead of being resolved positively. In the third scenario for instance, the positive resolution (“but then you drive on safely”) was removed, leaving the ambiguity retained until the end (“you realise you skidding”). In addition, participants were not asked to generate imagery but instead they were asked to keep their eyes open and consider the words and meanings as the sentence unfolded. Each scenario was then read out in turn by the researcher followed by a rating of how difficult it was for participants to understand the meaning of the description (from 1: *not at all* to 5: *extremely*). Comprehension questions were asked after each scenario to reinforce participants’ focus on the verbal meaning of the situations.

Introduction to the online CBM program

Following the introductory training phase, participants proceeded to the computer to be introduced to the online CBM program and complete a training session that included three blocks of Auditory CBM-I (24 trials), three blocks of Picture-Word CBM (24 trials) and two blocks of CBM of appraisals (16 trials). Participants started the training session by rating their mood on the computer using visual analogue scales, and then they were given a series of reminder instructions and practice examples on the computer to ensure they understood what they needed to do before starting the first block of training. Following completion of the CBM practice session participants were instructed to rate their mood on the computer again.

Participants were then explained the protocol for the one-week CBM program and were encouraged to complete the CBM sessions at approximately the same time each day. Finally, they were given motivational instructions (see Appendix 5.6) and were informed that the computer would log their results and that the researcher would enquire about how they got on following the completion of the first two sessions of the CBM program.

Time 4: Post-CBM Assessment Session

Following completion of the one-week CBM program participants returned to the research center to attend the post-CBM treatment session. They completed the BDI-II and the HRSD, followed by experimental measures of prospective imagery (PIT) and depressive interpretation bias (SST). Participants then completed a series of questionnaires about their experience of the CBM program, followed by an interview conducted by the researcher. Finally, participants were explained about the follow-up measures to be completed online

Time 5: Follow-up

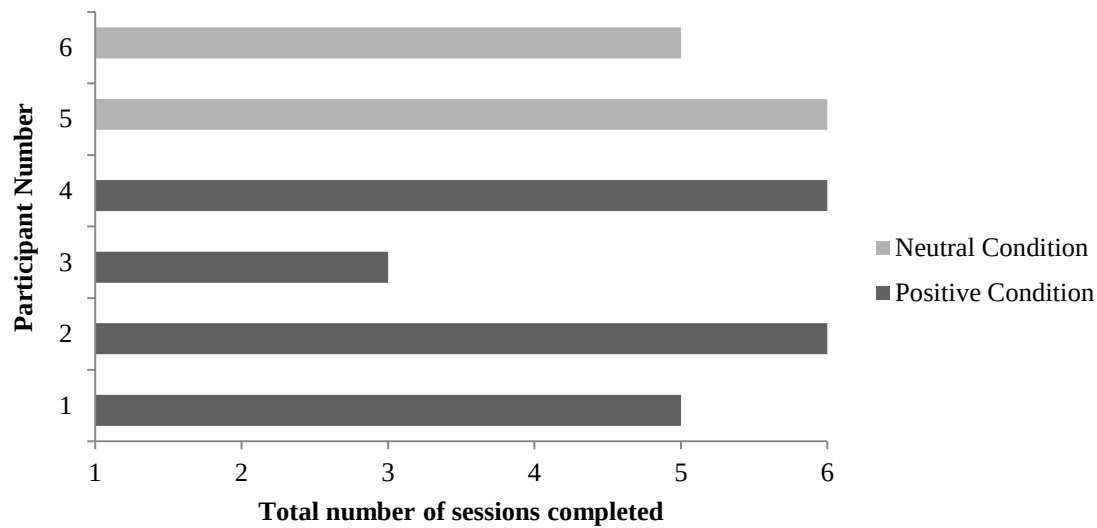
Two weeks following the completion of the post-CBM treatment session, participants were contacted via email to complete the BDI-II and the PIT online.

Results

Adherence to the Daily Sessions of CBM and to the study assessments

Figure 4.5 displays the number of sessions (from 0 to 6) completed by each of the six participants across the one-week CBM program. The overall adherence rate was 86 %. Five of the six participants completed at least five of the six sessions included in the CBM program ($M = 5.17$; $SD = 1.17$). One participant (3) failed to complete more than three sessions because they found the appraisal task (session 3 of the CBM program) aversive and reported feeling too low to carry on with the remaining sessions. Participants 1 and 6 failed to complete a session due to technical glitches, such as unreliable internet connections (Participant 1) and the use of an old version of internet browser that was not compatible with the study server (Participant 6). None of the eligible participants failed to complete any of the three assessment sessions included in the research protocol.

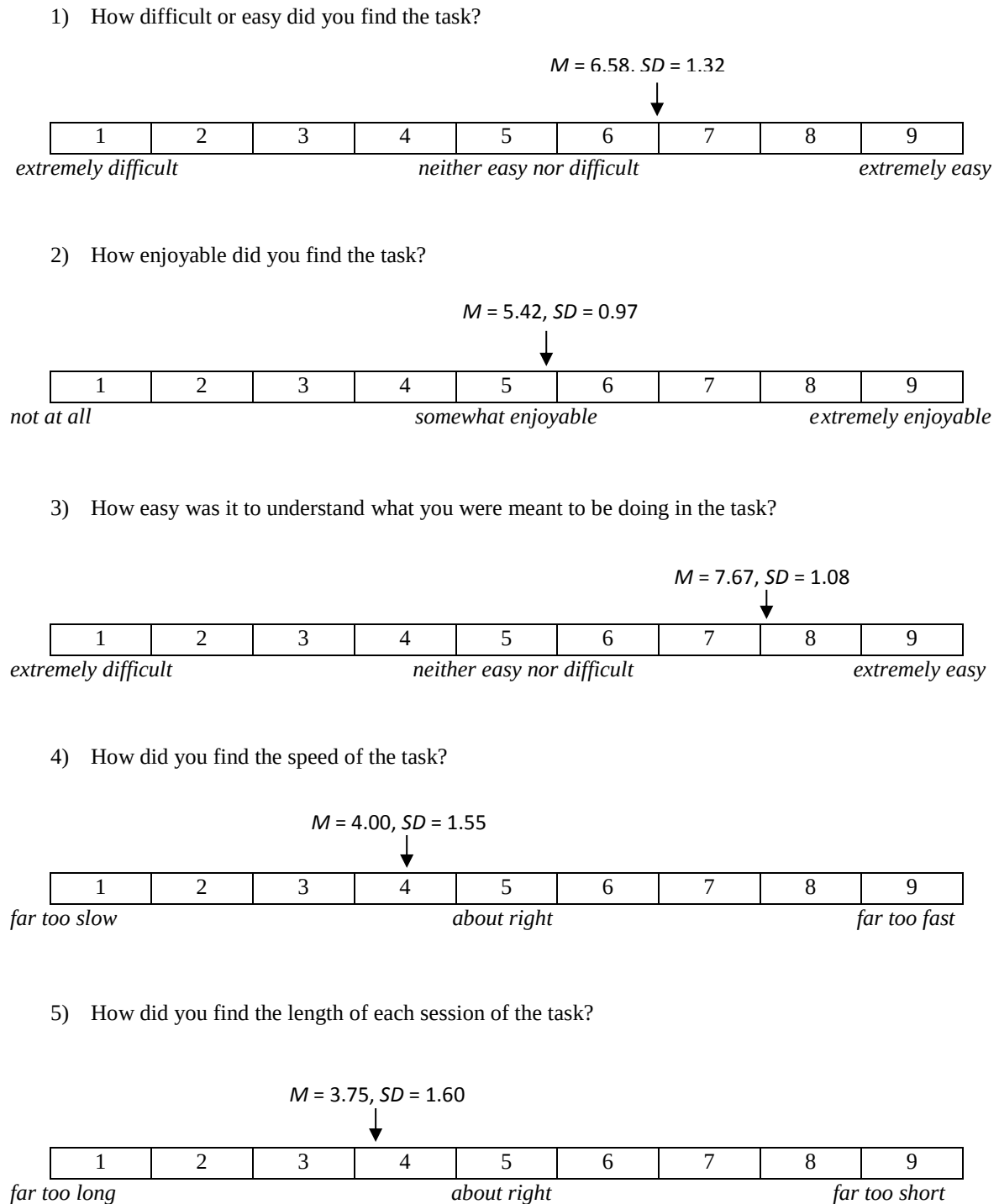
Figure 4.5. Number of sessions completed by each of the six participants across the one-week CBM program out of a total of 6 sessions



Acceptability of the online CBM program

Figure 4.6 display participants' mean ratings on the various indicators pertaining to the acceptability of the OxIGen tasks. Participants' mean ratings of the internet interface are displayed in Figure 4.7. Ratings indicated that overall participants found both CBM tasks rather easy to carry out, somewhat enjoyable, very easy to understand but slightly too slow and lengthy. Examination of the ratings for the two different CBM tasks separately indicated that both of them were rated equivalently, with the exception that the Picture-Word CBM was reported to be less easy to carry out than the Auditory CBM ($M = 5.67$, $SD = 2.42$ vs. $M = 7.5$, $SD = 1.38$). Feedback collected during the final interview suggested that this difference was mostly due to difficulties in matching some of the emotional words with their associated pictures.

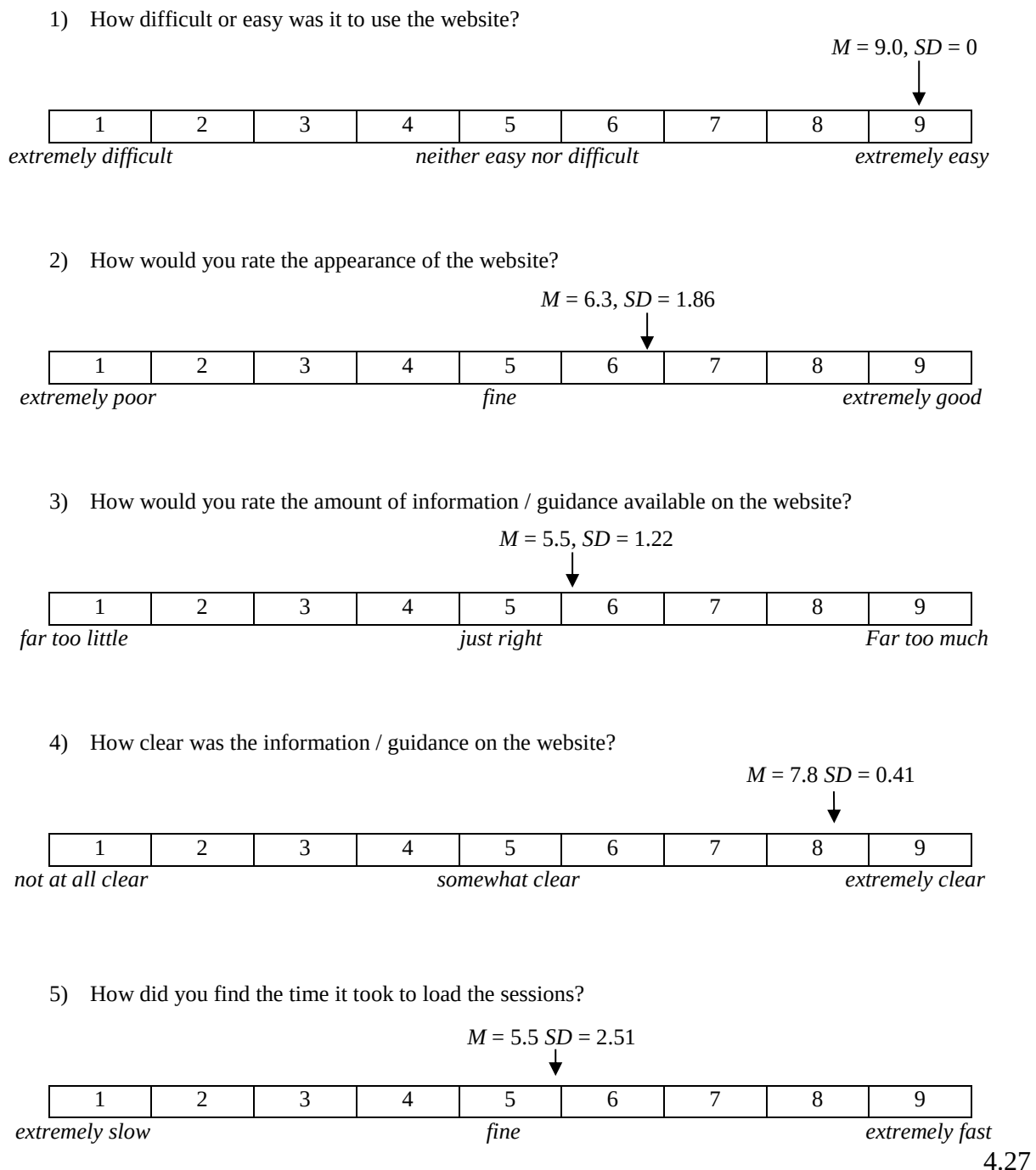
Figure 4.6. Means and Standard Deviations for Acceptability Ratings of the Auditory CBM-I and the Picture-Word CBM¹ Tasks across the Six Participants



¹ the values represent the aggregated means for auditory and picture-word CBM

Ratings of the internet interface revealed that participants found the website extremely easy to use, with a good appearance and providing just the right amount information or guidance. The information or guidance was judged to be very clear, and the time required loading the sessions was just fine (see Figure 5.6)

Figure 4.7. Means and Standard Deviations for Acceptability Ratings of the CBM Internet Interface across the Six Participants



Engagement with the online CBM, Change Scores on Symptoms and Process Measures and Feedback for each of the Six Participants

Participants' scores on depression, cognitive bias and prospective imagery are displayed in Tables 4.2, 4.3, and 4.4. Each participant is discussed in turn in the following section. Although the current feasibility study did not aim to assess the efficacy of the online CBM program, direction of participants' scores were examined in line with the hypotheses formulated in previous clinical studies of imagery-based CBM (Blackwell & Holmes, 2010; Lang et al., 2012). It was hypothesised that 1) participants in the positive condition would show reduced scores from pre- to post-test measures of depressive symptomatology (as assessed by the BDI-II and the HRSD), and 2) participants in the positive condition would show improved scores for interpretation bias and more vivid positive future-oriented imagery (as assessed by the SST and the PIT respectively).

In line with previous studies, changes in depressive symptoms were described as “reliable” improvements if change on the BDI-II was greater than a reliable change index (RCI) of 7.16 calculated from the methodology provided by Jacobson and Truax (1991). Further, improvements on the BDI-II were described as “clinically significant” (marked with an asterisk in Table 4.2) if in addition to meeting criteria for reliable change there was a shift to a lower category of depression severity on the BDI-II (e.g. from “severe” to “moderate” depression). 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. Change scores on the HRSD were described as reliable if there was a reduction of 50% or greater, and so were marked as “improvement” (Hollon, Thase, & Markowitz, 2002). Change scores in interpretation bias and vividness for positive future-

oriented imagery were visually inspected to see whether change was in the hypothesised direction.

Table 4.4

Raw Scores of Depression (BDI-II, HRSD) for each of the Six Participants at Pre-CBM, Post-CBM and Follow-up

Participant	Condition	BDI-II			HRSD		Improved
		Pre-CBM	Post-CBM	Follow-up	Pre-CBM	Post-CBM	
1	Positive	24	12	3	13	5	yes*
2	Positive	16	11	11	12	5	yes
3	Positive	19	29	34	12	12	no
4	Positive	22	29	30	14	13	no
5	Control	37	21	9	13	9	yes*
6	Control	27	27	33	11	12	no

Note: BDI-II = Beck Depression Inventory-II; HRSD = Hamilton's Rating Scale for Depression
Improved = "yes" indicates change exceeding the reliable change index on the BDI-II or a reduction of 50% or greater on the HRSD; "*" = indicates clinically significant change, i.e. when there is a shift to a lower category of depression severity on the BDI-II.

Table 4.5

Raw Scores of Negative Cognitive Bias (SST) for each of the Six Participants at Pre- and Post-CBM

Participant	Condition	SST		Improved
		Pre-CBM	Post-CBM	
1	Positive	0.62	0.32	yes
2	Positive	0.5	0.57	no
3	Positive	0.37	0.33	no
4	Positive	0.71	1.00	no
5	Control	0.76	0.43	yes
6	Control	0.43	0.44	no

Note: SST = Scrambled Sentences Test. Percentage of sentences in the scrambled sentences test unscrambled to form negative statements, i.e. higher percentages indicate more negative cognitive bias;

Improved = indicates change in the hypothesised direction, i.e. reduction in negative bias

Table 4.6

Raw Scores of Prospective Imagery (PIT) for Positive Future Events For each of the Six Participants at Pre-CBM, Post-CBM, and Follow-up

Participant	Condition	Vividness			Improved
		Pre-CBM	Post-CBM	Follow-up	
1	Positive	4	2.3	2.7	no
2	Positive	2.9	3.9	3.8	yes
3	Positive	2.5	2.5	3	no
4	Positive	3.3	4	3.6	yes
5	Control	3.1	3.3	3.4	no
6	Control	2.8	2.2	1.8	no

Note: PIT = Prospective Imagery Task. Mean ratings of imagery vividness for positive future-oriented events; Improved = indicates change in the hypothesised direction, i.e. increase in vividness ratings.

Participant 1 (positive condition)

Engagement in the CBM practice session. Participant 1's engagement in imagery was initially impeded by his high level of anxiety. He was extremely worried about his "performance" and felt he was being scrutinised by the researcher. As a result he struggled to generate vivid imagery and particularly to feel involved in the practice scenarios. To address this, the researcher deviated from the standard imagery training protocol to help participant 1 to find out how he could get more engaged in imagery. This involved guiding him through more "basic" imagery exercises, such as asking him to remember a time when he felt a certain way (e.g. excited) and then trying to incorporate this feeling into the practice scenario, or to focus on non-emotional bodily sensations when trying to imagine them. In addition, the

researchers tried hard to reassure him and encourage him to “have a go” at the imagery task instead of trying to “get it right”.

Adherence. Participant 1 failed to complete one of the six sessions of CBM due to an unreliable internet connection. Given his difficulties during the practice session, his progress was closely monitored over the course of the intervention and assistance was provided when needed. Daily emails were sent to try and reduce his anxiety about the task and implement the strategies used during the practice session.

Feedback and link with relevant measure. During the feedback interview participant 1 reported that although his task anxiety persisted he found himself able to progressively engage in the task. Going through the repeated sessions allowed him to identify what helped him engage in the task (e.g. reminding himself of the instructions, completing the task earlier in the evening and having breaks). He also became aware that certain categories of situations (e.g. those related to nature or outdoor activities) were easier to engage in, whereas others (e.g. social situations) were particularly likely to upset him and make him indulge in verbal analytic thinking. Despite this he reported finding the task calming and quite pleasant to do, and thought it was useful in that it helped him not to worry about things. Consistent with this positive feedback, change scores on the depression scales showed a clinically significant change, with both the BDI-II (-10) and HRSD (-8) going down beyond the RCI and depression severity moving from “moderate” to “minimal” on the BDI-II (see Table 5.2). These improvements were maintained at 2 week follow-up. Further, change scores on the SST were in the hypothesised direction and indicated an improvement in interpretation bias. By contrast, there was no improvement in vividness for positive future-oriented imagery. It should be noted however that the latter results are difficult to interpret as participant 1 experienced great difficulties with understanding and completing the PIT.

Participant 2 (positive condition)

Engagement in the CBM practice session. Participant 2 initially experienced difficulties with engaging in the imagery task and feeling involved in the scenarios. He reported finding it hard to imagine the positive scenarios as they appeared unrealistic and distant from what he would actually experience in reality. The researcher tried to address this by emphasising that verbally comparing the scenarios to reality could distract him from feeling involved in the image, and by encouraging him to leave these verbal thoughts aside and re-focus back on trying to make the image as vivid as possible. Participant 2 was further reminded about the example of imagining a flying elephant (see Figure 5.4) to highlight that it was possible to imagine anything. As he went along the practice session, he progressively gained confidence and found it easier to engage in the imagery task.

Adherence. Participant 2 completed all six sessions of the CBM program. He initially missed two sessions due to unexpected events but managed to catch up on them the next days.

Feedback and link with relevant measures. During the feedback interview Participant 2 reported finding it first hard at first to engage with the CBM tasks but then it became easier over time. Further, he reported being surprised to notice that completing the daily sessions made him feel happier and calmer, and helped him think more positively about himself. This positive feedback was consistent with reliable improvements shown on the HRSD (-7), with depression scores going down by 58% (see Table 4.2). With regards to process measures, scores on the PIT changed in the hypothesised direction and indicated an increase in vividness for positive future-oriented imagery. Scores on the SST, however, did not show the

expected reduction in negative bias. It should be noted that Participant 2 reported being dyslexic when completing the SST, which suggests that the verbal task may have not been suitable to assess his cognitive bias.

Participant 3 (positive condition)

Engagement in the CBM practice session. Initially, participant 3 did not seem to experience any particular difficulties with the CBM task. However, although she was able to generate detailed images of the practice scenarios she often found herself comparing them with reality, which prevented her from feeling involved in the positive outcomes. Similarly to Participant 2, this was addressed by encouraging her to stick to the scenarios as they were described and to focus on imagining the outcome, however unrealistic they appeared. Despite repeated efforts made by the researcher participant 3 did not appear to be involved in the task and rushed through the practice scenarios without appearing to engage in them. In addition, she found the appraisal task very aversive and upsetting as it forced her to think about distressing thoughts she had as a result of suffering from PTSD.

Adherence. Participant 3 failed to complete three of the six sessions of the CBM program. She reported feeling too depressed to carry on. Further, her negative reaction to the appraisal task which was completed during the practice session also suggests that she might have been reluctant to carry on with the sessions after completing the appraisal task on day 3. Even though daily reminders were sent about completing the last three sessions, the researcher did not inspect the study server and thus failed to notice soon enough that the three last sessions had not been completed.

Feedback and link with relevant measures. During the feedback interview participant 3 reported struggling to concentrate on the CBM tasks because she found them too lengthy.

Further, she reported not wearing headphones during the CBM sessions, thus letting the sound come out of her computer speakers. She mentioned again how much the appraisal task upset her, particularly because she felt forced to provide answers that she often did not agree with. Overall, she did not think the CBM program had any positive impact on her mood, thinking or behaviour. She added that she thought the CBM program could not “work” with her because working as a psychiatric nurse made her too aware of what the intervention aimed to achieve (i.e. “getting people to think more positively”). This negative feedback was echoed by her scores on the depression measures, which remained unchanged on the HRSD and worsened on the BDI-II (+7) from pre to post-CBM (see Table 5.2). Further, no improvement was found in negative bias or mental imagery.

Participant 4 (positive condition)

Engagement in the CBM practice sessions. During the practice session participant 4 struggled to imagine most of the practice scenarios because she could not relate them to her own experiences and found them unrealistic. Imagining social situations turning out positively was particularly difficult for her as it would not correspond to the way she would normally feel in such situations. She also experienced great difficulties in keeping herself focussed on the task and stopping her mind from wandering off.

Adherence. Participant 4 completed all six sessions of the CBM program. She missed a session one day due to problems with Internet connection, but then caught up the following day.

Feedback and link with relevant measures. During the feedback interview participant 4 reported struggling to concentrate on the CBM tasks because she found the sessions too long, repetitive and tedious. In addition, she reported being frequently distracted by thoughts

about other things which she needed to do (e.g. errands, phone calls). She further mentioned feeling irritated and “patronised” by the reminder instructions that repeatedly came up after each set of scenarios. Finally, she reported having no emotional reactions to most of the scenarios, with the exception of a few which made her think about positive memories. Overall she did not think the task had any impact on her mood or thinking. Results on the depression measures reflected the absence of response to the intervention, with both the BDI-II (+1) and the HRSD (-1) scores remaining unchanged from pre to post CBM (see Table 4.2). Further, visual inspection of the change scores for the process measures indicated an improvement in the vividness ratings of positive future-oriented imagery improving but a worsening of interpretation bias.

Participant 5 (control condition)

Engagement in the CBM practice session. Participant 5 was fully compliant throughout the successive stages of the practice session. She found the imagery task easy to carry out and despite being allocated to the control condition, she reported enjoying imagining the positive scenarios as well as the negative ones.

Adherence. Participant 5 completed all six sessions of the CBM program.

Feedback and link with relevant measures. During the feedback interview participant 5 reported finding the CBM sessions helpful in that it helped her stop thinking about her current mood problems. She further reported enjoying having to sit down and complete a task every day at the same time. In addition, she mentioned reacting positively to most of the scenarios and not finding any of them particularly negative or distressing. By contrast, she did not find the appraisal task helpful because she found herself focussing on completing the letters rather than forming mental images. This positive feedback about the two imagery tasks

fitted in with clinically significant improvements in depressive symptoms as assessed by the HRSD and the BDI-II, moving from a category of severe to moderate depression on the latter (see Table 4.2). However, means indicated no improvement in cognitive bias and mental imagery from pre- to post-CBM.

Participant 6 (control condition)

Engagement in the CBM practice sessions. Participant 6 did not experience any problems whilst being guided through the imagery training and practice session. She reported that she was not used to generating mental imagery but found that it became easier as she went along.

Adherence. Participant 6 completed five out of the six sessions of the CBM program. One session was missed due to maintenance work carried out in the CBM server on the day the session was due.

Feedback and link with relevant measures. During the feedback interview participant 6 reported finding it rather easy to go through the CBM sessions, although their repetitive nature often resulted in her getting distracted and bored towards the end of each session. Although she found the task fairly enjoyable and reported feeling a bit better simply because of having to carry out a task every day, she did not think the task had any positive impact on mood or thinking. Consistent with this feedback, depressive symptoms remained unchanged from pre to post CBM (-3 on the BDI-II, +1 on the HAMD, see Table 4.2). Further, there was no improvement in cognitive bias and mental imagery.

Discussion

The aim of the current study was to assess the feasibility of delivering a CBM program over the internet to people with depressed mood in their own home. Specifically, the study aimed to 1) assess participants' adherence to the daily sessions of CBM and to the study assessments; 2) assess participants' experience of the internet intervention and change scores on relevant measures of symptomatology and mechanisms and 3) refine the online CBM program before testing a one-month version of the program in Experiment 3b. Accordingly, a series of implications and adjustments made for Experiment 3b are discussed below.

Implications and Adjustments Made for Experiment 3b

Increasing adherence

Overall, participants completed 86% of the sessions included in the online CBM program and none of them dropped out of the study or failed to attend either of the three assessment sessions. These preliminary results suggest that providing email support and tracking session completion was successful in ensuring that participants adhered to the daily sessions of online CBM and attended the study assessments. The case of participant 3, who's failure to complete more than 3 sessions of the online CBM remained unnoticed by the researcher, suggests that tracking session completion should be carried out more systematically by checking on a daily basis that participants have completed their session in due time. In addition, the protocol was revised to explicitly state that those who had completed the sessions should be acknowledged and encouraged by email, whereas those who had failed to complete them should be notified and the researcher should enquire about what got in the way of completing the session and offer assistance when needed.

Enhancing engagement in the imagery task

Various difficulties reported by participants in the current study allowed identifying additional barriers to engagement and implementing systematic strategies to overcome them. The most problematic and frequent difficulties reported by participants were feeling anxious about their performance, engaging in comparative verbal thinking, relating the training scenarios to their memories and struggling to concentrate on the task. The protocol was revised to address each of these potential barriers to engagement.

The first revision made to the CBM instructions for Experiment 3b involved addressing participants' anxiety with regards to their performance in the imagery task. Participant 1 initially felt they were being scrutinised by the researcher and reported feeling very anxious about his "performance", and as result struggled to engage in imagery. Participants 2 and 3 also struggled to engage in imagery because they found the positive scenarios too distant from what they actually experienced in real life, and thus felt frustrated at being unable to carry out the imagery task as prescribed. With regards to participant 1, the repeated attempts made by the researchers to reduce his anxiety seemed to have been effective, since he experienced a clinically significant benefit from the CBM program. To systematically address the risk of participants feeling upset or anxious as a result of struggling to engage in imagery, the protocol was modified to put more emphasis on trying to reduce task-anxiety and limit the impression that participants were being evaluated or scrutinised. The revised protocol stated that the researcher should be encouraging and provide positive feedback, and try hard not to make the CBM program appear like a "test" designed to establish participants' level of performance. Rather, the researcher should encourage non-judgmental curiosity towards any problems reported by participants, and focus on the parts of the task they are doing well on rather than pointing out potential errors.

In addition to the implementation of a non-judgmental and encouraging attitude towards participants' performance on the imagery task, the examples of participants 1 and 2 suggests that the use of specific strategies to address poor initial task engagement could be helpful in order for participants to benefit from the CBM program. A new protocol was thus developed ("Protocol for Enhancing Engagement in Imagery") for dealing with participants who struggle with engaging and feeling involved in imagery, see Appendix 4.6 for a full description of the protocol. This protocol describes the most frequent problems reported by participants and provides detailed descriptions of the strategies to address these. For example, a frequent difficulty reported by participants 2, 3 and 4 was that they were comparing the positive CBM scenarios to their own lives and as a result engaged in verbal analysis, e.g. thinking that "it would never happen to me". To address this the protocol outlined a multi-step strategy that involved 1) reassuring the participant and normalising their experience (e.g. "yes, you might find that if the scenarios seem a bit unrealistic you're more likely to think about them like that") ; 2) emphasising how engaging in verbal comparison can impede with feeling involved in imagery (e.g. "however, this can distract you from feeling involved in the image") ; 3) reminding them that they can imagine fantasy situations (e.g. "remember the example we always give of a flying elephant") and 4) inviting them to re-focus on the image and find out by themselves what makes it easier for them to engage with imagery ("what might help you focus on the image and make it more vivid?").

A third revision to the instructions involved addressing a misunderstanding reported by participants 2, 3 and 4 that the task was about retrieving positive memories. Relating the scenarios to memories increased the risk of slipping into comparative verbal thinking as it enhanced the perceived discrepancy between overly positive scenarios and the overwhelmingly negative experiences retrieved by participants. Thus, the revised instructions

stated that although it was fine for participants to use their own experiences to inform their images, the main purpose of the task was not to recall memories but rather to take the scenarios as hypothetical events and imagine them exactly as they were described.

A final revision made to the instructions aimed to address concentration problems reported by participants 1, 3, 4 and 6 as they went through the CBM sessions at home. Participants reported getting easily distracted (participant 1, 4) or finding the CBM tasks too long and tedious (participant 3, 6). Participant 3 did not use the headphones as prescribed whilst completing the sessions at home. Concentration problems represented an important barrier to engagement as they increased the risk of participants disengaging from the CBM program. Thus, the revised instructions acknowledged the demanding nature of the task and invited participants to think about ways of improving their concentration when completing the sessions at home, such as wearing headphones, closing the door or switching off their phone. Participants were also encouraged to break the sessions up if they were feeling tired and struggling to concentrate. Finally, it was acknowledged that the task could be experienced as boring and repetitive and that it was likely to take a lot of practice before feeling any benefit.

Removing the CBM for appraisal from the CBM program

During the feedback interview participants 1 and 5 reported not finding the CBM for appraisal useful and finding it confusing and upsetting to be forced to provide answers even though they did not agree with them. Participant 3 reported finding the CBM for appraisal task highly aversive as it forced them to think about distressing events they had experienced in the past. All participants reported struggling to imagine the statements as prescribed and finding themselves focussing on analysing their meaning instead. Further, the CBM for appraisal differed from the two other components of CBM program and the introductory

training phase in that it did not explicitly require participants to generate mental imagery. For this reason, this task was removed from the CBM program in Experiment 3b to focus on the imagery generation component and maximise its coherence and efficacy.

Improving the efficacy of the online CBM and extending it to a one-month intervention

The results of Experiment 3a indicated that two out of the four participants allocated to the positive condition showed an improvement in depressed mood as a result of completing the CBM program. This 50% response rate is similar to the one found in previous studies testing a one-week imagery CBM in samples of clinically depressed individuals (Blackwell & Holmes, 2010; Lang et al., 2012). Thus, the intervention showed only moderate effects and its efficacy need to be increased if it was developed into a clinical intervention. One way to increase the efficacy of the CBM program is to maximise adherence and task engagement via the series of refinements made to address the difficulties encountered by participants in Experiment 3a.

One further way that is likely to enhance the efficacy of the online CBM program is to increase the “dose” of the intervention, so that larger and more stable effects on depressed mood can be produced. In support of this, three out of the four participants assigned to the positive CBM in Experiment 3a reported thinking that completing more sessions of CBM over a few weeks would help to improve their mood. Even though clinically significant improvements in depressive symptoms were shown in a few participants after only a week of daily CBM sessions in Experiment 3a as in previous clinical studies (Blackwell & Holmes, 2010; Lang et al., 2012), it remained possible that interpretation biases and deficits in positive imagery were particularly resistant to change in some participants because they presented deeply entrenched negative thinking styles and beliefs about themselves. Thus, a longer intervention might be necessary to modify the targeted cognitive processes and lead to

symptom improvements, in the same way that CBT interventions for depression requires a number of sessions before improvements in symptoms can be detected (e.g. Forde et al., 2005). In support of this, a recent meta-analysis of CBM has found that studies using multiple training sessions of CBM yielded larger effect on symptoms than did studies with a single training session (Hallion & Meron Ruscio, 2011). Further, most CBM studies conducted with a clinical sample have provided multiple training sessions: for example, Beard et al (2011) tested the efficacy of a 8 session CBM program delivered over 8 weeks to individuals with Social Anxiety Disorder, while Amir et al (2012) administrated 12 sessions of CBM over 6 weeks to people with Generalised Anxiety Disorder. Accordingly, the CBM program was extended in the next pilot study (Experiment 3b) to a 12-sessions CBM program completed over the course of a month, with the aim of testing the hypothesis of a dose-response relationship and providing a more realistic intervention for depression.

Experiment 3b

Aim and Background

The results of Experiment 3a provided initial support for the feasibility and acceptability of an imagery-based CBM program that was delivered for the first time over the Internet to a sample of individuals with depressed mood. However, the effects of the one-week online CBM program on depression measures were moderate and the findings were perhaps limited by the brief time scale of the study. Further, feedback indicated that a few participants reported reacting negatively or being confused about the CBM of appraisal task. Finally, this first pilot indicated that participants experienced various difficulties while trying to engage in the CBM program.

Experiment 3b aimed to address these limitations by assessing the feasibility of a refined online CBM program called “OxIGen” for “Oxford Imagery Generation”. In the OxIGen program, the CBM of appraisal task was removed and the protocol was refined to address the difficulties encountered by participants in Experiment 3a and enhance their engagement in the task. In addition, the number of CBM sessions was increased from 6 to 12 sessions of Auditory and Picture-Word CBM which were delivered over a month to eight individuals experiencing a current episode of Major Depression. Further, the follow-up period was extended from two weeks to one month after completion of the CBM program. Expanding the online CBM program and research assessment to such an extent could have a negative impact on participants’ willingness to participate in the study and complete the repeated sessions and assessments. Similarly, the extended CBM program could be perceived as less acceptable by participants due to the increased time commitment and the requirement to complete twice as many sessions of a task (Experiment 3a) that three out of six participants found somewhat long and tedious. To address these questions, Experiment 3b had the following aims:

1. To assess participants’ adherence to the repeated sessions of the OxIGen program and to the study assessments.
2. To assess whether the one-month OxIGen program would be acceptable to individuals with clinical depression.
3. To assess the efficacy of the OxIGen program in improving depression and anxiety symptoms, behavioural activation, cognitive bias and positive future-oriented imagery in a sample of 8 individuals with a current episode of Major Depression.

Method and Development

Extending the online CBM program

The online CBM program was extended to a four-week intervention divided into a first week of six daily sessions (as in Experiment 3a) followed by two sessions per week over the subsequent three weeks. Thus, the new format used resembled that which is used in intensive CBT approaches, whereby a first intensive burst of treatment is followed by “booster sessions” over the following weeks or months (e.g. Ehlers et al., 2010). The use of this particular schedule was motivated by the demonstrated benefit of distributed practice across multiple sessions over massed practice into fewer sessions (Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006). More specifically, booster sessions over the subsequent three weeks were spaced in order to allow participants to practice in the positive imagery-based resolution of ambiguity and translate it to novel ambiguous situations which they may encounter in real life.

Removing the imagery component from the control condition

In Experiment 3a as in Lang et al. (2012), participants in both positive and control conditions were instructed to generate mental imagery in response to initially ambiguous situations, whereas in the positive condition all the ambiguous stimuli were resolved positively and in the control condition half of them were resolved positively and the other half negatively. Thus the difference between the two conditions laid in the interpretation modification component. As a result, it could be argued that any difference obtained in Lang et al. (2012) was due to the presence or absence of a learning contingency rather than to the effects of generating mental imagery per se. In line with the combined cognitive bias hypothesis (Hirsch, Mathews, & Clark, 2006), the imagery instructions were removed from

the control condition to investigate the combined effect of imagery generation and cognitive bias modification together. Instead of being actively instructed to imagine the scenarios, participants in the control group were asked to engage in a more typical depressed style of thinking and focus on the verbal meaning of the situations (as in Holmes, Mathews, Dalgleish, & Mackintosh, 2006). See appendix 4.6 for a full description of the verbal OxIGen instructions.

Additional Outcome Measures

The following two additional measures were included in the current study to assess any transfer of the effects of the OxIGen program to other depression-related clinical dimensions:

First, a measure of anxiety (State-Trait Anxiety Inventory-Trait scale; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) was included in the current study to explore the possibility that some of the effects of the OxIGen program could reduce anxiety. Feedback from Experiment 3a indicated that many participants reported finding the CBM task “calming”, and that it reduced their worrying. Consistent with these reports, preliminary tests with clinically depressed individuals have shown a significant decrease in trait anxiety following completion of the imagery-based CBM (Blackwell & Holmes, 2010; Lang et al., 2012). Further, five out of six participants in Experiment 3a met criteria for a current anxiety disorder, which is in line with the high co-morbidity reported between depression and anxiety (Moffitt et al., 2007).

Second, a measure of behavioural activation (The Behavioural Activation for Depression Scale; Kanter, Mulick, Busch, Berlin, & Martell, 2006) was included to explore whether depressed participants would be more willing to engage in goal-oriented behaviours

as a result of completing the OxIGen program. In Blackwell & Holmes (2010), participants reported being more “active” behaviourally whilst engaging in the positive imagery CBM, but this was not measured formally. Further, Experiment 1 from the current thesis has shown greater performance on a behavioural task (the Fishing Game) in participants who had undergone a positive Picture-Word CBM session compared to those who had undergone a neutral and a negative Picture-Word CBM (Pictet et al., 2011). These findings suggest that the effects of CBM could transfer to behaviour. The Behavioural Activation for Depression Scale (BADs) was chosen as it specifically measures the types of behaviours that are reduced in people with depression.

Procedure

Following online completion of screening survey, participants who scored higher than 14 on the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996) and lower than 7 on the Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000) were invited for an eligibility assessment session. Eligible participants (as assessed by the SCID-I; First et al., 1996) were randomly allocated to either the positive or control condition of the OxIGen program and invited to return for the OxIGen baseline assessment session.

During the OxIGen baseline assessment session, participants completed measures of depression, anxiety, behavioural activation, cognitive bias and mental imagery and were then guided through a practice session of the online OxIGen program. Following the OxIGen baseline assessment session, participants completed 12 sessions of the online OxIGen program from home every day.

After completing the one-month OxIGen program, participants returned to the research centre for a post-OxIGen assessment session during which the measures of

depression, anxiety, behavioural activation, cognitive bias and mental imagery were repeated. At the end of the session a feedback interview was carried out by the researcher to enquire about participants' experience of the OxIGen program. One month later, participants completed follow-up measures of depression, anxiety, behavioural activation and mental imagery.

Participants

Participants with depression were recruited through advertisements placed online requesting people “for a study investigating the effects of an internet-based computer program in depression”. Those who expressed their interest in participating (N = 41) were sent an information sheet about the study and then directed to complete the screening questionnaires online via the OxIGen website. Upon completion of the online screening questionnaires, 13 participants who scored 14 or higher on the BDI and lower than 7 on the MDQ were invited for an eligibility assessment session. Participants were included in the study if they met criteria for a current major depressive episode (MDE) based on DSM-IV criteria using the SCID (First et al., 2002). They were excluded if they (a) met criteria for current psychotic disorder; (b) had a history of mania or hypomania; c) started or changed antidepressant medication during the last month; d) met criteria for current substance abuse disorder; e) were involved in other current treatment trials; f) were currently receiving psychological therapy. Ten of the 13 participants invited for an eligibility assessment met eligibility criteria and were invited for an OxIGen baseline assessment session. Two eligible participants chose not to attend the OxIGen baseline assessment session due to other time commitments.

Participants were one man (participant 2) and seven women with a mean age of 34.4 years ($SD = 13.13$). Seven of the eight participants had experienced 5 or more past episodes

of depression, and six participants also met criteria for other current Axis-I diagnosis. See Table 4.7 for clinical information across each participant.

Table 4.7

Clinical Information for each of the Eight Participants

Participant number	1	2	3	4	5	6	7	8
BDI-II	10	33	16	48	18	29	29	16
Current MDE duration (months)	12	24	0.5	5	11	1	1	4
Number of Past MDEs	5	10	5-10	10	5	5-10	10	0
Other current Axis 1 disorders	PTSD	GAD	none	GAD PD PTSD SP SpecP	none	GAD SpecP	GAD	GAD PTSD Hypoch
Current medication (mg)		Mirtaz.30 Propan.160	Venlaf.37.5		Cital.40	Cital.25		

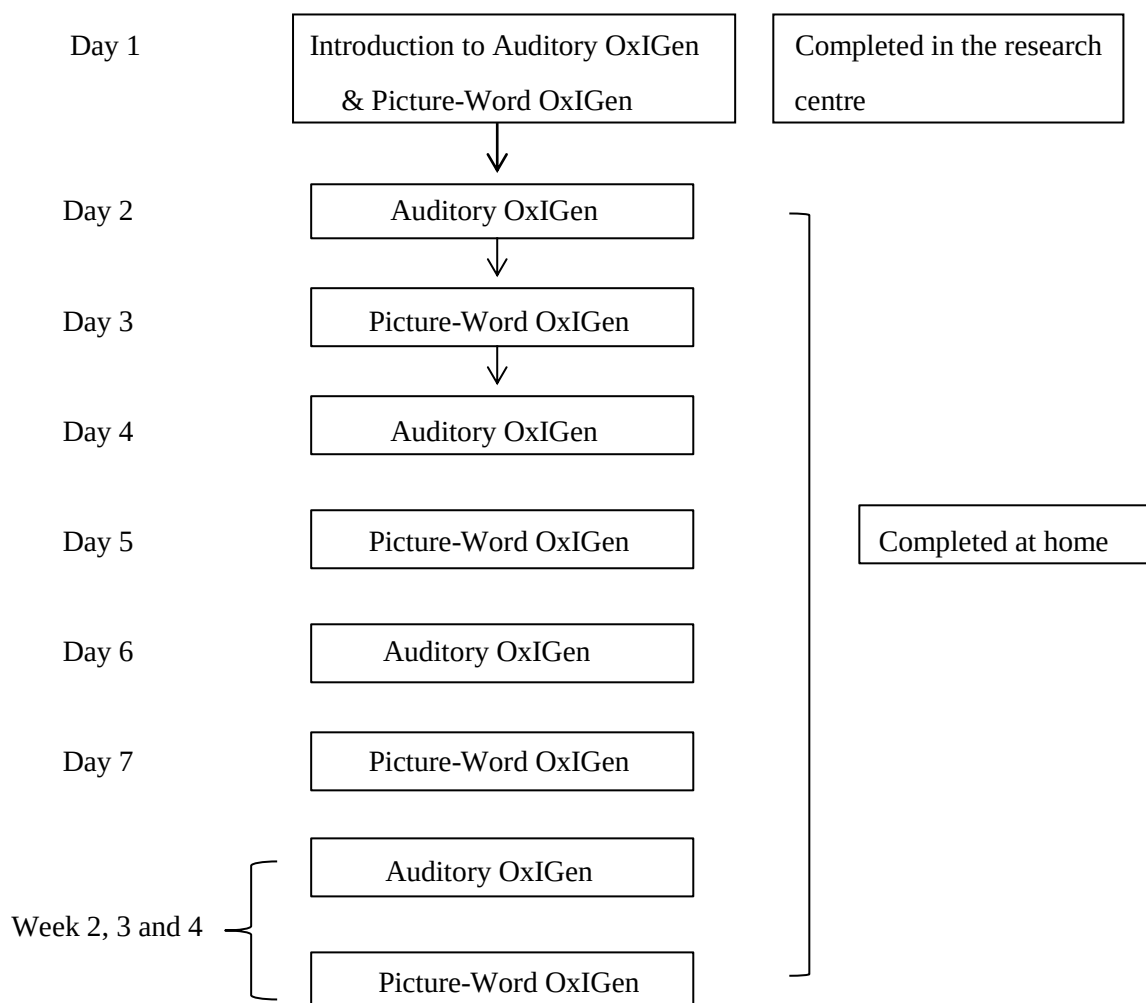
Note. MDE = major depressive episode; PTSD = Post Traumatic Stress Disorder; GAD = generalized anxiety disorder; PD = Panic Disorder; SP = social phobia; SpecP = specific phobia; Hypoch = Hypochondriasis; Mirtaz = Mirtazapine; Propan = Propanol; Venlaf = Venlafaxine; Cital = Citalopram

Materials

OxIGen program

The OxIGen program consisted of a combination of Auditory CBM-I (further described as “Auditory OxIGen”) and Picture-Word CBM (“Picture-Word OxIGen”). The two CBM tasks were presented in alternating order and on separate days over the four weeks of the intervention. They are discussed in turn below. Figure 4.8 outlines the order of presentation of the two components across the four weeks.

Figure 4.8. Overview of the Auditory OxIGen and Picture-Word OxIGen sessions across the four weeks of the OxIGen program.



Auditory OxIGen

Each of the six sessions of Auditory OxIGen included 64 training scenarios presented over headphones in eight blocks of eight scenarios as in previous studies (Blackwell & Holmes, 2010; Lang et al., 2012). Thirty-two scenarios were presented at the baseline assessment session to introduce participants to the task, making a total of 416 scenarios across the seven sessions of the OxIGen program (see Appendix 4.7). Of the 416 descriptions, 218 were taken from Blackwell and Holmes (2010), 73 from Holmes et al. (2006), 20 from Cortina (2006) and 105 additional scenarios were created for the study. All scenarios were re-recorded digitally and were read in two different voices, one male and one female. Each description lasted between 10 and 13 s and was followed by a 2 s gap. As in previous studies and Experiment 3a, Participants were instructed to “imagine the scenarios as if you are actively involved, seeing them through your own eyes”. At the end of each scenario they rated the vividness of their imagery on the computer from 1 (*not at all vivid*) to 5 (*extremely vivid*).

Picture-word OxIGen

Each of the six sessions of Picture-Word OxIGen included 64 picture-word combinations presented in eight blocks of eight trials. Of the 416 picture-word combinations, 100 were taken from Experiment 1 of the current thesis (Pictet et al., 2011), 52 were taken from Lang et al. (2012) and 264 additional stimuli were created for the study (see Appendix 5.8). Pictures were colour photographs of neutral everyday objects and scenes with dimensions of approximately 640 x 480 pixels, displayed on the computer screen. Each picture was combined with a word or a short phrase, which intended to create a positive or a negative interpretation of the situation depicted. As in Experiment 3a, participants were instructed to “imagine the combination of the picture and word as you’re actively involved

and seeing what's happening through your own eyes". Each picture-word combination was presented on a screen for 3000 ms followed by a beep at which point participants rated the vividness of their imagery using the same scale previously described in Auditory OxIGen.

Measures

Screening survey

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II was used in the online survey to assess levels of depressive symptoms. As in Experiment 3a, participants with BDI-II scores of 14 or above were invited to continue with the study.

Mood Disorder Questionnaire (MDQ; Hirschfeld et al., 2000). The MDQ was used to assess symptoms or behaviours related to a manic or hypomanic syndrome. Participants whose MDQ scores was 7 or above were excluded from the study.

Clinical Assessment

Structured Clinical Interview for DSM-IV Axis 1 Disorder (SCID-I; First et al., 1996). As in Experiment 3a, the SCID-I was used in the eligibility assessment session to determine whether participants were eligible to participate in the study.

Adherence to OxIGen and to the Study Assessments

As in Experiment 3a, adherence to the daily sessions of OxIGen was assessed by computing the number of sessions completed across the 4 weeks of intervention (from 0 to 12), while dropout referred to the number of assessment sessions participants failed to complete once they had attended the eligibility assessment session (from 0 to 3). The number of sessions completed by participants over the internet was automatically recorded on the OxIGen server.

Acceptability of the online OxIGen program

Acceptability of the OxIGen program was assessed at the post-OxIGen session using the same set of questions as the one used in Experiment 3a (see Figure 4.9.1 and 4.9.2). To complement the assessment of the feasibility of the OxIGen program as a potential clinical intervention, participants were additionally asked about how useful they found each of the two OxIGen tasks was, and whether they would be willing to try such an intervention if it was offered by their GP or any other health professionals as part of a future treatment.

Questionnaire Measures of Depression, Anxiety and Behavioural Activation

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II was used to assess levels of depressive symptoms as in Experiment 3a.

Spielberger State-Trait Anxiety Inventory – Trait scale (STAI-T; Spielberger et al., 1983). The trait scale of the STAI is a 20-item measure that assesses general levels of anxiety. This measure is widely used and reported to have satisfactory reliability and validity (Spielberger et al., 1983).

Behavioral Activation for Depression Scale (BADS; Kanter et al., 2006) The BADS is a 25-item scale that was developed to assess the frequency of specific types of behaviours targeted in Behavioural Activation treatment for depression (Dimidjian et al., 2006). Scores range from 0 to 150 and higher scores indicate increased behavioural activation. The BADS has recently been validated in a sample of individuals with elevated depressive symptoms and has been shown to have adequate reliability and validity (Kanter, Rusch, Busch, & Sedivy, 2009). BADS scores have been reported to correlate strongly with measures of depression (Kanter et al., 2009). Further, it has recently been shown that changes in BADS scores

following CBT predicted reductions in depressive symptoms (Christopher, Jacob, Neuhaus, Neary, & Fiola, 2009).

Process Measures

Scrambled Sentences Test (SST; Rude et al., 2002). The SST was used as in Experiment 3a to assess cognitive bias.

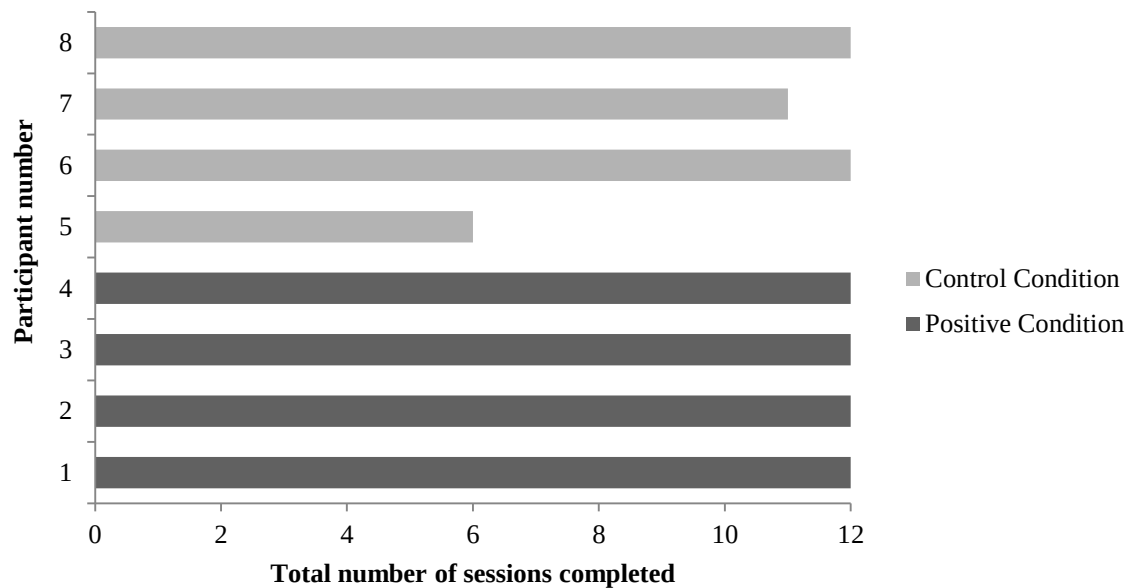
Prospective Imagery Task (PIT; Holmes, Lang, et al., 2008; Stöber, 2000). The PIT was used as in Experiment 3a to assess the ability to generate mental imagery about future events.

Results

Adherence to the Sessions of OxIGen and to the study assessments

Figure 4.9 displays the total number of sessions (from 0 to 12) completed by each of the eight participants across the one-month OxIGen program. The overall adherence rate was 93%. Seven of the eight participants completed at least 11 of the 12 sessions included in the OxIGen program ($M = 11.13$; $SD = 2.1$). One participant (5) only completed the first week of the OxIGen program, so 6 of the 12 sessions, because she was feeling too low to carry on with the remaining sessions in the subsequent three weeks of the intervention. With regards to adherence to the study assessments, all participants attended the OxIGen baseline and post-OxIGen assessment sessions, two (4, 5) did not complete the online follow-up measures and one only partially completed them (7), which gives an overall dropout rate of approximately 13%.

Figure 4.9. Number of sessions completed by each of the eight participants across the one-month OxIGen program of a total of 12 sessions.



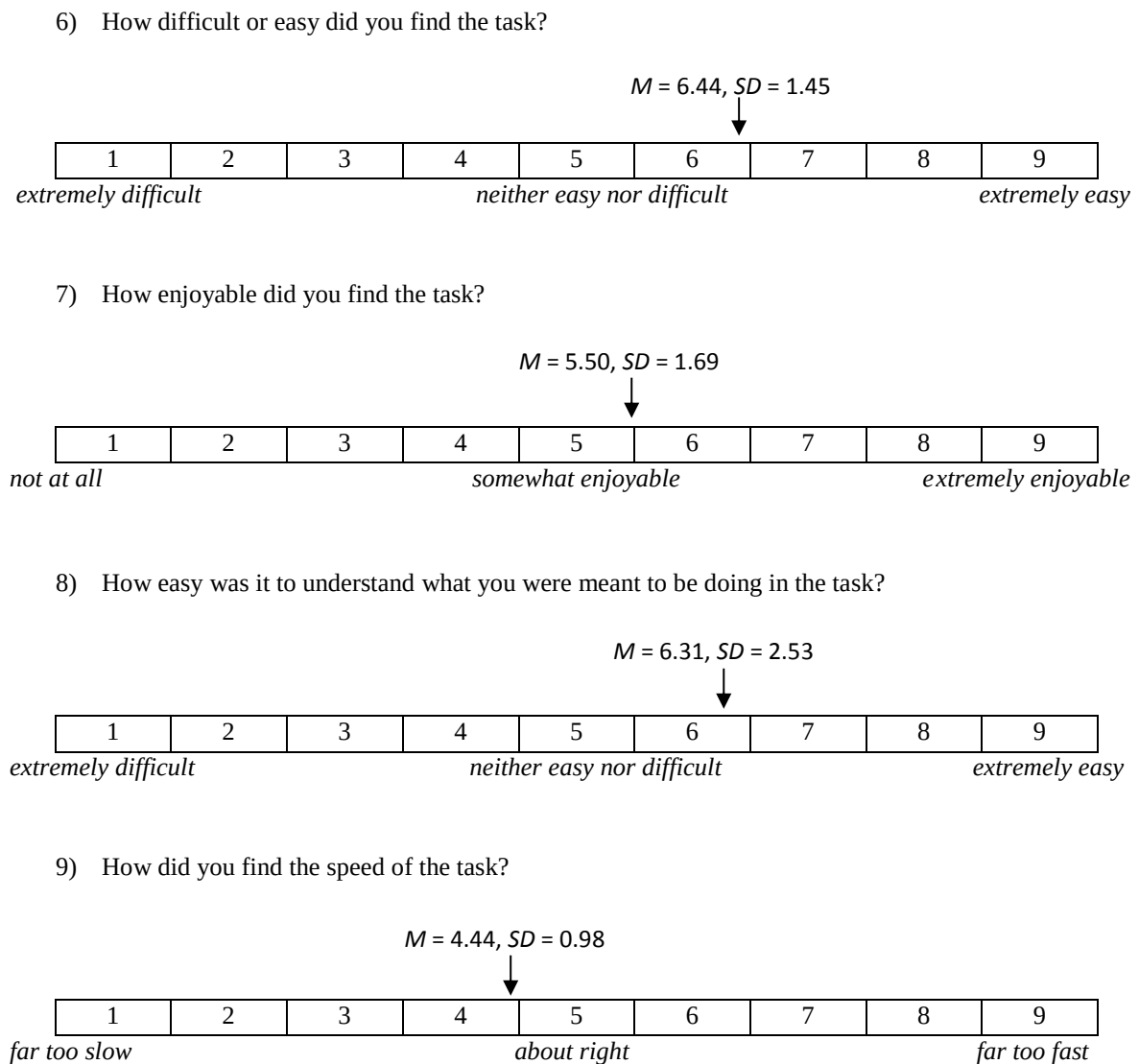
Acceptability of the online OxIGen program

Figure 4.9.1 display participants' mean ratings on the various indicators pertaining to the acceptability of the OxIGen tasks. Participants' mean ratings of the internet interface are displayed in Figure 4.9.2. Ratings of the OxIGen tasks indicated that overall participants found the CBM tasks easy to carry out, somewhat enjoyable, fairly easy to understand, about the right speed but slightly too lengthy. Further, ratings of perceived usefulness indicated that participants found the tasks "somewhat useful". Ratings were fairly equivalent across the OxIGen tasks, although the Picture-Word OxIGen was rated to be easier to carry out than the Auditory OxIGen ($M = 7.13$, $SD = 1.46$ vs. $M = 5.75$, $SD = 1.75$) and more enjoyable ($M = 6.13$, $SD = 1.89$ vs. $M = 4.88$, $SD = 1.96$).

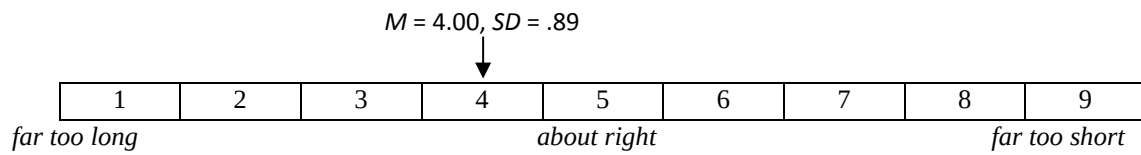
Differences in ratings between the positive imagery group and the control group were also examined as it was anticipated that removing the imagery instructions from the control condition would make it less enjoyable and more difficult for participants to understand. As

expected, visual inspection of the means indicated that participants in the control group found the OxIGen tasks less enjoyable ($M = 4.38$, $SD = 1.68$ vs. $M = 6.63$, $SD = 1.32$), and more difficult to understand ($M = 5.25$, $SD = 2.24$ vs. $M = 7.38$, $SD = 3.25$) than participants in the positive imagery group. Of note, participants in the control group did not seem to find the OxIGen tasks less useful than participants in the positive imagery group ($M = 4.88$, $SD = 0.8$ vs. $M = 5.3$, $SD = 2.06$).

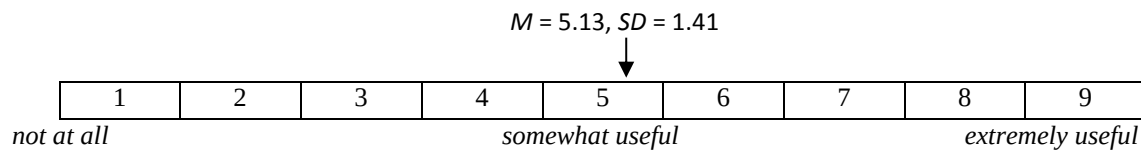
Figure 4.9.1 Means and Standard Deviations for Ratings of the OxIGen Tasks across the Eight Participants



10) How did you find the length of each session of the task?



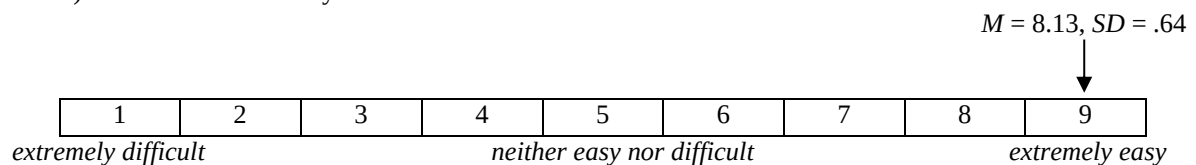
11) How useful did you think the task was?



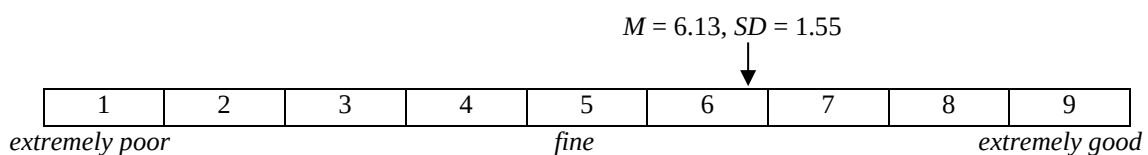
Ratings of the internet interface revealed that participants found the website extremely easy to use, with a good appearance and providing just the right amount information or guidance. The information or guidance was judged to be very clear, and the time required loading the sessions just fine (see Figure 4.9.2).

Figure 4.9.2 Means and Standard Deviations for Ratings of the OxIGen Internet Interface across the Eight Participants

6) How difficult or easy was it to use the website?

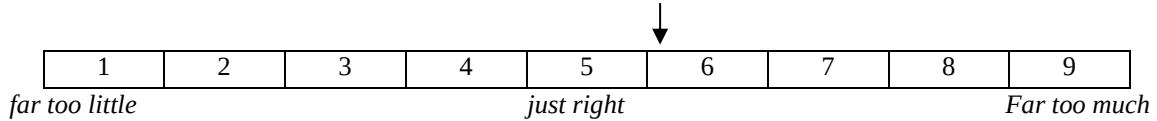


7) How would you rate the appearance of the website?



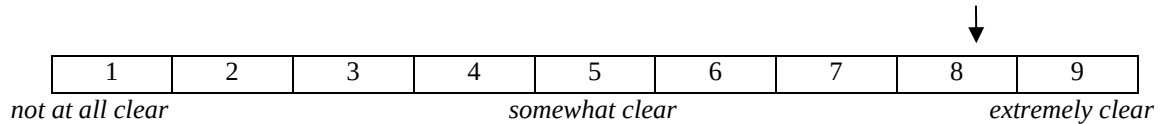
8) How would you rate the amount of information / guidance available on the website?

$M = 5.38, SD = 1.41$



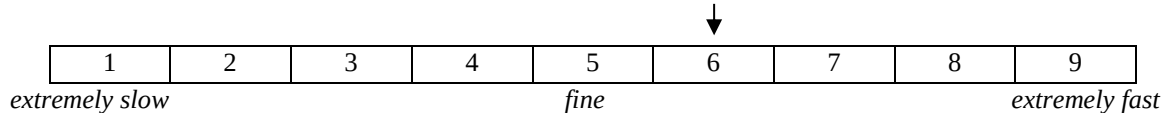
9) How clear was the information / guidance on the website?

$M = 7.25 SD = 1.98$



10) How did you find the time it took to load the sessions?

$M = 4.5 SD = 2.27$



Engagement with the online CBM, Change Scores on Symptoms and Process Measures and

Feedback for each of the Eight Participants

Participants' scores on measures of depression (BDI-II), anxiety (STAI-T), behavioural activation (BADs), cognitive bias (SST) and prospective imagery (PIT) are each discussed in turn in the following section. As in Experiment 3a, change scores on the BDI-II and STAI-T were analysed according to correspondent reliable change indices (RCI) of 7.16 for the BDI-II and 7.86 for the STAI-T based on the methodology proposed by Jacobson and Truax (Jacobson & Truax, 1991). Clinically significant change was defined by a change greater than the RCI and a shift from one category of depression to another on the BDI-II. For the STAI-T, change was said to be clinically significant if it was greater than a RCI of 7.86 and if participant's score fell below a cut-off of 45.7 (Fisher & Durham, 1999). For the BADs, a cut off of 90 and a RCI of 16 was calculated based on the methodology proposed by

Jacobson and Truax (1991). See Appendix 4.9 for a description of how the cut-off c and the RCI were calculated for the BADS. With regards to the process measures, change scores were visually inspected to examine whether change was in the hypothesised direction, i.e. reduction in negativity scores on the SST and increase in vividness scores on the PIT.

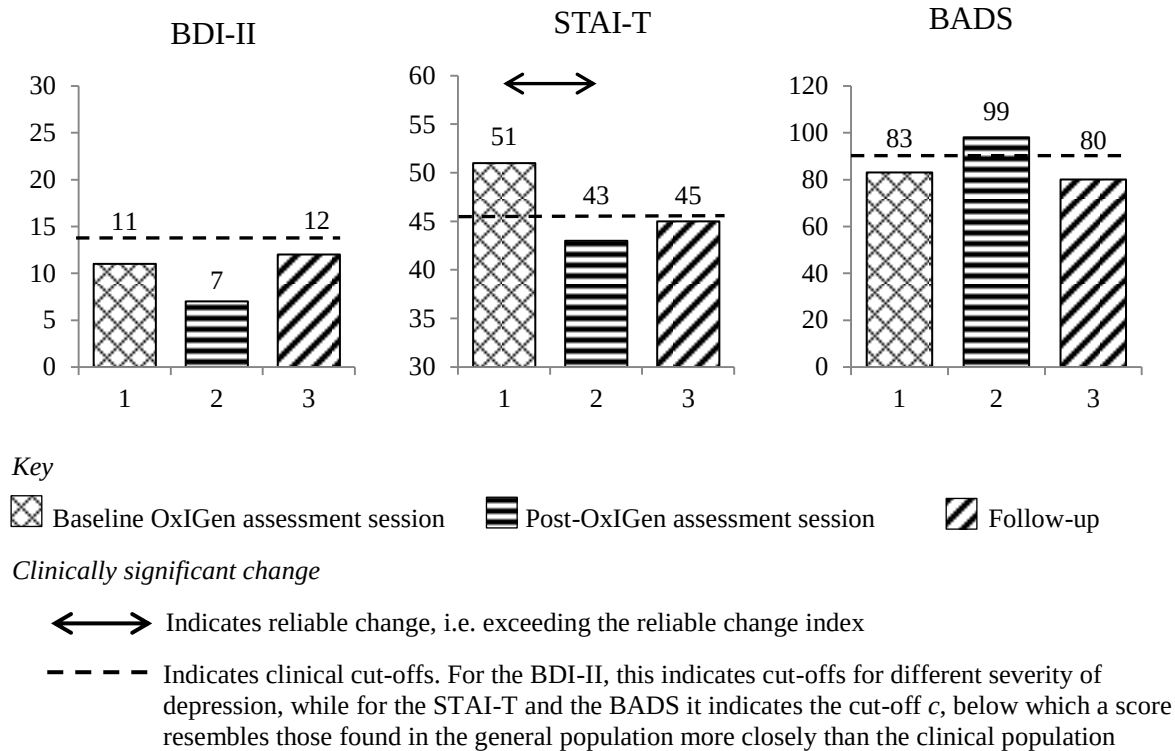
Participant 1 (positive condition)

Participant 1 reported during the practice session that although she was able to imagine most of the scenarios quite vividly, she could not help comparing them with what she had actually experienced in her life. On the other hand, she found herself struggling to imagine scenarios that she could not relate to (e.g. winning the raffle prize, having an interview for a job). Further, she reported feeling tired and finding it hard not to let her mind wander off.

Outcome and process measures. Although participant 1 met criteria for a current episode of Major Depression (as assessed by the SCID) at the eligibility assessment, her BDI-II scores were in the minimal range at the eligibility and baseline assessments (10 and 11 respectively). Reduction in depression scores (-4) from pre- to post-OxIGen was below the RCI. However, change scores on the STAI-T reached the RCI and went down beyond the clinical cut-off, thus indicating a clinically significant improvement in anxiety (see Figure 4.9.3a). Scores of behavioural activation (BADS) improved beyond the clinical cut-off and reached the RCI, indicating clinical improvement. However, these improvements in behaviour were not maintained at follow-up. Examination of the scores on the process measures did not indicate any improvement in cognitive bias and mental imagery (see Figure 4.9.3b)

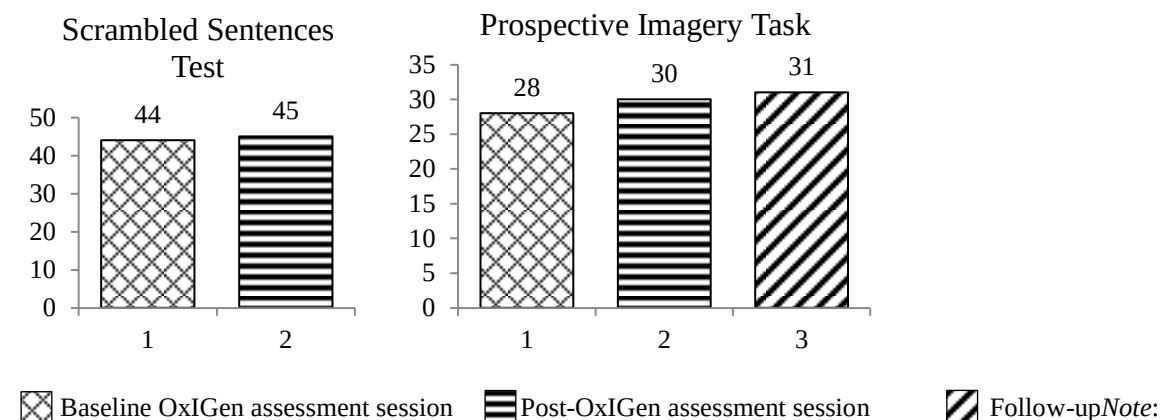
Figure 4.9.3. Participant 1: A) Changes in score on measures of depression, anxiety and behaviour B) Changes in score on laboratory measures of cognitive bias and imagery²

A)



Note: BDI-II = Beck Depression Inventory- II, STAI-T = Spielberger State-Trait Anxiety Inventory – Trait scale; BADS = Behavioural Activation for Depression Scale

B)



Note: Scrambled Sentences Test = Percentage of sentences in the scrambled sentences task unscrambled to form negative statements, i.e. higher percentages indicate more negative cognitive bias; Prospective Imagery Task = mean vividness ratings (*10) for images of positive future events.

² Scores were multiplied by 100 on the SST and by 10 on the PIT to increase the visibility of the results

Feedback at interview. At feedback participant 1 reported struggling not to let her mind wander off and finding herself verbally analysing the scenarios about half of the time. She further reported feeling often irritated by the fact that all the scenarios ended up positively, and thinking that “everything in life is not that positive”. Despite these negative comments participant 1 said she felt her mood had improved since the last visit to the research centre (i.e. baseline session), although she could not tell why. She reported finding the task “somewhat useful” in that completing the OxIGen program helped her to think more positively about everyday situations. For example, on one occasion when she came back to the car park and thought she had gone over the time limit and started feeling angry at herself, she had this voice in the back of her mind saying “stop it, be positive, you might not have gone over the 2 hours limit after all.” On another occasion she went to the cinema and thought she was not going to enjoy the film as she had not enjoyed seeing films for a while, and then she realised how negatively she was thinking and said to herself: “hang on, it could well be that I am going to enjoy this film”. When she was asked about her thoughts on being offered such a program if it was developed into an online intervention, she said she would probably give it a try because when her mood was low she felt reluctant to admit to anybody, so she would rather have a go at completing few sessions before going to her doctor.

Participant 2 (positive condition)

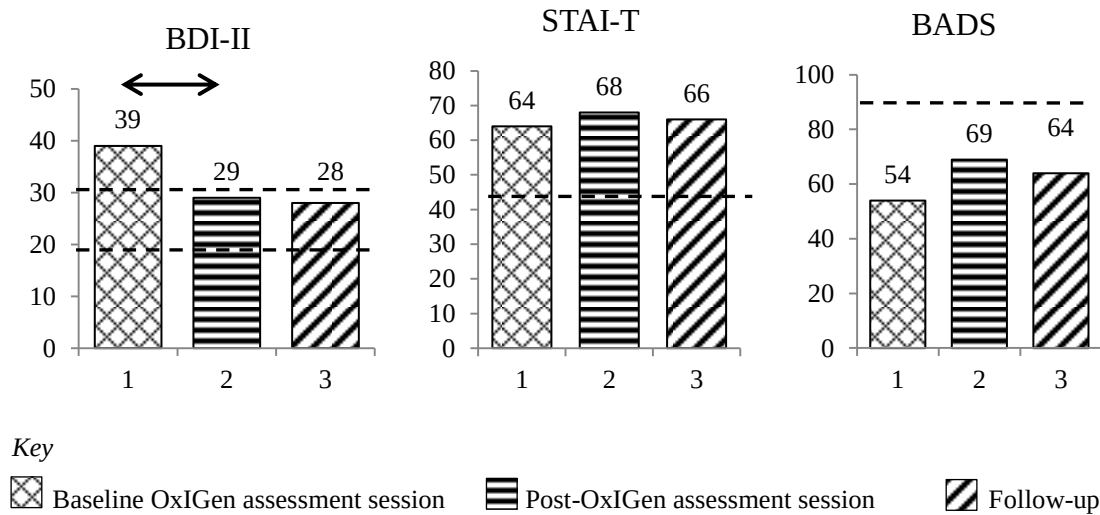
During the introductory session participant 2 managed to imagine most of the practice scenarios, except those which were not relevant to him such as the one about meeting a new partner (as he had been married for over 30 years). He reported that most of the images formed were based on past memories, and that he found himself thinking verbally about some of them but managed to focus back on the image. Further, he experienced great difficulties with generating positive imagery in response to work-related situations as he had recently

been dismissed from work. Throughout the practice session participant 2 reported feeling very anxious, which is consistent with his high levels of trait anxiety at baseline (STAI-T = 64).

Outcome and process measures. Change scores on the BDI-II indicated an improvement in depressive symptoms beyond the RCI and only one-point far from moving participant 2 to a lower category of depression severity and thus being clinically significant. By contrast, there was no improvement in anxiety scores (STAI-T). Scores of behavioural activation increased from pre-to post-OxIGen but the amplitude of change was just one-point below the RCI and scores remained below the cut-off. With regards to process measures, examination of change scores indicated a substantial decrease in negative cognitive bias but no improvement in positive future-oriented imagery.

Figure 4.9.4. Participant 2: A) Changes in score on measures of depression, anxiety and behaviour B) Changes in score on laboratory measures of cognitive bias and imagery

A)



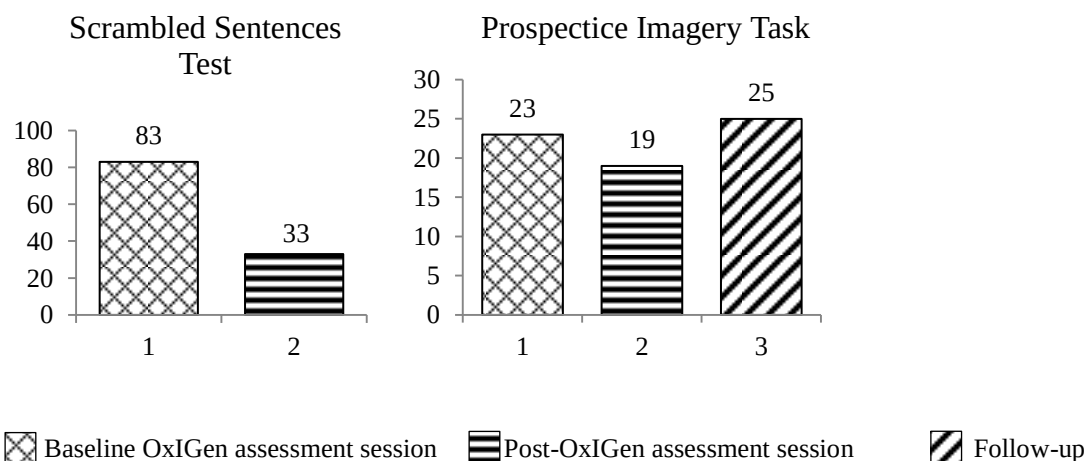
Clinically significant change

↔ Indicates reliable change, i.e. exceeding the reliable change index

--- Indicates clinical cut-offs. For the BDI-II, this indicates cut-offs for different severity of depression, while for the STAI-T and the BADS it indicates the cut-off *c*, below which a score resembles those found in the general population more closely than the clinical population

Note: BDI-II = Beck Depression Inventory- II, STAI-T = Spielberger State-Trait Anxiety Inventory – Trait scale; BADS = Behavioural Activation for Depression Scale

B)



Note: Scrambled Sentences Test = Percentage of sentences in the scrambled sentences task unscrambled to form negative statements, i.e. higher percentages indicate more negative cognitive bias; Prospective Imagery Task = mean vividness ratings (*10) for images of positive future events.

Feedback at interview. At feedback participant 2 reported enjoying carrying out the computer task at home but did not think it had any positive impact on his mood. Despite his effort to imagine the scenarios as they were described, he noted that work-related scenarios tended to automatically bring up negative memories and distressing images and made him think about his current situation as an unemployed person. He reported that completing the OxIGen program made him realise how “deeply entrenched” and difficult to change his negative thinking was. When asked whether he would be willing to complete a program like this if it was developed into an online intervention, he answered that he would be a bit sceptical about it but added that it might be helpful for others.

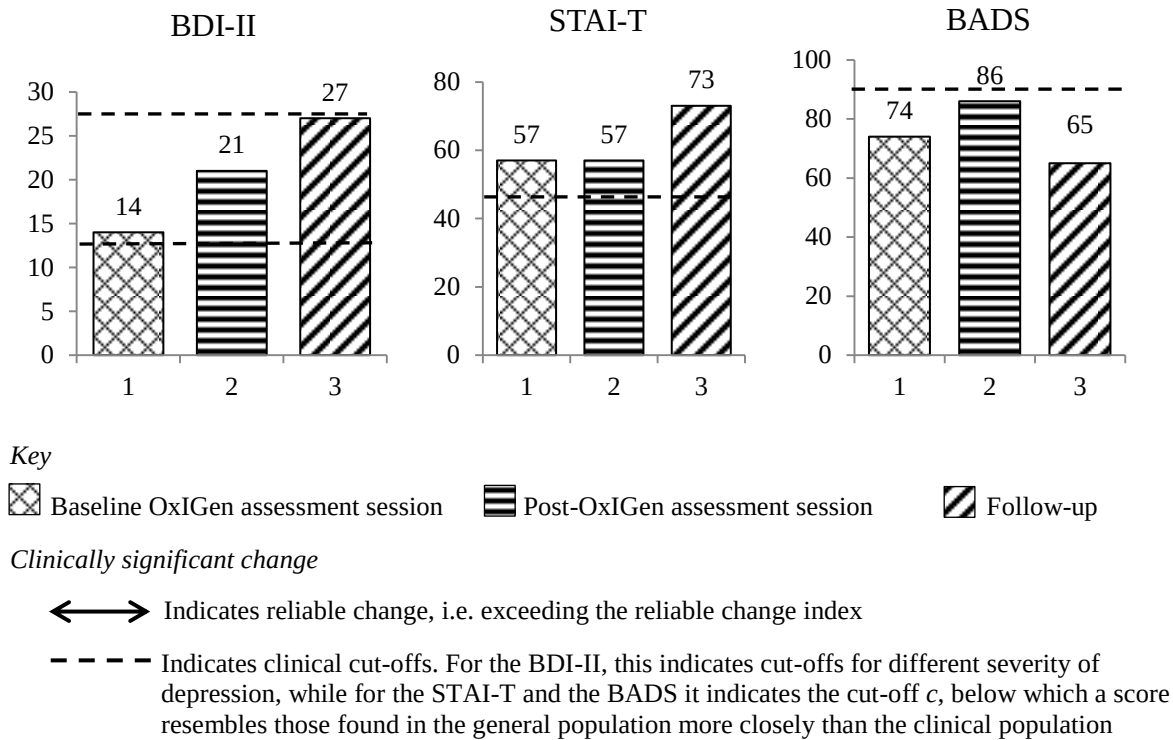
Participant 3 (positive condition)

Participant 3 reported being currently under a lot of stress due to heavy workload at university, which made her concerned about committing herself to the one-month OxIGen program. During the practice session she came across as very inattentive and easily distracted, and kept asking the researcher to repeat his instructions or questions. However, she reported being a “visualiser” and thus finding very easy to imagine the practice scenarios very vividly. She went swiftly through the practice scenarios with apparent ease and reported enjoying the tasks.

Outcome and process measures. Measures of depression and anxiety did not show any improvement from pre to post-OxIGen. Depression scores even indicated a worsening of her symptoms, moving her from a category of “minimal” to “moderate” depression. Increases in behavioural activation from pre- to post-OxIGen did not reach the RCI and remained below the clinical cut-off. Examination of PIT scores indicated an improvement in vividness for positive future-oriented imagery, but this improvement was not maintained at one month follow-up. Further, there was no improvement in negative cognitive bias.

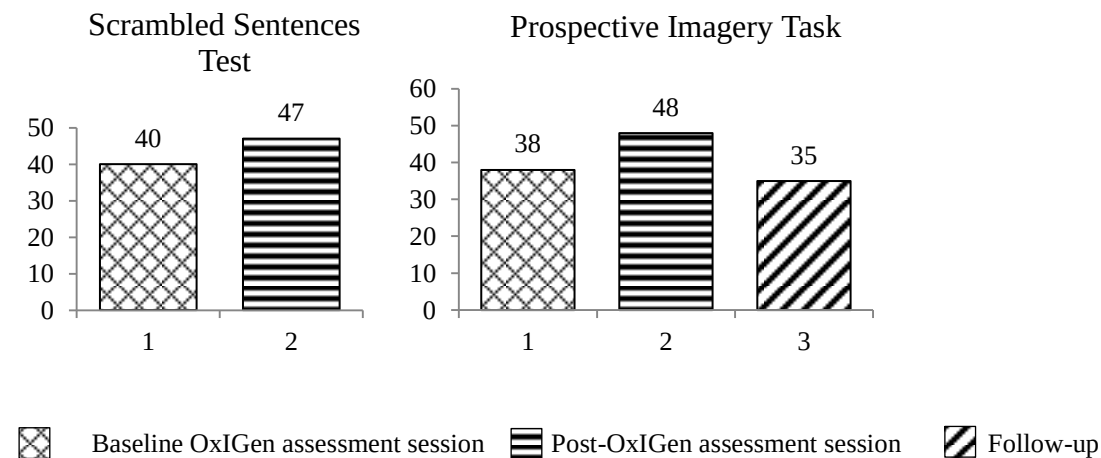
Figure 4.9.5 Participant 3: A) Changes in score on measures of depression, anxiety and behaviour B) Changes in score on laboratory measures of cognitive bias and imagery

A)



Note: BDI-II = Beck Depression Inventory- II, STAI-T = Spielberger State-Trait Anxiety Inventory – Trait scale; BADS = Behavioural Activation for Depression Scale

B)



Note: Scrambled Sentences Test = Percentage of sentences in the scrambled sentences task unscrambled to form negative statements, i.e. higher percentages indicate more negative cognitive bias; Prospective Imagery Task = mean vividness ratings (*10) for images of positive future events.

Feedback at interview. At feedback participant 3 admitted “getting through” the sessions at home as rapidly as possible because she had heavy workload and was under a lot of stress. She would not always close her eyes and focus on the task but would just listen to the scenarios without headphones and do other things at the same time (e.g. put on make-up, get dressed, cook). She further reported experiencing great difficulties with focusing on the tasks at home and finding herself checking her emails or commenting the scenarios with her boyfriend while carrying out the sessions. When asked about her opinion on being offered such a program in the future as part of a treatment, she said she would happily give it a try as it offered “a subtle and non-judgmental way” to try and change her thinking without being confronted to the opinion of a therapist.

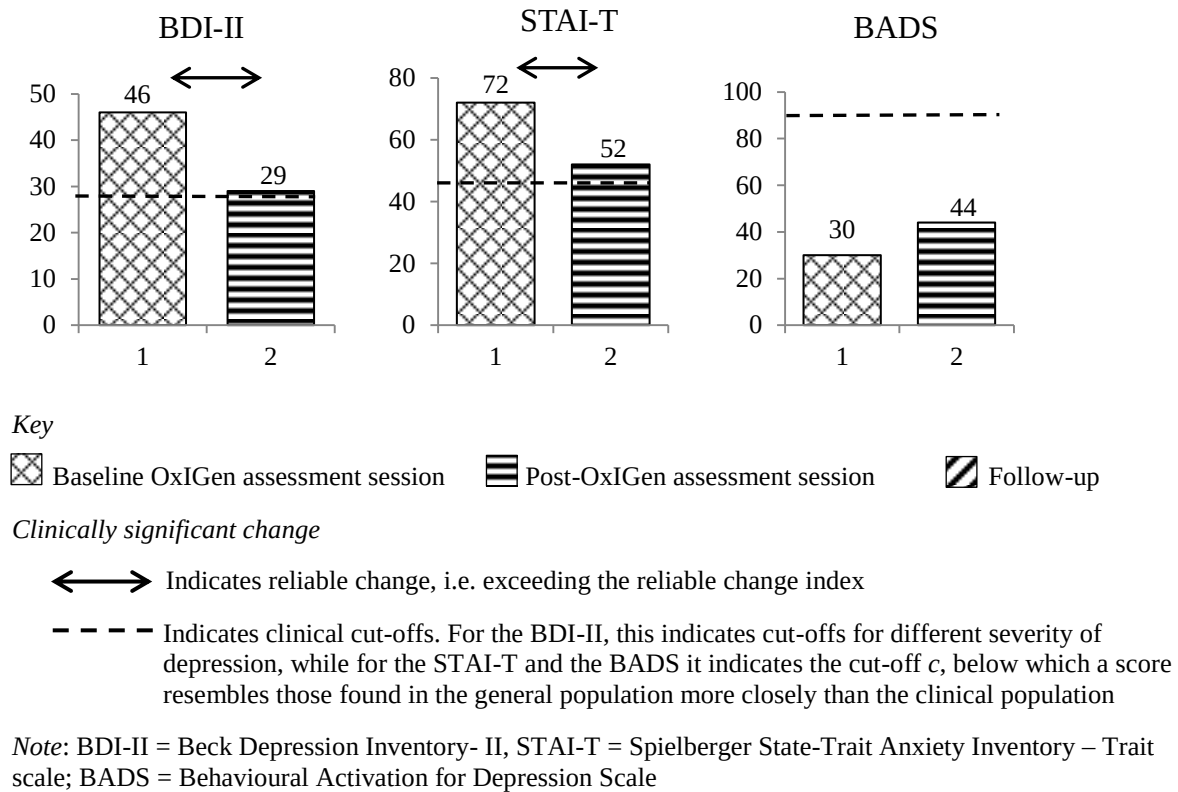
Participant 4 (positive condition)

Participant 4 initially reported being sceptical about the usefulness of the OxIGen program as she had tried a variety of interventions in the past (pharmacological, CBT) and none of them turned out to be helpful. However, as she went along with the imagery task she realised that it was very easy for her to vividly imagine the scenarios and reported enjoying the task, as it was very different from what she had tried in the past.

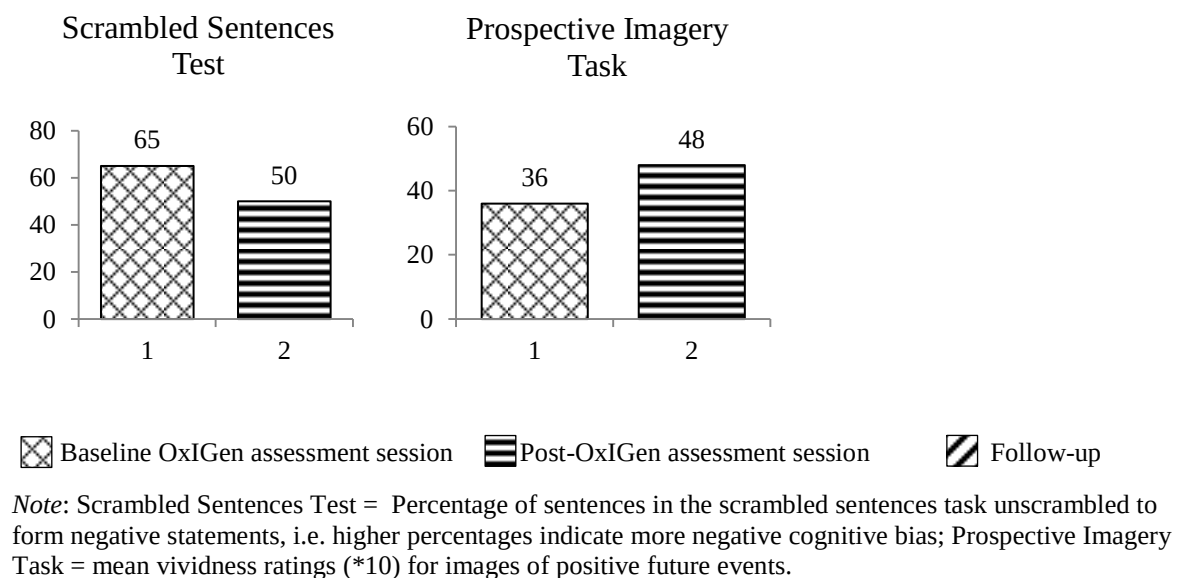
Outcome and process measures. Evolution of scores on the BDI-II and the STAI-T indicated reliable improvements in symptoms of depression and anxiety (both beyond the RCIs) from pre- to post-OxIGen, but none of them were clinically significant. Improvements in behavioural activation (BADS) did not reach the RCI and scores remained below the clinical cut-off. Examination of change scores on the SST and the PIT indicated congruent improvements in negative bias and vividness for positive future-oriented imagery. Participant 4 failed to complete the follow-up assessment, leaving unanswered the question of whether these improvements were maintained one month after the intervention.

Figure 4.9.6. Participant 4: A) Changes in score on measures of depression, anxiety and behaviour B) Changes in score on laboratory measures of cognitive bias and imagery

A)



B)



Feedback at interview. At feedback participant 4 reported that although she sometimes struggled with the Auditory OxIGen sessions because she found them too long and felt she was “constrained” in her imagination, she found the tasks easy and enjoyable. She reported that she would like to be offered such a program if it was further developed into an intervention that could be offered by her GP. She noted that she felt “refreshed” and more positive after each session, and that carrying out the tasks helped her modify the way she was thinking about her everyday life. She gave the example of one occasion where she was at home on a rainy day and had a scenario popping into her head about being at home on a rainy day and enjoying a cup of tea, which made her think: “Well let’s sit down, have a cup of tea and enjoy being cosy at home while it’s raining out there”. On another occasion she went out for a walk on a snowy day and remembered a picture of a snowy path with a caption word saying “enjoying a walk”, which made her enjoy the walk much more. When asked whether she would like to be offered a program like this if it was developed into an online intervention, she said she would be happy to use it as an alternative to counselling.

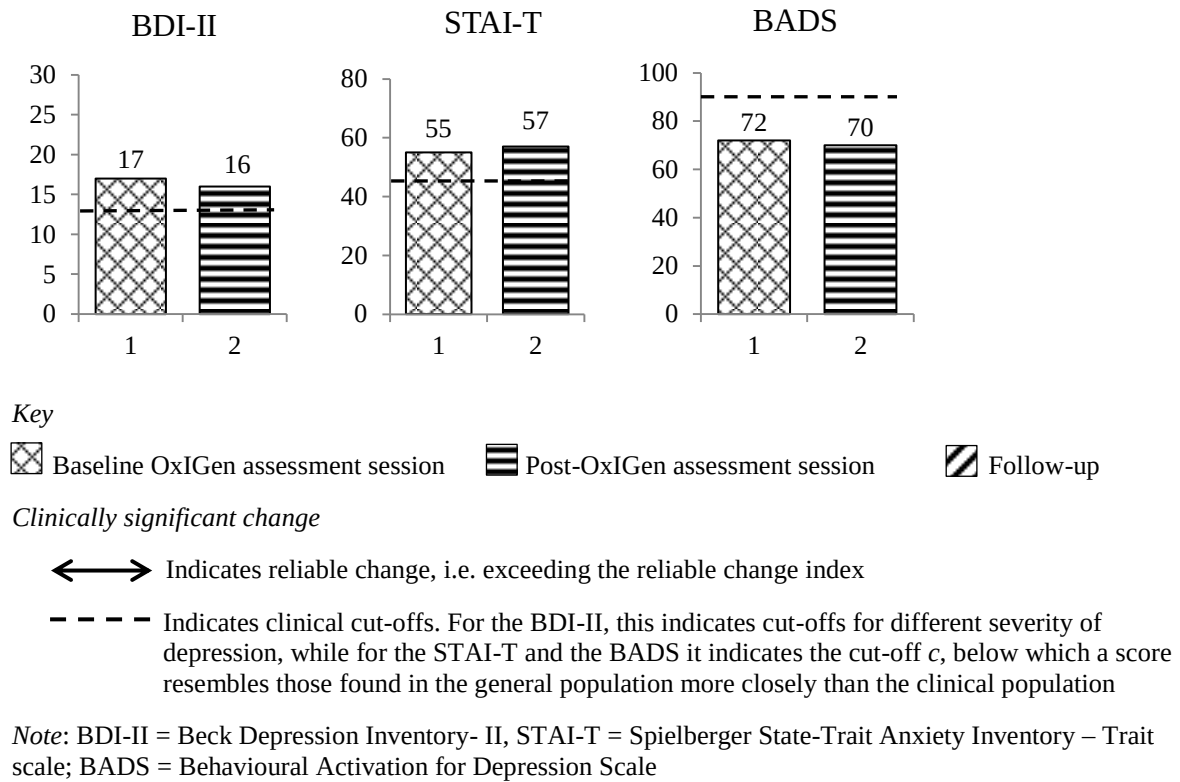
Participant 5 (control condition)

During the practice session participant 5 reported struggling to think in words about the scenarios as she would normally rather think in images. She further reported being confused about what she was meant to be doing in the task, noting that the rating seemed to suggest that she was asked to focus on understanding the meaning of the description rather than actively thinking about it.

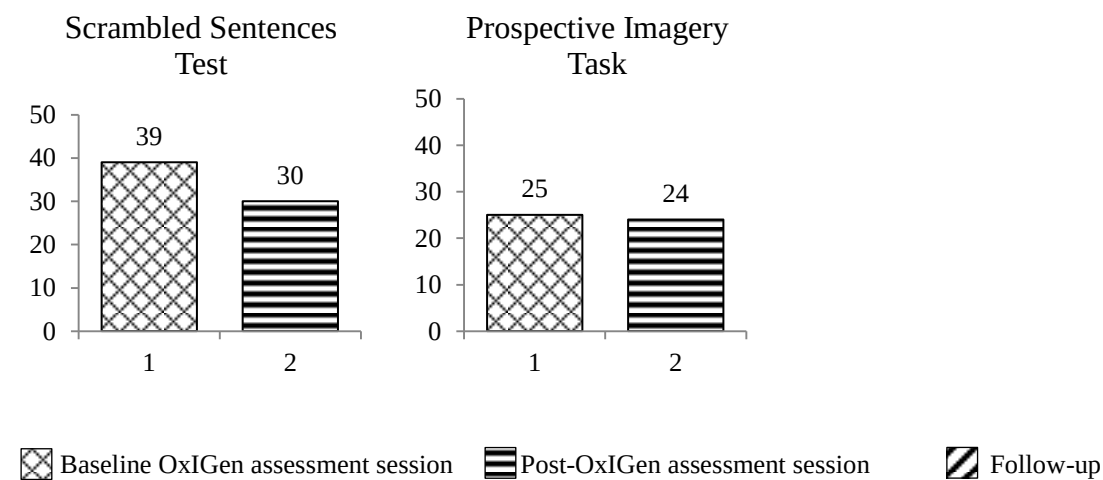
Outcome and process measures. Evolution of scores on the three outcome measures indicated no improvement in depression, anxiety and behavioural activation from pre- to post-OxIGen. Further, there was no improvement in cognitive bias and positive future-oriented imagery.

Figure 4.9.7. Participant 5: A) Changes in score on measures of depression, anxiety and behaviour B) Changes in score on laboratory measures of cognitive bias and imagery

A)



B)



Note: Scrambled Sentences Test = Percentage of sentences in the scrambled sentences task unscrambled to form negative statements, i.e. higher percentages indicate more negative cognitive bias; Prospective Imagery Task = mean vividness ratings (*10) for images of positive future events.

Feedback interview. At feedback participant 5 reported finding the task useful for “picking up on thoughts” and found that formalising thoughts and putting words on them help her notice what she was thinking and think in a different way. Further, she reported that despite her effort to think verbally about the scenarios she could not prevent mental imagery from coming up in about half of the scenarios. She also reported resenting the task in the end and finding the sessions far too long, which caused her to give up on carrying out the sessions after the first week of the OxIGen program. She said she would have completed more sessions if they had been longer, but the sessions felt like a “mammoth task” and she found hard to commit herself to doing them for so long. When asked about her opinion on being offered such a program by her GP if it was developed into an online intervention, she answered that she thought it would possibly be useful, but only if it was offered in combination with a therapist she could talk to.

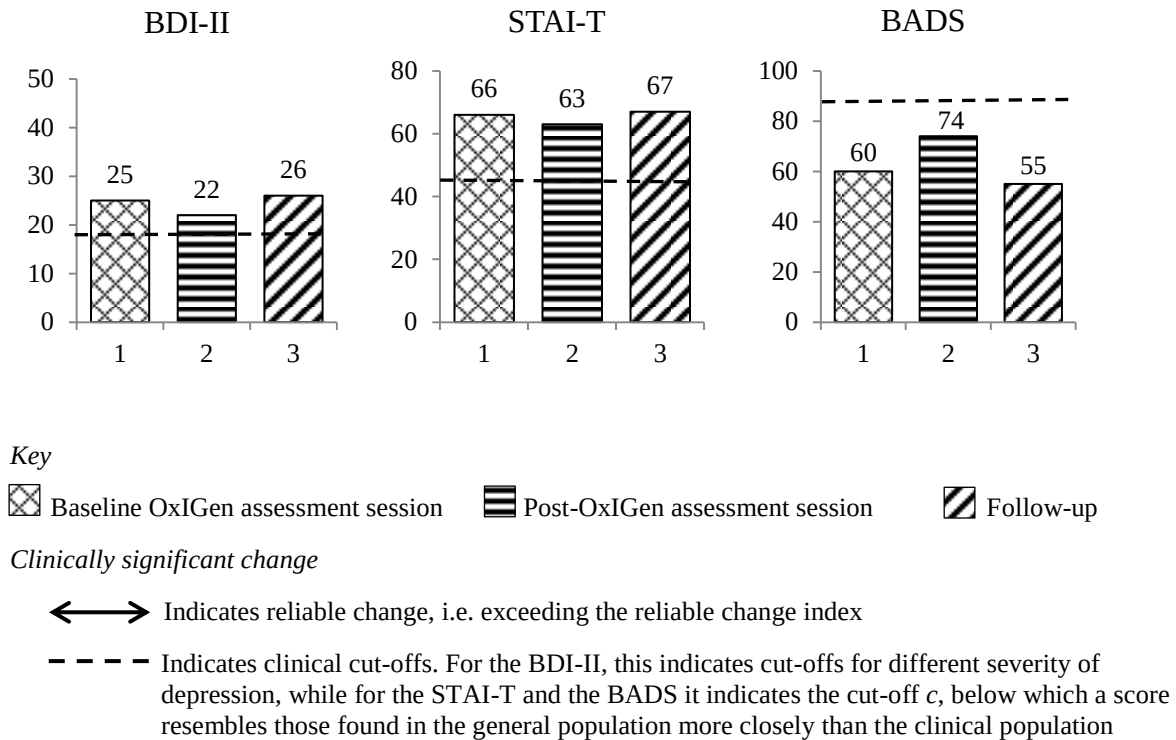
Participant 6 (control condition)

Participant 6 reported during the practice session finding the task interesting as she was used to “deal with words” in her work as a freelance editor. However, she reported experiencing great difficulties with “suppressing” images from her mind, particularly when she could closely relate to the situation described. Further, she found herself struggling to understand what she was meant to be doing in the task.

Outcome and process measures. Change scores from pre- to post-OxIGen indicated no improvements in depression, anxiety and behavioural activation. However, there was an unexpected improvement in vividness for positive future-oriented imagery, while scores of negative bias remained unchanged.

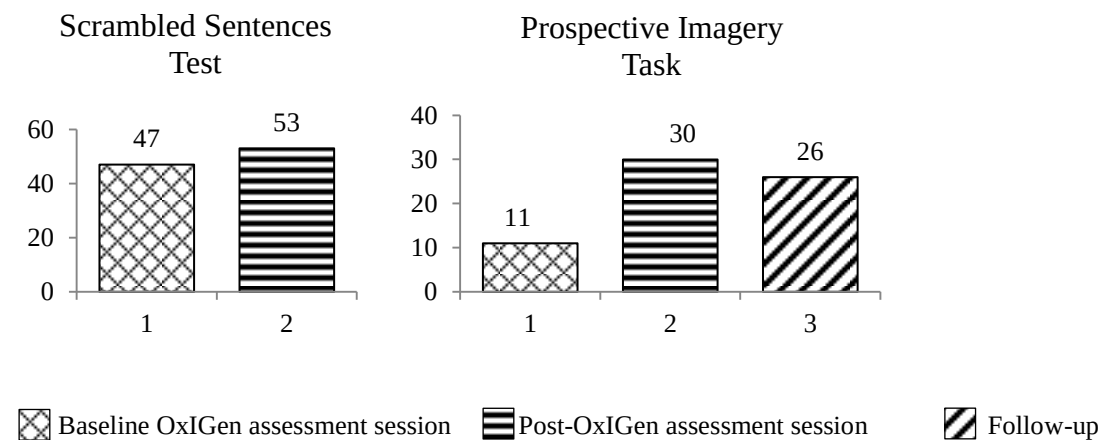
Figure 4.9.8. Participant 6: A) Changes in score on measures of depression, anxiety and behaviour B) Changes in score on laboratory measures of cognitive bias and imagery

A)



Note: BDI-II = Beck Depression Inventory- II, STAI-T = Spielberger State-Trait Anxiety Inventory – Trait scale; BADS = Behavioural Activation for Depression Scale

B)



Note: Scrambled Sentences Test = Percentage of sentences in the scrambled sentences task unscrambled to form negative statements, i.e. higher percentages indicate more negative cognitive bias; Prospective Imagery Task = mean vividness ratings (*10) for images of positive future events.

Feedback interview. At feedback participant 6 reported that although she found the task interesting at first, she gradually became bored and irritated towards the end of each session due to the repetitive and “predictable” nature of the scenarios and to the fact that they were read out by the same voices. She further reported that images came up automatically for about half of the scenarios despite her effort to focus on their verbal meaning. She reported thinking that the task was somewhat useful in helping her to “apply a neutral logic” to scenarios rather than allowing herself to imagine them, and in helping her to “shut down” her negative thoughts. Finally she said that she would like to be offered such an intervention in the future if it was combined with a more “human-based treatment”, because she thought it would be useful as a way of introducing a routine into managing one’s mind.

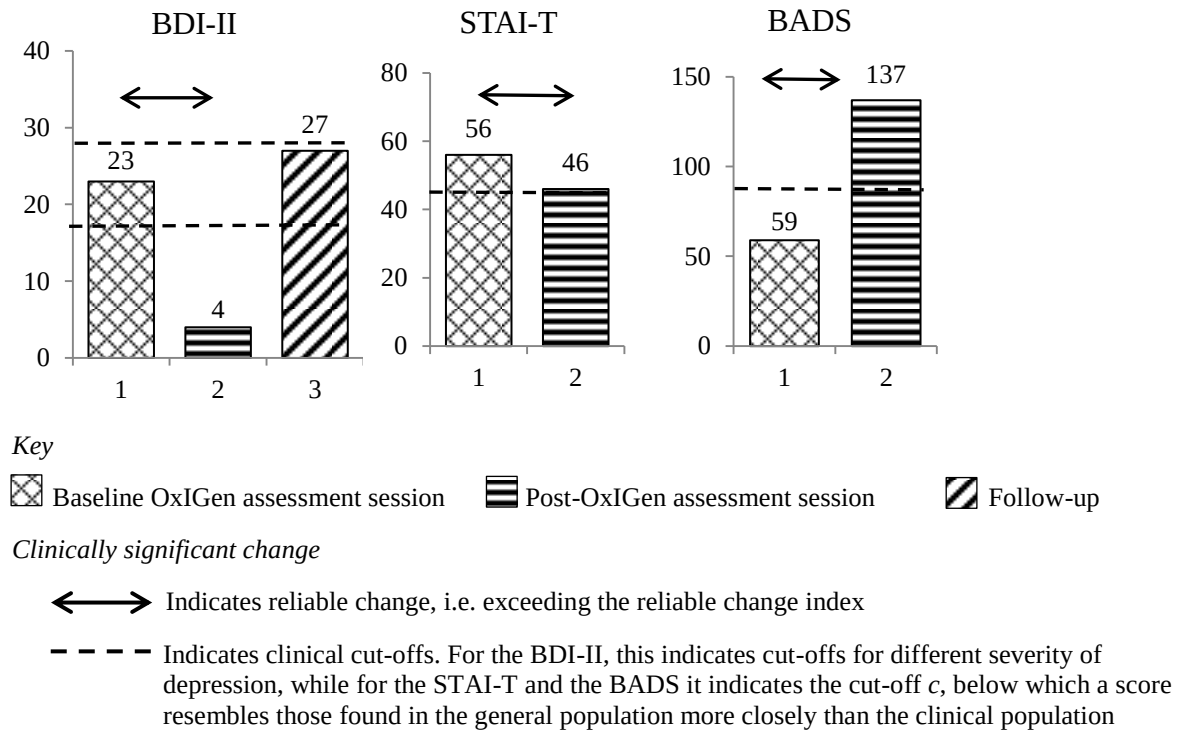
Participant 7 (control condition)

During the introductory session participant 7 came across as very speedy and rushed through the practice scenarios without really trying to engage with them in the way prescribed. Further, she experienced important concentration problems throughout the session and had to be constantly reminded of what she was meant to be doing in the task.

Outcome and process measures. Change scores on the BDI-II indicated a clinically significant improvement from pre-to post-OxIGen, with depression severity moving down from a “moderate” to a “minimal” level (see Figure 4.9.8(a)). However, these improvements were not maintained at follow-up. Further, change scores on the STAI-T indicated an improvement in anxiety beyond the RCI but just one point below the cut-off to be described as clinically significant. BADS scores changed beyond the RCI and the clinical cut-off, indicating a clinically significant improvement in behavioural activation. Further, examination of change scores on the SST indicated an improvement in negative bias, but no improvement was observed in positive future-oriented imagery.

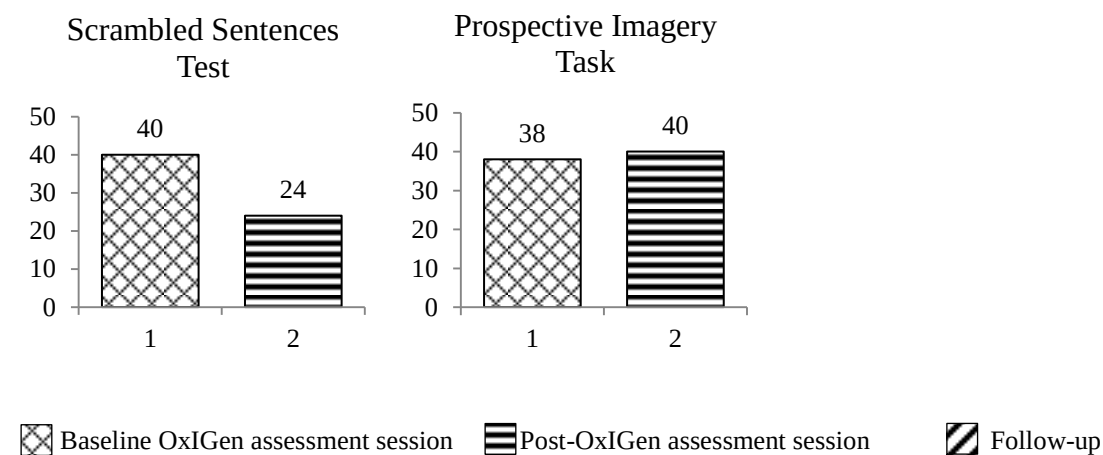
Figure 4.9.9 Participant 7: A) Changes in score on measures of depression, anxiety and behaviour B) Changes in score on laboratory measures of cognitive bias and imagery

A)



Note: BDI-II = Beck Depression Inventory- II, STAI-T = Spielberger State-Trait Anxiety Inventory – Trait scale; BADs = Behavioural Activation for Depression Scale

B)



Note: Scrambled Sentences Test = Percentage of sentences in the scrambled sentences task unscrambled to form negative statements, i.e. higher percentages indicate more negative cognitive bias; Prospective Imagery Task = mean vividness ratings (*10) for images of positive future events.

Feedback interview. At feedback participant 7 reported finding at first the OxIGen tasks useful because it gave her something to focus her mind on and possibly help her concentration problems, but then she became extremely annoyed and irritated by the slowness of the sessions and the triviality of the scenarios, and thus lost interest for the tasks. She further reported being worried that she had messed up the study because she rated all the scenarios as “not at all difficult to understand” and thought this meant she was not doing the task properly. She further mentioned getting a new job during the intervention, which made it even harder for her to set aside time to carry out the sessions and resulted in her missing a session during the last week of the intervention. She reported that being offered a new job has had a positive impact on her mood, which is consistent with improvements shown in depressive symptoms, anxiety and behavioural activation from pre to post-OxIGen.

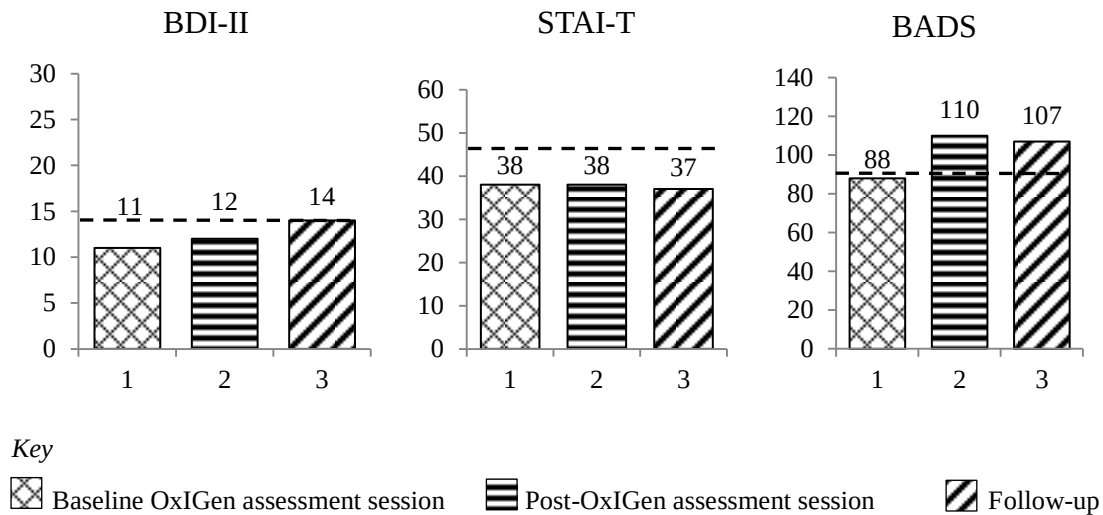
Participant 8 (control condition)

During the practice session participant 8 reported struggling to understand what she was meant to be doing in the Auditory OxIGen task. She found that the difficulty ratings after each scenario added to her confusion because she found that all the scenarios were very easy to understand. She further commented that she thought her confusion about the task might come from the fact that she had being allocated to a “placebo” condition.

Outcome and process measures. Change scores on the BDI-II and the STAI-T did not show any improvement in symptoms of anxiety and depression from pre- to post-OxIGen. However, there was a clinically significant change in behavioural activation (BADS), with scores improving beyond the RCI and the clinical cut-off. By contrast, there was no improvement in negative bias and positive future-oriented imagery.

Figure 4.9.9.1 Participant 8: A) Changes in score on measures of depression, anxiety and behaviour B) Changes in score on laboratory measures of cognitive bias and imagery

A)

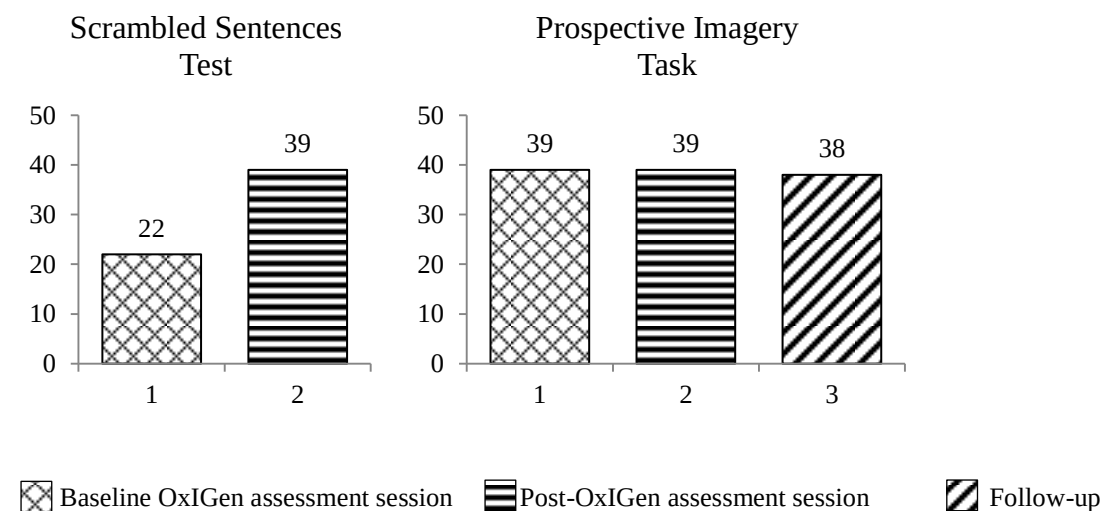


Clinically significant change

- ↔ Indicates reliable change, i.e. exceeding the reliable change index
- Indicates clinical cut-offs. For the BDI-II, this indicates cut-offs for different severity of depression, while for the STAI-T and the BADS it indicates the cut-off c , below which a score resembles those found in the general population more closely than the clinical population

Note: BDI-II = Beck Depression Inventory- II, STAI-T = Spielberger State-Trait Anxiety Inventory – Trait scale; BADS = Behavioural Activation for Depression Scale

B)



Note: Scrambled Sentences Test = Percentage of sentences in the scrambled sentences task unscrambled to form negative statements, i.e. higher percentages indicate more negative cognitive bias; Prospective Imagery Task = mean vividness ratings (*10) for images of positive future events.

Feedback at interview. Participant 8 reported finding the Auditory OxIGen sessions increasingly annoying over time because she was confused about the purpose of the task and whether she was doing it properly. By contrast, she enjoyed the Picture-Word OxIGen sessions a lot more because it reminded her the time when she was taking English lessons and were asked to make grammatically correct sentences. While completing the auditory tasks she would repeatedly check out the instructions but it did not help to make the task clearer. Further, she reported being irritated by the repetition of the same examples before each set of scenarios, and also to be repeatedly asked to rate her feelings before and after each session. She also noted that although she was focussing on the verbal meaning of the scenarios, images popped up automatically for at least half of them. She reported feeling slightly better and being more “activated” behaviourally, which is consistent with the substantial increase in BADS scores from pre- to post-OxIGen. However, although she enjoyed doing the picture-word task and thought it may have helped her to think differently about certain things, she doubted these perceived improvements were entirely due to the intervention. When asked about her thoughts about being offered this by her GP if it was developed into an online intervention, she answered that it would only be potentially useful if she was offered more guidance on how to carry out the task.

Discussion

The aim of Experiment 3b was to assess the feasibility of delivering a refined and extended in time CBM program called “OxIGen” over the internet to a sample of eight clinically depressed individuals. Specifically, the study aimed to 1) assess participants’ adherence to the 12 sessions of OxIGen and attendance to the study assessments 2) assess whether the extended OxIGen program was acceptable to a sample of individuals

experiencing a current episode of major depression 3) assess the efficacy of the OxIGen program in improving depression and anxiety symptoms, behavioural activation, cognitive bias and positive future-oriented imagery.

Adherence to the one-month online OxIGen program and to the study assessments

Results from the current pilot study indicated good adherence to the online OxIGen program, with seven of the eight participants completing at least 11 of the 12 sessions included in the program. This finding provides further support that the monitoring system in place, involving tracking session completion and providing email support and technical assistance, was efficient in ensuring participants' engagement with the OxIGen program. Further, adherence rate in Experiment 3b was higher than the one obtained in Experiment 3a (93% vs. 86%). This could be explained by the removal of the CBM for appraisal task, to which a few participants in Experiment 3a had reacted negatively, and to the fact that monitoring was carried out more systematically in the present study. These results are encouraging because they answer one important concern, namely that extending the number of sessions and the duration of the intervention could have resulted in increased disengagement from the OxIGen program for individuals at high risk of presenting motivational and concentration problems.

Findings concerning participants' completion of the post-eligibility study assessments (i.e. OxIGen baseline, post-OxIGen and online follow-up assessments) indicated an overall dropout rate of approximately 15%. All participants attended the post-OxIGen assessment sessions, but three of them did not complete or only partially completed the online follow-up measures, which gives a dropout rate of 38% for the follow-up assessment.

This rate of late (post-randomisation) dropout is higher than the limit of 20% missing data to guarantee sufficient statistical power to detect the effects of interest (e.g. Peng, Harwell, Liou, & Ehman, 2006). This could be of concern if the efficacy of the OxIGen program was tested in a larger controlled study relying on an intention to treat principle (as in Lang et al., 2012), where all participants randomised are included in the analysis regardless of whether they completed the post-treatment and follow-up assessments. In addition to the amount of missing data, another potential concern could be the presence of a pattern in which missing values are related to other variables such as the condition participants were allocated to or the severity of depressive symptoms. Closer examination of the current data did not indicate that missing values were related to depression scores or participants' allocation to one of the two versions of the OxIGen program, as the two participants (4 and 5) who failed to complete the follow-up measures were from different conditions.

Acceptability of the one-month OxIGen program

Examination of the various indicators pertaining to the acceptability of the OxIGen program suggested that the intervention was acceptable to participants, in line with the results obtained in Experiment 3a. Of note, the greater number of sessions involved in the OxIGen program did not seem to negatively affect participants' perception of the tasks' enjoyability ($M = 5.5$ in the OxIGen program vs. $M = 5.4$ in the one-week CBM program) and length ($M = 4.00$ vs. 3.7). Further, participants' perception of the usefulness of the OxIGen tasks was equivalent across tasks and conditions, which suggests that the modified control condition had good face validity. Finally, ratings of the web interface replicated the results obtained in Experiment 3a, confirming that the interface was judged positively by participants.

One potential issue emerging from ratings made by participants in the control group was that they reported finding the tasks less enjoyable and experienced important difficulties

with understanding what they were meant to be doing in the “verbal” version of the OxIGen program. Not only did they struggle to comply with instructions to think “only in words” in response to descriptions that tended to automatically conjure up images in their mind, but they also reported being confused about what exactly was meant by the requirement to “focus on the verbal meaning”, followed by a rating of “how difficult it was for them to understand the meaning of the description”. Indeed, the verbal instructions seemed to allow various interpretations of how people processed the training scenarios: These included focussing on the grammatical structure of the descriptions, generating alternative outcomes to the descriptions or providing reasons as to why the descriptions unfolded to a particular outcome.

This lack of clarity resulted in two participants (7 and 8) worrying about whether they were doing the task properly, and may further have contributed to the fact that participants found the verbal tasks less enjoyable than those completing the imagery ones. This should be addressed in future use of the OxIGen control condition, as there is a risk that participants assigned to this condition would be more likely to drop out of the study as a result of finding the verbal task too confusing and tedious, which would carry the risk of creating a bias in the analysis of the results.

Efficacy of the OxIGen program

The results from Experiment 3b have shown that three of the four participants assigned to the positive version of the OxIGen program presented reliable improvements in depression and/or anxiety symptoms, with one of them being clinically significant and the two others above the reliable change index used in the study. Although moderate, this response rate is higher than the one obtained in Experiment 3a, where two out of four had shown

clinically significant improvements. Further, even though only one participant (participant 1) in the positive condition showed clinically significant improvement in behavioural activation, all participants in the positive condition saw their scores changing in the hypothesised direction. Overall, these results suggest that the various refinements made following Experiment 3a may have contributed to improving the efficacy of the program. Among participants assigned to the control condition, only one showed a clinically significant improvement in depressive symptoms, which may have been due to the job they were offered during the time of the intervention. Further, two participants in the control condition showed clinically significant increases in behavioural activation, which suggests that these behavioural improvements may have at least partially been caused by non-specific factors such as participation in a study, contact with researchers and daily completion of a computerized task.

Interestingly, the two participants who benefited the most from the positive version of the OxIGen program had the highest scores of depression (33 and 46), which suggests that the “low-intensive” OxIGen intervention may also be of benefit for people with more severe forms of depression. This finding is in contrast with the recent findings of a CBM-A study carried out by Baert, De Raedt et al. (2010), where an attention bias modification procedure was shown to only benefit those with mild levels of depressive symptoms, while those with moderate to severe depression displayed even a worsening of their symptoms. The case of participant 3, who did not properly engage with the CBM task and who’s depression scores went up, highlight the importance for the researcher to closely monitor and guide the participant to ensure they fully engage in the task. This is crucial given that some participants in both pilot studies reported finding the OxIGen tasks too long, and a few of them found them repetitive and boring. Hence, in line with recent research indicating that internet-based

CBT is more efficient when delivered with therapist support than without (Richards & Richardson 2012), a close and supportive guidance from the researcher may be necessary to guarantee participant's engagement in the OxIGen program.

A further aim of Experiment 3b was to explore whether imagery, cognitive bias and behaviour could be modified through training. Observation of the results indicated that among the four participants who were assigned to the positive OxIGen program, only one of them showed improvements in both interpretation bias and positive future-oriented imagery. Interestingly, this participant was the one who benefited the most from the OxIGen intervention. Another participant improved in bias while a third one improved in positive future-oriented imagery. By contrast, only one participant in the control condition showed improvement in bias and another one in imagery. With regards to behavioural activation, all participants in the positive imagery condition showed improvements close or equal to the calculated Reliable Change Index. However, three of the four participants in the control condition showed reliable improvements in behavioural activation. This leaves open the possibility that non-specific factors (i.e. contact with researcher, completion of a daily computer task) might influence the effects of imagery-based CBM on behaviour. This preliminary observation provided mixed results with regards to the hypothesised malleability of imagery, bias and behaviour and a larger scale study was needed to establish the existence of training effects.

General Conclusion about the Two Pilot Studies and Future Directions

In Experiment 3a, an imagery-based CBM program was administrated for the first time over the internet to a sample of people with depressed mood. The results provided initial support for the feasibility of the intervention, with the caveat that a number of participants

found the tasks slightly long and repetitive and some of them did not appear to fully engage in the CBM program. Further, the effects of the CBM intervention on symptoms were only moderate. Based on these findings the CBM program and the protocol of Experiment 3a were refined and a one-month CBM program called “OxIGen” was tested in Experiment 3b with a sample of currently depressed individuals. The systematic implementation of a tracking and monitoring system of participants’ progress and the refinements made to enhance task engagement appeared to have a positive impact on a number of variables investigated in the second pilot study. Adherence to the OxIGen program was high and acceptability increased despite the greater number of sessions involved and the higher time commitment required. Further, the percentage of treatment response in the positive group was higher in Experiment 3b compared to Experiment 3a with three out of four participants showing benefit from the OxIGen program. Overall, the findings of the two pilot studies indicate that overall 5 of the 8 participants assigned to the positive version of the OxIGen program showed reliable (although non-clinically significant) improvements in depressive symptoms.

The two pilot studies represented important steps in the translation of a laboratory paradigm into an internet-delivered intervention for clinical depression. The results, however, did not provide conclusive evidence that OxIGen led to symptom improvements and increases in imagery and behaviour. The two pilot studies used very small samples ($N = 14$ in total), thus any interpretation of the findings should be taken with caution. A more rigorous test of the effects of OxIGen on mental imagery and behaviour would require a sufficiently powered, larger-scale study, which will be the focus of the next chapter of the thesis. This last study forms part of a large clinical trial, and the aim in this next study was not to assess primary outcome measures (i.e. BDI change) but to test the mechanisms of key interest to this thesis.

CHAPTER 5

Experiment 4: The Effects of the Oxford Imagery Generation (OxIGen) Program on Mental Imagery and Behaviour

Aim and Background

The final chapter of the current thesis reports a clinical study in which the effects of the Oxford Imagery Generation (OxIGen) program (an imagery-based CBM described in detail in Chapter 4 of this thesis) on positive future imagery and behavioural activation were tested in a sample of currently depressed individuals. An important step in the development of OxIGen into a clinical intervention is to identify the underlying mechanisms by which the intervention may produce any clinical outcome (Kraemer, Wilson, Fairburn, & Agras, 2002). An overarching aim of Experiment 1 (Chapter 2) and Experiments 3a and 3b (Chapter 4) of the current thesis was to explore some of the mechanisms by which imagery-based CBM was hypothesised to produce its effects on mood. The putative processes explored were mental imagery, emotion and behaviour.

Findings from Experiment 1 highlighted that a single session of positive imagery-based Picture-Word CBM resulted in immediate effects on behaviour and cognitive bias 24 hours later compared to both a negative and control version of the CBM. Further, participants in the positive condition were shown to rate the imagined CBM scenarios as increasingly vivid as they went along with the training, which provided initial support for the hypothesis that imagery CBM could enhance people's tendency to generate vivid positive imagery.

In Experiments 3a and 3b, the imagery-based CBM was further developed into a larger scale, potential clinical intervention, the OxIGen program, which involved pilot studies with first 6 and then 12 sessions of imagery-based CBM to be completed over the internet. This allowed the hypothesis to be explored that increasing the “dose” of training may yield more robust and durable training effects on variables such as positive future imagery,

cognitive bias and behaviour. Observation of the pilot data did not support the existence of training effects, but the pilot sample size used was too small and thus a larger scale study using an appropriately powered sample was required to test these hypotheses. The current study aimed to address this limitation by testing the hypothesis that within a large sample of individuals with current depression ($N = 124$), participants who had completed a positive imagery version of the OxIGen program would show greater increases in positive future imagery and behaviour than participants who had completed a control version of OxIGen.

Possible Impact of the OxIGen Program on Positive Future Imagery

The OxIGen program relies on the assumption that deficits in positive future imagery and negative interpretation bias play an important role in depressed mood, and thus targeting these two combined processes in a computerized CBM program could be beneficial in depression (Holmes, Lang, & Deeprose, 2009). Preliminary tests of imagery-based CBM have provided initial evidence that the computer program could alleviate depressive symptoms in samples of clinically depressed individuals (Blackwell & Holmes, 2010; Lang, Blackwell, Harmer, Davison, & Holmes, 2012). At a more fundamental level however, the assumption that the effects of OxIGen on depressive symptoms were caused by the successful modification of its active components has received very little attention or support, particularly with regards to positive future imagery. Indeed, there is very little evidence yet to suggest that the tendency to generate vivid imagery of positive future events can be modified through systematic practice.

Preliminary support for the modifiability of mental imagery through repeated practice was recently provided by Szpunar and Schacter (2012). In this study, the authors examined the influence of repeatedly simulating future emotional events on various features such as plausibility, ease of simulation, event detail and arousal. Results showed that positive and negative (but not neutral) events which had been repeatedly simulated were then rated as

including more details and being more arousing than those simulated just once. In a different line of research, Odou and Vella-Brobick (2013) tested whether mental imagery ability could be enhanced by the completion of a one-week intervention combining two Positive Psychology Interventions (PPIs), i.e. Three Good Things (TGT) and Best Possible Selves (BPS). Notably, BPS relied heavily on positive future imagery as it involved 7 daily sessions in which participants were required to write about and imagine one's best possible self (Sheldon & Lyubomirsky, 2006). Results indicated that the PPIs led to significant increases in mental imagery ability, defined in the study as the vividness and controllability of imagery for non-emotional events (e.g. "the whistle of a locomotive").

Unlike the two studies described above, the present study predicted that change in vividness would be valence specific, i.e. that only positive, but not negative future imagery would increase over the course of OxIGen. This hypothesis was based on recent evidence for a selective deficit in vividness for positive future imagery in depression. By contrast, vividness of negative imagery was found to be equivalent in depressed and in healthy individuals (Morina, Deeprose, Pusowski, Schmid, & Holmes, 2011). Hence, the rationale behind OxIGen was that a repeated practice in generating positive future imagery could lead depressed individuals to spontaneously generate more frequent and more vivid positive imagery in future circumstances. The importance of positive future imagery was further underlined by the finding in Lang et al. (2012) that participants who had greater ability to generate vivid positive future imagery at baseline (as assessed by the Prospective Imagery Task, used in Chapter 4) were subsequently more likely to clinically benefit from the intervention. Beyond the moderating influence of baseline imagery ability on treatment response, one critical question that needed to be addressed was whether the ability to vividly imagine positive future events could actually be trained through imagery-based CBM.

The present study aimed to test the hypothesis that OxIGen (i.e. one month of imager-based CBM) would produce changes in specific qualities of positive future imagery that were theorised as relevant to depression. A particular emphasis in the current study was put on the dimension of vividness, both because of the demonstrated deficit in vividness for positive future imagery in depressed mood (Holmes, Lang, Moulds, & Steele, 2008; Morina et al., 2011) and also because more vivid memories have been shown to evoke stronger emotions (Sutin & Robins, 2007). Further, vividness of positive future imagery has recently been shown to be associated with dispositional optimism (Blackwell et al., 2013). Thus encouraging vivid positive future imagery may be beneficial for the promotion of positive affect in depression. Accordingly, participants in the OxIGen program were prompted during training to generate positive images of the future with as much vividness as possible. Further, vividness of imagery was rated after each trial during the CBM (i.e. 64 times per session).

A second dimension of positive imagery that was explored in the current study was vantage perspective. As described in the first chapter of the current thesis, previous research has shown that imagining past and future events from a field perspective (i.e. as if watching the event through one's own eyes) had greater emotional impact than imagining them from an observer perspective (i.e. as if watching oneself from the outside and experiencing the event as a bystander) (e.g. Bernstein & Rubin, 2006). A tendency to recall past positive memories from an observer perspective has been found to be characteristic of depression and has been hypothesised to contribute to the lack of emotional response evoked by positive memories (Bergouignan et al., 2008; Joorman, Siemer, & Gotlib, 2007; Kuyken & Moulds, 2009). Further, experimental manipulation of visual perspective in a positive imagery-based CBM revealed that mood improved following the use of field perspective imagery but worsened following the use of observer perspective imagery or verbal processing of the same positive scenarios (Holmes, Coughtrey, & Connor, 2008). However, while Nelis, Vanbrabant,

Holmes and Raes (2012) replicated the differential effect of imagery versus verbal processing in this paradigm, a differential effect of field versus observer perspective was not replicated. Despite this latter null finding, there was accumulating evidence that promoting field perspective imagery for positive events could potentially hold benefit in depression. A critical question that had yet to be examined was whether depressed individuals could be trained to use field instead of observer perspective through repeated training. The present study sought to address this by testing the hypothesis that compared to participants who had completed a control version of the OxIGen program, participants who had completed a positive (field perspective) imagery version would show greater use of field perspective imagery for positive future events at the end of the program.

A third and last dimension of positive imagery that was explored in the current study was the sense of likelihood or plausibility people attributed to the imagined event. In Szpunar and Schacter (2012), it was found that positive (as well as negative) future events that had been repeatedly simulated were then seen as more plausible than those simulated just once. While previous research has shown that imagining future events increases people's subjective probability that the same outcome will occur in the future (e.g. Carroll, 1978), Szpunar and Schacter's (2012) finding represented an important extension in that it suggested that people's expectations towards the future could actually be enhanced through repeated simulation in imagery. This result has important implications for depression, as depressed people have been shown to perceive positive future events as less likely to occur than their non-depressed counterparts (e.g. MacLeod & Salaminiou, 2001). Therefore, the present study sought to investigate whether compared to controls, participants completing the OxIGen program would show greater increases from pre to post-OxIGen in perceived likelihood of positive future events.

Positive Future Imagery and Optimism

The ability to generate vivid and plausible imagery of positive future events has recently been proposed to be a marker of dispositional optimism (Blackwell et al., 2013). The latter can be defined as the tendency to have generalised positive expectancies about the future (Carver, Scheier, & Segerstrom, 2010). People with depression have been shown to hold a view of the future that is overwhelmingly pessimistic (Alloy et al., 1999; Strunk, Lopez, & DeRubeis, 2006). Thus, a computer program specifically aimed to increase positive future imagery in depression could also lead to concurrent increases in optimism.

Although seemingly self-evident, the link between positive future imagery and optimism has only recently been explored. In a recent neuroimaging study by Sharot and colleagues (2007), participants were asked to complete an Imagery Generation Task (IGT) which involved generating past or future imagery in response to positive, neutral and negative life episodes (the imagery generation task was adapted for the purpose of this study and will be further referred as “IGT” in the rest of the thesis. Sharot et al (2007) found that participants with higher levels of optimism were more likely to expect the positive events they imagined to happen closer in the future compared to negative ones, and were more likely to imagine them with a greater sense of “pre-experiencing”. A more direct evidence of the link between positive future imagery and optimism has been provided in a recent study by Blackwell and colleagues (2013), in which levels of optimism in a community sample were found to be associated with vividness, likelihood and pre-experiencing of positive future imagery (as assessed by the PIT). As the association found was correlational no conclusion could be drawn about the causal influence of positive imagery on optimism.

Appropriate tests of causality have been conducted in two recent experimental studies. In Peters et al. (2010), participants completed a session of Best Possible Self (BPS) which involved imagining themselves in an imaginary future in which everything had turned out in

the best possible way. Compared to a condition in which participants were required to think about a typical day, the positive future imagery condition was shown to increase positive expectations about the future, and this within a single session in the laboratory. In Meevissen et al (2011), a two-week intervention involving daily sessions of BPS exercises was shown to produce sustained increases in dispositional optimism, as assessed by the Life Orientation Test-Revised (LOT-R; Scheier, Carver, & Bridges, 1994). Overall, these findings suggested that optimism, although usually conceptualised as a personality dimension, could be modifiable through the practice of generating positive future imagery. The present study aimed thus to extend previous findings in the following three ways: First, the association between vividness of positive future imagery and optimism was tested in a sample of currently depressed individuals, unlike the community sample tested in Blackwell et al. (2013). Second, the relationship between the two variables was examined when controlling for depressed mood, and thus the potential extraneous influence of mood on this association could be examined. Third, the study aimed to examine whether the predicted increases in positive future imagery following the completion of the OxIGen program would be associated with concurrent increases in dispositional optimism. This question had important treatment implications as if a relationship was found between the two change scores, it would suggest that the OxIGen program may be a therapeutic tool to boost optimism.

Possible Impact of the OxIGen Program on Behaviour

Another potential benefit of promoting positive future imagery in depression is that it may enhance people's motivation to approach and actively engage with everyday situations. This hypothesis has received preliminary support in Experiment 1, where it was found that participants assigned to a positive imagery CBM (i.e. the picture-word combination task) showed greater performance on a behavioural task compared to participants assigned to a control or a negative condition (Pictet, Coughtrey, Mathews, & Holmes, 2011). Further, the

pilot work reported in the preceding chapter provided an indication that the online imagery-based CBM could lead to significant increases in behavioural activation, but these findings needed to be replicated in a larger sample. The current study aimed to extend Experiment 1 and pilot studies 3a and 3b in the following ways: First, by investigating the effects of a much larger-scale program, involving 12 sessions of CBM compared to the single session tested in Experiment 1. Hence, more durable effects on behaviour will be examined. Second, by using a larger sample ($N = 124$) of individuals with clinical depression, thus providing greater statistical power to test the effects of imagery-based CBM on imagery and behaviour. Finally, instead of using the fishing game task to assess behavioural change the current study employed a clinical, self-report scale (i.e. the BADS, fully described in Chapter 4) used in Behavioural Activation treatments to assess behaviours specifically associated with depression.

Hypotheses

The present study aimed to test the hypotheses that within a sample of individuals experiencing a current major depressive episode

1. Compared to participants completing a control version of OxIGen, participants completing a positive imagery version of the OxIGen program will show greater increases pre to post-OxIGen in vividness and likelihood of positive, but not negative future imagery (PIT) (hypothesis 1a); at post-OxIGen, they will have greater levels of vividness and use of field perspective for positive, but not negative future imagery (IGT) (hypothesis 1b).
2. At baseline, there will be a positive association between scores of vividness of positive future imagery (PIT) and optimism (LOT-R), replicating Blackwell et al (2013) (hypothesis 2a). This association will remain significant when controlling for depressed mood (BDI-II) (hypothesis 2b).

3. Within the positive imagery group, from pre to post-OxIGen training, increases in vividness of positive future imagery (PIT) will be associated with increases in dispositional optimism (LOT-R).
4. Compared to participants completing a control version of OxIGen, participants in the positive imagery group will show significantly greater increases in behavioural activation (BADs) from pre to post-OxIGen.

Method

The method section reported below follows recommendations set by the Consolidated Standards of Reporting Trials for reporting parallel group randomised trials (Moher et al., 2010; Schulz, Altman, Moher, & Grp, 2010).

Design

The current study formed part of a wider clinical trial investigating the effects of OxIGen in depression¹. The aim of the present study was to use a mixed design to test the effects of the OxIGen program against a control version in participants with depression. The OxIGen trial was approved (see approval letter in Appendix 5.1.) by the UK National Health Service Research Ethics Committee South Central Oxford (Ethics reference number: 11/SC/0278). Participants 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 an internet-based computer program in depression”. Those who met inclusion criteria and gave written informed consent to participate were randomly allocated to a positive imagery or a control version of the OxIGen program.

¹ OxIGen training was complete at the time the present analysis was carried out, as well as the collection of the post treatment and 1 month follow-up. Approximately 15% of the 3 month follow-up and 50% of the 6 month follow-up data remained to be collected.

The current study used a block randomisation method with stratification by gender and baseline BDI-II score to make sure both groups were balanced on these variables (Kernan, Viscoli, Makuch, Brass, & Horwitz, 1999). The study was single-blind in terms of administering the computer program, in that whilst participants were not aware of whether they had been allocated to an active or a control condition, the researcher conducting the assessment could not be blinded as they had to introduce the appropriate instructions for the version of the program participants had been assigned to. However, experimenter bias was minimised by having different researchers conducting the baseline and post-OxIGen assessments for the same participant. All participants were assessed by the research team at the eligibility assessment (Time 1(T_1)), at the pre-OxIGen assessment (Time 2 (T_2)), at the post-OxIGen assessment (Time 3(T_3)), and at 1, 3 and 6 month follow-up². The trial was registered at NCT01443234 (see Appendix 5.3 for trial registration).

Participants were included in the OxIGen trial if they met criteria for a current major depressive episode based on DSM-IV criteria using a semi-structured clinical interview (SCID; First, Spitzer, Gibbon, & Williams, 1996). Exclusion criteria were current psychotic disorder, history of mania or hypomania, starting or changing antidepressant medication during the last month, current substance abuse disorder, enrolment in other current treatment trials, currently receiving psychological therapy.

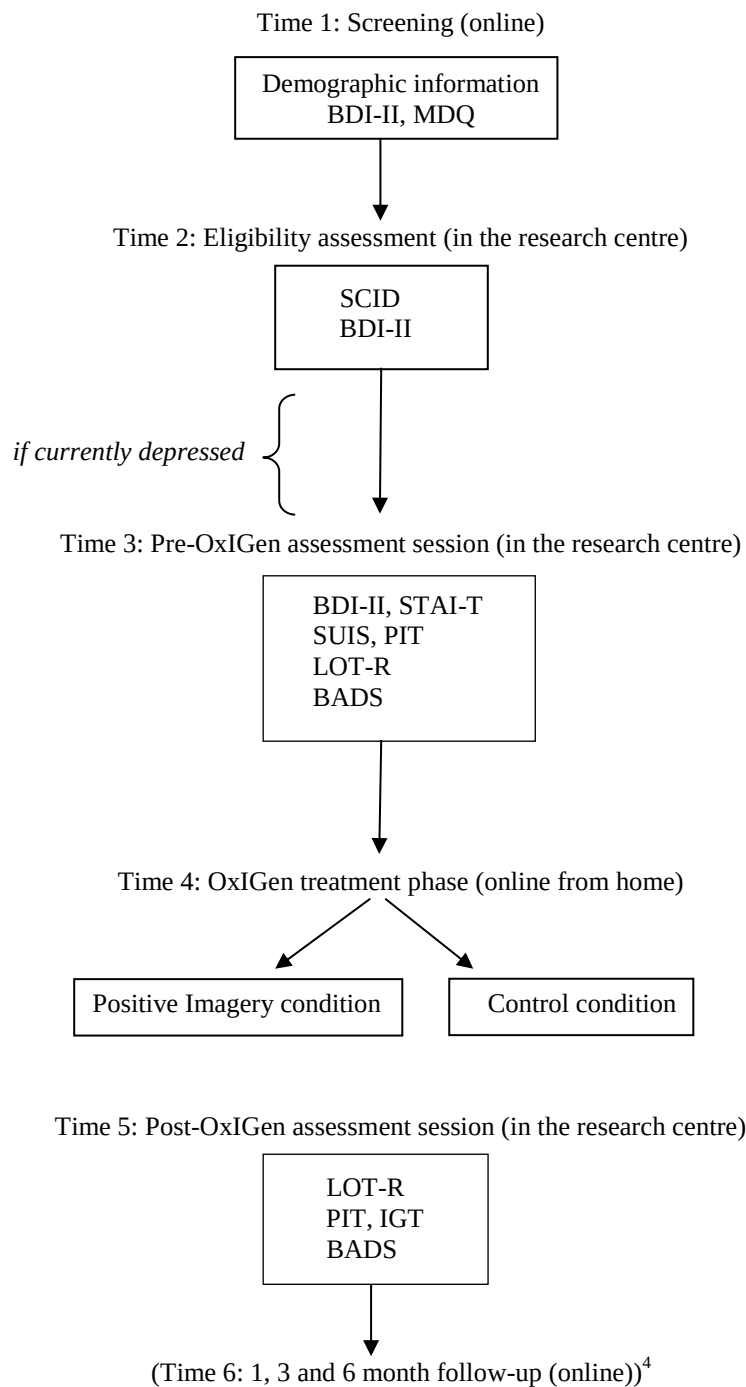
Overview

For a diagrammatic of the procedure see Figure 5.1. Following online completion of screening questionnaires, participants were invited for an eligibility assessment session.

Participants' eligibility was ascertained by a clinical interview (SCID-I; First et al., 1996)

² The variables of interest for the current study were only examined at eligibility, baseline and post-OxIGen assessment because the collection of follow-up measures was still on-going at the time of the analysis.

conducted by the researcher and those who were eligible were invited to return for a baseline assessment session. At the baseline assessment session participants completed a battery of self-report and experimental measures, followed by an introductory session of the OxIGen program guided by the researcher. Participants then completed the online sessions of the OxIGen program from home over a period of four weeks, and then returned to the research centre for a post-OxIGen assessment session in which the battery of measures was repeated along with a feedback interview enquiring about their experience of the OxIGen program. One, three and six month later, participants completed follow-up measures over the internet (not reported in the current study as part of an on-going trial). A full description of the procedure is reported in the procedure section below.

Figure 5.1 Schematic overview of the experimental procedure for Experiment 4³

Note: BDI-II = Beck Depression Inventory II; MDQ = Mood Disorder Questionnaire; SCID = Semi-structured clinical interview; STAI-T = State-Trait Anxiety Inventory; SUIS = Spontaneous Use of Imagery Scale; PIT = Prospective Imagery Task; LOT-R = Life Orientation Test-Revised; IGT = Imagery Generation Task; BADS = Behavioural Activation for Depression Scale

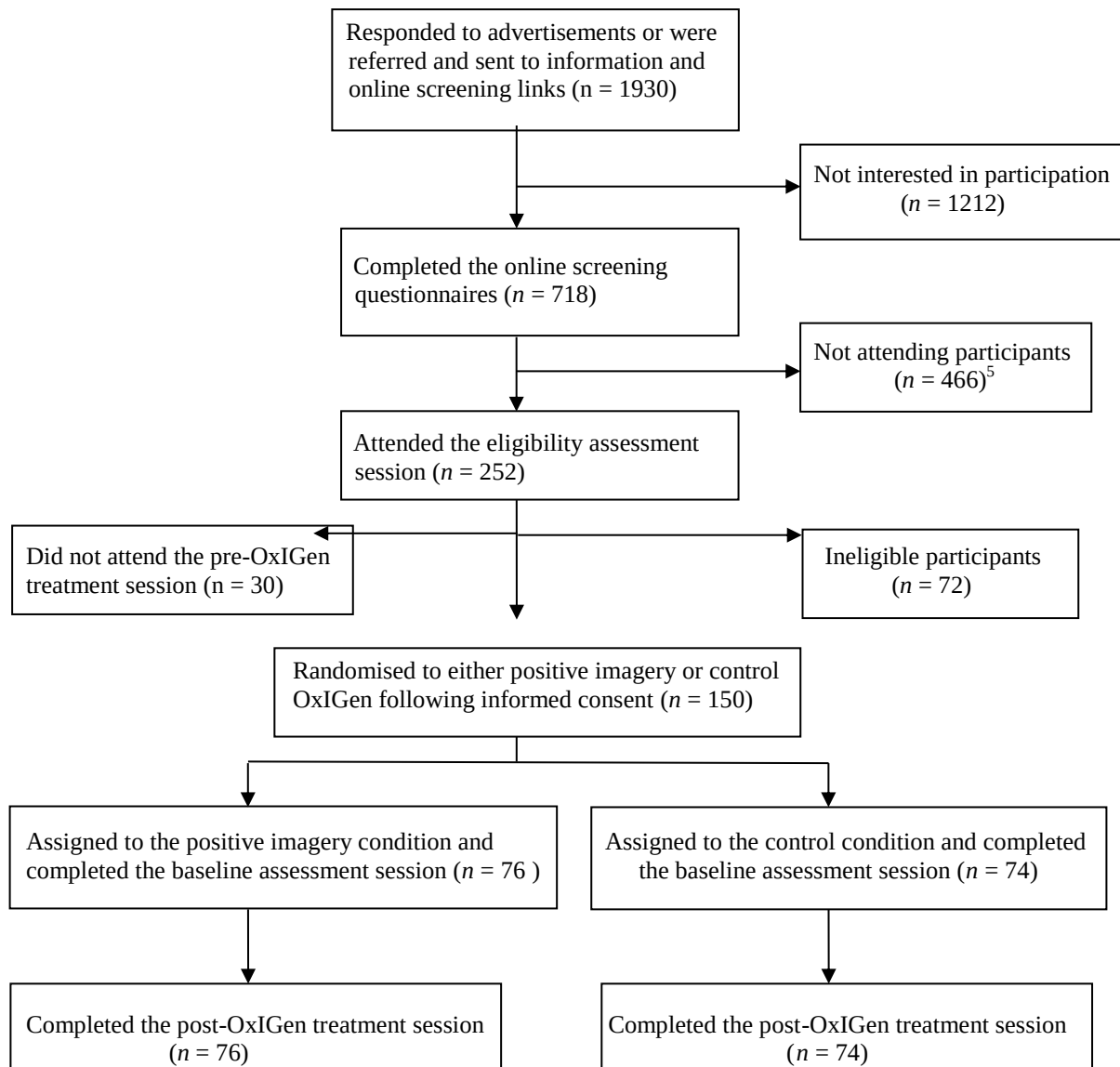
³ The measures described are only those reported in the current analysis, and not all the measures included in the wider trial.

⁴ Time 6 not reported in this chapter.

Participants

Participants were recruited through clinicians in the local health services and multiple forms of advertisements, such as in the newspaper or on the radio. A total of 1930 participants expressed their interest by registering on the study server and 718 completed screening questionnaires online. Of these, 252 participants who scored 14 or higher on the BDI-II and did not meet any exclusion criteria based on the information provided at screening and further were able to arrange an assessment date were invited for an eligibility assessment session. 180 of these were included in the study as they fulfilled criteria for a current major depressive episode (MDE). Thirty participants did not attend the pre-OxIGen treatment session (due to the fact that they were no longer interested or could not arrange a time), leading to a final sample of 150 participants included in the trial. The trial CONSORT flowchart (Fig. 5.2) describes the flow of potential participants screened for eligibility through to randomization either to positive imagery OxIGen ($n = 76$) or control OxIGen ($n = 74$).

Figure 5.2. Diagram of the participant flow throughout the study



⁵ This includes participants who were not eligible to the study and those who were unable to arrange an assessment date.

Inclusion criteria

The present study employed a complete case analysis, whereby only participants who had provided the outcome measures within two weeks of the end of the OxIGen program and had completed at least 6 full sessions (i.e. 8 full sets completed) recorded in the online system were included in the analysis. A completer analysis has been widely used in clinical trials of internet CBT and has been shown to produce equivalent results to intention to treat analysis (Carlbring, Nordgren, Furmark, & Andersson, 2009; Spek et al., 2008). Moreover, a completer analysis seemed more appropriate with regards to the study's aim of exploring the mechanisms of change in imagery-based CBM, whereas an intention to treat analysis would have been preferable for an outcome analysis.

Sixteen participants did not provide the outcome measures within the two weeks of the end of OxIGen, and thus were categorised as “non-completers”. Comparison of these non-completers with the rest of the sample indicated no differences in age, $t(132) = 1.49$, $p = .138$, gender, $\chi^2(1, 1) = 1.44$, $p = .230$, presence of comorbid anxiety disorders, $\chi^2(1, 1) = 0.115$, $p = .734$, current use of medication, $\chi^2(1, 1) = 0.248$, $p = .618$. There was also no difference in baseline scores of depression (BDI-II), $t(148) = 0.487$, $p = .627$, anxiety (STAI-T), $t(148) = p = .107$, and vividness of positive prospective imagery $t(148) = .385$, $p = .701$. Further, the proportion of participants assigned to the active or the control condition was not statistically different between the non-completers and the completers, $\chi^2(1, 1) = 0.248$, $p = .618$.

Treatment of Non-Completers and Missing Data

Ten participants were further identified as presenting missing values on the post-OxIGen Imagery Generation task (IGT). These missing values seemed to be mostly due to the difficulty of the task. Participants frequently reported finding the task very difficult

because of the time pressure (14 s to generate an image and elaborate on it), the number of dimensions to rate for each image (the IGT included seven dimensions to rate, although only two of them were examined in the current study) and the length of the task (over 20 minutes).

The 10 participants with missing data were shown to not significantly differ from the rest of the sample with regards to age, $t(132) = 1.056, p = .293$, gender, $\chi^2(1, 1) = 1.44, p = .230$, presence of comorbid anxiety disorders, $\chi^2(1, 1) = 0.115, p = .734$, current use of medication, $\chi^2(1, 1) = 0.248, p = .618$. Baseline scores of depression (BDI-II), $t(132) = 1.456, p = .627$, anxiety (STAI-T), $t(132) = 1.573, p = .118$, and vividness of positive prospective imagery $t(132) = .743, p = .459$. These results suggested that the missing data were missing at random and that removing the non-completers did not affect the main sample analysis. Thus, 26 participants were withdrawn from the current analysis, leading to a final sample of 124 participants for the current study.

Materials

OxIGen program

The OxIGen program consisted of a combination of auditory CBM-I (further described as “Auditory OxIGen”) and picture-word CBM-I (“Picture-Word OxIGen”). These two CBM-I components were presented in alternating order and on separate days over the four weeks of the OxIGen program. See Chapter 5 of the current thesis for a detailed description of the program.

Auditory OxIGen

Each session of Auditory OxIGen included 64 training scenarios presented over headphones in eight blocks of eight scenarios. Thirty-two scenarios were presented at the pre-OxIGen treatment session to introduce participants to the technique, making a total of 480 different scenarios across the seven sessions of Auditory OxIGen. Participants were instructed to listen to the scenarios through headphones and to imagine the scenarios as if

they were actively involved, seeing them through their own eyes. Each scenario was followed by a rating of how vividly they could imagine the situation from 1 (*not at all vivid*) to 5 (*extremely vivid*). See Experiment 3b in Chapter 4 and Appendix 4.7 for a full description of the Auditory OxIGen sessions and training stimuli.

Picture-word OxIGen

Each session of Picture-Word OxIGen included 64 picture-word combinations presented in eight blocks of eight trials. Thirty-two scenarios were presented at the pre-OxIGen treatment session to introduce participants to the technique, making a total of 480 scenarios across the seven sessions of Picture-Word OxIGen. Participants were instructed to have a quick look at the picture and the word and then close their eyes and imagine the combination as if they were actively involved and experiencing the situation through their own eyes. Each picture-word stimulus was followed by a rating of how vividly they could imagine the situation from 1 (*not at all vivid*) to 5 (*extremely vivid*). See Experiment 3b in Chapter 4 and Appendix 4.8 for a full description of the Picture-Word OxIGen sessions and training stimuli.

Measures

Structured Clinical Interview for DSM-IV Axis 1 Disorder (SCID; First et al., 1996). The SCID is a semi-structured interview that assess current and past diagnosis of Axis 1 psychiatric disorders according to DSM-IV criteria (American Psychiatric Association, 2000). The SCID-I was used in the eligibility assessment session to determine whether participants were eligible to participate in the study.

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II was used in the online survey to assess levels of depressive symptoms. Participants with BDI-II scores of 14 or above were invited to continue with the study, see Chapter 4.

Spielberger State-Trait Anxiety Inventory (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The STAI-T was used as an index of trait anxiety. Participants were asked to rate 20 anxiety related statements for how relevant they are to how they “generally feel” on a 4-point scale (from *almost never* to *always*). The scale is reported to have satisfactory reliability and validity (Spielberger et al., 1983)

Spontaneous Use of Imagery Scale (SUIS; Reisberg, Pearson, & Kosslyn, 2003). The SUIS was used as in study 2 as a measure of participant’s everyday use of imagery.

Prospective Imagery Task (PIT; Holmes, Lang, et al., 2008; Stöber, 2000). The PIT is a measure that assesses the ability to generate mental imagery about future events. Participants were instructed to form a mental image of 10 negative future scenarios and 10 positive future scenarios (see Appendix 4.9.2). These included events such as “you will have a serious disagreement with your friend” and “you will do well on your course”. After each scenario participants were asked to make a rating of how vivid their image was (from *no image at all* to *very vivid*) and how likely they thought the scenario was to occur in the near future (from *not at all likely* to *extremely likely to occur*). The PIT is reported to have excellent internal consistency, $\alpha = 0.90$ (Lang et al., 2012).

Imagery Generation Task (IGT; adapted from Sharot et al., 2007). The IGT is a computer-based task that assesses the ability to generate imagery about future events (see Appendix 5.2). In each trial, participants were presented with a description of a possible life episode and were prompted by the word “future” to generate an image of the future. Each trial lasted 14 s, during which participants were instructed to press a key once a mental image of the life episode began to form in their mind, and again if they had finished elaborating on it before the end of the trial. Participants were then asked to rate on six-point Likert scales the

vividness of their image (from *no image at all* to *very vivid*) and the visual perspective used (from *involved* to *observer*).

Life Orientation Test-Revised (LOT-R; Scheier et al., 1994). The LOT-R is a 10-item questionnaire that assesses dispositional optimism. The scale includes three positively worded items (e.g. “I am always optimistic about my future”), three negatively worded items (e.g. “I hardly expect things to go my way”) and four filler items. Items were rated on a 5-point scale from 0 (strongly disagree) to 4 (strongly agree). Possible score range from 0 to 24, with higher scores indicating higher levels of optimism. The LOT-R has been reported to show acceptable internal consistency ($\alpha = 0.78$), as well as good convergent and discriminant validity.

Behavioral Activation for Depression Scale (BADS; Kanter, Mulick, Busch, Berlin, & Martell, 2006) The BADS (see Appendix 4.9.3) is a 25-item scale that was developed to assess the frequency of specific types of behaviours targeted in Behavioural Activation treatment for depression (Dimidjian et al., 2006). This measure includes four subscales related to activation, avoidance and rumination, work and social impairment. Higher BADS scores indicate higher levels of activation and less avoidance. BADS scores have been reported to correlate strongly with depression (Kanter, Rusch, Busch, & Sedivy, 2009) and a recent study by Christopher et al. (2009) has reported that changes in BADS scores following CBT predicted reductions in depressive symptoms.

Procedure

Time 1: Screening

Participants who expressed an interest in participating in the study were emailed a password to enable them to log into the OxIGen web page via a secure connection. On logging in, participants provided informed consent to complete a set of screening

questionnaires. Participants scoring 14 or above on the BDI-II and who did not meet any of the exclusion criteria were then invited for an eligibility assessment session.

Time 2: Eligibility Assessment Session

After gaining informed consent to participate in the assessment session, the researcher conducted the SCID-I to ascertain eligibility for the study and obtain information about any comorbid anxiety disorders. Participants were also asked about any current or past treatment for psychological disorders, and then completed the BDI-II, VAS-mood and the Fishing Game⁶. Eligible participants provided written consent to take part in the study and were invited to return to the research center for a pre-OxIGen treatment session, at a date that was arranged as far as possible within a week of the eligibility assessment.

Time 3: Pre-OxIGen Treatment Session

Participant started the pre-OxIGen treatment session by completing a number of self-report questionnaires including the BDI-II, STAI-T, SUIS, LOT-R, BADS, and then a measure of prospective imagery (PIT). Participants were shown an overview of the OxIGen program and schedule for the next four weeks.

OxIGen positive imagery condition. Participants allocated to the positive imagery condition were first guided through an imagery training phase which involved 1) defining mental imagery 2) practising imagery through an exercise involving cutting a lemon, see Appendix 2.3 3) describing what specific type of imagery was to be deployed in the OxIGen task (i.e. field, multi-sensorial imagery). Participants then completed four practice scenarios and subsequently started the introductory session of the OxIGen program guided by the researcher. See Experiment 3a for a detailed description of the imagery training phase and the OxIGen introductory session.

⁶ VAS-mood and Fishing game results are reported in CH3 and thus not reported in this chapter

OxIGen control. The control condition was designed as a “non-imagery” condition in which the participants were encouraged to avoid thinking in imagery by focusing on the verbal meaning of the stimuli. The control condition was further designed so that the structure of the training directly mapped on to the structure of the imagery training. Participants were first guided through an introductory training phase which involved 1) defining verbal rather than imagery processing 2) practicing a verbal version of the lemon exercise, see Appendix 5.3 3) describing what specific type of verbal processing was to be used in the OxIGen program, i.e. a thinking in a logical, analytical way about the meaning of each scenario. Following this training phase participants completed four practice scenarios and subsequently started the non-imagery, control version of the OxIGen introductory session guided by the researcher (see Appendix 4.5 for a full description of the task instructions given in the verbal version of the OxIGen introductory session)

In the introduction to verbal processing a particular focus was on discouraging the use of mental imagery by emphasizing that participants should try not to imagine the scenarios but only focus on the words and meanings of the descriptions. The researcher used the example of thinking about the words “lying on the ground looking up at the sky” and pointed out that while focusing on the words and meanings participants may find images of the situation popping into their head, such as images of a blue sky or of someone lying on the grass. It was further emphasised that although it was natural for the mind to wander and start imagining the scenarios like this, it could distract participants from focusing on the words and meanings of the situation described. Participants were thus encouraged not to worry if they noticed images of the situations popping into mind, but they were prompted to leave them alone and to re-focus on the words and meanings of the description.

OxIGen positive imagery and control conditions. Finally, participants in both conditions were encouraged not to be put off if the descriptions were not realistic as it was

possible to imagine/think about the meaning of any kind of description, even if it was “complete fantasy”. To illustrate this, the researcher gave the example of an “elephant flying past through the clouds” and pointed out that although this description was not realistic it was still possible to imagine it/understand what it meant and think about the words and meanings. As another example, participants were invited to imagine/think about “watching the lottery draw on television and getting the perfect match”. Similarly, it was emphasised that although this situation was fairly unrealistic it was still possible to imagine/think about the likelihood of winning the lottery and what kinds of things could be done with that amount of money.

Following the training phase, participants completed four practice examples of auditory scenarios with the researcher. The practice scenarios were similar in both conditions, the only difference being that the outcome was removed in the last two scenarios of the control condition to retain ambiguity. In the positive imagery condition, participants were instructed to close their eyes and imagine themselves in the scenario as the sentence unfolded, followed by a rating of how vividly they could imagine the scenario, from 1 (*not at all vivid*) to 5 (*extremely vivid*). In the control condition, participants were asked to keep their eyes open and consider the words and meanings as the sentence unfolded, followed by a rating of how difficult it was for them to understand the meaning of the description, from 1 (*not at all difficult*) to 5 (*extremely difficult*). In addition, comprehension questions were asked after each scenario to reinforce participants’ focus on the verbal meaning of the situations. For example, in the first practice scenario where the situation described someone waiting for the raffle prizes and leaping out his chair after the first number had been called, the following question was asked: “What kind of reasons might you have for leaping out of your chair?” Following the practice scenarios participants completed the introductory session of the OxIGen program (see Experiment 3a for a detailed description of the OxIGen introductory session).

Time 4: OxIGen Treatment Phase

Participants completed the OxIGen program over the internet from home for the following four weeks. They completed six alternating sessions of Auditory and Picture-word OxIGen over the first week and two sessions over each of the following three weeks (see Figure 5.7 chapter 5). Participants were contacted by the researcher to provide feedback following the first two sessions of OxIGen. Reminders were sent by email or over the phone to increase adherence and reduce attrition (as per internet CBT: e.g. Andersson et al., 2005)

Time 5: Post-OxIGen Treatment Session

Following completion of the four weeks OxIGen program participants returned to the research center to attend the post-OxIGen treatment session. They completed the BDI-II, SUIS, LOT-R, BADS, PIT and an experimental measure of prospective imagery on the computer (IGT). Following this participants were thanked for their participation and explained about the online follow-up measures.

Statistical Analysis Plan⁷

Exploratory comparisons of participants' baseline characteristics (see Table 1) across the two groups were examined using independent samples *t*-tests (comparing continuous responses between groups) and chi-square tests of independence (associations in two-way tables of frequencies). In addition, correlations (for comparing two or more continuous responses) were also used to assess the specific a priori hypotheses mentioned earlier.

In hypotheses 1 and 4, the predictions that compared to participants in the control group, those in the positive imagery group would show greater increases in vividness and likelihood of positive future imagery (PIT) and greater increases in behavioural activation

⁷ Thank you to Dr. Peter Watson, MRC statistician from the Cognition and Brain Sciences Unit (Cambridge) for statistical consultation and advice during the statistical plan and analysis

(BADs) were investigated using repeated ANOVAs with within-subjects factor of time (pre vs. post-OxIGen) and between-subjects factor of condition (positive imagery vs. control). Significant (< 0.05) or trend level (< 0.1) effects were then further examined by using paired-samples t tests.

The hypothesis (1b) that participants in the positive imagery group would show higher levels of vividness and use of field perspective for positive future imagery (IGT) than participants in the control group was analysed using independent samples t tests (one-tailed).

The hypothesis (2a) that vividness of positive future imagery (PIT) and optimism (LOT-R) would be positively associated at baseline was tested using Pearson correlation. The prediction that this relationship would remain significant when controlling for depressed mood (BDI-II) was tested by running a first order partial correlation (hypothesis 2b).

The hypothesis (3) that within the positive imagery group increases in vividness of positive future imagery (PIT) would be associated with increases in dispositional optimism (LOT-R) was analysed by running Pearson correlations between change scores on the two variables.

An alpha level of .05 was used for all statistical tests.

Results⁸

Randomisation checks

Tables 5.1 and 5.2 below shows participants' characteristics in the two OxIGen conditions. Participants in the positive imagery and control groups did not statistically differ

⁸ See statistical output in Appendix 5.2

with regards to age, $t(122) = .971, p = .334$, gender, $\chi^2(1, N = 122) = .434, p = .510$, ethnicity $\chi^2(1, N = 122) = .686, p = .953$, and clinical variables such as the number of previous episodes of depression reported, $t(122) = .207, p = .836$, the duration of the current episode of depression, $t(122) = 1.331, p = .186$, the presence of co-morbid anxiety disorders, $\chi^2(1, N = 122) = .133, p = .715$ and current intake of antidepressant medication, $\chi^2(1, N = 122) = .156, p = .693$. Comparison of baseline scores indicated no difference in depression (BDI-II), $t(122) = .549, p = .584$, with both groups showing average scores in the severe depression range (BDI-II > 29, see table 5.1). Participants in both groups were also equivalent with regards to trait anxiety (STAI-T), $t(122) = .413, p = .680$, general use of imagery (SUIS), $t(122) = .403, p = .681$, optimism (LOT-R), $t(122) = .337, p = .737$ and behavioural activation, $t(122) = .516, p = .607$. Comparison of prospective imagery (PIT) scores revealed no group difference in vividness of positive imagery, $t(122) = .650, p = .517$, likelihood of positive imagery, $t(122) = .120, p = .950$ and likelihood of negative imagery, $t(122) = 1.044, p = .298$. However, there was a significant group difference in vividness of negative future imagery, $t(122) = 2.082, p = .039, d = .374$, i.e. lower in the positive imagery than in the control group. Thus, vividness of negative future imagery was entered as a covariate in later analyses of repeated measures.

Table 5.1: *Characteristics of Participants at Baseline per Condition*

	Positive Imagery (n = 63)	Control (n = 61)
Age (years), <i>M</i> (SD)	36.92 (13.99)	34.48 (14.05)
Gender: female, <i>n</i> (%)	45 (71)	42 (69)
Ethnicity: Caucasian, <i>n</i> (%)	60 (95)	56 (92)
BDI-II score, <i>M</i> (SD)		
At eligibility	32.95 (7.59)	30.89 (8.91)
At baseline	30.59 (8.45)	29.70 (9.44)
Number of previous episodes of depression, <i>M</i> (SD)	22.48 (37.76)	23.89 (38.09)
Duration of current episode of depression (months), <i>M</i> (SD)	9.82 (17.74)	18.59 (49.10)
Presence (absence) of Co-morbid anxiety disorders, <i>n</i> (%)	35 (56)	32 (52)
Reported taking antidepressant medication (or not), <i>n</i> (%)	29 (46)	25 (41)
STAI-T, <i>M</i> (SD)	60.97 (5.76)	60.51 (6.69)
SUIS, <i>M</i> (SD)	39.84 (9.74)	40.49 (8.11)

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

Adherence to the OxIGen Program

The mean number of OxIGen sessions completed by participants was 11.413 (SD = 1.231). Participants showed similar rates of adherence in both conditions, i.e. 94 % in the positive imagery condition and 96% in the control condition.

Change in Prospective Imagery over the OxIGen Program

PIT scores (see Table 5.2) were analysed in a repeated ANCOVA with a within-subjects factor of time (pre vs. post-OxIGen), a between-subjects factor of condition (positive imagery vs. control) and vividness of negative future imagery as a covariate. Contrary to our prediction in hypothesis 1a, analysis of vividness scores for positive future-oriented imagery indicated no significant interaction of time with condition, $F(1, 124) = 1.57, p = .212, \eta^2 =$

0.003. There was a main effect of time, $F(1, 124) = 22.97, p < .001, \eta^2 = 0.165$, with vividness increasing over time, and no main effect of condition $F(1,124) = .019, p = .889, \eta^2 = 0.008$.

Analysis of likelihood scores for positive future imagery indicated that, contrary to our prediction in hypothesis 1a, there was no significant interaction of time with condition, $F(1, 124) = .963, p = .328, \eta^2 = 0.008$. There was no main effect of time or condition, both $F(1,124) < 1$.

Table 5.2:

Means and Standard Deviations for Imagery, Optimism and Behavioural Measures at pre-OxIGen and post-OxIGen for each condition

	Positive Imagery (n = 63)		Control (n = 61)	
	Pre-OxIGen	Post-OxIGen	Pre-OxIGen	Post-OxIGen
PIT, <i>M</i> (SD)				
Vividness of positive scenarios	2.81 (.90)	3.19 (.76)	2.90 (.74)	3.13 (.76)
Vividness of negative scenarios	3.19 (.87)	3.30 (.69)	3.49 (.75)	3.38 (.78)
Likelihood of positive scenarios	2.52 (.61)	2.80 (.73)	2.53 (.66)	2.72 (.78)
Likelihood of negative scenarios	3.13(.64)	2.92 (.63)	3.49 (.75)	2.98 (.78)
IGT, <i>M</i> (SD)				
Vividness of positive scenarios		4.14 (.85)		4.18 (.83)
Vividness of negative scenarios		3.75 (.94)		4.02 (.92)
Perspective of positive scenarios		1.95 (.81)		2.01 (.93)
Perspective of negative scenarios		2.31 (.82)		2.45 (1.01)
LOT-R, <i>M</i> (SD)	8.16 (4.31)	9 (4.95)	8.13 (4.67)	9.31 (5.35)
BADS, <i>M</i> (SD)	64.90(19.31)	83.25 (24.3)	66.57 (16.6)	78.50(24.39)

PIT = Prospective Imagery Task; IGT = Imagery Generation Task; LOT-R = Life Orientation test-revised; BADS = Behavioural Activation for Depression Scale

Analysis of vividness scores for negative future imagery indicated that there was no main effect of time, $F(1, 124) < 1$, or condition $F(1,124) = 2.415, p = .123, \eta^2 = 0.019$. There

was a trend towards a significant interaction of time with condition, $F(1, 124) = 2.879$, $p = .092$, $\eta^2 = 0.023$, but this did not reach significance.

Analysis of likelihood scores for negative future imagery indicated that there was no significant interaction of time with condition, $F(1, 124) < 1$. There was a main effect of time, $F(1, 124) = 5.252$, $p = .024$, $\eta^2 = 0.042$, and no effect of condition, $F(1, 124) < 1$.

Group differences in prospective imagery at post-OxIGen

IGT scores of vividness and use of field perspective for positive future imagery (see Table 5.2) at post-OxIGen were compared between the positive imagery and the control groups using independent sample t-tests. Contrary to the prediction in hypothesis 1b, there was no significant difference in vividness and use of field perspective for positive future imagery between the positive imagery and the control group, $t(122) = .293$, $p = .770$, $d = .054$ and $t(122) = .428$, $p = .669$, $d = .077$ respectively.

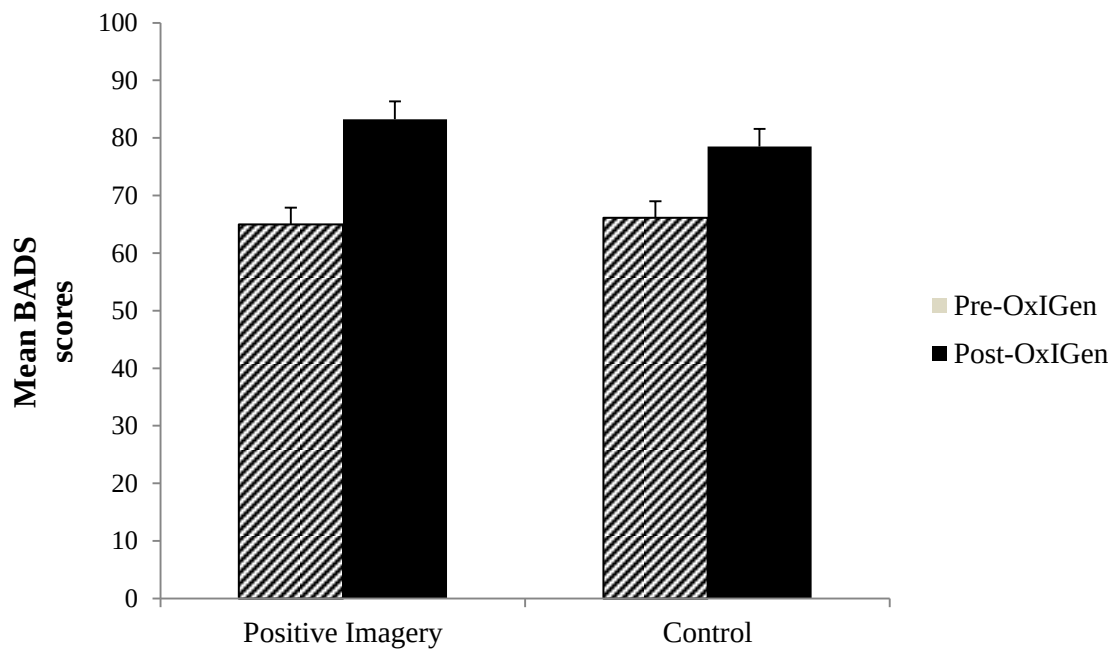
Comparison of vividness scores for negative future imagery revealed a trend towards lower levels of vividness for negative future imagery in the positive imagery compared to the control group, $t(122) = 1.640$, $p = .104$, $d = .295$. There was no difference in the use of field perspective for negative future imagery between the positive imagery and the control groups, $t(122) = .833$, $p = .406$, $d = .149$.

Change in Behavioural Activation over the OxIGen Program

BADS scores were analysed in a repeated ANCOVA with a within-subjects factor of time (pre vs. post-OxIGen), a between-subjects factor of condition (positive imagery vs. control) and baseline scores of vividness for negative future imagery as covariate. There was no main effect of time, $F(1, 124) < 1$, or condition, $F(1, 124) < 1$. In partial support of hypothesis 4, there was a trend towards a significant interaction of time with condition, $F(1, 124) = 2.697$, $p = .103$, $\eta^2 = .022$. This interaction was decomposed by comparing the

behavioural activation means over time separately for each group using paired sample t-tests. As predicted, there was a significant increase in behavioural activation within the positive imagery condition from pre to post-OxIGen, $t(62) = 5.919$, $p < .001$, $d = .835$. Unexpectedly, a significant increase in behavioural activation was also found in the control group, $t(59) = 4.301$, $p < .001$, $d = .594$ (see Figure 5.3).

Figure 5.3. Mean Scores of Behavioural Activation (BADS) at pre and post-OxIGen for participants in both OxIGen conditions



Positive Future Imagery and Optimism

Correlations between PIT and LOT-R scores at baseline were conducted across the whole sample. As predicted in hypothesis 2, there was a significant positive correlation between PIT and LOT-R scores, $r(124) = .428$, $p < .001$. Thus, higher scores of vividness for positive future imagery were associated with greater dispositional optimism. Consistent with hypothesis 2b, partial correlations showed that the correlation remained significant when controlling for depressed mood (BDI-II), $r(121) = .398$, $p < .001$.

To investigate whether changes in positive future imagery over the course of the OxIGen program related to changes in dispositional optimism across the whole sample, correlations between the relevant change scores were carried out. Consistent with hypothesis 3, change scores on the PIT (positive future imagery) from pre- to post-OxIGen across groups correlated with change on the LOT-R (optimism) across the same time-scale, $r(124) = .250, p = .005$.

Discussion

The present study sought to explore for the first time the role of imagery, optimism and behavioural activation in the context of a newly developed imagery-based CBM program (i.e. OxIGen) delivered over the internet to a sample of individuals with clinical depression. While the first pilot of OxIGen (reported in Chapter 4 of the thesis) had suggested that it might be feasible to deliver the potential intervention in participants' own home via the internet, this larger scale study provided further support by showing that participants exhibited on average very high rates of adherence (i.e. 11.5 out of the 12 sessions). Of note, adherence was found to be as high in the control condition as in the positive imagery condition. This reinforced the face validity of the control condition and demonstrated its validity as a closely matched comparison condition for further tests of OxIGen. Overall, the high rates of adherence reported in this study answered the concern, raised in the previous chapter of the thesis and elsewhere in the CBM literature (e.g. Beard, Weisberg, & Primack, 2012), that completing such repetitive computerized training at home over a prolonged period of time could be too demanding for individuals suffering from clinical depression.

The primary aim of the present study was to test the hypotheses that completing the OxIGen program would produce greater training effects on positive future imagery and behavioural activation than completing the control version of the program. The study

provided a valid and sufficiently powered design to test these hypotheses. In particular, randomisation was successful, as reflected by the fact that participants across both conditions were well-balanced on most variables explored in the study (e.g. age, gender, depression, anxiety).

The hypothesis that greater training effects would be observed over the course of OxIGen compared to a control version of the program was partially supported with regards to behavioural activation, although the interaction effect was only trend-significant. There was a main effect of time, as reflected by the fact that behavioural activation increased over time across both experimental conditions. Comparison of change scores across both conditions revealed that behavioural activation increased significantly over time across both conditions. However, increases in behavioural activation reached the RCI (= 16, see Appendix 4.9) only in the positive imagery condition (+ 18.35), but not in the control condition (+12.35). This was further reflected in the large effect size found within the positive imagery group ($d = .835$), compared to the medium effect size found within the control group ($d = .594$). Overall, these findings suggested that part of the improvements in behavioural activation across both conditions may have been caused by the regular completion of a computerized task activity, or possibly non-specific factors such as contact with researchers, or travels to the research centre. However, the potential superiority of the positive imagery condition (although only at trend level) opened up the possibility that the active components of OxIGen (i.e. training in positive imagery and interpretation) may augment the effects of the training on behavioural activation. Overall, these results added to the behavioural findings reported in Chapter 2 of the thesis (i.e. enhanced performance on the fishing game following positive imagery-based CBM) by suggesting that the effects of OxIGen may have transferred to subsequent improvements in specific behaviours associated with depression.

The current study also sought to examine two strands of hypotheses regarding imagery. A first aim was to provide the first test of the link between vividness of positive future imagery and optimism in a sample of clinically depressed individuals. As predicted, the analysis revealed a positive medium-size correlation whereby higher baseline levels of vividness for positive imagery were associated with higher levels of dispositional optimism at baseline. Further, this association was still significant when controlling for depressed mood. This result extended earlier findings from Blackwell et al. (2013) by showing that the link between vividness of positive imagery and optimism applied to a clinical sample, thus reinforcing the idea that focussing on this specific feature of imagery (improving vividness) may be a promising target for future treatment research (improving optimism).

A central aim of the present study was to explore whether specific features of positive imagery, namely vividness, likelihood and vantage perspective, could be modified through the action of OxIGen. Contrary to our hypotheses, the results provided no evidence of such training effects between groups on positive future imagery. Analysis of change scores on the PIT indicated no difference in vividness and likelihood of positive future imagery between the “active” (i.e. positive imagery condition) version of the program and the control version. Unexpectedly, there was a main effect of time for imagery vividness, whereby vividness increased significantly over time across both OxIGen conditions. Of note, however, visual inspection of the means indicated that vividness for positive imagery increased nearly twice as much in the positive group (+.38 on the PIT) than in the control group (+.23). Nevertheless, the amplitude of change was very limited, as reflected by the small effect size found ($\eta^2 = 0.165$). Further, examination of IGT scores at post-OxIGen revealed no evidence of higher levels of imagery vividness and use of field perspective in the positive imagery group compared to the control one. By contrast, exploration of negative imagery provided a somewhat counterintuitive picture: While analysis of IGT scores indicated a trend towards

lower vividness for negative imagery in the positive imagery compared to the control group, analysis of PIT scores showed a trend towards greater increase in vividness for negative imagery in the positive compared to the control group. However, none of these findings reached significance and they could reflect “false positives” due to multiple comparisons.

The null findings regarding greater increases in positive future imagery in the positive imagery group from pre to post-OxIGen allow various and not necessarily mutually exclusive interpretations. One possibility is that none of the OxIGen conditions produced any impact on positive future imagery, and that the main effect of time found for positive imagery vividness was due to non-specific factors. A further possibility could be that the amount of practice involved in the OxIGen training was insufficient to produce a measurable effect on positive future imagery. That is, the CBM manipulation was not sufficient. If this was the case, changing the type of training or the “treatment dose” (by increasing the number or the length of the sessions) may lead to actual change in imagery.

One alternative interpretation of the present results is that both conditions were effective (although to a limited extent) at enhancing vividness of positive future imagery, but none of them outperformed the other at doing so. If such an interpretation was correct, this would raise the thorny question of why a repeated practice in generating imagery did not produce greater training effects on imagery than a computerized task in which participants were explicitly required not to use any imagery.

A further possibility is that the OxIGen program did lead to actual training effects on positive future imagery, but that these effects were not visible immediately after training but only at a later time, i.e. at one, three or sixth months follow-up. Consistent with this proposal, a recent trial comparing the efficacy of an internet-based CBM procedure with a CBT program for socially anxious adolescents found that improvements in positive automatic

threat-related associations following CBM were only seen at 12 month follow-up (Sportel, de Hullu, De Jong, & Nauta, 2013). However, this proposition is not consistent with the finding of immediate increases in positive imagery vividness in Experiment 1. Another option that cannot be ruled out is that vividness of imagery could be hard to change over longer time periods.

Another possible interpretation is that the OxIGen program did produce change in positive imagery but that the measures used to assess imagery (i.e. the PIT and the IGT) were insensitive to the effects of the training. The PIT and the IGT assess the ability to generate imagery of emotionally unambiguous scenarios, e.g. “people with admire you”. In OxIGen, by contrast, the tasks involve the generation of positive imagery in response to scenarios that are initially ambiguous as to their emotional tone, thus requiring participants to actively resolve the ambiguity by generating a mental image. Therefore, it remains possible that OxIGen training effects on imagery will only emerge if imagery is assessed in the presence of ambiguous information. Thus, using a measure that combine both components, such as the Ambiguous Scenario Test (Berna, Lang, Goodwin, & Holmes, 2011), could be more appropriate to capture the effects of the training. Alternatively, as suggested in the introduction of the present chapter, it could be that the effects of OxIGen are not reflected in the phenomenology of imagery but in the *frequency* with which participants subsequently generate positive imagery in their day-to-day lives. This could be assessed in future research using a diary measure or some form of experience sampling.

The various and not necessarily mutually exclusive interpretations (of absent, present, delayed or not appropriately captured training effects of OxIGen) outlined above remain highly speculative at this stage, and more research is needed to determine the existence and the exact nature of the “training” processes involved in OxIGen. A central feature of OxIGen that was not explored in the present study but will be examined in the wider trial is

interpretation bias. In line with previous evidence of successful modification of bias following imagery-based CBM-I (Lang et al., 2012), one could speculate that significant improvements in bias will again be observed in the final analysis. If such finding was accompanied by the demonstration of a clinical benefit for depressed participants, then this would suggest that the actual mechanism of change involved in OxIGen may be interpretation rather than imagery per se. Participants may have benefited from the use of mental imagery during OxIGen without seeing their imagery ability being enhanced as a result of the training. Separating these components will be an important direction for future research.

The results of the present study should be interpreted within the confines of several limitations. One important limitation was that only a few dimensions of imagery (i.e. vividness, likelihood and visual perspective) were scrutinised. Other features of imagery could play an important role in depressed mood, such as the speed with which imagery is generated or the ability to maintain imagery over time (Cocude, Charlot, & Denis, 1997; Heller et al., 2009). As outlined above, a potentially important feature that the current study did not explore is whether participants did experience more frequent positive future imagery in their day-to-day life as a result of completing OxIGen. A further limitation of the study and of the wider trial is that it did not provide the temporal sequence required to establish the causal influence of imagery on behaviour and further the potential mediating effect of these two dimensions on symptom improvement, as these three variables were assessed simultaneously immediately after completion of the OxIGen program. For example, it could well be that symptom improvement led to enhanced behaviour or reciprocally. Instead, future studies should measure change in imagery and behaviour early in the training (e.g. after the first OxIGen session as in Experiment 1) to allow causal interpretations to be made.

As adjunct to extant therapies or a stand-alone, low-intensity intervention, imagery-based CBM-I techniques are beginning to hold promise as a potential intervention for people

with depression or anxiety (e.g. Williams et al., 2013). In parallel to the exploration of the clinical benefit of CBM-I, the determination of the underlying mechanisms thought to contribute to this clinical effect is a critical area of research.

The importance of imagery vividness has been further supported in this study by the association found between vividness of positive imagery and optimism in a clinically depressed sample. In addition, the present study has provided tentative support to the hypothesis that a systematic practice of positive imagery-based CBM versus a control task could boost approach behaviour in a population of currently depressed individuals. No evidence was provided however to suggest that imagery-based CBM-I lead to improvements in mental imagery ability in comparison to a control task. An important area for future research, if the overall intervention is effective, will be to determine whether interpretation bias and other features of imagery (such as frequency, generation time, maintenance, valence or pre-experiencing) could be more sensitive than vividness to the effects of imagery-based CBM-I. In this study imagery vividness was assessed using unambiguous scenarios, whereas the CBM training requires the deployment of imagery in the context of emotional ambiguity. Thus the possibility remains that using a “nearer” transfer measure of imagery combined with ambiguity resolution will produce measurable change in positive imagery. For the continuing improvement of imagery-based CBM-I as a clinical intervention, more research is needed to map out the active ingredients and identify the best way to enhance its efficacy.

CHAPTER 6

General Discussion

Overview of the Thesis

Over the past few years, there have been significant advances in our understanding of the many cognitive processes that are implicated in the development and maintenance of depression, such as overgeneral autobiographical memory (Raes et al., 2006), rumination (Watkins & Teasdale, 2001), or the tendency to interpret emotionally ambiguous information in a negative manner (Rude, Valdez, Odom, & Ebrahimi, 2003). These cognitive processes play a pivotal role because they directly influence how people react to stressful situations and what expectations they hold about the future. An interesting development from recent research in experimental psychopathology is that although these cognitive biases are often deeply entrenched and operate in a rather automatic way among individuals who suffer from mood disturbance, they might still be amenable to change through systematic training procedures such as CBM (Raes, Williams, & Hermans, 2009; Watkins et al., 2012). The possibility that people could be “re-trained” to adopt a more healthy or optimistic style of thinking has important implications, as it opens the way to the development of new psychological interventions that could help improve what can be offered to people with depression (Fox, 2012). Such innovative interventions are crucially needed to address the global health problem of depression.

The aim of the current thesis was to contribute towards developing a new computerized intervention designed to help people with depression adopt a more optimistic view of their future. Previous research conducted within the laboratory had shown that imagery-based CBM was efficient at improving positive mood, interpretation bias and protecting against a later induction of sad mood, opening up the possibility that such procedure could be helpful for people with depressed mood (Holmes, Lang, & Shah, 2009).

As outlined in Chapter 1, this hypothesis was supported in two small-scale studies in which imagery-based CBM was delivered to samples of clinically depressed individuals (Blackwell & Holmes, 2010; Lang, Blackwell, Harmer, Davison, & Holmes, 2012). While these preliminary findings were encouraging and suggested that imagery-based CBM could hold promise as a future treatment for depression, little was known about the underlying mechanisms and further research was needed to explore the effects of the procedure on variables that could potentially contribute to symptom improvements. In addition, the usability and accessibility of the CBM was limited by the use of specialised laboratory software, thus further research was needed to make the CBM more compatible a clinical intervention.

The overarching aim of the current thesis was to explore the effects of imagery-based CBM on positive mental imagery and approach behaviour and contribute towards developing it into an internet-delivered intervention for people with clinical depression. The present thesis focussed on mental imagery and approach behaviour because of their relevance for depression, and because they were hypothesised to be important in bringing about symptom improvements. Of note, participants in Blackwell and Holmes (2010) reported experiencing imagery intrusions from the training scenarios and increased behavioural engagement as a result of completing imagery-based CBM. Further, those who gained a clinically significant benefit from imagery-based CBM in Lang et al. (2012) displayed greater levels at baseline of vividness for positive future imagery compared to those who did not gain any benefit. These findings highlighted the potential importance of imagery and behaviour in imagery-based CBM, but more research was needed to determine whether imagery-based CBM could produce change in positive imagery and approach behaviour.

A parallel aim of the thesis has been to take steps in translating a laboratory administered CBM paradigm into an internet-delivered intervention for clinical depression.

The efficacy of imagery-based CBM has been supported in laboratory settings, but it is unknown whether similar effects would be observed if the computerized training was translated into an online, self-administered intervention that depressed people would complete in their own home. Throughout the pilot phase of the new online imagery-based CBM-I – called Oxford Imagery Generation (OxIGen) program – the number of CBM sessions was doubled from 6 (in experiment 3a) to 12 (in experiment 3b) to explore the possibility that increasing the amount of practice may produce changes in symptoms of depression, and also in other potentially important variables such as mental imagery and behavioural activation (i.e. a form of approach behaviour in the context of depression). The current thesis focussed on these two specific variables because they were hypothesised to be two important mechanisms by which imagery-based CBM might be able to exert its beneficial effects on depressive symptoms.

A series of four experiments (experiment 1, 3a, 3b, 4) and one study (Study 2) explored the effects of imagery-based CBM on mental imagery and behaviour in the context of non-clinical dysphoria as well as depression. Throughout the four experiments the CBM program evolved from a single laboratory session to a one-month clinical intervention delivered over the internet. This work contributed to the culmination in a large scale clinical study (experiment 4) in which the effects of the online Oxford Imagery Generation (OxIGen) program were tested on positive mental imagery and behavioural activation.

Main Findings of the Thesis

Experiment 1

Experiment 1 explored the effects of an imagery-based CBM procedure on positive mood, bias and behaviour in a sample of individuals with mildly depressed mood. Whilst the

critical importance of using positive imagery relative to verbal language for the successful modification of emotion and bias had been established in previous experimental studies (e.g. Holmes, Mathews, Dalgleish, & Mackintosh, 2006), the specific role of imagery valence had not been explored. Experiment 1 sought to address this by comparing positive to negative and mixed valence (control) imagery, using a recently-developed CBM paradigm (picture-word CBM) that used pictorial stimuli in a non-clinical sample with mildly depressed mood. The use of pictures as training stimuli was thought to be likely to be of particular use in depression as it could provide a springboard to facilitate the generation of imagery. Positive mood was shown to increase following the repeated generation of imagery in response to positive picture-word cues, whereas it deteriorated in the negative condition and remained stable in the control condition. This results was in support of the hypothesis that a deficit in positive future-oriented imagery may impede recovery from depressed mood. Further, the finding that positive affect improved in individuals with mildly depressed mood had potentially important implications for the use of imagery-based CBM as a future treatment for depression. Indeed, the importance of positive affect in the clinical outcome of depression has been highlighted by recent evidence showing that reduced positive affect predicted poorer prognosis (Morris, Bylsma, & Rottenberg, 2009) and that early improvements in positive affect predicted response to antidepressant treatments (Geschwind et al., 2011).

A further question that needed to be addressed in this line of research was whether imagery vividness could increase as a result of engaging in a repeated practice of generating mental imagery. In Experiment 1, it was shown that imagery vividness increased from the first to the last block of CBM training within the positive imagery group, thus providing preliminary support for the malleability of imagery following repeated training. Interestingly, such change was not observed within the negative or mixed valence imagery groups. One possibility was that participants in these two conditions were more reluctant to vividly engage

with the scenarios because all of them (or half of them in the mixed imagery condition) were negative and thus perhaps slightly aversive. Although encouraging, the finding about increased imagery vividness within the positive imagery condition was based on a measure that constituted part of the CBM training itself (in which each scenario is followed by a vividness rating). Thus, a more independent measure of imagery, such as the Prospective Imagery Task (PIT) used in Experiment 3 and 4, was needed to establish the existence of training effects on imagery vividness.

Experiment 1 also examined the effects of imagery-based CBM 24 hours after the experimental session. Another important question that future CBM research needed to address was whether CBM could produce long-lasting change in cognitive biases, behaviour and symptoms (MacLeod, Koster, & Fox, 2009). At some notable exceptions (e.g. Yiend, Mackintosh, & Mathews, 2005), most studies in which a single session of CBM was administered have exclusively focussed on short-lived, immediate effects of the technique. Experiment 1 sought to explore the durability of change in interpretation bias by assessing participants on a homophone task administered on the phone 24 hours after the experimental session. Participants in the positive group were found to endorse significantly fewer negative interpretations than those in the negative group (though did not differ from the control mixed group). Thus, this finding provided preliminary evidence that bias modification may endure at least 24 hours after the CBM session. In addition, the measure used to assess bias (i.e. the homophone task) – a word spelling task – was arguably only distantly related to the imagery-generation task involved in the CBM technique, and therefore could be described as a “far” transfer effect. Promoting and assessing the generalisation of the newly acquired bias to a variety of situations and context is central to the continuing development of CBM.

A central aim of Experiment 1 was to explore the impact of picture-word CBM on approach behaviour in individuals with mild levels of depressed mood. More specifically, it

was hypothesised that following positive imagery-based CBM, participants would show enhanced approach behaviour compared to those in the control or negative imagery groups. This behavioural hypothesis was based on a large body of evidence showing that imagining the future in a positive way could increase achievement motivation, effort and performance (reviewed in Chapter 1). Further, the possibility that future positive imagery could promote approach behaviour was highly relevant in the context of depression, as the condition has been associated with important behavioural deficits, in particular a deficit in approach behaviour and persistence (see Chapter 3 for a review). Experiment 1's findings supported the hypothesised knock-on effect of imagery-based CBM on approach behaviour. That is, immediately after training, performance on the fishing game task was significantly higher for participants assigned to the positive imagery group than for those assigned to the control or negative group. This finding supported the idea that positive imagery may constitute a useful tool to boost approach behaviour in depression.

The differences observed in behavioural performance on the fishing game across the three experimental conditions provided some evidence for an additional “far transfer” effect to a distantly-related behavioural task. Far transfer effects are usually observed when the CBM training and transfer “problems” (e.g. emotional task) invoke the same cognitive procedures but a different context (as in the homophone task). In Experiment 1 although the context of the behavioural task (i.e. a fishing game) was arguably different from the one presented during training (i.e. imagery-based CBM), the cognitive procedures invoked in these two tasks may have shared some similarities. In particular, the relative incongruity of being required to play a children game (i.e. the fishing game) in the context of an experimental session might have created an ambiguous situation to which participants responded (behaviourally) in a way that was congruent with their training condition. More specifically, a repeated practice in anticipating success (in the form of positive imagery)

under ambiguous situations might have prompted participants to envision the scenario of a positive outcome (e.g. “the experimenter wants to entertain me with a fun game and see how well I can perform.” versus “the experimenter is making fun of me by asking me to play a childish game”) and as a result increase their engagement in the fishing game task.

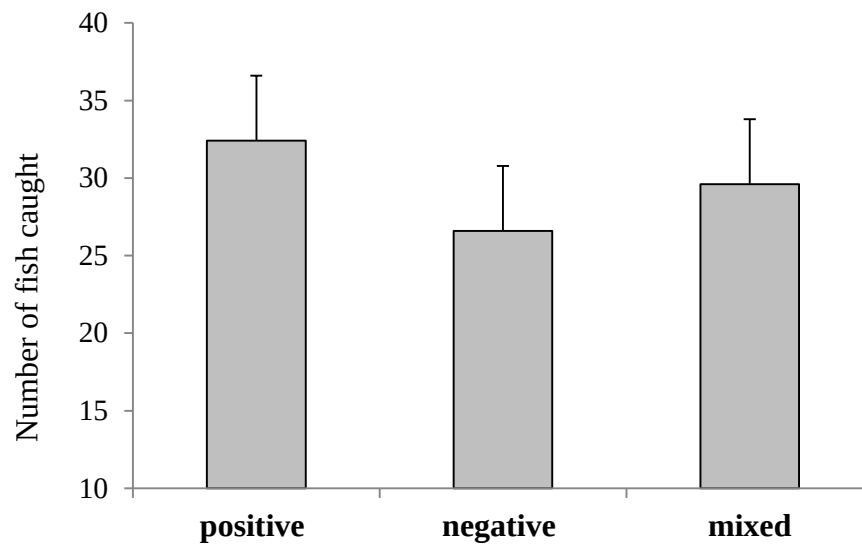
Study 2

Study 2 focussed further on this fishing game task in a clinically recruited sample. Whilst behavioural performance in mildly depressed individuals had been shown to change following experimental manipulation, the natural variations in approach behaviour within a population of individuals with varying levels of depressed mood had been relatively unexplored. As outlined in Chapter 3 of the current thesis, there was substantial evidence to suggest that depression was associated with motivational and behavioural deficits, in particular a lack of approach behaviour and persistence. Study 2 therefore tested the hypothesis that people with higher and clinical scores of depression would perform less well on the fishing game than those with lower scores of depression. The large sample ($N = 179$) comprised a range of depression levels, from minimal to severe ones. Correlation across the whole sample confirmed the negative association between depression scores and performance on the fishing game task (see Figure 6.1 below). Following the division of the sample into two groups, the analysis revealed that participants who were severely depressed ($BDI-II > 29$) performed less well than those who were in the minimal-to-moderate range ($BDI-II < 29$), and this remained significant when controlling for variables such as age and state mood. While most studies so far have used sophisticated and lengthy tasks to assess approach behaviour in depression (e.g. Treadway, Buckholtz, Schwartzman, Lambert, & Zald, 2009), the Fishing Game could hold promise as a very simple and short tool to assess approach behaviour within a laboratory setting, although the data may not be robust enough for using it as clinical tool at the individual patients level.

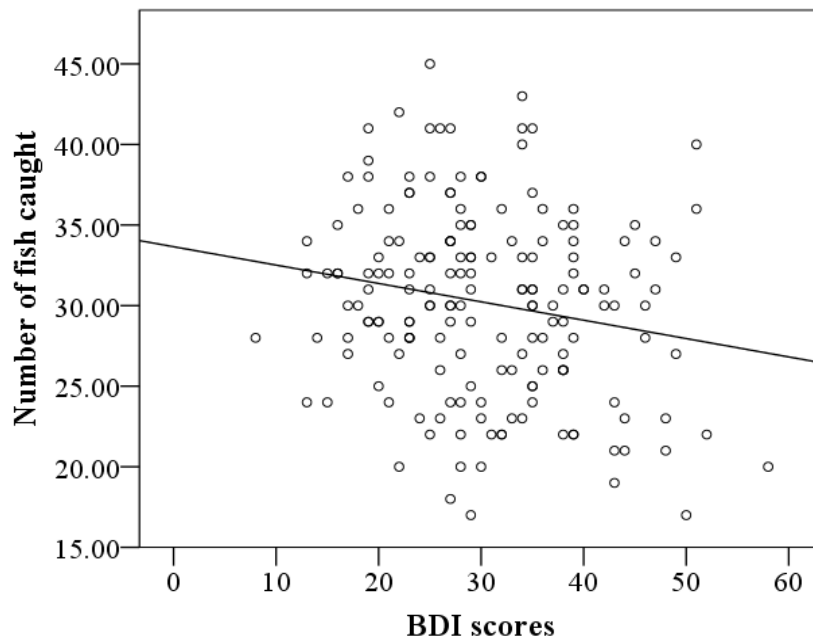
In summary, Experiment 1 examined positive affect, mental imagery and behaviour because of their relevance with depressed mood and their potential sensitivity to the effects of imagery-based CBM. Results showed improvements in positive affect, bias and approach behaviour in a sample of individuals with mildly depressed mood. The finding that differences in behavioural performance on the fishing game task could be observed in a non-clinical sample opened up the possibility that performance on this task might be associated with depression severity in a clinical sample. Study 2 tested this possibility and extended findings from Experiment 1 by showing that the measure of behavioural performance was indeed associated with clinical levels of depression. Figures 6.1 below provides an overview of behavioural performance on the fishing game task according to the experimental condition participants were assigned to in Experiment 1 and according to the depression score (BDI) reported by each participant in Study 2.

Figure 6.1. A) Mean scores of behavioural performance (number of fish caught on the Fishing game) for each of the three experimental conditions. Error bars show one standard error of the mean. B) Scatterplot representing each participant's values on the fishing Game and Beck Depression Inventory-II (BDI)

A)



B)



Experiments 3a and 3b

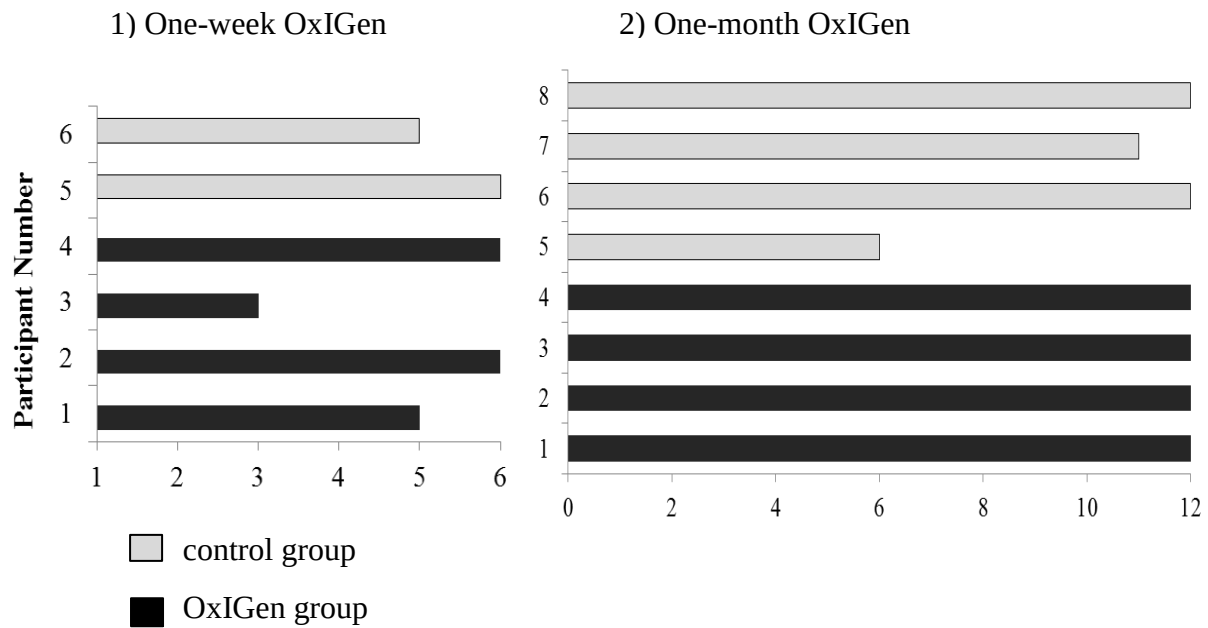
Experiment 3a and 3b focussed on developing and piloting an internet-based platform for imagery-based CBM – called “OxIGen” – in two small samples of clinically depressed individuals. A focus was on adherence, as unlike the CBM tested in Experiment 1 the OxIGen program tested in Experiments 3a and 3b involved repeated sessions of CBM. One important limitation in the translation of this laboratory paradigm into a clinical intervention was that the CBM technique was previously delivered via specialised laboratory software (E-prime). To address this, Experiments 3a and 3b sought to develop and test a new internet platform that would allow imagery-based CBM to be administered in the most flexible and easily accessible way. Participants accessed the intervention alone (i.e. not in the presence of an experimenter/therapist) over the internet without any additional specialised software required and completed the successive sessions in their own home and at the most convenient time to them.

The two pilot CBM interventions tested in Experiments 3a and 3b involved multiple sessions of internet-based CBM, namely 6 in experiment 3a (completed over a week) and 12 in experiment 3b (completed over a month). Participants were assigned to either a positive imagery or a control condition, which was a mixed valence imagery condition in Experiment 3a and a mixed valence verbal condition in Experiment 3b. The imagery component was removed from the control condition in Experiment 3b so that the combined effects of imagery and bias modification in the positive condition could be investigated together. The increase in the number of CBM sessions was based on the hypothesis that multiplying training sessions and distributing them over time would be more likely to induce long-term changes in mental imagery, bias, behaviour, and last but not least symptoms of depression. However, increasing the length of the intervention carried the risk of seeing participants disengage or even drop out of the study. This was particularly true for participants with depression, who have been

found to experience more difficulties in effortful tasks and to be less persistent than healthy people (Hartlage, Alloy, Vazquez, & Dykman, 1993; Miller & Seligman, 1975). Results from experiment 3a and 3b addressed this concern by showing that participants completed most of the OxIGen sessions (i.e. 90% on average, see Figure 6.2) and generally found the format of the intervention acceptable and comprehensible. In Experiment 3a however, close examination of participants' feedback indicated frequent misunderstandings of the CBM task and difficulties to engage with imagery in the way it was prescribed. The OxIGen program was refined to address these problems and enhance participant's engagement. This led to the development of the finalised version of the OxIGen program, which akin to the usual format of clinical interventions was of greater size and duration and included follow-up assessment.

The initial concern in experiment 3b that doubling the number of sessions and prolonging the intervention to one month might have a detrimental impact on participants' adherence was not confirmed by the data, as shown in Figure 6.2. Adherence rates increased from 87% in Experiment 3a to 93% in Experiment 3b. This suggests that the OxIGen program, despite being a relatively lengthy intervention (in CBM terms), is sufficiently engaging and acceptable to people with clinical depression.

Figure 6.2. Number of sessions completed by each participant across 1) the one-week OxIGen program (6 sessions) 2) the one-month OxIGen program (12 sessions)



The analysis of the impact of OxIGen on bias, imagery, behavioural activation and symptoms provided a mixed picture (see Table 6.1. below). Of the eight participants assigned to the positive imagery condition in Experiments 3a and 3b only four of them showed improvements in depressive symptoms. Two participants out of the four assigned to the positive imagery condition in Experiment 3b showed improvements in mental imagery that were thought to be reliable, and only one of them showed improvement in bias. Further, one participant (7) showed improvement in positive imagery but aggravation of depressive symptoms, while another one (6) showed symptom reduction without any improvement in mental imagery. More conclusively, a beneficial impact on behavioural activation (with close to reliable change scores) was found in all participants assigned to the positive group in Experiment 3b. However, three of the four participants in the control group showed substantial increases in behavioural activation as well. This suggests that part of this behavioural effect was likely to be caused by the mere passage of time, or non-specific factors

in addition to the internet engagement perhaps, such as traveling to the research centre, completing a computer task on a daily basis, or being in frequent contact with researchers.

Table 6.1 *Change Scores of Imagery (PIT), Behaviour (BADS), Bias (SST) and Symptom Improvement (BDI-II, HRSD) for each of the 14 Participants tested in Experiment 3a and 3b from Pre-OxIGen to Post-OxIGen*

Participant	Study	Condition	PIT	BADS	SST	Symptom Improvement (BDI-II, HRSD)
1	3a	Positive	-2.7		-0.3	yes*
2	3a	Positive	+1 ^R		+0.07	yes
3	3a	Positive	0		-0.4	no
4	3a	Positive	+0.7		+0.29	no
5	3b	Positive	+0.2	+16 ^R	+0.01	no
6	3b	Positive	-0.4	+15	-0.5	yes
7	3b	Positive	+1 ^R	+12	+0.7	no
8	3b	Positive	+1.2 ^R	+14	-1.55 ^R	yes*
9	3a	Control	+0.2		-0.33	yes*
10	3a	Control	-0.6		+0.01	no
11	3b	Control	-0.1	-2	-0.9	no
12	3b	Control	+2.9 ^R	+14	+0.6	no
13	3b	Control	+0.2	+78 ^R	-1.6 ^R	yes*
14	3b	Control	0	+22 ^R	+1.6	no

Note: PIT = Prospective Imagery Task, vividness for positive future imagery; BADS = Behavioural Activation for Depression Scale; SST = Scrambled Sentences Test; BDI-II = Beck Depression Inventory-II; HRSD = Hamilton Rating Scale for Depression; Symptom improvement = “yes” indicates change exceeding the reliable change index on the BDI-II or a reduction of 50% or greater on the HRSD; “*” = indicates clinically significant change, i.e. when there is a shift to a lower category of depression severity on the BDI-II. “^R” = indicates “reliable” change, arbitrarily set for the PIT ($\geq +1$) and SST (≥ -1) and according to a calculated cut off for the BADS (≥ 16)).

Any interpretation of these findings should be taken with caution as both pilot experiments used very small sample sizes and employed different CBM paradigms. Further, the primary aim of these two experiments was not to demonstrate treatment effects but to test the feasibility of delivering the OxIGen intervention over the internet to clinically depressed individuals. A general conclusion from this pilot work was that the online, home-based OxIGen program was perceived as relatively enjoyable and comprehensible (according to participants' feedback) and that participants adhered to the repeated sessions. This provided preliminary support for its feasibility as a clinical intervention for people with depression.

Experiment 4

Experiment 4 took a further step by testing the effects of OxIGen within a large-scale clinical trial. While the exploration of clinical outcome on depressed symptoms was restricted to the wider trial (which was still running at the time this part was analysed), Experiment 4 sought to explore the putative mechanisms of action in imagery-based CBM, with a particular focus on positive imagery and approach behaviour. While Experiments 1, 3a and 3b had focussed on the dimension of imagery vividness, the exploration of imagery in Experiment 4 was enlarged to two additional dimensions, visual perspective and subjective likelihood, because these two dimensions were also hypothesised to be potentially important “markers” of the OxIGen training.

An aim of OxIGen can be described as being to induce a more habitual tendency among depressed people to generate vivid imagery when simulating positive future outcomes in their mind's eye. A particular emphasis in the instructions is the requirement to generate imagery from a first-person perspective, in line with earlier research showing that using first-person perspective in a positive imagery-based CBM leads to greater increases in positive affect than using observer perspective (Holmes, Coughtrey, & Connor, 2008). Further, people with depressed mood have a tendency to recall positive autobiographical memories from an

observer perspective, and doing so may contribute to reducing the emotional benefit usually derived from such recall (Bergouignan et al., 2008; Nelis, Debeer, Holmes, & Raes, 2013). This hypothesis was supported in a recent study in which the emotional impact of shifting from one perspective to the other when imagining positive future scenarios was explored in a healthy sample (Vella & Moulds, 2013). Results confirmed that shifting from a field to an observer perspective led to decreased positive affect in response to positive future imagery, but the converse effect was not found. Further, an additional question that remained unanswered from this experimental manipulation was whether people with depression could be trained to use field rather than observer perspective in response to positive future scenarios. Findings from Experiment 4 did not support this hypothesis, as shown by the absence of significant differences between the positive imagery and control groups in the extent to which they uses of field perspective in response to positive future scenarios (as assessed at post-OxIGen by the IGT).

A further dimension explored in Experiment 4 was the likelihood of positive future imagery. Prior research suggested that a potential consequence of repeatedly generating positive imagery about the future is that it may enhance the perceived likelihood that positive future outcomes will happen in the future (Carroll, 1978). This could have important implications for depression, as a central feature of the disorder is an overwhelmingly pessimistic (or less optimistic) view of the future (Strunk, Lopez, & DeRubeis, 2006). Experiment 4 findings did not show the predicted increases in the likelihood for positive future imagery within the positive imagery group. However, the association found in Blackwell et al. (2013) between vividness for positive future imagery and optimism was replicated in a clinically depressed sample. Further, the relationship was still significant when controlling for state mood. Further, change scores on imagery vividness and optimism across

both conditions from pre to post-OxIGen were found to correlate, that is increases in vividness were positively associated with increases in optimism.

However, no significant differential effect of OxIGen training conditions (i.e. positive imagery versus control) was found on either imagery vividness or optimism. Positive future imagery increased significantly over time - although to a limited extent - across participants in both conditions, but the positive imagery condition was not superior to the control condition. This absence of differential effect between conditions is open to many interpretations (outlined in the preceding chapter), one of them being that both conditions were effective at enhancing vividness of positive future imagery or inversely that none of them was. The question remains open at this stage and more research is needed to determine whether imagery vividness can be modified over long period of time, and not only after a single session of imagery-based CBM such as in Experiment 1. One possibility is that this dimension requires intensive CBM training to be modified and thus after initial improvement following the first week of OxIGen (which included one session per day), it may have returned to a level close to baseline following the spaced booster sessions in the three following weeks (which included two sessions per week). Even if imagery vividness was not found to be malleable in the long term, it would not necessarily imply that encouraging it in a CBM technique does not play an important role in bringing about symptom improvements.

As in Experiment 3b, the behavioural hypothesis in Experiment 4 received stronger support. Behavioural activation increased significantly in both the positive imagery and the control groups, but only the former showed improvements beyond a predetermined reliable change index. This pattern seemed to suggest that non-specific factors may have contributed to this effect, although the positive imagery condition seemed to have a supplement of efficacy at enhancing behavioural activation. This results echoed the finding in Experiment 1 of enhanced performance (on the fishing game) following positive, compared to control and

negative imagery-based CBM. It supported the hypothesis that approach behaviour in people with depressed mood may be sensitive to the effects of imagery-based CBM, and further opened up the possibility that increases in approach behaviour may be an important contributor to symptom improvements. This possibility will be explored in the wider trial by testing whether there is a link between increased approach motivation and symptom improvement.

Limitations of the Research Presented in the Thesis

A number of limitations have been outlined at the end of each successive study of the present thesis. A key limitation of the current thesis was that the research described did not allow any conclusion to be drawn about the efficacy of imagery-based CBM for clinical depression. The research outlined was confined to the evaluation of imagery-based CBM in an analogue sample of individuals with mildly depressed mood, thus the results could not be generalised to a clinical population. Further, the pilot work conducted to develop the intervention from the laboratory to the clinic used very limited samples of clinically depressed individuals, thus precluding any conclusion about the efficacy of the intervention. More pilot subjects would have been needed to determine treatment effects as well as other important parameters usually scrutinized in preparation for a clinical trial, such as power or sample size calculation, recruitment rate, the number of eligible participants or adherence to follow-up assessment. In addition, criteria for determining success or feasibility should be explicitly stated in an adequately structured pilot study. While the pilot work described in this thesis indicated that the CBM intervention was feasible as a home-based online intervention, these important parameters could not be assessed with the right degree of precision.

A potentially important limitation regarding Experiment 4 was that the control condition was not ideal to provide an adequate test of the hypotheses regarding positive mental imagery and approach behaviour. The use of a control condition in which both the

imagery and the bias modification components were removed made it difficult to conclude on the specific influence of generating imagery on the variables explored in Experiment 4. A more rigorous test of the unique role of imagery would have required to compare the active version of OxIGen to a control version that only differed with regards to imagery, but involved the same positive bias modification training (as in Holmes et al., 2006).

A further limitation in Experiment 4 was that in the absence of a temporal sequence whereby imagery and behaviour would be assessed prior to the assessment of depressive symptoms, the possibility remained that any effect found could be the results of symptom fluctuations rather than caused by the intervention itself. The possibility of “reverse causality” can only be ruled out by designing the appropriate schedule of measurement, allowing the demonstration to be made that change in imagery or behaviour occurred *prior* to any change in the outcome variable (Kraemer, Wilson, Fairburn, & Agras, 2002).

An additional limitation was that Experiment 4 focussed on imagery and behaviour while neglecting other aspects potentially relevant to depression and which could have been sensitive to the effects of imagery-based CBM, such as memory specificity, the emotional impact of positive memory recall or negative interpretation bias. Future research would benefit from examining these potentially variables in the context of CBM for depression.

Future Directions

Research into clinical applications of CBM is burgeoning (Koster, Fox, & MacLeod, 2009), and there is an increasing number of clinic trials showing that CBM-I techniques, either as a stand alone or as an adjunct to an existing treatment, may have clinical benefit for depression and anxiety (Amir & Taylor, 2012; Sportel, de Hullu, De Jong, & Nauta, 2013; Williams et al., 2013). These preliminary findings are encouraging, but more research is required to determine the right format, the best content and the most appropriate context in

which CBM should be delivered to produce maximal efficacy. With regards to the format, the use of internet to deliver CBM allows great flexibility and ease of access. While the successive studies described in the thesis have incorporated initial, practice sessions as starting point of the intervention, recent evidence suggests that imagery-based CBM could be administered entirely over the internet without any face-to-face contact with a researcher (Williams et al., 2013).

Another important question with regards to the format of CBM will be to determine how much practice is needed to produce long term changes in bias and symptom. There seems to be a consensus among CBM researchers that at least four sessions of CBM are required to produce bias and symptom change, although this has never been formally determined (Yiend et al., 2013). To explore the durability and the time course of CBM-induced effects, long term follow-up assessments will be required. This will further allow exploring the possibility of delayed effects, as suggested as one of the possible interpretations of experiment 4's findings. In addition, long-term follow up could be used to identify the natural decay of induced cognitive effects and thus determine when "top up" booster sessions would be best employed.

A pivotal area for future research is to determine what specific ingredients of CBM are required to optimise its impact on mood, bias, behaviour and depressive symptoms (Clarke et al., 2013; Rohrbacher, Blackwell, Holmes, & Reinecke, 2013). While preliminary evidence suggests that imagery-based CBM may hold promise for the treatment of depression (Williams et al., 2013), other CBM paradigms such as ABM have so far proven to be of limited benefit in depression while being efficient at reducing symptoms of anxiety (Hallion & Meron Ruscio, 2011; Wells & Beevers, 2010). The efficacy of imagery-based CBM in depression may be due to various factors. For example, the use of imagery is perhaps better suited for depressed individuals because it makes the intervention engaging and absorbing, in contrast with ABM techniques which are frequently experienced as relatively repetitive and

boring by participants (Beard, Weisberg, & Primack, 2012). Other potential factors are the wearing of headphones to enhance concentration, or the initial practice session with the researcher to enhance motivation and engagement. All these elements may be particularly helpful to overcome the specific difficulties experienced by depressed individuals.

A central emphasis of the CBM paradigm tested in the current thesis was the use of mental imagery. However, other components may represent useful targets to enhance the efficacy of CBM. For example, recent research suggest that promoting future-oriented thinking, memory specificity or concreteness may have the effect of boosting the effects of CBM (Raes et al., 2009; Vilhauer et al., 2012; Watkins et al., 2012). Future research would benefit from comparing alternative forms of CBM for depression in order to establish the one with the greatest therapeutic effect, or ideally to combine approaches optimally if additive.

While the active CBM paradigm tested in the current thesis involved repeated exposure to positive material and the systematic deployment of positive mental imagery across all trials, it has recently been suggested that interventions using exclusively positive material (such as positive psychology interventions) might be experienced as invalidating and naively positive by people with severe levels of depression (Dunn, 2012). One way to overcome this could be to introduce positive scenarios in a graduated manner (Mathews, Ridgeway, Cook, & Yiend, 2007). Alternatively, one could devise a CBM paradigm in which participants are exposed to a mixture of positively and negatively resolved scenarios and required to flexibly deploy specific processing requirements in each of them. For example, participants could be trained to engage in vivid imagery in response to positive scenarios (a processing mode that could be termed “savouring”) and to process negative scenarios using a self-distancing mode of processing (Kross & Ayduk, 2008; Quoidbach, Berry, Hansenne, & Mikolajczak, 2010). This would be consistent with the idea that treatment should aim to

promote the flexibility with which processing modes are deployed in various circumstances, rather than the invariable use of the same processing mode in all situations.

While the development of imagery-based CBM as a potential intervention for depression is still at an embryonic stage, investigating mechanisms of change may be an important avenue to gain a better understanding of how the procedure achieves its effects (or alternatively fails to achieve effects) and ultimately contribute towards its further development as a potential future treatment for depression.

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APPENDIX 2.1: The 200 picture-word stimuli used in Experiment 1.

All picture-word combinations were presented in a randomised order with each block. Each block contains 40 picture-word combinations that included either a positive word in the positive condition (P), a negative word in the negative condition (N) or 50% of the time a positive word and 50% of the time a negative word in the control condition.

Block 1:



P: Functional
N: Spoiling the scenery



Cool design
In the way



Welcoming
Pretentious



On my way to meet friends
Alone again



P: Good times
N: Excluded



Hanging out with friends
No friends



Hope for your team
Fear for your team



Exciting boat trip
Sea sick



P: Best friend visiting
N: Jump



Celebration
Alone



Cute
Catching fleas



Winning buzz
Defeated again



P: Tastes delicious
N: Disgustingly fattening



Fascinating
Dull



Sense of Achievement
Essay crisis



Going for gold
Weary



P: Energised
N: Exhausted



Beautiful
Ugly



Escape
Delay



Fun!
Juvenile



P: 1st class
N: Disappointment



Enjoying formal hall
Worrying about finals



Enjoying my own company
Loner



Adorable
Drown



P: Finishing finals
N: Starting finals



Amazing view
Nothing special



Bursting with opportunities
Feeling lost



Warm soak in the bath
Cold and wet



P: Home
N: Prison



Civilised meal
Bored chat



Safe place to be
Caged in



Ages till exams
Exams looming



P: Excitement at graduation
N: Sorrow at graduation



Unite
Separate



Happy contemplations
Gloomy reflections



Brand new Christmas present
Flat tire



P: Modern facilities
N: Ugly new build



Fashionable club
Restricted club



Focused
Unmotivated



Awesome night out
Nowhere to go

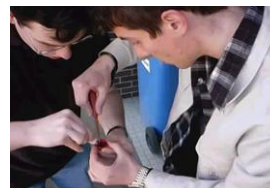
Block 2:



P: Young and carefree
N: Another year wasted



Reading for pleasure
Boring book for course



Ketchup
Blood



Happy children
Noisy obstruction



P: Healthy eating
N: Indecision



Joyful greeting
Painful to be leaving



My lovely home
Too expensive for me



Ahead of schedule
Behind schedule again



P: Cherished
N: Fidelity



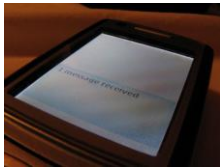
Celebrating success
Drowning sorrows



Energising boost
Sluggish and tired



Laughing and joking with friends
Being laughed at



P: Popular
N: Unpopular



Lunch time!
Grotty



Loving it here
Wish I was somewhere else



Inclusion
Exclusion



P: Vibrant street
N: Lonely street



Freedom!
I'm never going to pass



Joy for Arsenal
Sore losers



Enchanted
Enclosed and suffocating



P: Comforting voice
N: Bas news



It's great to be alive
I wish I was dead



Time to unwind
Lethargy



Hooray I've got a space
I will never find a space



P: Time to party!
N: Social pressure



Pleased to be home
No-one to go home to



Making great progress
failing to achieve



Sunny day
About to rain



P: Masterchef
N: Scalded



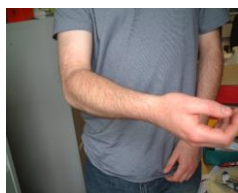
Contented daydreams
Missed deadline



Fired up and ready to learn
Overwhelming and pointless



Laid back
Lazy



P: Embrace
N: Stich



I love my subject
My subject is dull



Chilling out
Wasting time



Great backstage view
Set apart from everyone



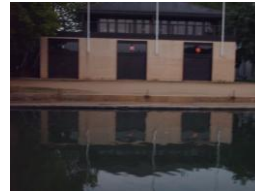
P: Glass half full
N: Glass half empty



Saving the environment
Stolen



Chatting with friends
Seating all alone



Teamwork
Snooty rowers

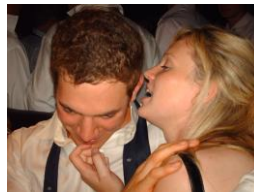
Block 3:



P: Coffee with friends
N: US domination



Holiday begin
Friend taken away



Loving kiss
Rejection



Delicious dinner
Rancid smell



P: Included
N: Excluded



Time for a picnic!
No time to stop



Fantastic party
Too much to drink



Popular
Unpopular



P: Gorgeous bag
N: Cheap and tacky



Relaxation
Lonely



Elated
Dismayed



Clean and tidy
Horrid smell



P: Joining in with the fun
N: Set apart from the crowd



Wining shot
Irritating miss



Go
Stop



Adventurous day trip
Tedious chore



P: Leisurely breakfast
N: Go away



Good memories
Social suicide



Stroll in the sunshine
I can't afford the bus



Motivated
I don't care



P: Fantastic costume
N: Fed up of waiting



Athletic
fat



Included
Excluded



Reassurance
Broken



P: Day out
N: Claustrophobia



It's my birthday!
Nauseatingly stinky



Capturing a special moment
Broken again



Helpful warning
Nasty accident



P: Festive joy
N: Festive hassle



Energetic swim
Sluggish and cold



Amazing architecture
Closed and inaccessible



Having a great time
Misfit



P: Friendly banter
N: Drunk and freaked out



Cards for me!
None for me



Fun sightseeing with family
Dull relatives visiting



Free parking!
Parking fine



P: Tasty
N: Mouldy



Start of a good day
Start of a bad day



Saving a place for a friend
No-one wants to sit with me



Blue skies ahead
Storm ahead

Block 4:



P: Safe family place
N: Prohibitive



Lolly pop
Slice



Go
Stop



Freedom for kids
Another limitation



P: Protection
N: restrictive



Police notice
Bossing order



Included
Excluded



enchanted nature
boring



P: Funny fart
N: Restless



Upstairs to relaxing cup of tea
To top floor with heavy shopping



Energised
Exhausted



Improvements
In the way



P: Focussed
N: Unmotivated



Lucky
Unlucky



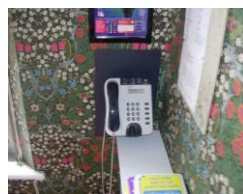
Bounding down the stairs
Trudging up the stairs



Lucky number
Mindless rules



P: Open till five
N: No time to stop



Best friend calling
No-one calling



Comedy face
In-joke



Playstation
Electrocute



P: Flowers in winter
N: Death and decay in winter



Caught
Dropped



Improvements in the way
Annoying



peaceful walk
lonely walk



P: Encouraging bystanders
N: Jeering bystanders



Day out with friends
People passing me by



Flattering
Fashion disaster



Hysterical laughter
Bullying



P: Alluring advert
N: Phoney



Hopeful anticipation
Hangover



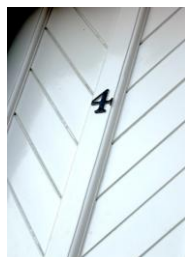
clean and tidy
Horrid smell



Being on time for the bus
Missing the bus



P: Savouring each mouthful
N: Unappetising



Invited in
Locked out



Day out
Claustrophobia



Sightseeing adventure
Late



P: Party!
N: Out of control



Enjoyable stories
Attack



Fun ahead
Drudgery



Fun
Scary

Block 5:



P: Chatting with friends
N: Sitting all alone



let's party!
Excluded



Halloween goodies
Cruel tricks



Time well spent
Mindless chore



P: Wildlife blooming
N: Destroyed by frost



Hilarious food fight
Sick



Enjoying my own company
Loner



Beautiful eyes
Scruffy eyebrows



P: Warm cosy room
N: Broken again



Great party
Boring



Great shopping
No money for shopping



Together for ever
Straying eyes



P: fascinating subject
N: dull subject



Safe place
Inaccessible place



Great cook
Can't cook



Carve delicious roast
Wound



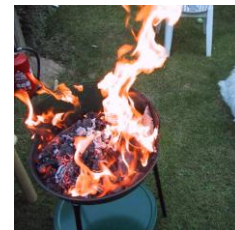
P: Many possible options
N: Nothing that interests me



Ahead of schedule
behind schedule



Feeling bold and confident
Anxious walk to exam hall



Party!
Out of control



P: Part of the community
N: Imposing



I'm loved
Splitting up



Relaxed and at ease
Hostile cliques



Celebration time!
Get out of my way!



P: Good end to the night
N: Greasy stodge



Facebook frolics
No time to join in



Skipping
Same, dreary street



Refreshing
Cold

APPENDIX 2.2: Statistical output from Experiment 1

1. Description of the sample (page 2.6)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
BDI at start of experiment	6	6.00	9.00	8.0000	1.54919
Valid N (listwise)	6				

Group Statistics

Excluded	N	Mean	Std. Deviation	Std. Error Mean
Age 1.00	6	23.0000	5.32917	2.17562
.00	81	27.9630	11.32524	1.25836

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Age	Equal variances assumed	2.083	.153	-1.060	85	.292	-4.96296	4.68068	-14.26941	4.34348
	Equal variances not assumed			-1.975	8.843	.080	-4.96296	2.51333	-10.66392	.73799

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Age	positive	27	29.7778	12.37035	2.38068	24.8842	34.6713	18.00	60.00
	negative	27	28.0370	12.00154	2.30970	23.2894	32.7847	18.00	58.00
	benign	27	26.0741	9.51083	1.83036	22.3117	29.8364	18.00	58.00
	Total	81	27.9630	11.32524	1.25836	25.4587	30.4672	18.00	60.00
BDI at recruitment	positive	27	18.1481	7.96484	1.53284	14.9974	21.2989	9.00	36.00
	negative	27	17.0000	6.97799	1.34291	14.2396	19.7604	10.00	32.00
	benign	27	17.7407	7.94012	1.52808	14.5997	20.8817	9.00	40.00
	Total	81	17.6296	7.56050	.84006	15.9579	19.3014	9.00	40.00
BDI at start of experiment	positive	27	16.6667	6.85004	1.31829	13.9569	19.3765	10.00	33.00
	negative	27	16.2963	7.14043	1.37418	13.4716	19.1210	10.00	35.00
	benign	27	16.5926	7.86550	1.51372	13.4811	19.7041	10.00	39.00
	Total	81	16.5185	7.20783	.80087	14.9247	18.1123	10.00	39.00
BHS	positive	27	6.0370	4.58661	.88269	4.2226	7.8514	.00	17.00
	negative	27	6.0000	5.42785	1.04459	3.8528	8.1472	.00	17.00
	benign	27	6.8889	5.10153	.98179	4.8708	8.9070	.00	18.00
	Total	81	6.3086	5.00410	.55601	5.2021	7.4151	.00	18.00
SUIS	positive	27	41.1481	6.52040	1.25485	38.5688	43.7275	26.00	53.00
	negative	27	38.6296	8.39023	1.61470	35.3106	41.9487	18.00	57.00
	benign	27	39.8519	9.09651	1.75062	36.2534	43.4503	22.00	57.00
	Total	81	39.8765	8.04112	.89346	38.0985	41.6546	18.00	57.00
Trait Anxiety on STAI	positive	27	46.3333	11.23182	2.16157	41.8902	50.7765	21.00	65.00
	negative	27	46.4074	11.93334	2.29657	41.6867	51.1281	23.00	75.00
	benign	27	48.9630	10.38298	1.99821	44.8556	53.0703	32.00	75.00
	Total	81	47.2346	11.12797	1.23644	44.7740	49.6952	21.00	75.00
Panas T1	positive	27	57.9259	15.42208	2.96798	51.8252	64.0267	32.00	93.00
	negative	27	58.1481	14.59110	2.80806	52.3761	63.9202	33.00	98.00
	benign	27	56.4815	14.95216	2.87754	50.5666	62.3964	25.00	87.00
	Total	81	57.5185	14.82237	1.64693	54.2410	60.7960	25.00	98.00
emotionality ratings of pictures (without words) pre training	positive	27	5.8352	.43163	.08307	5.6644	6.0059	4.94	6.80
	negative	27	5.6556	.45629	.08781	5.4751	5.8361	5.06	6.80
	benign	27	5.9548	.63001	.12125	5.7056	6.2040	4.90	7.50
	Total	81	5.8152	.52204	.05800	5.6998	5.9306	4.90	7.50

2. Randomization checks (page 2.13)

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	185.407	2	92.704	.718	.491
	Within Groups	10075.481	78	129.173		
	Total	10260.889	80			
BDI at recruitment	Between Groups	18.296	2	9.148	.157	.855
	Within Groups	4554.593	78	58.392		
	Total	4572.889	80			
BDI at start of experiment	Between Groups	2.074	2	1.037	.019	.981
	Within Groups	4154.148	78	53.258		
	Total	4156.222	80			
BHS	Between Groups	13.654	2	6.827	.268	.766
	Within Groups	1989.630	78	25.508		
	Total	2003.284	80			
SUIS	Between Groups	85.654	2	42.827	.657	.521
	Within Groups	5087.111	78	65.219		
	Total	5172.765	80			
Trait Anxiety on STAI	Between Groups	121.062	2	60.531	.482	.619
	Within Groups	9785.481	78	125.455		
	Total	9906.543	80			
Panas T1	Between Groups	44.222	2	22.111	.098	.906
	Within Groups	17532.000	78	224.769		
	Total	17576.222	80			
emotionality ratings of pictures (without words) pre training	Between Groups	1.225	2	.613	2.322	.105
	Within Groups	20.577	78	.264		
	Total	21.802	80			

3. Positive Affect Change over the Training Phase (page 2.15)

Descriptive Statistics				
	Training Condition	Mean	Std. Deviation	N
Panas T1	positive	57.9259	15.42208	27
	negative	58.1481	14.59110	27
	benign	56.4815	14.95216	27
	Total	57.5185	14.82237	81
Panas T2	positive	65.9630	16.64905	27
	negative	51.2963	12.01542	27
	benign	56.8148	15.33733	27
	Total	58.0247	15.82717	81

Tests of Within-Subjects Contrasts							
Measure: MEASURE_1							
Source	PANAS	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
PANAS	Linear	10.377	1	10.377	.198	.657	.003
PANAS * Condition	Linear	1496.938	2	748.469	14.308	.000	.268
Error(PANAS)	Linear	4080.185	78	52.310			

Tests of Between-Subjects Effects						
Measure: MEASURE_1 Transformed Variable: Average						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	540684.451	1	540684.451	1381.444	.000	.947
Condition	1510.568	2	755.284	1.930	.152	.047
Error	30528.481	78	391.391			

Group Statistics					
	Training Condition	N	Mean	Std. Deviation	Std. Error Mean
Panas difference T2-T1	positive	27	8.0370	6.64762	1.27934
	benign	27	.3333	12.42206	2.39063

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Panas difference T2-T1	Equal variances assumed	7.144	.010	2.841	52	.006	7.70370	2.71142	2.26284	13.14457
	Equal variances not assumed			2.841	39.763	.007	7.70370	2.71142	2.22270	13.18471

Group Statistics

Training Condition	N	Mean	Std. Deviation	Std. Error Mean
Panas difference T2-T1 negative	27	-6.8519	10.74066	2.06704
benign	27	.3333	12.42206	2.39063

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Panas difference T2-T1	Equal variances assumed	.587	.447	-2.274	52	.027	-7.18519	3.16034	-13.52687	-.84350
	Equal variances not assumed			-2.274	50.938	.027	-7.18519	3.16034	-13.53002	-.84035

3. Affect after filler task (page 2.17)

Descriptives

Panas T3

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
positive	27	61.0000	19.90748	3.83120	53.1249	68.8751	27.00	105.00
negative	27	59.5556	14.54789	2.79974	53.8006	65.3105	35.00	102.00
benign	27	58.6296	19.28361	3.71113	51.0013	66.2580	21.00	105.00
Total	81	59.7284	17.87177	1.98575	55.7766	63.6802	21.00	105.00

ANOVA

Panas T3

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	77.062	2	38.531	.118	.889
Within Groups	25474.963	78	326.602		
Total	25552.025	80			

4. Behavioural task (page 2.17)

Group Statistics

Fishing game	N	Mean	Std. Deviation	Std. Error Mean
Fish Total Score i.e. total number of fish caught Anna	45	21.6222	5.28845	.78836
Arnaud	36	39.1944	4.05547	.67591

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Fish Total Score i.e. total number of fish caught	Equal variances assumed	2.205	.142	-16.435	79	.000	-17.57222	1.06919	-19.70040	-15.44405
	Equal variances not assumed			-16.922	78.880	.000	-17.57222	1.03844	-19.63924	-15.50521

Tests of Between-Subjects Effects

Dependent Variable: Fish Total Score i.e. total number of fish caught

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6693.293 ^a	5	1338.659	77.915	.000	.839
Intercept	140.593	1	140.593	8.183	.005	.098
Condition	160.459	2	80.229	4.670	.012	.111
Fishing_games	6175.660	1	6175.660	359.445	.000	.827
Condition * Fishing_games	65.757	2	32.878	1.914	.155	.049
Error	1288.583	75	17.181			
Total	78148.000	81				
Corrected Total	7981.877	80				

a. R Squared = .839 (Adjusted R Squared = .828)

Estimates

Dependent Variable: Fish Total Score i.e. total number of fish caught

Training Condition	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
positive	32.407 ^a	.798	30.818	33.997
negative	26.630 ^a	.798	25.041	28.219
benign	29.259 ^a	.798	27.670	30.848

a. Covariates appearing in the model are evaluated at the following values: Fishing game = 1.4444.

Pairwise Comparisons

Dependent Variable: Fish Total Score i.e. total number of fish caught

(I) Training Condition	(J) Training Condition	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
positive	negative	5.778 [*]	1.128	.000	3.530	8.025
	benign	3.148 [*]	1.128	.007	.901	5.395
negative	positive	-5.778 [*]	1.128	.000	-8.025	-3.530
	benign	-2.630 [*]	1.128	.022	-4.877	-.382
benign	positive	-3.148 [*]	1.128	.007	-5.395	-.901
	negative	2.630 [*]	1.128	.022	.382	4.877

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

5. Homophone task (page 2.18)

Descriptives

% Negative spellings of homophones: negative interpretations/total spelt correctly x 100.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
positive	27	58.4699	13.44721	2.58792	53.1504	63.7894	35.71	78.60
negative	27	68.7877	12.23878	2.35535	63.9462	73.6292	42.86	92.86
benign	27	62.7010	9.36640	1.80257	58.9957	66.4062	42.86	78.60
Total	81	63.3195	12.41453	1.37939	60.5744	66.0646	35.71	92.86

ANOVA

% Negative spellings of homophones: negative interpretations/total spelt correctly x 100.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1452.675	2	726.337	5.209	.008
Within Groups	10876.963	78	139.448		
Total	12329.637	80			

Group Statistics

	Training Condition	N	Mean	Std. Deviation	Std. Error Mean
% Negative spellings of homophones: negative interpretations/total spelt correctly x 100.	positive	27	58.4699	13.44721	2.58792
	benign	27	62.7010	9.36640	1.80257

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
% Negative spellings of homophones: negative interpretations/total spelt correctly x 100.	Equal variances assumed	4.359	.042	-1.342	52	.186	-4.23106	3.15382	-10.55965	2.09754
	Equal variances not assumed			-1.342	46.421	.186	-4.23106	3.15382	-10.57781	2.11569

Group Statistics

	Training Condition	N	Mean	Std. Deviation	Std. Error Mean
% Negative spellings of homophones: negative interpretations/total spelt correctly x 100.	negative	27	68.7877	12.23878	2.35535
	benign	27	62.7010	9.36640	1.80257

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
% Negative spellings of homophones: negative interpretations/total spelt correctly x 100.	Equal variances assumed	2.326	.133	2.052	52	.045	6.08677	2.96596	.13513	12.03841
	Equal variances not assumed			2.052	48.677	.046	6.08677	2.96596	.12545	12.04810

Group Statistics

	Training Condition	N	Mean	Std. Deviation	Std. Error Mean
% Negative spellings of homophones: negative interpretations/total spelt correctly x 100.	positive	27	58.4699	13.44721	2.58792
	negative	27	68.7877	12.23878	2.35535

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
% Negative spellings of homophones: negative interpretations/total spelt correctly x 100.	Equal variances assumed	.334	.566	-2.949	52	.005	-10.31783	3.49929	-17.33966	-3.29600
	Equal variances not assumed			-2.949	51.546	.005	-10.31783	3.49929	-17.34114	-3.29452

6. Valence ratings (page 2.18)

Descriptive Statistics

	Training Condition	Mean	Std. Deviation	N
emotionality ratings of pictures (without words) pre training	positive	5.8352	.43163	27
	negative	5.6556	.45629	27
	benign	5.9548	.63001	27
	Total	5.8152	.52204	81
emotionality ratings of pictures (without words) POST training	positive	6.2622	.80006	27
	negative	5.2644	.78351	27
	benign	5.8881	.71445	27
	Total	5.8049	.86310	81

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Likings	Sphericity Assumed	.004	1	.004	.018	.894	.000
	Greenhouse-Geisser	.004	1.000	.004	.018	.894	.000
	Huynh-Feldt	.004	1.000	.004	.018	.894	.000
	Lower-bound	.004	1.000	.004	.018	.894	.000
Likings * Condition	Sphericity Assumed	4.583	2	2.291	9.686	.000	.199
	Greenhouse-Geisser	4.583	2.000	2.291	9.686	.000	.199
	Huynh-Feldt	4.583	2.000	2.291	9.686	.000	.199
	Lower-bound	4.583	2.000	2.291	9.686	.000	.199
Error(Likings)	Sphericity Assumed	18.453	78	.237			
	Greenhouse-Geisser	18.453	78.000	.237			
	Huynh-Feldt	18.453	78.000	.237			
	Lower-bound	18.453	78.000	.237			

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	Likings	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Likings	Linear	.004	1	.004	.018	.894	.000
Likings * Condition	Linear	4.583	2	2.291	9.686	.000	.199
Error(Likings)	Linear	18.453	78	.237			

Group Statistics

	Training Condition	N	Mean	Std. Deviation	Std. Error Mean
difference in emotionality ratings of pictures (without words) T2-T1	positive	27	.4270	.73110	.14070
	benign	27	-.0667	.50557	.09730

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
difference in emotionality ratings of pictures (without words) T2-T1	Equal variances assumed	1.960	.167	2.886	52	.006	.49370	.17106	.15044	.83697
	Equal variances not assumed			2.886	46.238	.006	.49370	.17106	.14942	.83799

Group Statistics

	Training Condition	N	Mean	Std. Deviation	Std. Error Mean
difference in emotionality ratings of pictures (without words) T2-T1	positive	27	.4270	.73110	.14070
	negative	27	-.3733	.80215	.15437

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
difference in emotionality ratings of pictures (without words) T2-T1	Equal variances assumed	3.748	.058	-1.681	52	.099	-.30667	.18248	-.67283	.05950
	Equal variances not assumed			-1.681	43.841	.100	-.30667	.18248	-.67446	.06113

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
How difficult or easy did you find your task of combining the picture with the word 1 = ex difficult 9 = ex easy	Between Groups	4.025	2	2.012	.668	.516
	Within Groups	234.889	78	3.011		
	Total	238.914	80			
How much did you find yourself VERBALLY ANALYSING THE MEANING of the picture word combinations? 1 = not at all 9 = all the time	Between Groups	.963	2	.481	.128	.880
	Within Groups	293.037	78	3.757		
	Total	294.000	80			
How much did you find yourself thinking in IMAGES (i.e. in mental pictures and sensory impressions) as you were combining the picture with the word?	Between Groups	.617	2	.309	.187	.830
	Within Groups	128.741	78	1.651		
	Total	129.358	80			
How much were you imagining the picture word combinations THROUGH YOUR OWN EYES AS IF THEY WERE HAPPENING TO YOURSELF (i.e. from a personal point of view)?	Between Groups	.222	2	.111	.055	.946
	Within Groups	156.667	78	2.009		
	Total	156.889	80			

APPENDIX 2.3: The Homophone task used in Experiment 1 and taken from Mathews, Richards and Eysenck (1989)

“I’m now going to read out some words to you and I would like you to spell each one aloud to me. E.g. I might say “SINK” and you would spell back “S-I-N-K”. Do you understand what you have to do?”

Read out the list of words to the participant and ask them to spell each one out.

If participant has two spellings, ask them to say aloud the spelling that comes to mind first. If they make a mistake say “Please can you spell that word for me again”. If they continue to make an error, say “Please can you tell me the meaning of the word”.

List of homophones:

DIE/DYE
SLAY/SLEIGH
FOUL/FOWL
MOAN/MOWN
GROAN/GROWN
LIAR/LYRE
BORE/BOAR
PAIN/PANE
WEAK/WEEK
SKULL/SCULL
TEASE/TEAS
BURY/BERRY
GUILT/GILT
FLU/FLEW
MONTH
MOBILE
RAKE
SPADE
MINT
SILVER
TRADES
CURVE
BIRD
SALT
PLANT
SHOE
DEED

APPENDIX 3.1: Statistical outline of data cleaning in Study 2

The cleaning of the data set extracted for study 2 on 21st of December 2012 involved:

- 1) checking for data entry errors by examining the minimum and maximum of each variable to see whether they fell within the expected range, and also by examining the means and standard deviations to spot any abnormality. Potential errors were then checked against the raw data and corrected accordingly.

The following entry errors were identified:

Participant	Entry Errors	checked and corrected score
P338	scored “505.00” on VAS happy scale	5.5
P557	scored "No" in "attended eligibility"	Yes
P608	scored "No" in "attended eligibility"	Yes
P632	scored "No" in "attended eligibility"	Yes
P676	scores (BDI, VAS and Fishing Game) mistakenly entered in P681	
P681	scores (BDI, VAS and Fish) mistakenly entered	

- 2) checking for missing values and looking into the raw data to see if they were actually missing or whether they had not been entered at the time the database was extracted (in which case they were completed by looking into the updated database)

The following missing values were identified:

Participant	Missing Values and reason for it
P109	Missing values on Fishing Game and VAS variables (due to medical condition)
P282	Missing values on BDI, Fishing Game and VAS variables due to discontinuation of session (because of poor English)
P600	Missing values on VAS scales (due to lack of time)
P888	Missing value on Fishing Game (completed but not collected by the researcher)

- 3) Once established as missing values, the 16 values were recoded as “Missing Value”s (= 999) in the database
- 4) Non parametric Mann-Whitney U tests were performed to compare:
 - participants (N = 3) who did not complete the fishing game with the rest of the sample (N = 176) with regards to age, $Z = .770$, $p = .44$, BDI-II scores at screening, $Z = .39$, $p = .69$ and MDQ scores, $Z = .19$, $p = .85$.

- participant ($N = 1$) who did not complete the BDI-II at baseline with the rest of the sample ($N = 178$) with regards to age $Z = .801$, $p = .86$, BDI-II scores at screening, $Z = .94$, $p = .96$ and MDQ scores, $Z = .88$, $p = .92$.
 - participants ($N = 3$) who did not complete the VAS scales with the rest of the sample ($N = 176$) with regards to age $Z = .30$, $p = .77$, BDI-II scores at screening, $Z = .86$, $p = .39$, MDQ scores, $Z = .83$, $p = .41$.
- 5) The results above indicated that values were missing completely at random (MCAR). The recommended approach to handle a small amount of MCAR is complete case analysis, i.e. running the analysis based on the cases with a complete set of variables values (e.g. Everett and Dunn's 2010).
- 6) The 4 (i.e. P109, P282, P600, P888) participants were withdrawn from the sample, leading to a final sample of 175 participants.

APPENDIX 3.2: Statistical output from Study 2

1. Data cleaning and treatment of missing data (page 3.8)

Mann-Whitney U tests to check values are missing at random.

Test Statistics^a

	Age
Mann-Whitney U	195.500
Wilcoxon W	201.500
Z	-.770
Asymp. Sig. (2-tailed)	.441

a. Grouping Variable:
Fishvsnofish

Ranks

	Fishvsnofish	N	Mean Rank	Sum of Ranks
Age	1.00	3	67.17	201.50
	2.00	176	90.39	15908.50
Total		179		

Ranks

	Fishvsnofish	N	Mean Rank	Sum of Ranks
BDI Screening	1.00	3	78.33	235.00
	2.00	176	90.20	15875.00
Total		179		

Test Statistics^a

	BDI Screening
Mann-Whitney U	229.000
Wilcoxon W	235.000
Z	-.394
Asymp. Sig. (2-tailed)	.694

a. Grouping Variable:
Fishvsnofish

Ranks

	Fishvsnofish	N	Mean Rank	Sum of Ranks
MDQ	1.00	3	95.50	286.50
	2.00	176	89.91	15823.50
Total		179		

Test Statistics^a

	MDQ
Mann-Whitney U	247.500
Wilcoxon W	15823.500
Z	-.186
Asymp. Sig. (2-tailed)	.852

a. Grouping Variable:
Fishvsnofish

Ranks

	Fishvsnofish	N	Mean Rank	Sum of Ranks
BDI Eligibility assessment	1.00	2	87.25	174.50
	2.00	176	89.53	15756.50
Total		178		

Test Statistics^a

	BDI Eligibility assessment
Mann-Whitney U	171.500
Wilcoxon W	174.500
Z	-.062
Asymp. Sig. (2-tailed)	.950
Exact Sig. [2*(1-tailed Sig.)]	.950 ^b

a. Grouping Variable: Fishvsnofish

b. Not corrected for ties.

Ranks

	BDI_vsNOBDI	N	Mean Rank	Sum of Ranks
Age	1.00	1	103.00	103.00
	2.00	178	89.93	16007.00
	Total	179		
BDI Screening	1.00	1	94.00	94.00
	2.00	178	89.98	16016.00
	Total	179		
MDQ	1.00	1	82.50	82.50
	2.00	178	90.04	16027.50
	Total	179		

Test Statistics^a

	Age	BDI Screening	MDQ
Mann-Whitney U	76.000	85.000	81.500
Wilcoxon W	16007.000	16016.000	82.500
Z	-.252	-.077	-.146
Asymp. Sig. (2-tailed)	.801	.938	.884
Exact Sig. [2*(1-tailed Sig.)]	.860 ^b	.961 ^b	.916 ^b

a. Grouping Variable: BDI_vsNOBDI

b. Not corrected for ties.

Ranks

	VAS_noVAS	N	Mean Rank	Sum of Ranks
Age	1.00	3	81.17	243.50
	2.00	176	90.15	15866.50
	Total	179		
BDI Screening	1.00	3	115.50	346.50
	2.00	176	89.57	15763.50
	Total	179		
MDQ	1.00	3	114.50	343.50
	2.00	176	89.58	15766.50
	Total	179		

Test Statistics^a

	Age	BDI Screening	MDQ
Mann-Whitney U	237.500	187.500	190.500
Wilcoxon W	243.500	15763.500	15766.500
Z	-.298	-.860	-.829
Asymp. Sig. (2-tailed)	.766	.390	.407

a. Grouping Variable: VAS_noVAS

2. Preliminary Analysis (page 3.13)

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
BDI Screening	175	43	14	57	31.67	8.808
BDI Eligibility assessment	175	50	8	58	30.30	9.491
Valid N (listwise)	175					

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	58	33.1	33.1	33.1
	Female	117	66.9	66.9	100.0
	Total	175	100.0	100.0	

Descriptive Statistics

	N	Mean	Std. Deviation
Age	175	37.03	13.110
MDQ	175	7.14	3.857
VAS happy pre-fishing	175	3.4474	1.88496
VAS sad pre-fishing	175	4.9636	2.31531
VAS anxious pre-fishing	175	4.9251	2.62467
VAS calm pre-fishing	175	4.4017	2.36484
Number of fish caught	175	30.2000	5.76753
Valid N (listwise)	175		

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
BDI Eligibility assessment	175	100.0%	0	0.0%	175	100.0%
Number of fish caught	175	100.0%	0	0.0%	175	100.0%

Descriptives

				Statistic	Std. Error
BDI Eligibility assessment	Mean			30.30	.717
	95% Confidence Interval for Mean	Lower Bound		28.89	
		Upper Bound		31.72	
	5% Trimmed Mean			30.10	
	Median			29.00	
	Variance			90.086	
	Std. Deviation			9.491	
	Minimum			8	
	Maximum			58	
	Range			50	
	Interquartile Range			14	
	Skewness			.331	.184
	Kurtosis			-.300	.365
Number of fish caught	Mean			30.2000	.43598
	95% Confidence Interval for Mean	Lower Bound		29.3395	
		Upper Bound		31.0605	
	5% Trimmed Mean			30.1746	
	Median			30.0000	
	Variance			33.264	
	Std. Deviation			5.76753	
	Minimum			17.00	
	Maximum			45.00	
	Range			28.00	
	Interquartile Range			8.00	
	Skewness			-.007	.184
	Kurtosis			-.405	.365

Extreme Values

			Case Number	Value
BDI Eligibility assessment	Highest	1	265	58
		2	269	52
		3	205	51
		4	441	51
		5	64	50
	Lowest	1	170	8
		2	226	13
		3	26	13
		4	4	13
		5	149	14
Number of fish caught	Highest	1	214	45.00
		2	336	43.00
		3	322	42.00
		4	144	41.00
		5	200	41.00 ^a
	Lowest	1	249	17.00
		2	64	17.00
		3	23	18.00
		4	362	19.00
		5	404	20.00 ^b

a. Only a partial list of cases with the value 41.00 are shown in the table of upper extremes.

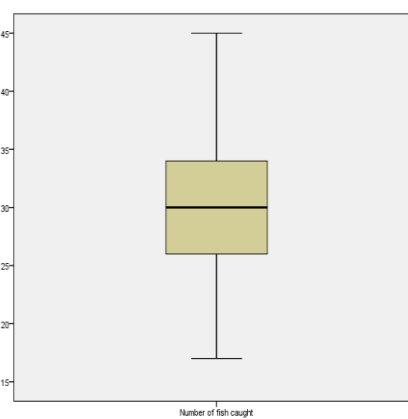
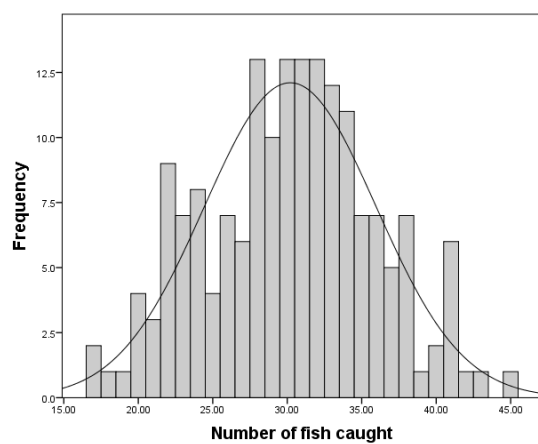
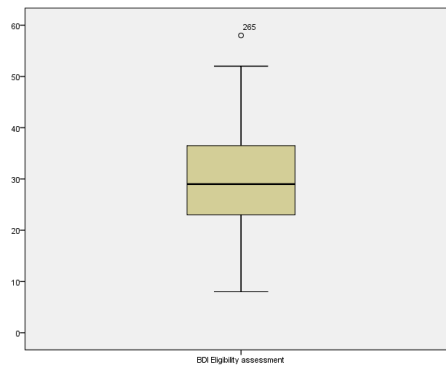
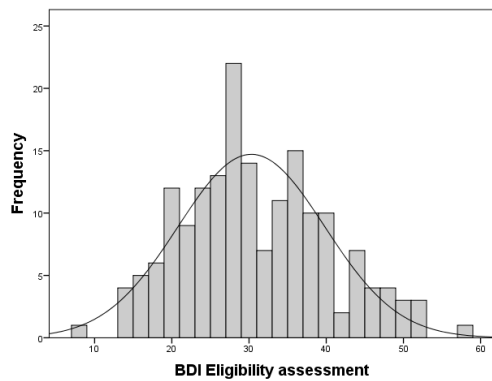
b. Only a partial list of cases with the value 20.00 are shown in the table of lower extremes.

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
BDI Eligibility assessment	.086	175	.003	.986	175	.077
Number of fish caught	.059	175	.200 [*]	.990	175	.253

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction



3. Comparison of the 2 depression groups (page 3.15)

Group Statistics

	Depressiongroup	N	Mean	Std. Deviation	Std. Error Mean
Age	1.00	84	36.81	13.230	1.443
	2.00	82	37.32	12.723	1.405
BDI Screening	1.00	84	26.82	6.416	.700
	2.00	82	36.99	8.187	.904
MDQ	1.00	84	6.99	3.842	.419
	2.00	82	7.26	3.654	.404
BDI Eligibility assessment	1.00	84	22.38	4.578	.500
	2.00	82	38.56	6.143	.678
VAS happy pre-fishing	1.00	84	3.9071	1.84396	.20119
	2.00	82	3.0756	1.83610	.20276
VAS sad pre-fishing	1.00	84	4.3524	2.26186	.24679
	2.00	82	5.5845	2.25033	.24851
VAS anxious pre-fishing	1.00	84	4.2738	2.56492	.27986
	2.00	82	5.6707	2.51384	.27761
VAS calm pre-fishing	1.00	84	4.7869	2.30807	.25183
	2.00	82	4.0232	2.37015	.26174
Number of fish caught	1.00	84	31.2500	5.50766	.60094
	2.00	82	29.1463	5.89857	.65139

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Age	Equal variances assumed	.029	.866	-.252	164	.801	-.508	2.015	-4.487	3.472
	Equal variances not assumed			-.252	163.964	.801	-.508	2.014	-4.485	3.470
BDI Screening	Equal variances assumed	4.643	.033	-8.917	164	.000	-10.166	1.140	-12.418	-7.915
	Equal variances not assumed			-8.891	153.419	.000	-10.166	1.143	-12.425	-7.908
MDQ	Equal variances assumed	.568	.456	-.460	164	.646	-.268	.582	-1.418	.882
	Equal variances not assumed			-.461	163.891	.646	-.268	.582	-1.417	.881
BDI Eligibility assessment	Equal variances assumed	5.196	.024	-19.273	164	.000	-16.180	.840	-17.838	-14.522
	Equal variances not assumed			-19.207	149.709	.000	-16.180	.842	-17.845	-14.515
VAS happy pre-fishing	Equal variances assumed	.822	.366	2.911	164	.004	.83153	.28566	.26749	1.39557
	Equal variances not assumed			2.911	163.935	.004	.83153	.28564	.26752	1.39554
VAS sad pre-fishing	Equal variances assumed	.403	.526	-3.518	164	.001	-1.23213	.35025	-1.92371	-.54055
	Equal variances not assumed			-3.518	163.940	.001	-1.23213	.35023	-1.92367	-.54059
VAS anxious pre-fishing	Equal variances assumed	.711	.400	-3.543	164	.001	-1.39692	.39429	-2.17545	-.61839
	Equal variances not assumed			-3.544	163.997	.001	-1.39692	.39419	-2.17526	-.61858
VAS calm pre-fishing	Equal variances assumed	.014	.907	2.103	164	.037	.76373	.36310	.04678	1.48069
	Equal variances not assumed			2.103	163.578	.037	.76373	.36322	.04654	1.48093
Number of fish caught	Equal variances assumed	1.170	.281	2.376	164	.019	2.10366	.88551	.35519	3.85213
	Equal variances not assumed			2.374	162.604	.019	2.10366	.88624	.35363	3.85369

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender* Depressiongroup	166	94.9%	9	5.1%	175	100.0%
Current Major Depressive Episode* Depressiongroup	166	94.9%	9	5.1%	175	100.0%

Gender * Depressiongroup Crosstabulation

Count

		Depressiongroup		Total
		1.00	2.00	
Gender	Male	31	22	53
	Female	53	60	113
Total		84	82	166

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.938 ^a	1	.164		
Continuity Correction ^b	1.502	1	.220		
Likelihood Ratio	1.946	1	.163		
Fisher's Exact Test				.185	.110
Linear-by-Linear Association	1.926	1	.165		
N of Valid Cases	166				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 26.18.

b. Computed only for a 2x2 table

Current Major Depressive Episode * Depressiongroup Crosstabulation

Count

		Depressiongroup		Total
		1.00	2.00	
Current Major Depressive Episode	No	31	7	38
	Yes	53	75	128
Total		84	82	166

4. Correlational analysis (page 3.14)

Descriptive Statistics

	Mean	Std. Deviation	N
BDI Eligibility assessment	30.30	9.491	175
Number of fish caught	30.2000	5.76753	175

Correlations

		BDI Eligibility assessment	Number of fish caught
BDI Eligibility assessment	Pearson Correlation	1	-.188
	Sig. (2-tailed)		.013
	N	175	175
Number of fish caught	Pearson Correlation	-.188	1
	Sig. (2-tailed)	.013	
	N	175	175

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Control Variables			BDI Eligibility assessment	Number of fish caught
Age	BDI Eligibility assessment	Correlation	1.000	-.199
		Significance (2-tailed)	.	.008
		df	0	172
	Number of fish caught	Correlation	-.199	1.000
		Significance (2-tailed)	.008	.
		df	172	0

Correlations

Control Variables			BDI Eligibility assessment	Number of fish caught
MDQ	BDI Eligibility assessment	Correlation	1.000	-.188
		Significance (2-tailed)	.	.013
		df	0	172
	Number of fish caught	Correlation	-.188	1.000
		Significance (2-tailed)	.013	.
		df	172	0

Correlations

Control Variables			BDI Eligibility assessment	Number of fish caught
VAS happy pre-fishing	BDI Eligibility assessment	Correlation	1.000	-.185
		Significance (2-tailed)	.	.015
		df	0	172
	Number of fish caught	Correlation	-.185	1.000
		Significance (2-tailed)	.015	.
		df	172	0

Correlations

Control Variables			BDI Eligibility assessment	Number of fish caught
VAS sad pre-fishing	BDI Eligibility assessment	Correlation	1.000	-.206
		Significance (2-tailed)	.	.006
		df	0	172
	Number of fish caught	Correlation	-.206	1.000
		Significance (2-tailed)	.006	.
		df	172	0

Correlations

Control Variables			BDI Eligibility assessment	Number of fish caught
VAS anxious pre-fishing	BDI Eligibility assessment	Correlation	1.000	-.160
		Significance (2-tailed)	.	.035
		df	0	172
	Number of fish caught	Correlation	-.160	1.000
		Significance (2-tailed)	.035	.
		df	172	0

Correlations

Control Variables			BDI Eligibility assessment	Number of fish caught
VAS calm pre-fishing	BDI Eligibility assessment	Correlation	1.000	-.154
		Significance (2-tailed)	.	.042
		df	0	172
	Number of fish caught	Correlation	-.154	1.000
		Significance (2-tailed)	.042	.
		df	172	0

5. Comparison of severely versus less severely depressed individuals (page 3.14)

Between-Subjects Factors

	N
Depressiongroup 1.00	84
2.00	82

Descriptive Statistics

Dependent Variable: Number of fish caught

Depressiongroup	Mean	Std. Deviation	N
1.00	31.2500	5.50766	84
2.00	29.1463	5.89857	82
Total	30.2108	5.78379	166

Tests of Between-Subjects Effects

Dependent Variable: Number of fish caught

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	196.512 ^a	2	98.256	3.009	.052	.036
Intercept	139419.874	1	139419.874	4269.205	.000	.963
StateMood	12.885	1	12.885	.395	.531	.002
Depressiongroup	140.678	1	140.678	4.308	.040	.026
Error	5323.108	163	32.657			
Total	157027.000	166				
Corrected Total	5519.620	165				

a. R Squared = .036 (Adjusted R Squared = .024)

Parameter Estimates

Dependent Variable: Number of fish caught

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	29.318	.688	42.636	.000	27.960	30.676	.918
StateMood	.041	.066	.628	.531	-.088	.171	.002
[Depressiongroup=1.00]	1.929	.930	2.076	.040	.094	3.765	.026
[Depressiongroup=2.00]	0 ^a	.	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

Estimates

Dependent Variable: Number of fish caught

Depressiongroup	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1.00	31.164 ^a	.638	29.903	32.425
2.00	29.235 ^a	.647	27.958	30.511

a. Covariates appearing in the model are evaluated at the following values: StateMood = -2.0189.

Pairwise Comparisons

Dependent Variable: Number of fish caught

(I) Depressiongroup	(J) Depressiongroup	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
1.00	2.00	1.929	.930	.040	.094	3.765
2.00	1.00	-1.929	.930	.040	-3.765	-.094

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Univariate Tests

Dependent Variable: Number of fish caught

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	140.678	1	140.678	4.308	.040	.026
Error	5323.108	163	32.657			

The F tests the effect of Depressiongroup. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

APPENDIX 4.1: Illustration of the translation of the E-prime based CBM into an internet-based intervention.

Figure A.1 presents (A) examples of the original E-prime based instructions for the auditory CBM-I used in Lang et al. (2012) (B) the modifications made for internet delivery as discussed in CH 4 of the current thesis.

A) Original instructions

Welcome

Thank you very much for taking the time to do this!

Today you will:

1. Indicate how you are feeling by rating 8 different emotion words with the mouse
2. Practice imagining a situation described through the headphones
3. Listen to 8 blocks of 8 scenarios and rate how vividly you can imagine them
4. Indicate how you are feeling a second time by rating the 8 different emotion words with the mouse again

This session will take about 25 minutes. If you need to exit the program early, please click the 'X' at any time. This will quit the session. You may restart it at a later date, or continue where you left off.

[Press any key to continue]

B) Adapted for this study

Welcome

Today you will:

1. **Indicate how you are feeling** by rating 8 different emotion words with the mouse
2. **Have a go at the two different tasks** you will be doing over the next four weeks
3. **Indicate how you are feeling** a second time

The researcher will guide you through the tasks and help answer any queries as you go along.

[Press any key to continue]

A) Original instructions

There will be some instructions and then a practice scenario before the main session begins.

*Remember - your task is to focus on the scenarios by thinking in images not words.
Your mental images can involve any or all of your senses.*

Please imagine each scenario happening to yourself, as if you are there, you are actually involved in the situation, and you are seeing it THROUGH YOUR OWN EYES.

Imagine the OUTCOME and focus on that before you continue.

Please SHUT YOUR EYES while listening. Try to make the images as VIVID as possible, and rate this as accurately as possible. Make sure you have an image before making your rating.

Please concentrate on generating imagery, as it is easy to slip into your normal habits.

[Press space to continue]

B) Adapted for this study

There will now be some instructions and then a practice scenario before the main session begins

Please remember:

- Try to think in **images**, not in words. Images can be in **any or all of your senses**.
- Please imagine each scenario
happening to yourself
as if you are **there** and **actively involved**
and seeing it **through your own eyes**
- Please try to imagine the scenario as **vividly** as possible, and in particular **focus on the outcome**
- **Please remember** that you will need to **concentrate on generating vivid imagery**, as it is very easy to slip into your normal thinking habits.

[Press any key to continue]

A) Original instructions

Now there will be 8 blocks of 8 scenarios, with breaks between the blocks. At the end of each break, please read carefully over the instructions on the screen as a reminder.

PLEASE MAKE SURE THAT YOU FOLLOW THE INSTRUCTIONS ABOUT IMAGINING
THE SCENARIOS

Respond as quickly as possible without making errors

[Press space to continue]

B) Adapted for this study

Now there will be 4 sets of 8 scenarios, with breaks between the sets.

At the end of each break, please read carefully over the instructions on the screen as a reminder.

Please remember that you will need to **concentrate on generating vivid imagery**, as it is very easy to slip into your normal thinking habits.

[Press space to continue]

A) Original instructions

Reminder instructions

Remember - your task is to focus on the scenarios by thinking in images not words.
Your mental images can involve any or all of your senses.

Please imagine each scenario happening to yourself, as if you are there, you are actively involved in the situation, and you are seeing it THROUGH YOUR OWN EYES.

Imagine the OUTCOME and focus on that before you continue.

Please SHUT YOUR EYES while listening. Try to make the images as VIVID as possible, and rate this as accurately as possible. Make sure you have an image before making your rating.

Please concentrate on generating imagery, as it is easy to slip into your normal habits.

Remember, if you need to exit the program early, you can do this by clicking the 'X' in the top right corner.

[Press space to continue]

Reminder instructions

Please remember:

- Try to think in **images**, not in words. Images can be in **any or all of your senses**.
- Please imagine each scenario **happening to yourself**
as if you are **there** and **actively involved**
and seeing it **through your own eyes**
- Please try to imagine the scenario as **vividly** as possible, and in particular **focus on the outcome**
- **Please remember** that you will need to **concentrate on generating vivid imagery**, as it is very easy to slip into your normal thinking habits.

[Press space to continue]

B) Adapted for this study

APPENDIX 4.2: The 216 scenarios included in Experiment 3a taken from Blackwell and Holmes (2010).

All scenarios were re-recorded in one male (50%) and one female (50%) voice.

All descriptions were presented in a randomized order within each block. Each block contained 8 descriptions. There were two conditions: the positive condition, where all positive conditions resolved positively, and the neutral condition where 50% of the descriptions resolved positively and 50% negatively.

Day 1

Block	Positive condition scenarios	Neutral condition scenarios
1	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 sadness about the lonely weekend ahead of you.
1	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 overwhelmed by the range of options available.
1	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.
1	Your manager tells you that, because of your recent work, they would like to change your terms of employment. They offer you a promotion with a significantly larger salary.	Your manager tells you that, because of your recent work, they would like to change your terms of employment. They're not sure you're managing and wonder if you're up to your current role.
1	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.	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 upset and fills you with disappointment.
1	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 good.

1	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 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.
1	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 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.
2	You go to your local shop to buy a newspaper and find they have run out. You walk down the road to next shop, enjoying the feeling of being out in the fresh air.	You go to your local shop to buy a newspaper and find they have run out. You walk down the road to next shop, annoyed at having the extra hassle of going even further.
2	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.
2	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 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 disappointed.
2	You are taking a bus to a town you haven't visited before. When you decide to get off, and look around, you are extremely pleased to find that you have got off at exactly the right place.	You are taking a bus to a town you haven't visited before. When you decide to get off, and look around, you are extremely pleased to find that you have got off at exactly the right place.
2	You organize 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.	You organize 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 quite bored.
2	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	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.	think that you would be ideal for the job.
2	It is your birthday and you have no particular plans. Having to spend the evening alone makes you feel calm and like doing something relaxing.	It is your birthday and you have no particular plans. Having to spend the evening alone makes you feel calm and like doing something relaxing.
2	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 successful.
3	You are feeling restless and decided to read to try and relax. You start turning the pages of your book and are soon engrossed in and enjoying the story.	You are feeling restless and decided to read to try and relax. You start turning the pages of your book and are soon engrossed in and enjoying the story.
3	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 it is a long time before you have it up and running.
3	It's Friday morning and when you think about the work you have to get done before the weekend you wonder when you will finish. As the afternoon approaches, you realise with pleasure that all your work's done.	It's Friday morning and when you think about the work you have to get done before the weekend you wonder when you will finish. As the afternoon approaches, you realise with dismay that all your work isn't done.
3	You are walking down an empty street when you hear someone shouting at you. You turn round and see a friend coming to say hello with a smile.	You are walking down an empty street when you hear someone shouting at you. You turn round and see a friend coming to say hello with a smile.
3	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.
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 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	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

	being.	are being.
3	You recently applied for a new job and know that others are more qualified than you. You think confidently you have a chance.	You recently applied for a new job and know that others are more qualified than you. You think confidently you have a chance.

Day 2

Block	Positive condition scenarios	Neutral condition scenarios
1	You ask a friend to look over some work you have done. They come back with some comments, which are all very positive.	You ask a friend to look over some work you have done. They come back with some comments, which are all highly critical.
1	You have had a particularly busy day with many things to get done. Later on you lie in bed thinking over the day's events, and looking back feel a rush of pleasure as you realise how much you achieved.	You have had a particularly busy day with many things to get done. Later on you lie in bed thinking over the day's events, and looking back feel a rush of pleasure as you realise how much you achieved.
1	You are getting ready to go out in the morning. Feeling like you have lost track of time you look up at the clock. You are happy to see that you have plenty of time left before you have to leave the house.	You are getting ready to go out in the morning. Feeling like you have lost track of time you look up at the clock. You are alarmed to see that you should have left the house fifteen minutes ago.
1	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	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
1	You go swimming at the local pool for exercise. A half hour of lengths leaves you feeling vigorous and invigorated.	You go swimming at the local pool for exercise. A half hour of lengths leaves you feeling worn-out and fatigued.
1	You are called into a surprise meeting with the boss. As you walk in, you find that everyone has only good things to say about you.	You are called into a surprise meeting with the boss. As you walk in, you find that everyone has only bad things to say about you.
1	Your boss is talking to you and your colleagues about your latest project. He is complaining that some people aren't	Your boss is talking to you and your colleagues about your latest project. He is complaining that some people aren't

	pulling their weight. As he singles you out as contributing work of exceptional quality you feel relieved and proud.	pulling their weight. As he singles you out as contributing work of exceptional quality you feel relieved and proud.
1	Your employer has asked that you meet him to discuss a change in your current working hours. They explain that because your work is of such a good standard, they would like to extend your contract.	Your employer has asked that you meet him to discuss a change in your current working hours. They explain that because your work is of such a good standard, they would like to extend your contract.
2	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.
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 really struggle to do it.
2	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.
2	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.	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.
2	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.	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 awful to play with.
2	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 the it, you are filled with excitement at the thought of meeting new people.
2	Your friend tells you about their new exercise project that they would like you to join in with. Your reply is enthusiastic	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.	as you think about how fit and well this will make you.
2	You are meeting a friend for coffee. As you leave the house you are feeling very tired and consider cancelling. When you arrive you realise how glad you are you came and have a very enjoyable time.	You are meeting a friend for coffee. As you leave the house you are feeling very tired and consider cancelling. When you arrive you realise how glad you are you came and have a very enjoyable time.
3	Your best friend rings you to tell you that they are engaged to be married. You feel happy and think about how excited you are for them.	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.
3	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 been doing some local charity work. You go to the charity to give them a cheque. Your efforts are not very appreciated.
3	Your favourite band is coming to town and you've been wanting to see them. You can't wait to ring your friends and make plans to go together.	Your favourite band is coming to town and you've been wanting to see them. You decide not to go, as you have no one to go with and you don't want to go alone.
3	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	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
3	A project at work has fallen behind schedule. The manager has asked to see you, and as you sit down in his office he tells you how pleased he has been with your contribution.	A project at work has fallen behind schedule. The manager has asked to see you, and as you sit down in his office he tells you how disappointed he has been with your contribution.
3	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.
3	You are at home getting ready for an evening out. Thinking about the evening ahead of you, you feel excited and full of energy.	You are at home getting ready for an evening out. Thinking about the evening ahead of you, you feel excited and full of energy.
3	You arrive at an evening class for the first time. There are many people there already, and as they look up at you as you	You arrive at an evening class for the first time. There are many people there already, and as they look up at you as

	enter you feel very welcomed.	you enter you feel very welcomed.
4	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 enjoying the music enormously.
4	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 making many mistakes and performing really badly.
4	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 go to a wedding where you know very few other guests. When you get there you find that the other guests are very cold and unfriendly.
4	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 really bright and you have a lot to look forward to.
4	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.
4	You are about to leave the house to go to work. As you step outside, you realise it is raining heavily and you put up your umbrella. You walk to your car under the shelter of the umbrella, listening with pleasure to the sound of the raindrops.	You are about to leave the house to go to work. As you step outside, you realise it is raining heavily and you put up your umbrella. You walk to your car in a hurry, and are annoyed to find yourself splashing mud up your trousers.
4	You are at an evening class. You have been asked to feed back on a homework assignment in front of the class. As you speak, you can tell by the expression on the others' faces that they are impressed.	You are at an evening class. You have been asked to feed back on a homework assignment in front of the class. As you speak, you can tell by the expression on the others' faces that they are impressed.
4	A large family gathering has been planned for the upcoming weekend. Thinking about it, you realise that there will be many people there you don't know and you feel excited by the prospect of meeting new people.	A large family gathering has been planned for the upcoming weekend. Thinking about it, you realise that there will be many people there you don't know and you feel excited by the prospect of meeting new people.
5	You go to a place you visited on holiday as a child. Walking around, it brings back	You go to a place you visited on holiday as a child. Walking around, it brings

	very happy memories.	back very sad memories.
5	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 unlucky you are.
5	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.
5	A friend is doing a massage course. They practise on you and you find that it is soothing and relaxing.	A friend is doing a massage course. They practise on you and you find that it is soothing and relaxing.
5	You have made a cake for a friend's birthday. You worry that the icing hasn't come out as neatly as you had hoped. When you reveal it to your friend she is clearly impressed.	You have made a cake for a friend's birthday. You worry that the icing hasn't come out as neatly as you had hoped. When you reveal it to your friend she is clearly unimpressed.
5	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 disappointed and realise that you have made poor choices.
5	You are about to start a new job. Thinking about the prospect of meeting new colleagues and making new connections fills you with excitement.	You are about to start a new job. Thinking about the prospect of meeting new colleagues and making new connections fills you with excitement.
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 pleasure that you have plenty of time.
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 go to the cinema with a friend. You have chosen the film, and are 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 sure it is to their taste. Afterwards you can see by the look on their face that they have hated it.

6	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.	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 unfriendly and unhelpful.
6	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.
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 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.
6	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.
6	You are driving to work when you become stuck in an unexpected traffic jam. You relax, and with pleasure spot some beautiful woodland flowers next to the roadside that you had not seen before.	You are driving to work when you become stuck in an unexpected traffic jam. You relax, and with pleasure spot some beautiful woodland flowers next to the roadside that you had not seen before.
7	It is your annual appraisal for your job. Your manager says she has particularly noticed your work. She thinks it has been excellent.	It is your annual appraisal for your job. Your manager says she has particularly noticed your work. She thinks it has been excellent.
7	You have spent the day cleaning the house. Looking over it at the end of the day you can see that you've done an excellent job and feel extremely satisfied.	You have spent the day cleaning the house. Looking over it at the end of the day you can see that you've done an excellent job and feel extremely satisfied.
7	You are lying at home feeling really exhausted. You are expected to go out for	You are lying at home feeling really exhausted. You are expected to go out

	some drinks in the next half hour. After finally forcing yourself to go to the drinks you feel yourself start to become energised and have a fantastic time.	for some drinks in the next half hour. After finally forcing yourself to go to the drinks you feel yourself start to become energised and have a fantastic time.
7	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 you feel wide awake and look forward to the day ahead.	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 you feel so tired and dread the day ahead.
7	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 unease and doubt.
7	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.
7	You have been helping a friend paint their bedroom. They had to go out and meanwhile you have finished painting the walls. When they see what you have done they gasp. You feel extremely proud as they say how wonderful it looks.	You have been helping a friend paint their bedroom. They had to go out and meanwhile you have finished painting the walls. When they see what you have done they gasp. You feel embarrassed as they say how awful it looks.
7	You receive a request from a colleague asking you to help them with a project they are working on. It is not your area, and when you start trying to help them, you are extremely pleased when you have lots of ideas.	You receive a request from a colleague asking you to help them with a project they are working on. It is not your area, and when you start trying to help them, you are very disappointed that you have very few ideas.
8	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 an invoice and wonder how you will manage to pay.
8	You are having breakfast when you suddenly remember something that you have to do later in the day. The thought fills you with excitement.	You are having breakfast when you suddenly remember something that you have to do later in the day. The thought fills you with dread.
8	It is a Friday and you are thinking about the weekend. Contemplating your options, you feel happy that there are so many enjoyable things you could do.	It is a Friday and you are thinking about the weekend. Contemplating your options, you feel happy that there are so many enjoyable things you could do.
8	You have planted lots of bulbs in the	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.	garden. It is spring and they are starting to grow. The plants coming up are sickly and unattractive.
8	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 delighted to hear from you.
8	You bought a new CD, but when you tried to play it at home you found out that it was scratched and would not play. You return to the shop, and when you approach the shop assistant to exchange it, he is extremely friendly and happy to help you out.	You bought a new CD, but when you tried to play it at home you found out that it was scratched and would not play. You return to the shop, and when you approach the shop assistant to exchange it, he is extremely unfriendly and reluctant to help.
8	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.
8	A junior colleague is stuck with a deadline. You realise they are struggling and go over and offer to help them. They respond with gratefulness with a big smile.	A junior colleague is stuck with a deadline. You realise they are struggling and go over and offer to help them. They respond with gratefulness with a big smile.

Day 5

Block	Positive condition scenarios	Neutral condition scenarios
1	You are talking to someone at a party when they make their excuses and leave. They return later on and immediately come back to talk to you, saying how much they enjoyed talking to you earlier.	You are talking to someone at a party when they make their excuses and leave. They return later on and immediately come back to talk to you, saying how much they enjoyed talking to you earlier.
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 crowdedness of the town.

1	You have always loved taking long trips. When you think about taking one this year, you decide that you are eager and can't wait to go.	You have always loved taking long trips. When you think about taking one this year, you decide that you are eager and can't wait to go.
1	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.
1	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.
1	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.
1	You are spending an evening in a bar with a friend. When you look over at her you can tell by the look on her face that she is having a great time.	You are spending an evening in a bar with a friend. When you look over at her you can tell by the look on her face that she is not having a very good time.
2	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 well.	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 badly.
2	You have taken an exam as part of some evening classes. The following week your teacher asks to see you after the class. They tell you that you did excellently, and remark on how hard you must have worked.	You have taken an exam as part of some evening classes. The following week your teacher asks to see you after the class. They tell you that you did poorly, and remark that you need to work harder.
2	You are having breakfast and remember that you have to give a presentation at work that day. As you continue to get ready to leave the house that morning you feel full of confidence and energy.	You are having breakfast and remember that you have to give a presentation at work that day. As you continue to get ready to leave the house that morning you feel full of confidence and energy.
2	You have been asked to make a speech at a friend's wedding. Thinking about it fills you with excitement.	You have been asked to make a speech at a friend's wedding. Thinking about it fills you with dread.
2	You have decided to build yourself a garden patio, even though you have never	You have decided to build yourself a garden patio, even though you have

	built one before. Looking at the patio once it is finished, you realise how professional it looks and are filled with pride.	never built one before. Looking at the patio once it is finished, you realise how amateur it looks and are filled with disappointment.
2	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 animated.
2	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.	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.
2	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 earlier than you had thought and are extremely productive.
3	You have been feeling unsatisfied with your job and start to think about where you might be heading career-wise. You contemplate all the possibilities with excitement.	You have been feeling unsatisfied with your job and start to think about where you might be heading career-wise. You contemplate all the possibilities with excitement.
3	A friend has invited you to a summer barbeque. Thinking about the people who might be there, you feel full of excitement as you contemplate seeing your friends.	A friend has invited you to a summer barbeque. Thinking about the people who might be there, you feel full of excitement as you contemplate seeing your friends.
3	It's the Easter holidays and you're on vacation in the countryside. There are lambs playing in a 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 a field. Their games and antics make you smile with delight.
3	You are sitting in the kitchen at home and catch your partner looking at you. They meet your glance with a big smile.	You are sitting in the kitchen at home and catch your partner looking at you. They meet your glance with a big smile.
3	Your firm is raising money for a local hospital. You're put in charge of your department's efforts. You arrange a	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.	meeting to discuss it and afterwards, feel how very unmotivated and negative everyone is.
3	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 rather half-hearted applause.
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	You are taking an evening class and have been set some homework. The teacher warned that it may be difficult. As you sit down to do it you feel full of confidence.	You are taking an evening class and have been set some homework. The teacher warned that it may be difficult. As you sit down to do it you feel apprehensive.
4	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.
4	A stranger comes and introduces themselves 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 themselves to you at a party. After chatting to you for a few minutes they are obviously greatly enjoying your company.
4	You have had a 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 easily fall asleep and feel well rested in the morning.
4	You receive an unexpected phone call from a friend you fell out with several months ago. As they ask how you are you realise that they want to make amends, and feel happy to be back on good terms again.	You receive an unexpected phone call from a friend you fell out with several months ago. As they ask how you are you realise that they want to make amends, and feel happy to be back on good terms again.
4	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.
4	You wake up, get out of bed, stretch and really notice how you feel energetic and	You wake up, get out of bed, stretch and really notice how you feel lethargic and

	healthy today.	unhealthy today.
4	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 frustrated to discover that you cannot get yourself understood.
4	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.
5	You have a busy week of work ahead 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 have a busy week of work ahead of you, and when you wake on Monday morning and start thinking about it you feel overwhelmed by everything you need to get done by Friday.
5	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.	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.
5	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 be able to manage it.
5	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 hour's drive away. As you get into the car you anticipate a boring drive ahead of you.
5	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.
5	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 full of joy and alive.
5	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	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,

	that the others completely support you.	you find that the others are completely against you.
5	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.	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.
6	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.
6	You are at the pub with a bunch of friends. Everyone around you is laughing and having fun. You feel very close to them.	You are at the pub with a bunch of friends. Everyone around you is laughing and having fun. You feel very disconnected from them.
6	You are moving to a new town for a new job. Thinking about everything you will have to arrange you feel excited about the move.	You are moving to a new town for a new job. Thinking about everything you will have to arrange you feel overwhelmed by prospect of moving.
6	You are waiting to hear back about a job interview. Your phone rings and you are filled with relief and pleasure as they tell you that you have been short-listed for the job.	You are waiting to hear back about a job interview. Your phone rings and you are filled with relief and pleasure as they tell you that you have been short-listed for the job.
6	You are in a hurry and have forgotten to buy your friend a birthday present. You quickly buy the first thing you see in a shop. When your friend opens the present, she tells you how much she likes it.	You are in a hurry and have forgotten to buy your friend a birthday present. You quickly buy the first thing you see in a shop. When your friend opens the present, you can tell that she's disappointed.
6	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 optimistic.
6	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 unhappy, unsuccessful, and unfulfilling.
6	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	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.
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 is obviously unimpressed by the end-result.
7	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 unsure who will show up. By the end of the night it's clear that the party was a total success.
7	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 dismayed by how long you will have to wait for another break.
7	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 go out and have fun.
7	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.
7	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 give you a warm embrace.
7	You are about to start a new job. Thinking about it, you feel full of confidence and enthusiasm for the new challenge ahead of you.	You are about to start a new job. Thinking about it, you feel full of anxiety about the new challenge ahead of you.
8	You have decided to make a complaint to your boss. You go to see him, and after you have finished talking you feel incredibly relaxed and proud.	You have decided to make a complaint to your boss. You go to see him, and after you have finished talking you feel incredibly relaxed and proud.
8	It is your first day at a new job. When	It is your first day at a new job. When

	you wake up in the morning you feel full of energy and enthusiasm.	you wake up in the morning you feel full of anxiety and dread.
8	Lying in bed you think about the stressful day you have just had. Looking back you feel proud of everything you have accomplished.	Lying in bed you think about the stressful day you have just had. Looking back you feel proud of everything you have accomplished.
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 are absorbed and can't seem to put it down.
8	You overhear some colleagues talking about you. Listening in, you realise that they have only good things to say about you.	You overhear some colleagues talking about you. Listening in, you realise that they have only good things to say about you.
8	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.	You have started an evening class which is tough going. You are determined to succeed, and after a while it becomes much harder and even less enjoyable.
8	You give a presentation at work and feel your performance could have gone a lot better. At the end, as people start coming up to you and telling you how they thought it was great you feel extremely proud.	You give a presentation at work and feel your performance could have gone a lot better. At the end, as people start coming up to you and telling you how they thought it wasn't that great you feel disappointed.
8	In a local café you order a large coffee. Drinking it makes you feel bright and alert.	In a local café you order a large coffee. Drinking it makes you feel tense and irritable.

Day 7

1	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 not been very successful.
1	You have had a busy day and your head is still buzzing when you go to bed later in the evening. You wonder if you will be able to switch off, but very soon fall fast asleep and wake up the next morning feeling refreshed and energised.	You have had a busy day and your head is still buzzing when you go to bed later in the evening. You wonder if you will be able to switch off, and in fact lie awake for hours before finally falling asleep and waking exhausted in the

		morning.
1	It's the night of a friends' party and you're unsure whether you feel like going. As you arrive, you feel yourself relaxing and by the end you are extremely happy that you went.	It's the night of a friends' party and you're unsure whether you feel like going. As you arrive, you feel yourself relaxing and by the end you are extremely happy that you went.
1	It is a sunny day and you are mowing the lawn. Pushing the lawnmower back and forth, you begin to feel more and more satisfaction from the job.	It is a sunny day and you are mowing the lawn. Pushing the lawnmower back and forth, you begin to feel more and more frustration with the job.
1	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.	You are lying on your sofa, with thoughts of what happened today running through your mind. They make you feel upset and that life, overall, is tough.
1	You climb a steep hill and get to the top. You find that the view is far reaching and exhilarating.	You climb a steep hill and get to the top. You find that the view is far reaching and exhilarating.
1	You are planning a holiday to somewhere you haven't been before. Thinking about everything you have to sort out before you go, you start to feel more and more excited about the prospect of the trip.	You are planning a holiday to somewhere you haven't been before. Thinking about everything you have to sort out before you go, you start to feel more and more excited about the prospect of the trip.
1	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.
2	You are late for work, and have spent the morning rushing about to get ready. As you arrive, one of your colleagues greets you with a smile and asks if you would like a drink.	You are late for work, and have spent the morning rushing about to get ready. As you arrive, one of your colleagues looks disapprovingly in your direction before turning his back without even saying hello.
2	You are going on a long car journey with a friend. They are driving and you are reading the map. As you get further along your route, you feel extremely satisfied with the good job you are doing of navigating.	You are going on a long car journey with a friend. They are driving and you are reading the map. As you get further along your route, you feel extremely satisfied with the good job you are doing of navigating.
2	You think back to a large family gathering that happened the previous weekend. There were many people you didn't know there, and you think you	You think back to a large family gathering that happened the previous weekend. There were many people you didn't know there, and you think you

	must have come across as very friendly.	must have come across as rather unfriendly.
2	You have to make an important presentation at work in the afternoon. As you think over it in the morning you feel more and more excited and confident.	You have to make an important presentation at work in the afternoon. As you think over it in the morning you feel more and more anxious and uneasy.
2	You are standing alone on a beach by the sea. Being there fills you with a sense of calmness.	You are standing alone on a beach by the sea. Being there fills you with a sense of loneliness.
2	You have been organising a birthday party for a friend. You are unsure how it will go. On the night of the party, as you look around to see everyone having a great time, you think of what a good job you've done.	You have been organising a birthday party for a friend. You are unsure how it will go. On the night of the party, as you look around to see everyone having a great time, you think of what a good job you've done.
2	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 excitement that this will give you the opportunity to really organise yourself.
2	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.
3	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.
3	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 fantastic.
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 difficult moments that you would rather forget.
3	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 nowhere near strong or fit enough to do

		it.
3	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 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.
3	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.
3	Your train has been delayed and you wonder how you will pass the time until it arrives .You open a book and soon find yourself absorbed, so that when you look up you are delighted to see that much time has passed and your train is pulling in.	Your train has been delayed and you wonder how you will pass the time until it arrives .You open a book and soon find yourself absorbed, so that when you look up you are delighted to see that much time has passed and your train is pulling in.
3	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 excited by the prospect of changing things around.
4	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 restaurant and order your favourite food from the menu. When it arrives you find that it is mouth watering.
4	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.
4	You settle down to watch television. You can't see anything on that you'd particularly like to watch, but soon you are settled down engrossed in and enjoying a programme.	You settle down to watch television. You can't see anything on that you'd particularly like to watch, but soon you are settled down engrossed in and enjoying a programme.
4	Your boss challenges you about some of your work. When you try to answer his challenges, you find yourself fluently and eloquently making your point, and can tell that he is impressed.	Your boss challenges you about some of your work. When you try to answer his challenges, you find yourself stumbling over the words and struggling to make your point, and you can tell he is unimpressed.
4	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	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.	obvious that she thinks it is NOT IDEAL.
4	You have spent a busy day cleaning and tidying. The next morning you wake up feeling very achey and think back with pride over everything you achieved the previous day.	You have spent a busy day cleaning and tidying. The next morning you wake up feeling very achey and think back with pride over everything you achieved the previous day.
4	You are sitting at home and notice the huge pile of laundry that has mounted up. Whilst you don't feel like doing it you realise you have no choice at this point. As you begin, you find yourself relaxing and actually enjoying yourself.	You are sitting at home and notice the huge pile of laundry that has mounted up. Whilst you don't feel like doing it you realise you have no choice at this point. As you begin, you find it overwhelmingly tedious and soon give up.
4	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.
5	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.
5	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.	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.
5	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.
5	You are having your hair cut at a hairdresser's you haven't tried before. You look in the mirror once they've finished and realise that you look wonderful.	You are having your hair cut at a hairdresser's you haven't tried before. You look in the mirror once they've finished and realise that you look awful.
5	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.
5	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 appreciate how much you enjoy yourself with them
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 sluggish and lethargic, and struggle to make a start.
5	You wake up feeling tired and struggle to	You wake up feeling tired and struggle

	get out of bed. By the time you leave the house you feel much better and look forward to the day ahead.	to get out of bed. By the time you leave the house you feel much better and look forward to the day ahead.
6	Looking through your diary you are struck by how empty the next two weeks are. You contemplate how you might spend your free time with great pleasure.	Looking through your diary you are struck by how empty the next two weeks are. You contemplate how you might spend your free time with great pleasure.
6	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.
6	You are in a reflective mood and think back at 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 are in a reflective mood and think back at past achievements and disappointments that you have experienced during your life. Overall, your main feeling about life so far is one of sadness and frustration.
6	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 interest and enjoyment.
6	You are looking through an old photo album and see some photos of you as a child. They trigger memories of your childhood and you find yourself smiling at some of the happy times.	You are looking through an old photo album and see some photos of you as a child. They trigger memories of your childhood and you find yourself smiling at some of the happy times.
6	A friend comes round with her two children, who you haven't met before. You spend some time playing with her children, and it is clear that they thoroughly enjoy it.	A friend comes round with her two children, who you haven't met before. You spend some time playing with her children, and it is clear that they aren't enjoying it.
6	You are feeling ill. You phone a friend to ask if they can get something for you. They say that will be fine and they would love to help.	You are feeling ill. You phone a friend to ask if they can get something for you. They say that will be problematic and they're not sure they can help.
6	You go to a restaurant that you've never tried before. As you look down the menu you see many of your favourite dishes and look forward with pleasure to your meal.	You go to a restaurant that you've never tried before. As you look down the menu you see many of your favourite dishes and look forward with pleasure to your meal.
7	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 turn up late to a party. As you walk in it looks like everyone's busily engaged in conversation. As you walk around no one seems to take notice of the

	you to join them.	fact that you've arrived.
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 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 have a busy day ahead of you, but wake up feeling tired and sluggish. You start working and are soon enjoying the tasks and carrying them out with enthusiasm.	You have a busy day ahead of you, but wake up feeling tired and sluggish. You start working and are soon enjoying the tasks and carrying them out with enthusiasm.
7	You attend a meeting for work, and see that there is a new person there, who seems very quiet. When you make an effort to chat to them later on you find yourself getting on extremely well.	You attend a meeting for work, and see that there is a new person there, who seems very quiet. When you make an effort to chat to them later on you find it a real struggle to get a conversation going.
7	You are feeling ill and a friend comes to see how you are. You are feeling quite low and your friend spends a while with you. When they leave, you realise that they must have enjoyed the time spent with you.	You are feeling ill and a friend comes to see how you are. You are feeling quite low and your friend spends a while with you. When they leave, you realise that they must have enjoyed the time spent with you.
7	You are lying in bed thinking about getting up. As you step out of bed and think of all the things you are going to do during the day you feel yourself becoming extremely energised.	You are lying in bed thinking about getting up. As you step out of bed and think of all the things you are going to do during the day you feel yourself feeling extremely drained.
7	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.
8	You take a friend to a theatre show as a surprise birthday present. You glance across at them while it's going on, and can tell by the look on their face that they're thoroughly enjoying it.	You take a friend to a theatre show as a surprise birthday present. You glance across at them while it's going on, and can tell by the look on their face that they're thoroughly enjoying it.
8	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.
8	It is your birthday approaching. As you	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.	think about being a year older you appraise your current situation and are filled with a sense of satisfaction.
8	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.	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 badly.
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	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.	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 not that successful.
8	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.
8	You are assembling some flat-packed furniture you have just bought. It has become complicated, and when you check back over the instructions you realise that you have done it very well.	You are assembling some flat-packed furniture you have just bought. It has become complicated, and when you check back over the instructions you realise that you have done it completely wrong.

APPENDIX 4.3: The 152 picture-word stimuli used in Experiment 3a taken from Study 1, Holmes, Mathews and Mackintosh (2008) and Lang et al. (2012)

All picture-word combinations were presented in a randomized order within each block. Each block contained 8 pictures that were combined either with a positive word in the positive condition (P) or 50% of the time with a positive word and 50% of the time with a negative word in the neutral condition (N).

Day 1

Block 1:



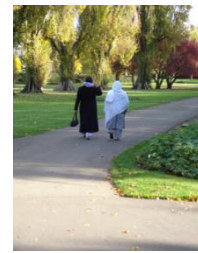
P: Close friend visiting
N: Missed it



Fun
Malfunction



Found a great place
Found a great place



Pleasant stroll
In the way



P: Sunshine
N: Sunshine



Peaceful walk
Lonely walk



Just enough
Just enough



Welcome visit
Welcome visit

Block 2:



P: An exciting parcel
N: Lonely Job



Ripe
Ripe



Tasty treat
Fattening



Fun crowd
Fun crowd



P: Productive
N: Hurt finger



Satisfying job
Satisfying job



Blue skies ahead
Storm breaking



Friend visiting
Friend visiting

Block 3:



P: Satisfying labour
N: Worthless strain



Present
Present



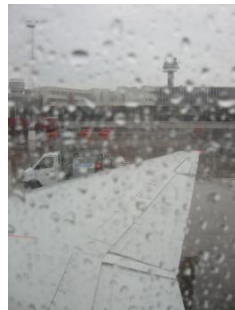
Playful fun
Mangy stray



Exciting holiday
Exciting holiday



P: Good book
N: Can't afford to buy



Leaving rain behind
Leaving rain behind



Wonderful evening
Nowhere to go



Exciting
Exciting

Day 2

Block 1:



P: Bursting with opportunities
N: Feeling lost



Fascinating
Fascinating



All done
Chores still do



Great day out
Great day out



P: Peaceful
N: Lost



Vibrant street
Vibrant street



Great trip
Too crowded

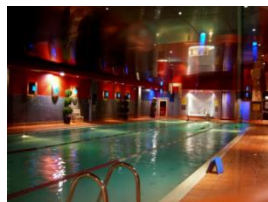


Satisfying clearout
Satisfying clearout

Block 2:



P: Just on time
N: Missing the bus



Energising swim
Energising swim



Sunny day
About to rain



Peaceful rest
Peaceful rest



P: Fun
N: Bite finger



Tidy
Tidy



Strike!
Missed again



Delicious fresh ingredients
Delicious fresh ingredients

Block 3:



P: Beautiful colours
N: Winter coming



Juicy
Juicy



Exciting improvements
Expensive repair



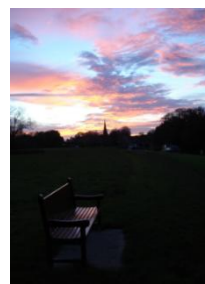
Beautiful snow
Beautiful snow



P: Popular
N: Wrong number



Cosy
Cosy



Beautiful view
Cold and dark



Great food
Great food

Block 4:



P: Feeling flush
N: Fraud



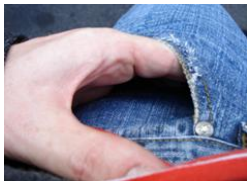
Faithful friend
Faithful friend



Cosy inside
Cold



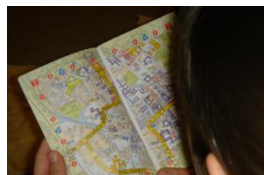
Beautiful
Beautiful



P: Found cash
N: Lost key



Found it!
Found it!



Planning a trip
Lost

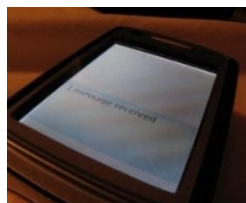


Focused
Focused

Block 5:



P: Fresh morning
N: Bleak



Message from a friend
Message from a friend



Understanding
Struggling



Savouring each mouthful
Savouring each mouthful



P: Welcome relaxation
N: Lonely



Contented daydreams
Contented daydreams



Welcome call
Unwelcome call



Fun day trip
Fun day trip

Block 6:



P: Holiday begins
N: Holiday over



Enchanted
Enchanted



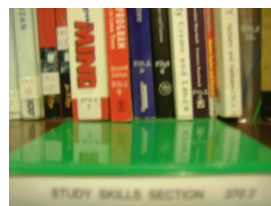
Making great progress
Failing to achieve



Fascinating
Fascinating



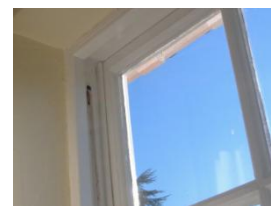
P: Lucky
N: Unlucky



Sparking my interest
Sparking my interest



Peaceful
Meaningless rules



Warming sunshine
Warming sunshine

Block 7:



P: Comforting voice
N: Bad news



Exciting options
Exciting options



Clean and tidy
Horrid smell



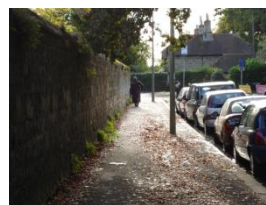
Wildlife blooming
Wildlife blooming



P: Reading for pleasure
N: Tedious book



Happy contemplations
Happy contemplations



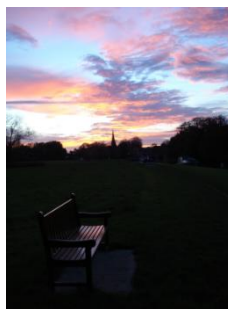
Stretching your legs
Tired out



Pretty
Pretty



P: Delicious drink
N: Substandard drink



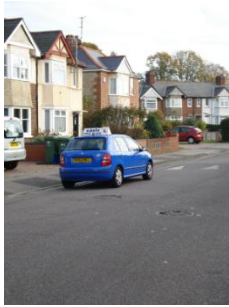
Beautiful sunset
Beautiful sunset



Great to be out
Slipped



Great view
Great view



P: Patiently helping
N: Mistakes



Delicious meal
Delicious meal



Relaxing bath
Cold and wet



Escape
Escape

Day 6

Block 1:



P: Energising boost
N: Sluggish and tired



Invited in
Invited in



Time well spent
Mindless chore



Just in time
Just in time



P: Delicious dinner
N: Rancid smell



Masterchef
Masterchef



Fun barbecue
Out of control



Beautiful morning
Beautiful morning

Block 2:



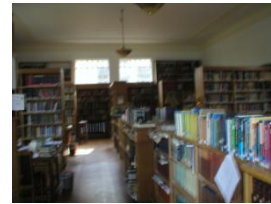
P: Stroll in the sunshine
N: I can't afford the bus



Ahead of schedule
Ahead of schedule



Start a good day
Start a bad day



Full of interest
Full of interest



P: Sense of achievement
N: Where to start



Exciting travels
Exciting travels



Exciting anticipation
Exciting anticipation



Cute
Cute

Block 3:



P: Picturesque
N: Lonely



Beautiful morning
Beautiful morning



New power
Flat



Break time
Break time



P: Exciting adventures
N: Windy and cold



First time winner
First time winner



Safe child
Dangerous pavement



Fun!
Fun!

Block 4:



P: Lunch with friends
N: Windy and cold



Energised
Energised



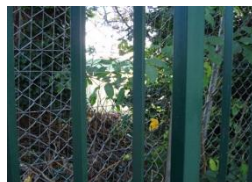
Lie in
Early start



Careful driver
Careful driver



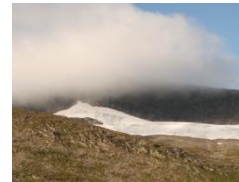
P: Healthy travel
N: Stolen



Safe inside
Safe inside



Luck me
Not worth picking up



Pleasant blue sky
Pleasant blue sky

Block 5:



P: Warming
N: Danger



Ready to play
Ready to play



Interesting sights
Irritating tourists



Glad to help
Glad to help



P: Welcome improvements
N: In the way



Bargains
Bargains



Interesting
Interesting



Happy kids
Happy kids

Block 6:



P: Peaceful
N: Peaceful



Meeting friends
Alone again



New friend
New friend



Safely home
Missed the stop



P: Sunny day
N: Sunny day



Entertaining
Irritation



Safe here
Safe here



Enjoyable walk
Exasperating

Block 7:



P: Beautiful colours
N: Beautiful colours



Job done
Missed the collection



Celebration
Celebration



Delicious cakes
Delicious cakes



P: Joyful greeting
N: Painful parting



Pleasant walk
Left behind



Go!
Stop



Fun sightseeing with family
Fun sightseeing with family

Block 8:



P: Part of the group
N: Part of the group



Part of the celebrations
Left out



Peaceful
Peaceful



Joining in with the fun
Set apart from the crowd



P: Beautiful colours
N: Beautiful colours



Relaxing break
Lots to clear up



Plenty of space
Plenty of space



Wonderful concert
Wonderful concert

APPENDIX 4.4: The verbal version “Lemon Exercise” used with Participants Allocated to the Control Condition in Experiment 3a

LEMON EXERCISE: Thinking about having to imagine a lemon

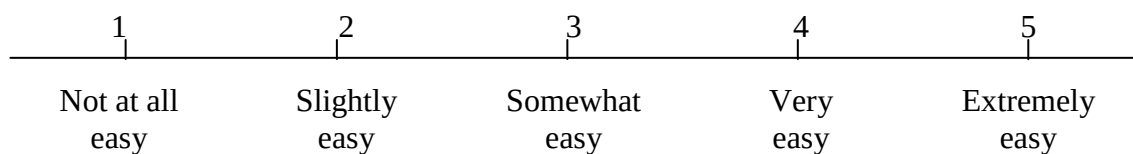
“I am now going to talk you through a situation. As we go through, please focus on the description of the situation.

Once we get onto the computer, you will be asked to try to imagine similar kinds of situations, but before we start using any imagery we need to first make sure that the descriptions make sense by giving a few examples.

Don’t try to imagine the situation right now, just listen and try to understand.”

“As we go through I am going to ask you: How easy was it to understand the meaning of the description?”

“And you can use this scale to make your rating”



Go through the following swiftly. Anchor the ratings, so if a participant says 3, say “3 – somewhat easy.” Read the sections on the left column and ask “How easy was it to understand the meaning of the description?” Then mention the part in the ‘notes’ section below to illustrate the ambiguity and complexity of some of the language.

“So again, just listen to the description and focus on understanding it”.

Experimenter says:	Notes for experimenter to prompt:	Easiness rating (1–5)
You have bought a yellow citrus fruit.	“How easy was it to understand the meaning of the description? What fruit did you buy?” “Although it’s kind of easy to understand this description it is ambiguous in that it could have been a lemon or a grapefruit for example.”	
The lemon cost more than an orange, but less than a lime.	“How easy was it to understand the meaning of the description?”	
You pick up a knife to cut it and it drops on the floor.	“How easy was it to understand the meaning of the description?” If participant rates as easy, ask “What drops on the floor – the knife or the lemon?” (reinforce ambiguity)	
You rinse the lemon and	“How easy was it to understand the	

start again.	meaning of the description?” “Start doing what again? Cut it? Drop it?”	

APPENDIX 4.5: The verbal instructions used for the OxIGen control condition in Experiment 3b.

“There are two different computer tasks that we’ll be asking you to do. One involves listening to descriptions of everyday situations and considering the words and meanings. The other involves looking at pictures of everyday scenes and creating sentences about them. As you can see, you will alternate between these different tasks different days, and today you will be practising both. Does that make sense?”

“So, over the next week we’re asking you to complete an online computer task that mostly involves verbal processing, that is focussing on words and their meanings. This might sound simple enough, but actually isn’t necessarily so straightforward. So before we go onto the computer to have a go at the task, we’re just going to spend a little while giving you an introduction to verbal processing.

Let’s start by thinking about what we mean by “verbal processing”. Sometimes we think in words and 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 and focussing in a logical way on the words and their meanings. This is the way I’d like you to focus on the sentences you will hear and on the pictures you will see. So for example, I’ve just been speaking to you about the task you’re going to be doing and giving you a bit of introduction. Could you tell me a bit about what you’ve understood from what I’ve been saying? Great that’s right, so you’ve been focussing on the meaning of what I’ve been saying.”

LEMON EXERCISE (see Appendix 4.5)

AVOIDING MENTAL IMAGERY

“There are just two final points I’d like to make before we go through some more examples.”

“So, once we get onto the computer you’ll be asked to think about different kinds of situations, and as you go along focusing on the words and meanings of the descriptions you might find yourself starting to imagine them, or thinking about them in pictures. So for example if you were asked to think about the words and meanings of “lying on the ground looking up at the sky”, you might be thinking “so if I’m looking up at the sky I must be lying on my back, not my front, the grass could be long or short..” and so on. But then you might find images popping into your head like this (show the clouds picture) or this (show the observer picture) It’s very natural for your mind to wander and start imagining the scenarios like this, but this can distract you from focussing on the words and meanings. So if you notice images of the situations popping into head, don’t worry about it, but just try to leave them aside and re-focus back on the words and meanings of the description.”

VERBALLY PROCESSING ANYTHING

*“Lastly, try not to be put off if the situations seem unrealistic- focus on the words and meanings even if they’re complete fantasy. For example, **what if the situation was about an elephant flying past through the clouds?** Would that be a realistic scenario?? But you could still understand what it means and think about the words and meanings. In fact thinking about how unrealistic it is is a way of thinking about the meaning!*

*“Now, what if the situation described was of watching the lottery draw on TV and getting the perfect match? Again although it sounds unrealistic **you can still think about the likelihood of winning the lottery and what kind of things can be done with that amount of money.** So these examples highlight that it’s possible to think about the meaning of any kind of situations described, even if it’s complete fantasy.”*

EXAMPLES OF AUDITORY SCENARIOS

“We will now talk through four examples of the type that will be in the study. In these next examples, you may find that at first it’s unclear what is about to happen, but focussing verbally on the meanings of the words in the sentence can help you.

Please keep your eyes open and consider the words and meanings as the sentence unfolds. You will have question after each.

*And just to warn you, you may need to **CONCENTRATE** quite hard on focussing on the words and meanings, as it’s easy to slip into your normal way of thinking.*

Whenever you’re ready, please let me know and we’ll go through the first example.”

Scenario 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 difficult was it to understand this description? What kind of reasons might you have for leaping out of your chair? [Follow up their answer, e.g. prompt for 2 or 3 alternative reasons such as mishearing, or being angry at not winning]

*“Well done! Now for the second example. **Please keep your eyes open and consider the words and meanings as the description unfolds.**”*

Scenario 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 smiling.***

“How difficult was it to understand this description? What do you think the outcome was? [Again, follow up their answer, e.g. prompt for 2 or 3 alternative outcomes].

*“Well done! Now for the third example. **Please keep your eyes open and consider the words and meanings as the description unfolds.**”*

Scenario 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.***

“How difficult was it to understand this description? What kinds of reasons might there be for skidding?”

*“Well done! Now for the final example before moving to the computer. **Please keep your eyes open and consider the words and meanings as the description unfolds.**”*

Scenario 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 difficult was it to understand this description? Can there be different ways of the sky being cloudy?”

SEEK FEEDBACK AND ENCOURAGE

“Well done! How did you find those examples? Did it make sense, the kinds of things we’ll be asking you to listen to?”

Provide feedback as appropriate: e.g. *“Well done - you did really well at understanding the situations and what was going on. As you can see it’s kind of straightforward but not necessarily”/ “Well done – you had a really good go at trying to understand the situations and what was going on.”*

INTRODUCING AUDITORY OXIGEN PRACTICE SCENARIO

“So now we’re going to through the practice scenario and then you will be starting the actual task.

[Indicate instructions on screen] “Please keep your eyes open while listening to the scenario through the headphones.

Focus on the words and meanings as the description unfolds.

At the end of the scenario you will hear a beep and will be asked to rate how difficult it was to understand the meaning of the description from 1 if it was not at all difficult to 5 if it was extremely difficult”.

To answer the questions put your hand by the “1, 2, 3, 4, 5” keys at the top of the keyboard. Does that make sense? When you’re ready, please press the space bar and the scenario will start.”

Go through the practice example on computer

- Check participant understands: *“How was that – what were you thinking about the last situation? [give positive feedback – and summarise back what they’ve described]*
- Check participant has eyes OPEN
- If unclear:

- Check participant is not slipping into mental imagery: *“Were you able to focus on the words and meanings, or did you find yourself starting to imagine the scenario as they were actually happening?”*
- Check participant is using correct keys to make their rating and not pressing spacebar, etc

STARTING AUDITORY OXIGEN

“Now you’re going to start the actual task, which will involve 4 sets with 8 scenarios in each. At the end of each set you’ll be able to take a brief break.”

“If you’re having trouble concentrating on the words and meanings of some of the situations, don’t worry about it, make your rating and move on to the next one. Just concentrate as much as you can for each one, all the time trying to focus on the words and meanings of the situations.

And also just to warn you’ll need to concentrate quite hard on focussing on the meaning of the situations, as it’s easy to slip into your normal way of thinking.

Does this make sense? Please press the space bar whenever you are ready to start the first set of scenarios.”

INTRODUCING PICTURE-WORD OXIGEN

“Now we’re on to the second part of the program. In this next part you’re going to see some pictures with words underneath and what we would like you to do is simply to create a sentence combining the picture with the words.

So you will have to create your sentence by using the word at the bottom of the picture and the picture itself. Most importantly make sure that your sentence refers to both the picture and the words and that it is grammatically correct.

We’ll go over a few examples together – and for these first few I’ll give you suggestions of how you could create sentences about the picture and words, so for now don’t worry about trying to make sentences until I prompt you to.”

PRACTICE SCENARIO

“Now we’re going to go through a practice example of how the pictures and words will be presented in the actual task.

First the picture and the words will appear on the screen **for a very brief time.**

Within that very short time have a quick look at the picture and words and then make a sentence combining the two so it’s really important that you **don’t spend too much time looking** at the picture and the words, as soon as you’ve registered them start generating your sentence – but keep your eyes open while you do so..

Remember that you should focus on the words and meaning and on producing a grammatically correct sentence.

At the end of that very short time, you will hear a beep at which point you can rate how difficult it was to make a sentence on the scale below, from 1 if it was not at all difficult to 5 if it was extremely difficult.

Does it make sense? Please press the space bar to go on.”

“There is a large number of sentences to generate, so don’t worry if have trouble combining the picture and word, just make your rating and move on the next one. And as I said the time you’ve got to create your sentence is very short, so don’t worry if you feel that you are rushing, try to really focus on making a sentence, however briefly”.

STARTING PICTURE-WORD OXIGEN

“Now you’re going to start the actual task, which includes 4 sets with 8 picture-word combinations in each. At the end of each set again, you’ll be able to take a brief break and I will ask you how it went.”

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APPENDIX 4.6: The 200 auditory scenarios added to the 216 included in the one-week online CBM (see Appendix 4.2) to make the 416 scenarios of the one-month OxIGen program.

All descriptions were presented in a randomized order within each block. Each block contained 8 descriptions. There were two conditions: the positive condition, where all positive conditions resolved positively, and the neutral condition where 50% of the descriptions resolved positively and 50% negatively.

Week 2 – session 1

Block	Positive condition scenarios	Neutral condition scenarios
1	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.
1	You receive a letter out of the blue from an old friend with whom you had a disagreement a few years ago. They want to meet and explain that they have some issues to discuss. From their tone you feel that the conversation will go positively.	You receive a letter out of the blue from an old friend with whom you had a disagreement a few years ago. They want to meet and explain that they have some issues to discuss. From their tone you feel that the conversation will go positively.
1	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.	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.
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 see a friend coming towards you on the street. As you get close it looks like they're just going to walk straight past you, but then they suddenly see you and break into a big smile.	You see a friend coming towards you on the street. As you get close it looks like they're just going to walk straight past you, but then they suddenly see you and break into a big smile.

1	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.
1	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.
1	You are trying to solve a difficult word puzzle. You find your mind continues to wander off and have difficulty concentrating on the task. As your mind wanders you feel suddenly pleased as the answer pops into your mind.	You are trying to solve a difficult word puzzle. You find your mind continues to wander off and have difficulty concentrating on the task. As your mind wanders you feel suddenly pleased as the answer pops into your mind.
2	You overhear some friends talking about a dinner party you hosted the previous week. They are saying how fantastic it was, and you feel extremely happy.	You overhear some friends talking about a dinner party you hosted the previous week. They are saying how fantastic it was, and you feel extremely happy.
2	You receive an unexpected letter from your gas company about your last bill. It seems that they overcharged you and they enclose a cheque.	You receive an unexpected letter from your gas company about your last bill. It seems that they undercharged you and enclose an additional bill.
2	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 irritation how badly you are doing it.
2	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 something special 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 has obviously no idea about the day and proceeds to complain about their job.
2	Walking past a bus stop, you see someone you think you have met before. You approach them to ask who they are, and they recognise you immediately, greeting you with a broad smile.	Walking past a bus stop, you see someone you think you have met before. You approach them to ask who they are, and they obviously don't recognise you and seem irritated to be disturbed.
2	You are preparing to have some friends round for dinner, and realise late on that you've forgotten to get something for two	You are preparing to have some friends round for dinner, and realise late on that you've forgotten to get something for

	vegetarian guests. You quickly throw something together, and they comment on how kind of you it was to prepare such a delicious alternative for them.	two vegetarian guests. You quickly throw something together, and they comment on how kind of you it was to prepare such a delicious alternative for them.
2	You see someone you fell out of contact with a few years ago walking down the street. When they see you, they react immediately, telling you how they are excited to see you as they have been trying to track you down for ages.	You see someone you fell out of contact with a few years ago walking down the street. When they see you, they react immediately, telling you how they are excited to see you as they have been trying to track you down for ages.
2	You are going on holiday and are running late for the bus you plan to take to the airport. When you get to the stop, you see no one else is there waiting. The bus turns up very soon and you are pleased by how many seats there are spare.	You are going on holiday and are running late for the bus you plan to take to the airport. When you get to the stop, you see no one else is there waiting. The bus turns up very soon and you are pleased by many seats there are spare.
3	You have a difficult phone call to make. You dial the number, and as they pick up and you start to speak, you are filled with relief as you realise it will turn out just fine.	You have a difficult phone call to make. You dial the number, and as they pick up and you start to speak, you are filled with relief as you realise it will turn out just fine.
3	You see an outfit in a shop window that you wouldn't ordinarily wear. You go to try it on and when you look in the mirror you realise you realise how great you really look	You see an outfit in a shop window that you wouldn't ordinarily wear. You go to try it on and when you look in the mirror you realise you realise you how ridiculous you look
3	You decide to go for a swim. As you finish a length of the pool you glide to the edge feeling strong and healthy. You are looking forward to doing some more lengths	You decide to go for a swim. As you finish a length of the pool you struggle to the edge feeling tired and out of breath. You do not feel able to do another length
3	You wake up one morning and look over at your partner who is sleeping. As you look at them you feel a deep sense of love and contentment and you are pleased that they are there with you	You wake up one morning and look over at your partner who is sleeping. As you look at them you feel a deep sense of bitterness and resentment and you wish that they would leave
3	You visit your doctor for a regular checkup. After a lengthy series of tests, you are finally finished and the doctor informs you that you are in perfect health.	You visit your doctor for a regular checkup. After a lengthy series of tests, you are finally finished and the doctor informs you that your health has really gone downhill.

3	You are listening to the radio and happen across a new music station. The station's host puts on a song you are familiar with and that you really like.	You are listening to the radio and happen across a new music station. The station's host puts on a song you are familiar with and that you really dislike.
3	You are swimming lengths in your local pool and someone overtakes you. You feel encouraged to swim faster and soon catch them up.	You are swimming lengths in your local pool and someone overtakes you. You feel irritated and slow down even further.
3	It is Monday morning after a busy weekend and you have a lot to do in the week. You feel excited about how you are involved in so many things.	It is Monday morning after a busy weekend and you have a lot to do in the week. You feel apprehensive, worrying that you will not be able to get everything done.

Week 3 – session 1

Block	Positive condition scenarios	Neutral condition scenarios
1	Your boss calls you in for an emergency meeting. You are pleased that they respect your opinion enough to want it	Your boss calls you in for an emergency meeting. You are pleased that they respect your opinion enough to want it
1	It is 2 in the afternoon on a Saturday and you have not yet made it out of bed. You are happy that you are having such a relaxing day	It is 2 in the afternoon on a Saturday and you have not yet made it out of bed. You are disappointed with yourself and feel as though you have wasted the day
1	You've just started a new job, and after a 3 month probationary period your boss calls you into their office to give you feedback. When you open the door, you see that they are smiling warmly at you	You've just started a new job, and after a 3 month probationary period your boss calls you into their office to give you feedback. When you open the door, you see that they are smiling warmly at you .
1	The company you work for has had financial problems and there've been rumours of job cuts. You are unexpectedly called into your boss's office one day. When you enter you see that your boss is smiling warmly at you.	The company you work for has had financial problems and there've been rumours of job cuts. You are unexpectedly called into your boss's office one day. When you enter you see that your boss is smiling warmly at you.
1	It's the end of the year and you've been told at work that some employees may get a pay rise. Your boss calls you to their office. After thanking you for your	It's the end of the year and you've been told at work that some employees may get a pay rise. Your boss calls you to their office. After thanking you for your

	efforts this year they tell you that you will be getting a raise.	efforts this year they tell you that you will be getting a raise.
1	You have emailed someone you've only recently met to invite them to dinner at your place. A few days later you get an email apologising for not replying earlier and saying that they'd love to come.	You have emailed someone you've only recently met to invite them to dinner at your place. A few days later you get an email apologising for not replying earlier and saying that they'd love to come.
1	You want to borrow something off a friend but know that they're anxious about their possessions. When you ask, they answer without hesitation and say they're really happy to lend it to you.	You want to borrow something off a friend but know that they're anxious about their possessions. When you ask, they answer without hesitation and say they're really happy to lend it to you.
1	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 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.
2	At a restaurant, the waiter gets your order for dinner wrong. You only notice the error when you taste the dish, and it is delicious.	At a restaurant, the waiter gets your order for dinner wrong. You only notice the error when you taste the dish, and it is not to your taste at all.
2	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 frustrated at being unable to follow the programme.
2	You are starting a new job and have decided to move town. You ring an agency to enquire about somewhere to rent, and they say that there are plenty of places meeting your specifications.	You are starting a new job and have decided to move town. You ring an agency to enquire about somewhere to rent, and they say that there are plenty of places meeting your specifications.
2	You have been writing an important letter on your computer. There is a power cut and the computer switches off. When you switch it back on you are delighted to see that you had saved the letter just before the power cut so it is just as you left it.	You have been writing an important letter on your computer. There is a power cut and the computer switches off. When you switch it back on you are delighted to see that you had saved the letter just before the power cut so it is just as you left it.
2	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	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 bored they

	talking to you.	got talking to you.
2	You are sitting at home relaxing when you receive an unexpected email from work. It says that due to your recent work, you are being rewarded with an extra day off this week.	You are sitting at home relaxing when you receive an unexpected email from work. It says that due to your recent work, you are being rewarded with an extra day off this week.
2	You are doing some work on the computer when suddenly there is a beep and a message pops up. You are delighted to see that you've received an email from a friend you haven't heard from in years.	You are doing some work on the computer when suddenly there is a beep and a message pops up. You are irritated to see that it's yet more spam.
2	You have been putting off replying to a friend's email as you haven't been sure what to say. You sit down and start typing, and when you look over what you have written it seems just right.	You have been putting off replying to a friend's email as you haven't been sure what to say. You sit down and start typing, and when you look over what you have written it seems just right.
3	You are at your local cinema and see a colleague of yours ahead of you in the queue. You call their name to get their attention and they greet you with a smile.	You are at your local cinema and see a colleague of yours ahead of you in the queue. You call their name to get their attention and they greet you with a smile.
3	You are looking through your diary when you suddenly realise that you have missed your best friend's birthday. You call them and can tell by their voice that they are thrilled to hear from you.	You are looking through your diary when you suddenly realise that you have missed your best friend's birthday. You call them and can tell by their voice that they are disappointed and angry with you.
3	You come home from work to find that your house mate has friends round that you don't know. You feel pleased that you have the chance to meet new people.	You come home from work to find that your house mate has friends round that you don't know. You feel pleased that you have the chance to meet new people.
3	A friend pops round out of the blue. You spend the evening chatting. Afterwards you think about how you haven't laughed so much for a long time	A friend pops round out of the blue. You spend the evening chatting. Afterwards you think that your friend spent most of the evening complaining and you feel like you wasted your evening
3	You are about to take part in a competition. Looking around at the other contestants who have turned up for the event, you feel as though your chance of success is high.	You are about to take part in a competition. Looking around at the other contestants who have turned up for the event, you feel as though your chance of success is high.

3	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.	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.
3	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.
3	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 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.
4	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.
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 replacement fills you with irritation.
4	It's 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 decided to do some gardening, having not done any for a while. Looking at the state of your garden, you feel full of enthusiasm for the task ahead.	You have decided to do some gardening, having not done any for a while. Looking at the state of your garden, you feel full of enthusiasm for the task ahead.
4	You wake up late and realise that you haven't heard your alarm. As it sinks in that it is a weekend you relax with pleasure back into your bed.	You wake up late and realise that you haven't heard your alarm. Your clock has stopped and you realise with panic that you're already late for work.
4	You are sorting through your bills from the past few months. You see one that	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.	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.
4	You are sitting in a cafe and notice that a man has been looking at you intently with a frown on his face. As you go to leave he approaches you with a smile and you recognise him as an old school friend.	You are sitting in a cafe and notice that a man has been looking at you intently with a frown on his face. As you go to leave he approaches you with a smile and you recognise him as an old school friend.
4	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 no time at all.
5	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.
5	A friend's birthday celebrations are coming up but you've been feeling under the weather over the past week. When the day arrives you wake up and are immediately aware of how refreshed and full of energy you feel.	A friend's birthday celebrations are coming up but you've been feeling under the weather over the past week. When the day arrives you wake up and are immediately aware of how ill and drained you feel.
5	You go out with a friend who you haven't seen for a long time. They go home earlier than you'd expected. They phone you a couple of days later, and you feel full of pleasure as they say what a good time they had and want to arrange to go out again.	You go out with a friend who you haven't seen for a long time. They go home earlier than you'd expected. They phone you a couple of days later, and you feel full of pleasure as they say what a good time they had and want to arrange to go out again.
5	You receive a phone call from a friend who you have just had an argument with. They say they've been thinking about it and realise that they were in the wrong. You are very happy as they say they would like to make up.	You receive a phone call from a friend who you have just had an argument with. They say they've been thinking about it and realise that they were in the right. You are dismayed as you start arguing all over again.
5	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	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.	expression on their faces that they very much dislike it.
5	You have booked accommodation for your holiday. You receive an email which says that it is no longer available. When you try to search for another place you suddenly come across another that is much nicer and cheaper.	You have booked accommodation for your holiday. You receive an email which says that it is no longer available. When you try to search for another place you suddenly come across another that is much nicer and cheaper.
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 have decided to try and bake an elaborate cake for a friend's birthday. As you begin, you realise it is more difficult than you had anticipated. When it is finished, the sight of it fills you with pride.	You have decided to try and bake an elaborate cake for a friend's birthday. As you begin, you realise it is more difficult than you had anticipated. When it is finished, the sight of it fills you with disappointment.
6	You are feeling a little 'under the weather', and consider asking your boss for the day off, but hesitate to call them. When you do make the call they say that of course you should have the day off, and as they ask how you are you feel pleased by their concern.	You are feeling a little 'under the weather', and consider asking your boss for the day off, but hesitate to call them. When you do make the call they say that of course you should have the day off, and as they ask how you are you feel pleased by their concern.
6	You ask to try on a pair of shoes in a shop. It turns out there is only one size left. They fit you perfectly, and as they are the last pair you get a clearance discount.	You ask to try on a pair of shoes in a shop. It turns out there is only one size left. They fit you perfectly, and as they are the last pair you get a clearance discount.
6	You are checking in for your flight at the airport, and are informed that due to a computer error the seats you booked are no longer available. You are offered a free upgrade to first class on the same flight.	You are checking in for your flight at the airport, and are informed that due to a computer error the seats you booked are no longer available. You will have to rebook for a flight the next day.
6	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 needs someone to accompany her on a weekend away and	You are talking to a friend about plans for the weekend and become aware that you have nothing to do. Your friend continues to talk about her exciting plans and you feel more and more despondent.

	invites you to come with her.	
6	You are sitting at home and notice the huge pile of laundry that has mounted up. Whilst you don't feel like doing it you realise you have no choice at this point. As you begin, you find yourself relaxing and actually enjoying yourself.	You are sitting at home and notice the huge pile of laundry that has mounted up. Whilst you don't feel like doing it you realise you have no choice at this point. As you begin, you find it overwhelmingly tedious and soon give up.
6	You have run out of milk. You realise that you need to pop out to get some, and feel pleased to have the chance to take a walk.	You have run out of milk. You realise that you need to pop out to get some, and feel dismayed that you will have to go out.
6	As you are getting dressed in the morning you think about the day ahead. You anticipate it with pleasure and feel full of energy.	As you are getting dressed in the morning you think about the day ahead. You anticipate it with anxiety and feel drained.
6	You are on your way out of the house at the start of the day. As you step outside you contemplate the day ahead with pleasure.	You are on your way out of the house at the start of the day. As you step outside you contemplate the day ahead with pleasure.
7	You are going out to meet up with some friends who you haven't seen for many years. As you near the meeting place you are aware of how much you are looking forward to seeing them.	You are going out to meet up with some friends who you haven't seen for many years. As you near the meeting place you are aware of how much you are looking forward to seeing them.
7	You are doing some shopping in town. Turning a corner, you bump into someone who you haven't seen for years. As they say hello and ask how you are, you can tell that they are delighted to see you.	You are doing some shopping in town. Turning a corner, you bump into someone who you haven't seen for years. As they say hello and ask how you are, you can tell that they are indifferent to seeing you.
7	You promised a friend that you would join them for a run, but when it comes to the time you really don't feel like it. You manage to go out anyway, and soon find yourself enjoying the exercise.	You promised a friend that you would join them for a run, but when it comes to the time you really don't feel like it. You manage to go out anyway, and soon find yourself enjoying the exercise.
7	You spend 40 minutes trying to build a flat-pack chest of drawers. You get to the final page of instructions and realise you've done everything right	You spend 40 minutes trying to build a flat-pack chest of drawers. You get to the final page of instructions and realise you've missed something out.
7	You realise that you have made a mistake	You realise that you have made a

	at work that you can't fix. When you speak to your boss, they tell you not to worry and you feel relieved.	mistake at work that you can't fix. When you speak to your boss, they tell you not to worry and you feel relieved.
7	You receive a letter from a friend. In it, they say that they have been busy and they would have loved to have written to you sooner.	You receive a letter from a friend. In it, they say that they have been busy and they are annoyed that you have not contacted them sooner.
7	You forget your password for an online account for the second time, and you are about to be locked out. The third time you get the password right and are able to access it.	You forget your password for an online account for the second time, and you are about to be locked out. The third time you get the password wrong and are unable to access it.
7	You are sitting on the bus one morning, and notice a fellow passenger looking at you repeatedly. You realise that they must find you attractive.	You are sitting on the bus one morning, and notice a fellow passenger looking at you repeatedly. You realise that they must find you attractive.
8	You are walking down the street when an old acquaintance from college recognises you. They come over to talk and you find the interaction enjoyable and pleasant.	You are walking down the street when an old acquaintance from college recognises you. They come over to talk and you find the interaction enjoyable and pleasant.
8	You are invited to take part in sports tournament with people from work. You have not played the sport in a while and you feel excited about the opportunity.	You are invited to take part in sports tournament with people from work. You have not played the sport in a while and you feel excited about the opportunity.
8	You have agreed to go out with friends after work even though you are starting to feel very tired. Whilst surrounded by your friends that evening you start to feel more energised and happy you went out	You have agreed to go out with friends after work even though you are starting to feel very tired. Whilst surrounded by your friends that evening you start to feel more energised and happy you went out
8	You put a lot of effort into making a surprise birthday cake for your friend. When you drop it round to her house she invites you in and you can see she is thrilled with the cake	You put a lot of effort into making a surprise birthday cake for your friend. When you drop it round to her house you can see that you have interrupted her and that she wishes you would leave
8	You are walking down a deserted street. You pause suddenly upon hearing footsteps approaching. From behind you, you can hear a friendly voice calling your name.	You are walking down a deserted street. You pause suddenly upon hearing footsteps approaching. From behind you, you can hear an angry voice calling you.

8	You are at a friend's party. An unexpected guest joins halfway through the event. It is someone you recognise, and you realise then that the party is about to get a lot better.	You are at a friend's party. An unexpected guest joins halfway through the event. It is someone you recognise, and you realise then that the party is about to get a lot worse.
8	You are in the lost and found section of a shop in which you think you lost your wallet earlier. After some searching, the clerk tells you that your wallet has been found.	You are in the lost and found section of a shop in which you think you lost your wallet earlier. After some searching, the clerk tells you that your wallet has been found.
8	You go to the bank, intending to take care of some urgent financial business. On entering the building, you notice that the queue there is very short.	You go to the bank, intending to take care of some urgent financial business. On entering the building, you notice that the queue there is very long.

Week 4 – session 1

Block	Positive condition scenarios	Neutral condition scenarios
1	It is the weekend. You at home, sitting on the sofa and watching television when there is a knock on the door. You are pleased to have a visitor.	It is the weekend. You at home, sitting on the sofa and watching television when there is a knock on the door. You are annoyed to be disturbed.
1	In the paper you come across an interesting job advert and send in your CV. Two weeks pass and you get a letter from the company telling you that you've been selected for a job interview	In the paper you come across an interesting job advert and send in your CV. Two weeks pass and you get a letter from the company telling you that you've been selected for a job interview
1	You go to the fridge to find milk for your breakfast when you realise you forgot to buy some yesterday. You make a different breakfast and really enjoy it.	You go to the fridge to find milk for your breakfast when you realise you forgot to buy some yesterday. You are annoyed at yourself and go out without breakfast.
1	You go for a run but have to stop to rest as you are too out of breath. You feel pleased that you have pushed yourself hard and run particularly fast today.	You go for a run but have to stop to rest as you are too out of breath. You feel pleased that you have pushed yourself hard and run particularly fast today.
1	You can't find your favourite food item in the local supermarket. When you ask a shop assistant, he says that this week it's	You can't find your favourite food item in the local supermarket. When you ask a shop assistant, he says that this week

	on a special display at reduced price.	it's on a special display at reduced price.
1	You check into a hotel and find that your room is right by a noisy lift. When you ask at reception, they say they're happy to move you and are very accommodating.	You check into a hotel and find that your room is right by a noisy lift. When you ask at reception, they say they can't move you and are dismissive of your claim.
1	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.	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.
2	You buy a new outfit for a wedding in a rush. You don't have the chance to try it on until just beforehand. Putting it on you see it looks rather good on you.	You buy a new outfit for a wedding in a rush. You don't have the chance to try it on until just beforehand. Putting it on you see it looks rather good on you.
2	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 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.
2	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.
2	The boss calls you into their office & it seems they have found an error in your work. As they go through it with you they suddenly realise it was their mistake, and laughing, congratulate you on your achievement.	The boss calls you into their office & it seems they have found an error in your work. As they go through it with you they find another and express frustration with the quality of your work.
2	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 frustration that it is a pre-recorded advertising message.
2	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.

2	You finish work for the day and step outside. It has been grey and cloudy all day, but as you walk to your car the sun comes out, and you feel warm and happy.	You finish work for the day and step outside. It has been grey and cloudy all day, but as you walk to your car the sun comes out, and you feel warm and happy.
2	You open the curtains on a Sunday winter morning to find snow has fallen overnight, and lies thickly on the ground. You are amazed at how beautiful the garden looks, and look forward to a peaceful day relaxing at home.	You open the curtains on a Sunday winter morning to find snow has fallen overnight, and lies thickly on the ground. You are amazed at how beautiful the garden looks, and look forward to a peaceful day relaxing at home.
3	You are at work when your boss asks you to meet some new colleagues who will be starting in a few days time. As you greet them, you realise one of them is an old school friend who is delighted to see you.	You are at work when your boss asks you to meet some new colleagues who will be starting in a few days time. As you greet them, you realise one of them is an old school friend who is delighted to see you.
3	You have been cooking a meal for a friend. As you look back over the recipe you realise that you misread it earlier and have put in some of the wrong herbs. You serve it anyway, and your friend comments on how delicious it is.	You have been cooking a meal for a friend. As you look back over the recipe you realise that you misread it earlier and have put in some of the wrong herbs. You serve it anyway, and your friend comments on how it doesn't taste right.
3	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.
3	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.
3	You are on a train, making a journey with little time to spare. The driver makes an announcement about the journey. He says that due to some signal changes, the train will be arriving at your station a few minutes early.	You are on a train, making a journey with little time to spare. The driver makes an announcement about the journey. He says that due to some signal changes, the train will be arriving at your station a few minutes early.
3	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	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.	there is flowing extremely badly and you can expect to make very bad time.
3	You have been asked to prepare a speech for a friend's wedding. When you first sit down to think about it your mind is blank, and as the time draws closer you suddenly find yourself full of great ideas of what to say.	You have been asked to prepare a speech for a friend's wedding. When you first sit down to think about it your mind is blank, and as the time draws closer you suddenly find yourself full of great ideas of what to say.
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 regret and disappointment and feel extremely tired.
4	You have agreed to cook a meal for a friend. It goes wrong and you realise you will have to make other plans. You suggest to your friend that the two of you have a take-away. They sound extremely enthusiastic.	You have agreed to cook a meal for a friend. It goes wrong and you realise you will have to make other plans. You suggest to your friend that the two of you have a take-away. They sound extremely uninterested.
4	Your friend is showing you some photos of her recent party. Your attention is caught by one of you standing with a group of friends- you notice with pleasure how good you look.	Your friend is showing you some photos of her recent party. Your attention is caught by one of you standing with a group of friends- you notice with dismay how awful you look.
4	You have arrived in a town on holiday. You haven't booked a hotel, but spot somewhere that looks perfect. When you ask the concierge if they have any vacancies, he says there is a room available, with a fantastic view.	You have arrived in a town on holiday. You haven't booked a hotel, but spot somewhere that looks perfect. When you ask the concierge if they have any vacancies, he says there is nothing available.
4	You are going to stay at a hotel that you found at the last minute and don't know much about. When you arrive and see your room, it is wonderful.	You are going to stay at a hotel that you found at the last minute and don't know much about. When you arrive and see your room, it is wonderful.
4	You go to your dentist for a check-up. He spends a long time looking at your teeth. When he has finished he tells you that the condition of your teeth is excellent.	You go to your dentist for a check-up. He spends a long time looking at your teeth. When he has finished he tells you that the condition of your teeth is excellent.
4	You have arranged to go out with a friend. Early in the evening they phone to cancel. When you ask if they'd like to go	You have arranged to go out with a friend. Earlier in the evening they phone to cancel. When you ask if they'd like to

	out the following evening instead, you are delighted when they say that would be great.	go out the following evening instead, you are delighted when they say that would be great.
4	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.
4	You are on a long car journey. You see a sign coming up indicating the distance to your destination, and are surprised by the figure it shows. You realise with pleasure that you are much closer than you had thought.	You are on a long car journey. You see a sign coming up indicating the distance to your destination, and are surprised by the figure it shows. You realise with pleasure that you are much closer than you had thought.
5	You are filling in a form online. It is 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.	You are filling in a form online. It is 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 incorrectly.
5	You are expecting an email telling you some details of a holiday you booked online. You open your email programme, and notice that there is only one email in your inbox. You are delighted to see that it is the one you need.	You are expecting an email telling you some details of a holiday you booked online. You open your email programme, and notice that there is only one email in your inbox. You are delighted to see that it is the one you need.
5	You are going out in a hurry and have had to rush to get ready. As you get in the car you happen to glance in the rear-view mirror and see your reflection. You are delighted by how you look.	You are going out in a hurry and have had to rush to get ready. As you get in the car you happen to glance in the rear-view mirror and see your reflection. You are disappointed by how you look.
5	You are on holiday and spending the night in a budget hotel. When you check out the bed in your room you find it is extremely comfortable.	You are on holiday and spending the night in a budget hotel. When you check out the bed in your room you find it is extremely uncomfortable.
5	You have gone to the theatre, but the show is quite boring. You look at your watch to see how much is left, and when you see the time you feel very happy that the time has passed very quickly and it will soon be finished.	You have gone to the theatre, but the show is quite boring. You look at your watch to see how much is left, and when you see the time you feel dismayed at how little time has passed and how much more you have to sit through.

5	You are in a hurry driving down a small road. You get stuck behind a very slow car. You pull out to see if it would be possible to overtake and see immediately that it will be very easy.	You are in a hurry driving down a small road. You get stuck behind a very slow car. You pull out to see if it would be possible to overtake and see immediately that it will be impossible.
5	A relative is coming to stay with you for a few weeks and you have made up a room for her. When you show her the room she takes a long look at it before saying how wonderful it looks.	A relative is coming to stay with you for a few weeks and you have made up a room for her. When you show her the room she takes a long look at it before saying how wonderful it looks.
5	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 sad.
6	You are stopped at a roundabout when you hear a car behind you beep their horn. You realise that it's 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.
6	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.
6	You decide you need to buy a new computer and go to a computer shop. You stand trying to decide which one to get. You quickly choose one, and thinking about your decision on the way home, you feel very happy.	You decide you need to buy a new computer and go to a computer shop. You stand for a while trying to decide which one to get. You quickly choose one, and thinking about your decision on the way home, you feel you chose badly.
6	You go to the bank. There is a long line of people queuing ahead of you. As you stand in the queue you realise how quickly it is moving.	You go to the bank. There is a long line of people queuing ahead of you. As you stand in the queue you realise how quickly it is moving.
6	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 sadness and disappointment.
6	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	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

	enjoy yourself.	it.
6	You have had a fight with a friend and you wonder how long it will take to sort things out. You get a call from them the very next day, full of friendliness and hoping to meet up for a coffee.	You have had a fight with a friend and you wonder how long it will take to sort things out. You get a call from them the very next day, full of friendliness and hoping to meet up for a coffee.
6	You hear some work colleagues whispering outside your door, and hear them mention your name. When you open the door, they reply that they didn't want to disturb you, but that they have some very good news for you.	You hear some work colleagues whispering outside your door, and hear them mention your name. When you open the door, they reply that they didn't want to disturb you, but that they have some bad news for you.
7	You make a reservation for a weekend away in a hotel. At the last minute, they send you an e-mail informing you that the room they allocated to you is no longer available, but that they have upgraded you to an executive suite free of charge.	You make a reservation for a weekend away in a hotel. At the last minute, they send you an e-mail informing you that the room they allocated to you is no longer available, but that they have upgraded you to an executive suite free of charge.
7	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.
7	You go to a Cash Point to withdraw some money. Knowing that you have paid many bills recently, you expect to find that you have very little cash to withdraw. When you check your balance, you are pleasantly surprised.	You go to a Cash Point to withdraw some money. Knowing that you have paid many bills recently, you expect to find that you have very little cash to withdraw. When you check your balance, your fears are confirmed.
7	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 the drinks trolley is being pushed in your direction.	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 the drinks trolley is being pushed in your direction.
7	You are sitting in a bar and notice a group of people looking at you. As one of them comes up to the bar, they invite you to come and join them, and you have a wonderful evening meeting new people.	You are sitting in a bar and notice a group of people looking at you. As one of them comes up to the bar, they make a disparaging comment about you to the bartender and they both snigger.
7	You have decided to pop out for a walk.	You have decided to pop out for a walk.

	As you put on your shoes, you realise that you are looking forward to the fresh air.	As you put on your shoes, you realise that you are looking forward to the fresh air.
7	You have a lot to get done today, and have written a list of tasks. You look over it and feel full of confidence and energy.	You have a lot to get done today, and have written a list of tasks. You look over it and feel overwhelmed and drained.
7	You have just finished making a difficult phone call. As you put down the phone, you feel a surge of relief and pride as you realise that you've managed it.	You have just finished making a difficult phone call. As you put down the phone, you feel a surge of anxiety as you realise it has not gone well.
8	You are winding down in the evening at the end of a busy day. Reflecting back over it, you feel pleased that it's gone so well.	You are winding down in the evening at the end of a busy day. Reflecting back over it, you feel pleased that it's gone so well.
8	You are alone at home and find yourself sitting and staring out of the window. Your thoughts turn to the week ahead and you feel optimistic and full of hope.	You are alone at home and find yourself sitting and staring out of the window. Your thoughts turn to the week ahead and you feel pessimistic and full of anxiety.
8	You get home at the end of the day. You have to cook yourself something to eat. The thought of this fills you with pleasure.	You get home at the end of the day. You have to cook yourself something to eat. The thought of this fills you with pleasure.
8	You arrive back late in the evening after a brief holiday. When you get up to get back to work the next day you notice how you feel refreshed and full of enthusiasm.	You arrive back late in the evening after a brief holiday. When you get up to get back to work the next day you notice how you feel tired and drained of energy.
8	It is a Sunday. As evening approaches, your thoughts turn to the week ahead, and you feel relaxed and hopeful.	It is a Sunday. As evening approaches, your thoughts turn to the week ahead, and you feel relaxed and hopeful.
8	You think back to an argument you had with a friend last year. Going over it in your mind, you feel it is all in the past now and are pleased to think about how things have gone since.	You think back to an argument you had with a friend last year. Going over it in your mind, you feel annoyed about it and find it difficult to move on.
8	You buy a bag of apples from the local supermarket. You bite into one of the apples and find it delicious.	You buy a bag of apples from the local supermarket. You bite into one of the apples and find it delicious.

8	You meet up with an old friend that you haven't seen for years. As you start to talk, you think how good it is to see them	You meet up with an old friend that you haven't seen for years. As you start to talk, you think how good it is to see them

Week 3 – session 2

1	You arrive a little late for a meeting which has already started. When you open the door, your colleagues smile at you.	You arrive a little late for a meeting which has already started. When you open the door, your colleagues frown at you.
1	You have been waiting for someone to reply to an urgent email but they haven't yet. When you call to follow up on the email, the person is friendly and apologetic	in the evening. You wonder if you will be able to switch off, and in fact lie awake for hours before finally falling asleep and waking exhausted in the morning.
1	You are at work late when you suddenly realise that you are meant to meet a friend in five minutes. You call and you find out they are running late themselves, so are rather pleased that you are too.	You are at work late when you suddenly realise that you are meant to meet a friend in five minutes. You call and you find that they are rather annoyed with you as they're always on time.
1	You are on your way home and feeling rather hungry. You are imagining what you will eat for dinner when you realise you have the ingredients for your favourite dish.	You are on your way home and feeling rather hungry. You are imagining what you will eat for dinner when you realise that you have nothing left in the fridge.
1	You have recently started a new job. On Monday morning you are unexpectedly called to attend a meeting with your boss. You are pleased to find out you have been recommended for a promotion.	You are lying on your sofa, with thoughts of what happened today running through your mind. They make you feel upset and that life, overall, is tough.
1	You decide to ask a friend to come to the cinema with you at the weekend. When you speak to them you can tell by their face that they are really pleased you asked.	You decide to ask a friend to come to the cinema with you at the weekend. When you speak to them you can tell by their face that they do not want to go with you.
1	You are in a meeting and want to know some more information about a project that is taking place. When the opportunity for questions arises, you ask yours confidently and assertively.	You are in a meeting and want to know some more information about a project that is taking place. When the opportunity for questions arises, you remain silent and withdrawn.

1	It is a cold, dark winters evening. When you come home you are feeling chilly so decide to have a bath. Whilst lying in the soapy water you feel warm and relaxed and you feel yourself gently unwind	It is a cold, dark winters evening. When you come home you are feeling chilly so decide to have a bath. Whilst lying in the soapy water you feel sluggish and heavy as the day's events trouble your mind
2	You spend many hours on a document for work. As you go over the finished article on your computer you realise that you have completed an excellent piece of work and you are proud of what you have accomplished	You spend many hours on a document for work. As you go over the finished article on your computer you realise that you have completed an excellent piece of work and you are proud of what you have accomplished
2	You decide to be creative and take up sketching. As you look over your drawing you discover that you have much more of a creative flair than you realised.	You decide to be creative and take up sketching. As you look over your drawing you realise that you're not as good as you thought you would be.
2	You are going to meet your partner's friends for the first time and you feel very nervous. As you are introduced you feel very welcome and pleased to have gone	You are going to meet your partner's friends for the first time and you feel very nervous. As you are introduced you feel very welcome and pleased to have gone
2	You summon up the courage to speak to someone who you have only known in passing. When you go over to them you find you have a lot in common and you realise you've made a new friend	You summon up the courage to speak to someone who you have only known in passing. When you go over to them you find you have a lot in common and you realise you've made a new friend
2	Rather than go to your usual holiday destination you decide to try something different. When you arrive you are enchanted by the area and you realise how good it is to try something new	Rather than go to your usual holiday destination you decide to try something different. When you arrive you are enchanted by the area and you realise how good it is to try something new
2	You are going back to you family home for some celebrations and feel apprehensive. By the end of the day you are filled with cheer and are in high spirits	You are going back to you family home for some celebrations and feel apprehensive. By the end of the day you are drained and feel exhausted
2	You have had a disagreement with a friend. When you try to talk to them they are forgiving and kind	You have had a disagreement with a friend. When you try to talk to them they are spiteful and cruel
2	You are handing in a work assignment in person to your superior. They read over the work, then look up at you. You can tell that they are pleased with what you	You are handing in a work assignment in person to your superior. They read over the work, then look up at you. You can tell that they are pleased with what you

	have produced.	have produced.
3	You are at home. There is a knock on your door and you go to open it. You see that the person outside is someone you have been really looking forward to seeing.	You are at home. There is a knock on your door and you go to open it. You see that the person outside is someone you have been really looking forward to seeing.
3	You are trying out a new restaurant that has just opened in the neighbourhood. You have sat down at your table and are preparing to order. Taking in your surroundings, you get the feeling that the food is going to be amazing.	You are trying out a new restaurant that has just opened in the neighbourhood. You have sat down at your table and are preparing to order. Taking in your surroundings, you get the feeling that the food is going to be dreadful.
3	You are skimming through a magazine when a particular article catches your attention. According to this article, your favourite TV show is about to get a new season.	You are skimming through a magazine when a particular article catches your attention. According to this article, your favourite TV show is about to get a new season.
3	You have just come out of an interview. Thinking back on your performance during the interview, you become increasingly convinced that you have managed to impress the interviewer.	You have just come out of an interview. Thinking back on your performance during the interview, you become increasingly convinced that you have managed to impress the interviewer.
3	You are buying a soft drink at the store. You open your wallet to pay for it and find, to your surprise, that you have a voucher for a free drink.	You are buying a soft drink at the store. You open your wallet to pay for it and find, to your surprise, that you have a voucher for a free drink. .
3	You are waiting to board your flight at the airport. You are approached by a flight attendant who informs you that due to overbooking you are to receive a free upgrade to first class.	You are waiting to board your flight at the airport. You are approached by a flight attendant who informs you that due to overbooking you will have to get the next flight.
3	On entering a restaurant you see an old friend having dinner with someone you don't recognise. You struggle to get their attention, and when they finally notice you they seem very pleased to introduce you.	On entering a restaurant you see an old friend having dinner with someone you don't recognise. You struggle to get their attention, and when they finally notice you they seem very pleased to introduce you.
3	You are reading a book and early on you work out how it is going to end. You are really excited about seeing how the story gets you there	You are reading a book and early on you work out how it is going to end. You are really excited about seeing how the story gets you there

4	You are running in the park and notice people looking at you as you go past. You feel invigorated and pleased to be out.	You are running in the park and notice people looking at you as you go past. You feel invigorated and pleased to be out.
4	You have been invited to meet your partner's parents. You feel excited and good about yourself	You have been invited to meet your partner's parents. You feel excited and good about yourself
4	Your house is a mess and you have visitors arriving shortly. You start to rush around to try to sort it out, but realise that actually they won't mind and the visit will be fine.	Your house is a mess and you have visitors arriving shortly. You start to rush around to try to sort it out, but realise that actually they won't mind and the visit will be fine.
4	You are struggling with a problem at work, when someone points out something obvious you haven't noticed. You feel amused and are relieved that the problem is soon solved.	You are struggling with a problem at work, when someone points out something obvious you haven't noticed. You feel amused and are relieved that the problem is soon solved.
4	You see an advert in the paper for your dream job. You pick up the phone and ring the recruiter straight away. After describing your background and experience, you're told that your profile is perfectly suited to the job	You see an advert in the paper for your dream job. You pick up the phone and ring the recruiter straight away. After describing your background and experience, you're told that your profile is completely unsuitable for the job
4	You've just started a new job and have been invited with colleagues to a dinner to get to know each other. You're running late on the evening and everyone is already seated at the table. As you approach the table and greet your new colleagues you're given a warm welcome	You've just started a new job and have been invited with colleagues to a dinner to get to know each other. You're running late on the evening and everyone is already seated at the table. As you approach the table and greet your new colleagues you're given a warm welcome
4	You like one of your colleagues at work and eventually dare to ask them out for dinner some day next week. A few days pass and you haven't heard from them. As you call the day before the date to remind them about your dinner plan, they tell you that their looking forward to going out with you	You like one of your colleagues at work and eventually dare to ask them out for dinner some day next week. A few days pass and you haven't heard from them. As you call the day before the date to remind them about your dinner plan, they tell you that they're sorry but they don't feel well and don't want to come out.
4	One of your best friends tells you that they just got an exciting email invitation from a mutual friend. You check your	One of your best friends tells you that they just got an exciting email invitation from a mutual friend. You check your

	email as soon as you get the chance. You see that you've also been emailed an invitation and feel excited.	email as soon as you get the chance. You see that you have no emails and feel disappointed.
5	You are giving a talk at your best friend's wedding. As you've finished your talk you're struck by the silence in the audience and notice that everyone is very moved by the kind words you addressed to your best friend	You are giving a talk at your best friend's wedding. As you've finished your talk you're struck by the silence in the audience and notice that everyone is bored and unimpressed by your talk.
5	It's your friend birthday and you have spent hours trying to find a nice gift. When you give it to her you can see that she is very pleased	It's your friend birthday and you have spent hours trying to find a nice gift. When you give it to her you can see that she is very pleased
5	You are bored at home and don't know how to keep yourself busy. You finally decide to go outside for a stroll. After an hour you get back home and realise that the stroll did you good	You are bored at home and don't know how to keep yourself busy. You finally decide to go outside for a stroll. After an hour you get back home and realise that the stroll exhausted you.
5	You have been feeling really tired these days and you're told by your friend that the only way to get your energy back is to do some exercise. You decide to take his advice and go the gym in the evening. As you get up the day after you realise that you feel very energised.	You have been feeling really tired these days and you're told by your friend that the only way to get your energy back is to do some exercise. You decide to take his advice and go the gym in the evening. As you get up the day after you realise that you feel exhausted.
5	It is your birthday and by midday you have heard from no one to wish you happy birthday. By the end of the day, you have received many friendly messages.	It is your birthday and by midday you have heard from no one to wish you happy birthday. By the end of the day, you have still received no messages.
5	A sales assistant in a shop doesn't seem to have noticed you entering. When you approach her to ask for help she is very friendly and helpful.	A sales assistant in a shop doesn't seem to have noticed you entering. When you approach her to ask for help she is very friendly and helpful.
5	A new neighbour moves in next door to you. You go round to introduce yourself and find yourself getting on really well with them.	A new neighbour moves in next door to you. You go round to introduce yourself and find yourself really not getting on with them.
5	Someone you don't know very well asks for your help on something. You realise that they think you are really good with this kind of problem, and feel pleased.	Someone you don't know very well asks for your help on something. You realise that they think you are a pushover and feel annoyed.

6	You go for a run with a friend. At the end they say that running with you was great and they'd love to do it again.	You go for a run with a friend. At the end they say that running with you was frustrating and they don't really want to do it again.
6	You are having coffee with a friend and mention how one of your friends is always coming to you for help. You find out that this is because they find your advice so helpful.	You are having coffee with a friend and mention how one of your friends is always coming to you for help. You find out that this is because they find your advice so helpful.
6	You sit next to a stranger on a train and they get up and leave. It was their stop and you're happy to have even more space to yourself.	You sit next to a stranger on a train and they get up and leave. As they sit down elsewhere you worry about why they moved.
6	You fall behind on a project you were working on. A friend offers some help and you feel pleased to be so well supported.	You fall behind on a project you were working on. A friend offers some help and you feel annoyed not to be managing.
6	You are in the middle of cooking for your family at Christmas and you are quite stressed out. When it comes to serving the meal, you feel relaxed and enjoy it.	You are in the middle of cooking for your family at Christmas and you are quite stressed out. When it comes to serving the meal, you feel relaxed and enjoy it.
6	You have broken your arm and have to ask people for help with everyday things. You feel grateful for the help and well supported.	You have broken your arm and have to ask people for help with everyday things. You feel annoyed to need the help and impatient.
6	You are attending a 60th family birthday party, but you aren't looking forward to it. When you get there, you find that you have a good time after all.	You are attending a 60th family birthday party, but you aren't looking forward to it. When you get there, you find that you have a good time after all.
6	You are in the kitchen at work and someone you don't recognise walks in. You think they must have just started so introduce yourself. Their reply is very friendly and you are soon getting on extremely well.	You are in the kitchen at work and someone you don't recognise walks in. You think they must have just started so introduce yourself. Their reply is rather hostile and you struggle to get on with them.
7	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 no one seems to take notice of the fact that you've arrived.

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 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 have a busy day ahead of you, but wake up feeling tired and sluggish. You start working and are soon enjoying the tasks and carrying them out with enthusiasm.	You have a busy day ahead of you, but wake up feeling tired and sluggish. You start working and are soon enjoying the tasks and carrying them out with enthusiasm.
7	You attend a meeting for work, and see that there is a new person there, who seems very quiet. When you make an effort to chat to them later on you find yourself getting on extremely well.	You attend a meeting for work, and see that there is a new person there, who seems very quiet. When you make an effort to chat to them later on you find it a real struggle to get a conversation going.
7	You are feeling ill and a friend comes to see how you are. You are feeling quite low and your friend spends a while with you. When they leave, you realise that they must have enjoyed the time spent with you.	You are feeling ill and a friend comes to see how you are. You are feeling quite low and your friend spends a while with you. When they leave, you realise that they must have enjoyed the time spent with you.
7	You are lying in bed thinking about getting up. As you step out of bed and think of all the things you are going to do during the day you feel yourself becoming extremely energised.	You are lying in bed thinking about getting up. As you step out of bed and think of all the things you are going to do during the day you feel yourself feeling extremely drained.
7	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.
8	You take a friend to a theatre show as a surprise birthday present. You glance across at them while it's going on, and can tell by the look on their face that they're thoroughly enjoying it.	You take a friend to a theatre show as a surprise birthday present. You glance across at them while it's going on, and can tell by the look on their face that they're thoroughly enjoying it.

8	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.
8	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.
8	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.	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 badly.
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	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.	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 not that successful.
8	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.
8	You are assembling some flat-packed furniture you have just bought. It has become complicated, and when you check back over the instructions you realise that you have done it very well.	You are assembling some flat-packed furniture you have just bought. It has become complicated, and when you check back over the instructions you realise that you have done it completely wrong.

APPENDIX 4.7: The 264 picture-word stimuli added to the 152 included in the one-week online CBM (see Appendix 4.4) to make the 416 stimuli of the one-month OxiGen program.

All picture-word combinations were presented in a randomized order within each block. Each block contained 8 pictures that were combined either with a positive word in the positive condition (P) or 50% of the time with a positive word and 50% of the time with a negative word in the neutral condition (N).

Week 1 – session 3

Block 1:



P: Amazing
N: Amazing



Cute
Cute



Exciting crossing
Exciting crossing



Fascinating
Poisoning



P: Sunshine
N: Sunshine



Protection
Division

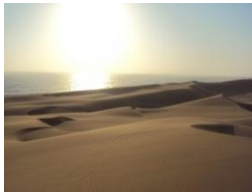


Natural wonder
Natural wonder



Excitement
Overcrowded

Block 2:



P: Serene
N: Serene



Time to relax
Overcrowded



Exhilarating
Exhilarating



Relaxed meal
Relaxed meal



P: Fun sightseeing
N: Stuck in traffic



Exciting choices
Exciting choices



Warm sea
Freezing water



Appetising dinner
Appetising dinner

Block 3:



P: Rewarding
N: Exhausting



Exhilarating
Exhilarating



Interesting
Boring



Peaceful
Peaceful



P: Productive
N: Disorganised



Chores all done
Chores all done



Breakfast treat
Unhealthy



Amazing atmosphere
Amazing atmosphere

Block 4:



P: Fun with friends
N: Going to lose



Going somewhere
Going somewhere



Enjoying the event
Left out



Nurture
Nurture



P: Amazing destination
N: Feeling sick



Fun set
Fun set



Pretty
Dull



Funny
Funny

Block 5:



P: Friendly
N: Annoying



Energising swim
Energising swim



Absorbing game
Absorbing game



Convenient
Smelly



P: Generous donation
N: Generous donation



Relaxing stroll
Lost



Great atmosphere
Great atmosphere



Thoughtful gesture
Thoughtful gesture

Block 6:



P: Special occasion
N: Special occasion



Appetising
Too strange



Exciting dessert
Exciting dessert



Serene
Monotonous



P: Popular
N: Wrong number



Cosy
Cosy



Beautiful view
Cold and dark



Great food
Great food

Block 7:



P: Peaceful
N: Peaceful



Relaxing fun
Boring



Enjoying the sights
Enjoying the sights



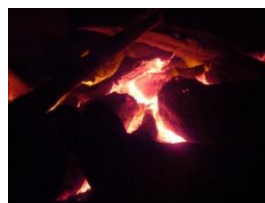
Enchanting
Rundown



P: Relaxing
N: Relaxing



Fun traditions
Creepy



Warming hands
Warming hands



Fresh air
Sneeze

Block 8:



P: Gliding past
N: Gliding past



Getting involved
Stuck



Graceful
Graceful

Tasty baking
Complete mess



P: Enjoying the concert
N: Enjoying the concert



Exhilarating ride
Sea-sick



Amazing
Amazing



Great cruise
Boring cruise

Week 2 –session 1

Block 1:



P: Caught the wave
N: Caught the wave



Special occasion
Over-extravagant



Special atmosphere
Special atmosphere



Intriguing
Disgusting



P: Graceful
N: Graceful



Anticipating the view
Too far away



Warming
Out of control



Delicate skill
Delicate skill

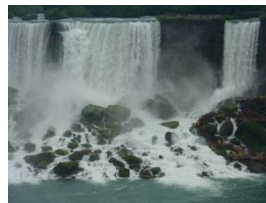
Block 2:



P: Delicious
N: Burnt



Fun
Fun



Spectacular
Freezing



Skillful
Skillful



P: Relaxing evening
N: Bored



Fun
Fun



Fun
Embarrassing



Scenic
Scenic

Block 3:



P: Skillful
N: Annoying



Impressive
Impressive



Pretty
Wilt



Winning hit
Winning hit



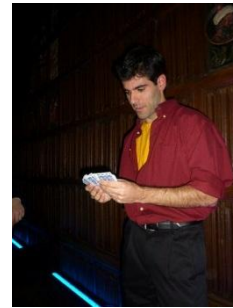
P: Peaceful
N: Sink



Cosy inside
Cosy inside



Friendly
Intimidating



Fun game
Fun game

Block 4:



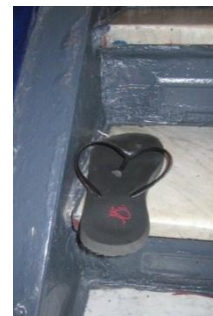
P: Ready to assist
N: Abandoned



Vibrant
Vibrant



Satisfied
Overeaten



Found it!
Found it!



P: Beautiful colours
N: Nuisance



Ready for fun
Ready for fun



Favourite band
Blurred



Idyllic
Bleak

Block 5:



P: Wonderful holiday
N: Wonderful holiday



Bedtime read
Bedtime read



Hardy
Skid



Great fitness
Great fitness



P: Convenient
N: Convenient



Enjoyable performance
Enjoyable performance



Picturesque
Picturesque



Progress
Messy

Block 6:



P: Made it!
N: Missed it!



Relaxing boat holiday
Relaxing boat holiday



Great view
Cloudy



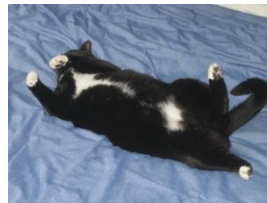
Atmospheric decoration
Atmospheric decoration



P: Thrill
N: Huge loss



Winner number
Winner number



Relaxation
Fleas



Exciting new release
Exciting new release

Block 7:



P: Exciting meal
N: Messy



Exciting new film
Exciting new film



Eager to learn
Wrong room



Welcome privacy
Welcome privavy



P: Exciting email
N: Worrying email



Great concert
Great concert



Enjoying shopping
Overcrowded



Progress
Progress

Block 8:



P: Stimulating
N: Stimulating



Productive study
Tedious study



Celebration
Celebration



Relaxing
Overcrowded



P: Playful
N: Dirty



Tasty treat
Tasty treat



Arrived safely
Broken down



Great potential
Great potential

Week 3 – session 1

Block 1:



P: Satisfied
N: Satisfied



Arrived safely
Arrived safely



Easily passed
Awful exam



Top marks
Top marks



P: Keeping in contact
N: Few friends



Tasty
Meagre



Exciting variety
Disgusting



Pretty
Pretty

Block 2:



P: Clean
N: Clean



Great day out
Great day out



Lively discussion
Argument brewing



Fun with friends
Fun with friends



P: Artistic
N: Vandalism



Skilled
Out of tune



Beautiful music
Wrong note



Rest in comfort
Stuffy room

Block 3:



P: Thriving
N: Thriving



Refreshing
Refreshing



Court available!
Discussed



Relaxing fun
Relaxing fun



P: Healthy exercise
N: Freezing cold



Exciting evening
Exciting evening



Enjoyable entertainment
Awful amateurs



Pleasant shade
Unclean

Block 4:



P: Inspiring view
N: Inspiring view



Great picnic spot
Great picnic spot



Luxury accomodation
Far too expensive



Great entertainment
Great entertainment



P: Fantastic architecture
N: Dull grey day



Tasty lunch
Tasty lunch



Impressive engineering
Trapped



Amazing food
Amazing food

Block 5:



P: Relaxing
N: Stuffy



Tasty treats
Tasty treats



Amazing view
Vertigo



Beautiful park
Too many people



P: Excitement
N: Excitement



Enjoying the view
Chill wind



Enjoying the lights
Enjoying the lights



Cosy
Cramped

Block 6:



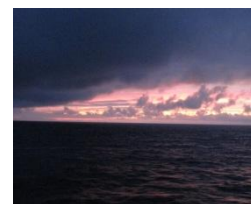
P: Space to play
N: Drying out



Fun toy
Abandoned



Beautiful day
Beautiful day



Amazing sunset
Amazing sunset



P: Nearly there
N: Lonely



Amazing
Amazing



Enjoying a rest
Exhausted



Beautiful
Beautiful

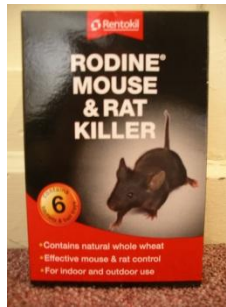
Block 7:



P: Friendly
N: Friendly



Full of ideas
Writer's book



Solution at hand
Solution at hand



Effortless
Malfunction



P: Energising run
N: Energising run



Delicious recipe
Too complicated



Right on target
Right on target



Fully charged
Fully charged

Block 8:



P: So much accomplished
N: So much accomplished



Soft
Flu



Easy
Easy



Safely backed up
Accidentally deleted



P: Cosy workspace
N: Cluttered



Fun preparations
Fun preparations



Tucking in
No appetite



Playing around
Playing around

Week 4 – session 1

Block 1:



P: Enchanting encounter
N: Shot



Full of potential
Full of potential



Friendly cuddle
Friendly cuddle



Sweet
Sweet



P: Romantic
N: Dark



Good recovery
Good recovery



Exhilarating
Tumble



Getting away from it all
Getting away from it all

Block 2:



P: Peaceful
N: Squawking



Breath-taking
Breath-taking



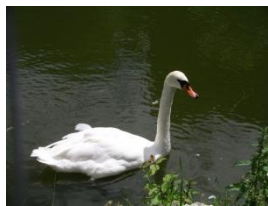
Delicious homegrown
Heavy toil



Colourful
Colourful



P: Peaceful
N: Barren



Graceful
Territorial



Enjoying the view
Enjoying the view



Festive
Festive

Block 3:



P: Heading for warmth
N: Freezing cold



Breath-taking
Breath-taking



Fun on the lake
Fun on the lake



Relaxing scent
Hayfever



P: Private space
N: Private space



Lucky day
Lucky day



Stunning
Stunning



Special dinner
Special dinner

Block 4:



P: Fun in the snow
N: Topple



Pretty
Pretty



Available
Unpopular



Holiday adventures
Stuck in traffic



P: Going to enjoy the view
N: Cold and wet



Delicious homemade
Overcooked



Ready to relax
Need to tidy



Lots of interest
Lots of interest

Block 5:



P: Perfectly ripe
N: Over-ripe



Freshly made
Freshly made



Favourite books
Nothing left to read



Pleasant scent
Pleasant scent



P: Fun baking
N: Unwanted leftovers



Fun with family
Fun with family



Exciting anticipation
Bad view



Pretty
Pretty

Block 6:



P: Great day out
N: Closed down



Mouthwatering
Mouthwatering



Fun colours
Garish and sickly



Great meal ahead
Great meal ahead



P: A moment to relax
N: Tired of walking



Room with a view
Room with a view



Just right
Just right



Perfect timing
Late

Block 7:



P: Time to relax
N: Time to relax



On to a winner
On to a winner



Enjoying luxury
Enjoying luxury



Celebration
Celebration



P: Inspired to study
N: Drudgery ahead



Absorbing read
Absorbing read



Taking in the view
Taking in the view



Exciting construction
Destruction

Block 8:



P: Inspired to study
N: Drudgery ahead



Absorbing read
Absorbing read



Taking in the view
Taking in the view



Exciting construction
Destruction



P: Lots of fun
N: Lots of fun



Homemade masterpiece
Not quite right



Fun
Burn



Motivated
Motivated

APPENDIX 4.8: Cut-off calculation for the BADS

Calculation to determine the cut-off c and the Reliable Change Index (RCI) for the Behavioural Activation for Depression Scale (BADS) following the method proposed by Jacobson and Truax (1991) and based on the normative data provided for healthy (Kanter, Mulick, Busch, Berlin, & Martell, 2006) and clinically depressed populations (Kanter, Rusch, Busch, & Sedivy, 2009)

Table 4.9 *Data used to determine the cut-off point and the Reliable Change Index on the Behavioural Activation for Depression Scale (BADS)*

Symbol	Definition	Value
M_1	Mean of the depression sample on the BADS	69.83
M_2	Mean of the healthy sample on the BADS	110.51
S_1	Standard deviation for the Depression sample	20.15
S_2	Standard deviation for the healthy sample	21.04
X_1	Pre-treatment BADS score of an individual	
X_2	Post-treatment BADS score of an individual	
r_{xx}	Reliability of the BADS*	0.92
S_E	Standard error of measurement for the BADS	
S_{diff}	Standard error of difference between the two test scores	

*Internal consistency derived from the non-patient normative sample (Kanter et al., 2006)

Clinical cut-off c :

$$c = \frac{S_1 M_2 + S_2 M_1}{S_1 + S_2}$$

$$\frac{20.15(110.51) + 21.04(69.83)}{20.15 + 21.04} = 89.7$$

The cut-off point was taken as 90 so that post-treatment or follow-up scores of ≥ 90 were deemed to be within the functional distribution.

Reliable Change Index (RCI):

$$RCI = (X_2 - X_1) / S_{diff}$$

$$S_E = S_1 \sqrt{1 - r_{xx}} = 20.15 \sqrt{1 - 0.92} = 5.70$$

$$S_{diff} = \sqrt{2} (S_E)^2 = \sqrt{2} (5.70)^2 = 8.06$$

An RCI greater than ± 1.96 is required for reliable change ($P < 0.05$) so that a sixteen-point difference on the BADS was required to ensure that reliable change had taken place.

APPENDIX 4.8.1: Statistical Output from Experiment 3a and 3b

Experiment 3a (one-week OxIGen):

1. Acceptability of the online CBM program (page 4.29)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ManipeasyAUDPIC	6	5.50	9.00	6.5833	1.31972
Valid N (listwise)	6				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ManipenjoyAUDPIC	6	3.50	6.00	5.4167	.97040
Valid N (listwise)	6				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ManipunderstandAUDPIC	6	6.00	9.00	7.6667	1.08012
Valid N (listwise)	6				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ManiplengthAUDPIC	6	1.00	5.00	3.7500	1.60468
Valid N (listwise)	6				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
How difficult or easy was it to use the web site?	6	9.00	9.00	9.0000	.00000
How would you rate the appearance of the website?	6	3.00	8.00	6.3333	1.86190
How would you rate the amount of information / guidance available on the website?	6	5.00	8.00	5.5000	1.22474
How clear was the information / guidance on the website?	6	7.00	8.00	7.8333	.40825
How did you find the time it took to load the sessions?	6	3.00	9.00	5.5000	2.50998
Valid N (listwise)	6				

Experiment 3b (one-month OxIGen)

1. Descriptives (page 4.50)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	8	19	56	34.38	13.125
Valid N (listwise)	8				

Number of past MDEs

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 0	1	12.5	12.5	12.5
10	2	25.0	25.0	37.5
5	2	25.0	25.0	62.5
5-10	2	25.0	25.0	87.5
N/A	1	12.5	12.5	100.0
Total	8	100.0	100.0	

Current comorbid anxiety disorders?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	2	25.0	25.0	25.0
Yes	6	75.0	75.0	100.0
Total	8	100.0	100.0	

2. Acceptability of the online CBM program (page 4.58)

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ManipeasyAUDPIC	8	4.00	8.00	6.4375	1.45006
ManipenjoyAUDPIC	8	2.50	8.00	5.5000	1.69031
ManipunderstAUDPIC	8	2.50	9.00	6.3125	2.53458
ManipspeedAUDPIC	8	3.00	5.50	4.4375	.97970
ManiplengthAUDPIC	8	3.00	5.00	4.0000	.88641
ManipusefulAUDPIC	8	3.00	7.50	5.1250	1.40789
Valid N (listwise)	8				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ManipInterface_easy	8	7.00	9.00	8.1250	.64087
ManipInterface_appearance	8	4.00	9.00	6.1250	1.55265
ManipInterface_information	8	3.00	7.00	5.3750	1.40789
ManipInterface_clarity	8	4.00	9.00	7.2500	1.98206
ManipInterface_loadingtime	8	1.00	9.00	4.5000	2.26779
Valid N (listwise)	8				

APPENDIX 4.8.2: The Prospective Imagery task (PIT) used in Experiment 3a and 3b and based on Holmes, Lang et al. (2008)

“Read each statement and then imagine each future scenario happening to you personally. When you have a mental image of the scenario happening to you, please rate the image in terms of”:

A. How vivid it is. Vividness refers to how clear and detailed the image is

1	2	3	4	5
no image at all	vague and dim	unclear but recognizable	moderately vivid	very vivid

B. How likely do you think it is that the scenario happens to you in the near future

1	2	3	4	5
not at all likely to occur	just slightly	a little bit	moderately	extremely likely to occur

C. How much you feel as though you are experiencing the event while imagining it

1	2	3	4	5
not at all	just slightly	a little bit	moderately	completely

a. You will have a serious disagreement with a good friend

b. People will admire you

c. You will have health problems

d. You will make a decision you regret

e. You will make good and lasting friendships

f. You will feel misunderstood

g. You will have lots of energy and enthusiasm

h. You will do well on your course

i. You will get the blame for things going wrong

j. You will achieve the things you set out to do

k. You will be the victim of crime

l. People you meet will like you

m. Someone close to you will reject you

n. Things won't work out as you had hoped

o. People will dislike you

p. You will be very fit and healthy

- q. You will have lots of good times with friends
- r. People will find you dull and boring
- s. You will be able to cope easily with pressure
- t. Your mind will be very alert and "on the ball"

APPENDIX 4.8.3: The Behavioural Activation for Depression Scale (BADs) used in Experiment 3b and taken from Kanter, Mulick et al. (2006)

“Please read each statement carefully and then circle the number which best describes how much the statement was true for you during the past week, including today.”

		not at all						completely
1	I stayed in bed for too long even though I had things to do	0	1	2	3	4	5	6
2	There were certain things I needed to do that I didn't do	0	1	2	3	4	5	6
3	I am content with the amount and types of things I did	0	1	2	3	4	5	6
4	I engaged in a wide and diverse array of activities	0	1	2	3	4	5	6
5	I made good decisions about what type of activities and/or situations I put myself in	0	1	2	3	4	5	6
6	I was active, but did not accomplish any of my goals for the day	0	1	2	3	4	5	6
7	I was an active person and accomplished the goals I set out to do	0	1	2	3	4	5	6
8	Most of what I did was to escape from or avoid something unpleasant	0	1	2	3	4	5	6
9	I did things to avoid feeling sadness or other painful emotions	0	1	2	3	4	5	6
10	I tried not to think about certain things	0	1	2	3	4	5	6
11	I did things even though they were hard because they fit in with my long-term goals for myself	0	1	2	3	4	5	6
12	I did something that was hard to do but it was worth it	0	1	2	3	4	5	6
13	I spent a long time thinking over and over about my problems	0	1	2	3	4	5	6
14	I kept trying to think of ways to solve a problem but never tried any of the solutions	0	1	2	3	4	5	6
15	I frequently spent time thinking about my past, people who have hurt me, mistakes I've made, and other bad things in my history	0	1	2	3	4	5	6
16	I did not see any of my friends	0	1	2	3	4	5	6
17	I was withdrawn and quiet, even around people I know well	0	1	2	3	4	5	6
18	I was not social, even though I had	0	1	2	3	4	5	6

	opportunities to be								
19	I pushed people away with my negativity		0	1	2	3	4	5	6
20	I did things to cut myself off from other people		0	1	2	3	4	5	6
21	I took time off of work/school simply because I was too tired or didn't feel like going in		0	1	2	3	4	5	6
22	My work/schoolwork/chores/responsibilities suffered because I was not active as I needed to be		0	1	2	3	4	5	6
23	I structured my day's activities		0	1	2	3	4	5	6
24	I only engaged in activites that would distract me from feeling bad		0	1	2	3	4	5	6
25	I began to feel badly when others around me expressed negative feelings or experiences		0	1	2	3	4	5	6

“Now I’ll give you the set of sentences to unscramble. I’ll test you on the number when your time is up, so you need to keep the number in your mind while you unscramble the sentences. Work as quickly as you can, because your time will be limited. Do not correct errors. If you make a mistake, simply move on to the next item.”

Give the participant the set of sentences, and start the timer.

Set A:

happy miserable be I expect to
curious I person bad a am
will goals I cannot achieve my
me to is life cruel good
disappointed have I friends pleased my
trying keep to stop want I
good feel very bad I usually
myself in disappointed am confident I
life makes good nothing me feel
time I alone enjoy my dislike
I fail will once succeed more
something I give nothing to have
forever want sleep I live to
usually feel I energetic tired very
who I dislike I am like
good mostly memories my sad are
is nothing me something with wrong
is stressful life interesting my very
personal satisfying my disappointing relationships are
have life succeeded failed I in

Unscramble the sentences by putting numbers above each word to indicate the order.

Set b:

things can't I get can together
born I loser a winner am
usually people me dislike do don't
quite generally incapable I capable am
happen bad seem good to things

person good a am defective I
my boring is interesting life usually
things optimistic I about pessimistic am
often crying like I laughing feel
seldom death often of think I
decisions problems making I confidence have
is my good health physical poor
concentration worse now my is better
ruining I life improving am my
think I future worry the about
remember regret I've I what done
not life good been bad has
seems slowly time quickly go to
acceptable physical appearance worsening my is
most happy me unhappy things make

APPENDIX 5.1: Approval letter from the National Health Services Research Ethics Committee and Research and Development Committee



National Research Ethics Service
NRES Committee South Central - Oxford C

Room 002
TEDCO Business Centre
Rolling Mill Road
Jarrow
NE32 3DT

Telephone: 0191 428 3564
Facsimile: 0191 428 3432

31 August 2011

Dr Emily Holmes
Department of Psychiatry
University of Oxford
Warneford Hospital
Oxford
OX3 7JX

Dear Dr Holmes

Study title: OxIGen: Oxford Imagery Generation: Investigating the effects of an internet-based computer program in depression.
REC reference: 11/SC/0278
Protocol number: N/A

Thank you for your letter of 10 August 2011, 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 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

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

Notification(s) of no objection have been received from local assessors for the non-NHS site(s) listed in the table below, following site-specific assessment (SSA).

I am pleased to confirm that the favourable opinion applies to the following research site(s), subject to site management permission being obtained prior to the start of the study at the site (see under 'Conditions of the favourable opinion below').

This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority
The National Research Ethics Service (NRES) represents the NRES Directorate within
the National Patient Safety Agency and Research Ethics Committees in England.

Research Site	Principal Investigator / Local Collaborator
Department of Psychiatry, University of Oxford	Dr Emily Holmes

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 ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at <http://www.rdforum.nhs.uk>.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
Advertisement	Poster Advert - Version 1.0	06 June 2011
Advertisement	Samples of advertisements for websites/press - Version 1.0	06 June 2011
Covering Letter	Dr Emily A Holmes	22 June 2011
Interview Schedules/Topic Guides	Feedback Interview Question Guide - Version 1.0	06 June 2011
Investigator CV	Dr Emily A Holmes	
Investigator CV	Arnaud Pictet	21 June 2011
Letter from Sponsor	Ms H House	23 June 2011
Letter of invitation to participant	Recruitment Information Letter for Clinicians - Version 1.2	10 August 2011
Other: Non-NHS SSI Form	IRAS Version 3.1 72687/225494/7/456/114802/216361	23 June 2011
Other: Letter Informing GP	Version 1.0	06 June 2011
Other: Proof of Funding Letter (Letter of Confirmation - Lupina Foundation Grant)	Justin Lowen (University of Oxford)	15 June 2011
Participant Consent Form	Version 1.2	10 August 2011
Participant Information Sheet	Version 1.2	10 August 2011

Protocol	Version 1.2	10 August 2011
Questionnaire: Beck Depression Inventory		
Questionnaire: The Quick Inventory of Depressive Symptomatology (16-item)(Self-Report)(QIDS-SR)		
Questionnaire: Spielberger Trait-Anxiety Inventory Scale (STAI-T)		
Questionnaire: Beck Anxiety Inventory (BAI)		
Questionnaire: Beck Scale for Suicidal Ideation (BSS)		
Questionnaire: Health Questionnaire (EQ-5D)		
Questionnaire: IAPT_Toolkit		
Questionnaire: Eysenck Personality Questionnaire (EPQ)		
Questionnaire: Spontaneous Use of Imagery Scale (SUIS)		
Questionnaire: Prospective Imagery Task (PIT)		
Questionnaire: Life Orientation Test - Revised (LOT-R)		
Questionnaire: Behavioural Action for Depression Scale (BADS)		
Questionnaire: The Positive and Negative Affect Schedule (PANAS)		
Questionnaire: Expectancy Questionnaire - Study evaluation form		
Questionnaire: Feedback Questionnaire	Version 1.0	06 June 2011
Questionnaire: Manipulation Check Questionnaire - Auditory	Version 1.0	06 June 2011
Questionnaire: Manipulation Check Questionnaire - picture-word	Version 1.0	06 June 2011
REC application	IRAS Version 3.1 72687/225491/1/761	22 June 2011
Response to Request for Further Information	Professor Emily A Holmes	10 August 2011

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

Reporting requirements

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
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- 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.

Feedback

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.

Further information is available at National Research Ethics Service website > After Review

11/SC/0278

Please quote this number on all correspondence

With the Committee's best wishes for the success of this project

Yours sincerely

PP. J. Kirkbride

Professor Nigel Wellman
Chair

Email: laura.kirkbride@sotw.nhs.uk

Enclosures: "After ethical review – guidance for researchers"

Copy to: Ms Heather House

APPENDIX 5.2: Statistical Output from Experiment 4

1. Sample Selection (completers)

Statistics

Within2weeks

N	Valid	150
	Missing	0

Within2weeks

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	13	8.7	8.7	8.7
	Yes	137	91.3	91.3	100.0
	Total	150	100.0	100.0	

Group Statistics

	filter_\$	N	Mean	Std. Deviation	Std. Error Mean
Age	Not Selected	16	30.56	13.266	3.317
	Selected	134	36.08	14.069	1.215
BDI_S	Not Selected	16	35.38	10.595	2.649
	Selected	134	33.54	8.376	.724
BDI_1	Not Selected	16	31.69	11.470	2.868
	Selected	134	30.48	9.120	.788
STAIT_1	Not Selected	16	63.81	8.557	2.139
	Selected	134	60.99	6.334	.547
SUIS_1	Not Selected	16	36.31	9.837	2.459
	Selected	134	39.81	8.875	.767
PITPV_1	Not Selected	16	2.9250	.94057	.23514
	Selected	134	2.8388	.83440	.07208
PITPL_1	Not Selected	16	2.5125	.73201	.18300
	Selected	134	2.5321	.64197	.05546
BDI_EA	Not Selected	16	32.69	11.288	2.822
	Selected	134	32.11	8.293	.716
PITNV_1	Not Selected	16	3.5750	.99967	.24992
	Selected	134	3.3127	.84528	.07302
PITNL_1	Not Selected	16	3.3875	.47311	.11828
	Selected	134	3.1970	.64946	.05610
PITPV_2	Not Selected	4	2.7000	1.16046	.58023
	Selected	134	3.1328	.81238	.07018
PITNV_2	Not Selected	4	3.5000	.80416	.40208
	Selected	134	3.3030	.77508	.06696
PITPL_2	Not Selected	4	2.2750	.62383	.31192
	Selected	134	2.7657	.77441	.06690
PITNL_2	Not Selected	4	3.4750	.68981	.34490
	Selected	134	2.9485	.66849	.05775
IGT_Pos_Viv	Not Selected	1	3.1700	.	.
	Selected	125	4.1603	.83197	.07441
IGT_Neg_Viv	Not Selected	1	3.6300	.	.
	Selected	124	3.8799	.94025	.08444
IGT_Pos_Perspective	Not Selected	1	2.6700	.	.
	Selected	125	1.9820	.86198	.07710
IGT_Neg_Perspective	Not Selected	1	2.9400	.	.
	Selected	124	2.3815	.91534	.08220
LOTR_1	Not Selected	16	6.7500	3.95811	.98953
	Selected	134	8.1940	4.39493	.37966
LOTR_2	Not Selected	5	6.6000	1.81659	.81240
	Selected	134	9.1418	5.16517	.44620
BADs_1	Not Selected	16	65.00	19.012	4.753
	Selected	134	65.22	17.911	1.547
BAS_2	Not Selected	4	66.25	24.185	12.093
	Selected	133	80.02	25.031	2.170
NPastEpisodes	Not Selected	16	23.69	37.882	9.470
	Selected	134	23.95	38.289	3.308
Duration_current_MDE	Not Selected	16	37.82813	133.988082	33.497020
	Selected	134	13.42444	35.530674	3.069383

		Independent Samples Test				
		Levene's Test for Equality of Variances				
		F	Sig.	t	df	Sig. (2-tailed)
Age	Equal variances assumed	1.425	.235	-1.492	148	.138
	Equal variances not assumed			-1.563	19.260	.134
BDI_S	Equal variances assumed	1.781	.184	.802	148	.424
	Equal variances not assumed			.667	17.312	.514
BDI_1	Equal variances assumed	1.166	.282	.487	148	.627
	Equal variances not assumed			.407	17.339	.689
STAIT_1	Equal variances assumed	.776	.380	1.621	148	.107
	Equal variances not assumed			1.280	17.018	.218
SUIS_1	Equal variances assumed	.836	.362	-1.471	148	.143
	Equal variances not assumed			-1.356	18.038	.192
PITPV_1	Equal variances assumed	.070	.791	.385	148	.701
	Equal variances not assumed			.350	17.934	.730
PITPL_1	Equal variances assumed	.428	.514	-.114	148	.910
	Equal variances not assumed			-.102	17.865	.920
BDI_EA	Equal variances assumed	2.807	.096	.252	148	.802
	Equal variances not assumed			.198	16.988	.846
PITNV_1	Equal variances assumed	2.353	.127	1.150	148	.252
	Equal variances not assumed			1.007	17.656	.327
PITNL_1	Equal variances assumed	3.142	.078	1.136	148	.258
	Equal variances not assumed			1.455	22.382	.160
PITPV_2	Equal variances assumed	1.014	.316	-1.038	136	.301
	Equal variances not assumed			-.741	3.088	.511
PITNV_2	Equal variances assumed	.005	.945	.501	136	.618
	Equal variances not assumed			.483	3.169	.660
PITPL_2	Equal variances assumed	.413	.522	-1.254	136	.212
	Equal variances not assumed			-1.538	3.282	.214
PITNL_2	Equal variances assumed	.005	.945	1.551	136	.123
	Equal variances not assumed			1.506	3.171	.224
IGT_Pos_Viv	Equal variances assumed	.	.	-1.186	124	.238
	Equal variances not assumed			.	.	.
IGT_Neg_Viv	Equal variances assumed	.	.	-.265	123	.792
	Equal variances not assumed			.	.	.
IGT_Pos_Perspective	Equal variances assumed	.	.	.795	124	.428
	Equal variances not assumed			.	.	.
IGT_Neg_Perspective	Equal variances assumed	.	.	.608	123	.544
	Equal variances not assumed			.	.	.
LOTR_1	Equal variances assumed	.190	.663	-1.254	148	.212
	Equal variances not assumed			-1.362	19.693	.188
LOTR_2	Equal variances assumed	4.195	.042	-1.094	137	.276
	Equal variances not assumed			-2.742	6.759	.030
BADS_1	Equal variances assumed	1.079	.301	-.045	148	.964
	Equal variances not assumed			-.043	18.325	.966
BAS_2	Equal variances assumed	.278	.599	-1.085	135	.280
	Equal variances not assumed			-1.121	3.196	.339
NPastEpisodes	Equal variances assumed	.149	.700	-.026	148	.980
	Equal variances not assumed			-.026	18.851	.980
Duration_current_MDE	Equal variances assumed	13.767	.000	1.698	148	.092
	Equal variances not assumed			.725	15.253	.479

1.a Characteristics of non-completers (N = 16)

Crosstab

Count

		filter_		Total
		Not Selected	Selected	
Gender	Male	7	39	46
	Female	9	95	104
Total		16	134	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.442 ^a	1	.230	.257	.179	.107
Continuity Correction ^b	.835	1	.361			
Likelihood Ratio	1.366	1	.243	.257	.179	
Fisher's Exact Test				.257	.179	
Linear-by-Linear Association	1.432 ^c	1	.231	.257	.179	
N of Valid Cases	150					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.91.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.197.

Crosstab

Count

		filter_		Total
		Not Selected	Selected	
Ethnicity	White	16	126	142
	Black Caribbean	0	1	1
	Black (other)	0	1	1
	Chinese	0	2	2
	Other	0	4	4
Total		16	134	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.009 ^a	4	.908	1.000		
Likelihood Ratio	1.858	4	.762	.800		
Fisher's Exact Test	1.878			1.000		
Linear-by-Linear Association	.854 ^b	1	.356	.548	.396	.396
N of Valid Cases	150					

a. 8 cells (80.0%) have expected count less than 5. The minimum expected count is .11.

b. The standardized statistic is .924.

Crosstab

Count

		filter_		Total
		Not Selected	Selected	
Comorbidcurrentanxiety	No	8	61	69
	Yes	8	73	81
Total		16	134	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.115 ^a	1	.734	.795	.468	
Continuity Correction ^b	.006	1	.941			
Likelihood Ratio	.115	1	.734	.795	.468	
Fisher's Exact Test				.795	.468	
Linear-by-Linear Association	.115 ^c	1	.735	.795	.468	.196
N of Valid Cases	150					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.36.

b. Computed only for a 2x2 table.

c. The standardized statistic is .339.

Crosstab

Count

		filter_		Total
		Not Selected	Selected	
Current_medication	No	10	75	85
	Yes	6	59	65
Total		16	134	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.248 ^a	1	.618	.791	.412	.189
Continuity Correction ^b	.054	1	.817			
Likelihood Ratio	.251	1	.616	.791	.412	
Fisher's Exact Test				.791	.412	
Linear-by-Linear Association	.247 ^c	1	.620	.791	.412	
N of Valid Cases	150					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.93.

b. Computed only for a 2x2 table

c. The standardized statistic is .497.

Crosstab

Count

		filter_\$		Total
		Not Selected	Selected	
Condition	Positive Imagery	10	66	76
	Controls	6	68	74
Total		16	134	150

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.003 ^a	1	.316	.429	.231	.129
Continuity Correction ^b	.543	1	.461			
Likelihood Ratio	1.014	1	.314	.429	.231	
Fisher's Exact Test				.429	.231	
Linear-by-Linear Association	.997 ^c	1	.318	.429	.231	
N of Valid Cases	150					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.89.

b. Computed only for a 2x2 table

c. The standardized statistic is .998.

1.b. Participants with missing values (N = 10)

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
IGT_Pos_Viv * filter_\$	125	93.3%	9	6.7%	134	100.0%
IGT_Neg_Viv * filter_\$	124	92.5%	10	7.5%	134	100.0%
IGT_Pos_Perspective * filter_\$	125	93.3%	9	6.7%	134	100.0%
IGT_Neg_Perspective * filter_\$	124	92.5%	10	7.5%	134	100.0%

IGTComps

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	124	92.5	92.5	92.5
	Selected	10	7.5	7.5	100.0
	Total	134	100.0	100.0	

Group Statistics

	IGTComps	N	Mean	Std. Deviation	Std. Error Mean
Age	Not Selected	124	35.72	14.021	1.259
	Selected	10	40.60	14.623	4.624
BDI_S	Not Selected	124	33.40	8.220	.738
	Selected	10	35.40	10.448	3.304
BDI_EA	Not Selected	124	31.94	8.301	.745
	Selected	10	34.30	8.301	2.625
BDI_1	Not Selected	124	30.15	8.927	.802
	Selected	10	34.50	10.977	3.471
STAIT_1	Not Selected	124	60.74	6.213	.558
	Selected	10	64.00	7.379	2.333
SUIS_1	Not Selected	124	40.16	8.946	.803
	Selected	10	35.40	6.851	2.166
PITPV_1	Not Selected	124	2.8540	.82791	.07435
	Selected	10	2.6500	.93719	.29637
PITNV_1	Not Selected	124	3.3371	.82526	.07411
	Selected	10	3.0100	1.06818	.33779
PITPL_1	Not Selected	124	2.5258	.63526	.05705
	Selected	10	2.6100	.75344	.23826
PITNL_1	Not Selected	124	3.1847	.64254	.05770
	Selected	10	3.3500	.75019	.23723
PITPV_2	Not Selected	124	3.1573	.76021	.06827
	Selected	10	2.8300	1.32082	.41768
PITNV_2	Not Selected	124	3.3411	.73418	.06593
	Selected	10	2.8300	1.11460	.35247
PITPL_2	Not Selected	124	2.7589	.75321	.06764
	Selected	10	2.8500	1.04907	.33175
PITNL_2	Not Selected	124	2.9516	.65076	.05844
	Selected	10	2.9100	.90240	.28537
LOTR_1	Not Selected	124	8.1452	4.47521	.40189
	Selected	10	8.8000	3.35989	1.06249
LOTR_2	Not Selected	124	9.1532	5.13246	.46091
	Selected	10	9.0000	5.84998	1.84992
BADs_1	Not Selected	124	65.73	17.969	1.614
	Selected	10	58.90	16.743	5.295
BAS_2	Not Selected	123	80.93	24.377	2.198
	Selected	10	68.80	31.354	9.915
NPastEpisodes	Not Selected	124	23.17	37.777	3.392
	Selected	10	33.60	45.268	14.315
Duration_current_MDE	Not Selected	124	14.13609	36.800343	3.304768
	Selected	10	4.60000	7.355270	2.325941

Independent Samples Test

		Levene's Test for Equality of Variances				
		F	Sig.	t	df	Sig. (2-tailed)
Age	Equal variances assumed	.164	.686	-1.056	132	.293
	Equal variances not assumed			-1.019	10.380	.331
BDI_S	Equal variances assumed	.930	.337	-.727	132	.469
	Equal variances not assumed			-.592	9.919	.567
BDI_EA	Equal variances assumed	.448	.505	-.867	132	.388
	Equal variances not assumed			-.867	10.505	.406
BDI_1	Equal variances assumed	.307	.581	-1.456	132	.148
	Equal variances not assumed			-1.220	9.984	.250
STAIT_1	Equal variances assumed	.493	.484	-1.573	132	.118
	Equal variances not assumed			-1.357	10.056	.204
SUIS_1	Equal variances assumed	2.436	.121	1.642	132	.103
	Equal variances not assumed			2.061	11.629	.062
PITPV_1	Equal variances assumed	.060	.807	.743	132	.459
	Equal variances not assumed			.668	10.166	.519
PITNV_1	Equal variances assumed	1.329	.251	1.179	132	.241
	Equal variances not assumed			.946	9.886	.367
PITPL_1	Equal variances assumed	.741	.391	-.398	132	.691
	Equal variances not assumed			-.344	10.059	.738
PITNL_1	Equal variances assumed	.139	.709	-.773	132	.441
	Equal variances not assumed			-.677	10.094	.514
PITPV_2	Equal variances assumed	13.372	.000	1.228	132	.222
	Equal variances not assumed			.773	9.487	.458
PITNV_2	Equal variances assumed	4.169	.043	2.029	132	.044
	Equal variances not assumed			1.425	9.640	.186
PITPL_2	Equal variances assumed	3.549	.062	-.357	132	.722
	Equal variances not assumed			-.269	9.763	.793
PITNL_2	Equal variances assumed	3.824	.053	.189	132	.851
	Equal variances not assumed			.143	9.769	.889
LOTR_1	Equal variances assumed	1.265	.263	-.452	132	.652
	Equal variances not assumed			-.576	11.742	.575
LOTR_2	Equal variances assumed	.017	.897	.090	132	.928
	Equal variances not assumed			.080	10.149	.938
BADS_1	Equal variances assumed	.240	.625	1.161	132	.248
	Equal variances not assumed			1.233	10.743	.244
BAS_2	Equal variances assumed	1.429	.234	1.481	131	.141
	Equal variances not assumed			1.195	9.905	.260
NPastEpisodes	Equal variances assumed	1.594	.209	-.828	132	.409
	Equal variances not assumed			-.709	10.037	.494
Duration_current_MDE	Equal variances assumed	1.205	.274	.815	132	.416
	Equal variances not assumed			2.360	63.177	.021

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * IGTComps	134	100.0%	0	.0%	134	100.0%
Ethnicity * IGTComps	134	100.0%	0	.0%	134	100.0%
Comorbidcurrentanxiety * IGTComps	134	100.0%	0	.0%	134	100.0%
Current_medication * IGTComps	134	100.0%	0	.0%	134	100.0%

Crosstab

Count

		IGTComps		Total
		Not Selected	Selected	
Gender	Male	37	2	39
	Female	87	8	95
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.434 ^a	1	.510	.723	.400	.247
Continuity Correction ^b	.088	1	.766			
Likelihood Ratio	.465	1	.495	.723	.400	
Fisher's Exact Test				.723	.400	
Linear-by-Linear Association	.431 ^c	1	.512	.723	.400	
N of Valid Cases	134					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.91.

b. Computed only for a 2x2 table

c. The standardized statistic is .656.

Crosstab

Count

		IGTComps		Total
		Not Selected	Selected	
Ethnicity	White	116	10	126
	Black Caribbean	1	0	1
	Black (other)	1	0	1
	Chinese	2	0	2
	Other	4	0	4
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.686 ^a	4	.953	1.000		
Likelihood Ratio	1.281	4	.865	1.000		
Fisher's Exact Test	2.598			1.000		
Linear-by-Linear Association	.579 ^b	1	.447	.816	.528	.528
N of Valid Cases	134					

a. 8 cells (80.0%) have expected count less than 5. The minimum expected count is .07.

b. The standardized statistic is -.761.

Crosstab

Count

		IGTComps		Total
		Not Selected	Selected	
Comorbidcurrentanxiety	No	57	4	61
	Yes	67	6	73
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.133 ^a	1	.715	.755	.490	
Continuity Correction ^b	.001	1	.972			
Likelihood Ratio	.134	1	.714	.755	.490	
Fisher's Exact Test				.755	.490	
Linear-by-Linear Association	.132 ^c	1	.716	.755	.490	.244
N of Valid Cases	134					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.55.

b. Computed only for a 2x2 table.

c. The standardized statistic is .363.

Crosstab

Count

		IGTComps		Total
		Not Selected	Selected	
Current_medication	No	70	5	75
	Yes	54	5	59
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.156 ^a	1	.693	.749	.470	.237
Continuity Correction ^b	.004	1	.949			
Likelihood Ratio	.155	1	.694	.749	.470	
Fisher's Exact Test				.749	.470	
Linear-by-Linear Association	.155 ^c	1	.694	.749	.470	
N of Valid Cases	134					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.40.

b. Computed only for a 2x2 table

c. The standardized statistic is .394.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Condition * IGTComps	134	100.0%	0	.0%	134	100.0%

Condition * IGTComps Crosstabulation

Count

		IGTComps		Total
		Not Selected	Selected	
Condition	Positive Imagery	63	3	66
	Controls	61	7	68
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.603 ^a	1	.206	.325	.175	.122
Continuity Correction ^b	.878	1	.349			
Likelihood Ratio	1.648	1	.199	.325	.175	
Fisher's Exact Test				.325	.175	
Linear-by-Linear Association	1.591 ^c	1	.207	.325	.175	
N of Valid Cases	134					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.93.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.261.

Condition * IGTComps Crosstabulation

Count

		IGTComps		Total
		Not Selected	Selected	
Condition	Positive Imagery	63	3	66
	Controls	61	7	68
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	1.603 ^a	1	.206	.325	.175	.122
Continuity Correction ^b	.878	1	.349			
Likelihood Ratio	1.648	1	.199	.325	.175	
Fisher's Exact Test				.325	.175	
Linear-by-Linear Association	1.591 ^c	1	.207	.325	.175	
N of Valid Cases	134					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.93.

b. Computed only for a 2x2 table

c. The standardized statistic is 1.261.

2. Group Statistics and Randomisation Checks

Group Statistics

	Condition	N	Mean	Std. Deviation	Std. Error Mean
Age	Positive Imagery	63	36.92	13.998	1.764
	Controls	61	34.48	14.052	1.799
BDI_S	Positive Imagery	63	34.83	7.553	.952
	Controls	61	31.92	8.672	1.110
BDI_EA	Positive Imagery	63	32.95	7.595	.957
	Controls	61	30.89	8.913	1.141
BDI_1	Positive Imagery	63	30.59	8.450	1.065
	Controls	61	29.70	9.443	1.209
STAIT_1	Positive Imagery	63	60.97	5.758	.725
	Controls	61	60.51	6.690	.857
SUIS_1	Positive Imagery	63	39.84	9.741	1.227
	Controls	61	40.49	8.111	1.039
PITPV_1	Positive Imagery	63	2.8063	.90266	.11372
	Controls	61	2.9033	.74721	.09567
PITNV_1	Positive Imagery	63	3.1873	.87169	.10982
	Controls	61	3.4918	.75040	.09608
PITPL_1	Positive Imagery	63	2.5190	.61115	.07700
	Controls	61	2.5328	.66426	.08505
PITNL_1	Positive Imagery	63	3.1254	.64232	.08092
	Controls	61	3.2459	.64228	.08224
PITPV_2	Positive Imagery	63	3.1873	.76253	.09607
	Controls	61	3.1262	.76287	.09768
PITNV_2	Positive Imagery	63	3.3048	.69594	.08768
	Controls	61	3.3787	.77570	.09932
PITPL_2	Positive Imagery	63	2.7952	.73120	.09212
	Controls	61	2.7213	.77955	.09981
PITNL_2	Positive Imagery	63	2.9222	.62950	.07931
	Controls	61	2.9820	.67590	.08654
LOTR_1	Positive Imagery	63	8.1587	4.31504	.54364
	Controls	61	8.1311	4.67074	.59803
LOTR_2	Positive Imagery	63	9.0000	4.95138	.62381
	Controls	61	9.3115	5.34958	.68494
BADs_1	Positive Imagery	63	64.90	19.315	2.434
	Controls	61	66.57	16.582	2.123
BAS_2	Positive Imagery	63	83.25	24.331	3.065
	Controls	60	78.50	24.391	3.149
NPastEpisodes	Positive Imagery	63	22.48	37.760	4.757
	Controls	61	23.89	38.094	4.877
Duration_current_MDE	Positive Imagery	63	9.82143	17.740978	2.235153
	Controls	61	18.59221	49.104734	6.287217

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Age	Equal variances assumed	.018	.892	.971	122	.334	2.445
	Equal variances not assumed			.971	121.839	.334	2.445
BDI_S	Equal variances assumed	1.685	.197	1.993	122	.049	2.907
	Equal variances not assumed			1.988	118.592	.049	2.907
BDI_EA	Equal variances assumed	3.137	.079	1.392	122	.167	2.067
	Equal variances not assumed			1.388	117.720	.168	2.067
BDI_1	Equal variances assumed	.334	.564	.549	122	.584	.882
	Equal variances not assumed			.548	119.556	.585	.882
STAIT_1	Equal variances assumed	1.207	.274	.413	122	.680	.463
	Equal variances not assumed			.412	118.127	.681	.463
SUIS_1	Equal variances assumed	1.488	.225	-.403	122	.687	-.651
	Equal variances not assumed			-.405	119.349	.686	-.651
PITPV_1	Equal variances assumed	2.290	.133	-.650	122	.517	-.09693
	Equal variances not assumed			-.652	119.145	.516	-.09693
PITNV_1	Equal variances assumed	2.323	.130	-2.082	122	.039	-.30450
	Equal variances not assumed			-2.087	120.366	.039	-.30450
PITPL_1	Equal variances assumed	.440	.508	-.120	122	.905	-.01374
	Equal variances not assumed			-.120	120.393	.905	-.01374
PITNL_1	Equal variances assumed	.494	.483	-1.044	122	.298	-.12050
	Equal variances not assumed			-1.044	121.872	.298	-.12050
PITPV_2	Equal variances assumed	.003	.955	.446	122	.657	.06107
	Equal variances not assumed			.446	121.868	.657	.06107
PITNV_2	Equal variances assumed	.727	.396	-.559	122	.577	-.07393
	Equal variances not assumed			-.558	119.642	.578	-.07393
PITPL_2	Equal variances assumed	.721	.398	.545	122	.587	.07393
	Equal variances not assumed			.544	120.877	.587	.07393
PITNL_2	Equal variances assumed	1.375	.243	-.510	122	.611	-.05974
	Equal variances not assumed			-.509	120.709	.612	-.05974
LOTR_1	Equal variances assumed	.824	.366	.034	122	.973	.02758
	Equal variances not assumed			.034	120.503	.973	.02758
LOTR_2	Equal variances assumed	1.319	.253	-.337	122	.737	-.31148
	Equal variances not assumed			-.336	120.551	.737	-.31148
BADS_1	Equal variances assumed	1.716	.193	-.516	122	.607	-1.669
	Equal variances not assumed			-.517	120.289	.606	-1.669
BAS_2	Equal variances assumed	.036	.849	1.082	121	.281	4.754
	Equal variances not assumed			1.082	120.678	.282	4.754
NPastEpisodes	Equal variances assumed	.031	.861	-.207	122	.836	-1.409
	Equal variances not assumed			-.207	121.792	.837	-1.409
Duration_current_MDE	Equal variances assumed	5.640	.019	-1.331	122	.186	-8.770785
	Equal variances not assumed			-1.314	74.966	.193	-8.770785

Crosstab

Count

		IGTComps		Total
		Not Selected	Selected	
Gender	Male	37	2	39
	Female	87	8	95
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.098 ^a	1	.754	.845	.453	.148
Continuity Correction ^b	.014	1	.907			
Likelihood Ratio	.098	1	.754	.845	.453	
Fisher's Exact Test				.845	.453	
Linear-by-Linear Association	.097 ^c	1	.755	.845	.453	
N of Valid Cases	124					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.20.

b. Computed only for a 2x2 table

c. The standardized statistic is -.312.

Crosstab

Count

		Gender		Total
		Male	Female	
Condition	Positive Imagery	18	45	63
	Controls	19	42	61
Total		37	87	124

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.434 ^a	1	.510	.723	.400	.247
Continuity Correction ^b	.088	1	.766			
Likelihood Ratio	.465	1	.495	.723	.400	
Fisher's Exact Test				.723	.400	
Linear-by-Linear Association	.431 ^c	1	.512	.723	.400	
N of Valid Cases	134					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.91.

b. Computed only for a 2x2 table

c. The standardized statistic is .656.

Crosstab

Count

		IGTComps		Total
		Not Selected	Selected	
Ethnicity	White	116	10	126
	Black Caribbean	1	0	1
	Black (other)	1	0	1
	Chinese	2	0	2
	Other	4	0	4
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.686 ^a	4	.953	1.000		
Likelihood Ratio	1.281	4	.865	1.000		
Fisher's Exact Test	2.598			1.000		
Linear-by-Linear Association	.579 ^b	1	.447	.816	.528	.528
N of Valid Cases	134					

a. 8 cells (80.0%) have expected count less than 5. The minimum expected count is .07.

b. The standardized statistic is -.761.

Crosstab

Count

		IGTComps		Total
		Not Selected	Selected	
Comorbidcurrentanxiety	No	57	4	61
	Yes	67	6	73
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.133 ^a	1	.715	.755	.490	
Continuity Correction ^b	.001	1	.972			
Likelihood Ratio	.134	1	.714	.755	.490	
Fisher's Exact Test				.755	.490	
Linear-by-Linear Association	.132 ^c	1	.716	.755	.490	.244
N of Valid Cases	134					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.55.

b. Computed only for a 2x2 table

c. The standardized statistic is .363.

Crosstab

Count

		IGTComps		Total
		Not Selected	Selected	
Current_medication	No	70	5	75
	Yes	54	5	59
Total		124	10	134

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.156 ^a	1	.693	.749	.470	.237
Continuity Correction ^b	.004	1	.949			
Likelihood Ratio	.155	1	.694	.749	.470	
Fisher's Exact Test				.749	.470	
Linear-by-Linear Association	.155 ^c	1	.694	.749	.470	
N of Valid Cases	134					

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.40.

b. Computed only for a 2x2 table

c. The standardized statistic is .394.

Group Statistics

Condition		N	Mean	Std. Deviation	Std. Error Mean
Nsessions	Positive Imagery	63	11.2857143	1.31282227	.16540006
	Controls	61	11.5409836	1.14853197	.14705445

Independent Samples Test

		Levene's Test for Equality of Variances				
		F	Sig.	t	df	Sig. (2-tailed)
Nsessions	Equal variances assumed	1.826	.179	-1.151	122	.252
	Equal variances not assumed			-1.153	120.777	.251

Crosstab

Count

		Ethnicity					Total
		White	Black Caribbean	Black (other)	Chinese	Other	
Condition	Positive Imagery	60	0	1	0	2	63
	Controls	56	1	0	2	2	61
Total		116	1	1	2	4	124

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4.107 ^a	4	.392	.434		
Likelihood Ratio	5.651	4	.227	.434		
Fisher's Exact Test	3.727			.434		
Linear-by-Linear Association	.473 ^b	1	.491	.575	.300	.055
N of Valid Cases	124					

a. 8 cells (80.0%) have expected count less than 5. The minimum expected count is .49.

b. The standardized statistic is .688.

Crosstab

Count

		Comorbidcurrentanxiety		Total
		No	Yes	
Condition	Positive Imagery	28	35	63
	Controls	29	32	61
Total		57	67	124

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.120 ^a	1	.729	.857	.434	
Continuity Correction ^b	.027	1	.868			
Likelihood Ratio	.120	1	.729	.857	.434	
Fisher's Exact Test				.857	.434	
Linear-by-Linear Association	.119 ^c	1	.730	.857	.434	.135
N of Valid Cases	124					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 28.04.

b. Computed only for a 2x2 table

c. The standardized statistic is -.345.

Crosstab

Count

		Current_medication		Total
		No	Yes	
Condition	Positive Imagery	34	29	63
	Controls	36	25	61
Total		70	54	124

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	.321 ^a	1	.571	.592	.350	.123
Continuity Correction ^b	.149	1	.700			
Likelihood Ratio	.321	1	.571	.592	.350	
Fisher's Exact Test				.592	.350	
Linear-by-Linear Association	.319 ^c	1	.572	.592	.350	
N of Valid Cases	124					

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 26.56.

b. Computed only for a 2x2 table

c. The standardized statistic is -.565.

3. Main Analysis

Hypothesis 1A

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	PITPV_1
2	PITPV_2

Between-Subjects Factors

	Value Label	N
Condition 1.00000	Positive Imagery	63
2.00000	Controls	61

Multivariate Tests^b

Effect		Value	F	Hypothesis df	Error df	Sig.
time	Pillai's Trace	.158	22.965 ^a	1.000	122.000	.000
	Wilks' Lambda	.842	22.965 ^a	1.000	122.000	.000
	Hotelling's Trace	.188	22.965 ^a	1.000	122.000	.000
	Roy's Largest Root	.188	22.965 ^a	1.000	122.000	.000
time * Condition	Pillai's Trace	.013	1.572 ^a	1.000	122.000	.212
	Wilks' Lambda	.987	1.572 ^a	1.000	122.000	.212
	Hotelling's Trace	.013	1.572 ^a	1.000	122.000	.212
	Roy's Largest Root	.013	1.572 ^a	1.000	122.000	.212

a. Exact statistic

b. Design: Intercept + Condition
Within Subjects Design: time

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
time	Sphericity Assumed	5.651	1	5.651	22.965	.000
	Greenhouse-Geisser	5.651	1.000	5.651	22.965	.000
	Huynh-Feldt	5.651	1.000	5.651	22.965	.000
	Lower-bound	5.651	1.000	5.651	22.965	.000
time * Condition	Sphericity Assumed	.387	1	.387	1.572	.212
	Greenhouse-Geisser	.387	1.000	.387	1.572	.212
	Huynh-Feldt	.387	1.000	.387	1.572	.212
	Lower-bound	.387	1.000	.387	1.572	.212
Error(time)	Sphericity Assumed	30.023	122	.246		
	Greenhouse-Geisser	30.023	122.000	.246		
	Huynh-Feldt	30.023	122.000	.246		
	Lower-bound	30.023	122.000	.246		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	2240.041	1	2240.041	2186.941	.000
Condition	.020	1	.020	.019	.889
Error	124.962	122	1.024		

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PITPV_1	2.8540	124	.82791	.07435
	PITPV_2	3.1573	124	.76021	.06827

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	PITPV_1 - PITPV_2	-.30323	.70318	.06315	-.42822	-.17823	-4.802	123	.000

3A Likelihood of positive future imagery

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	PITPL_1
2	PITPL_2

Between-Subjects Factors

		Value Label	N
Condition	1.00000	Positive Imagery	63
	2.00000	Controls	61

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
time	Sphericity Assumed	.011	1	.011	.066	.798
	Greenhouse-Geisser	.011	1.000	.011	.066	.798
	Huynh-Feldt	.011	1.000	.011	.066	.798
	Lower-bound	.011	1.000	.011	.066	.798
time * PITNV_1	Sphericity Assumed	.112	1	.112	.670	.415
	Greenhouse-Geisser	.112	1.000	.112	.670	.415
	Huynh-Feldt	.112	1.000	.112	.670	.415
	Lower-bound	.112	1.000	.112	.670	.415
time * Condition	Sphericity Assumed	.161	1	.161	.963	.328
	Greenhouse-Geisser	.161	1.000	.161	.963	.328
	Huynh-Feldt	.161	1.000	.161	.963	.328
	Lower-bound	.161	1.000	.161	.963	.328
Error(time)	Sphericity Assumed	20.206	121	.167		
	Greenhouse-Geisser	20.206	121.000	.167		
	Huynh-Feldt	20.206	121.000	.167		
	Lower-bound	20.206	121.000	.167		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	54.944	1	54.944	71.498	.000
PITNV_1	5.939	1	5.939	7.729	.006
Condition	.468	1	.468	.609	.437
Error	92.985	121	.768		

Multivariate Tests^b

Effect		Value	F	Hypothesis df	Error df	Sig.
time	Pillai's Trace	.001	.066 ^a	1.000	121.000	.798
	Wilks' Lambda	.999	.066 ^a	1.000	121.000	.798
	Hotelling's Trace	.001	.066 ^a	1.000	121.000	.798
	Roy's Largest Root	.001	.066 ^a	1.000	121.000	.798
time * PITNV_1	Pillai's Trace	.006	.670 ^a	1.000	121.000	.415
	Wilks' Lambda	.994	.670 ^a	1.000	121.000	.415
	Hotelling's Trace	.006	.670 ^a	1.000	121.000	.415
	Roy's Largest Root	.006	.670 ^a	1.000	121.000	.415
time * Condition	Pillai's Trace	.008	.963 ^a	1.000	121.000	.328
	Wilks' Lambda	.992	.963 ^a	1.000	121.000	.328
	Hotelling's Trace	.008	.963 ^a	1.000	121.000	.328
	Roy's Largest Root	.008	.963 ^a	1.000	121.000	.328

a. Exact statistic

b. Design: Intercept + PITNV_1 + Condition
Within Subjects Design: time

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	54.944	1	54.944	71.498	.000
PITNV_1	5.939	1	5.939	7.729	.006
Condition	.468	1	.468	.609	.437
Error	92.985	121	.768		

Hypothesis 1B (BADS)

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	BADS_1
2	BAS_2

Between-Subjects Factors

	Value Label	N
Condition	1.00000	63
	2.00000	60

Multivariate Tests^b

Effect		Value	F	Hypothesis df	Error df	Sig.
time	Pillai's Trace	.001	.117 ^a	1.000	120.000	.733
	Wilks' Lambda	.999	.117 ^a	1.000	120.000	.733
	Hotelling's Trace	.001	.117 ^a	1.000	120.000	.733
	Roy's Largest Root	.001	.117 ^a	1.000	120.000	.733
time * PITNV_1	Pillai's Trace	.016	1.960 ^a	1.000	120.000	.164
	Wilks' Lambda	.984	1.960 ^a	1.000	120.000	.164
	Hotelling's Trace	.016	1.960 ^a	1.000	120.000	.164
	Roy's Largest Root	.016	1.960 ^a	1.000	120.000	.164
time * Condition	Pillai's Trace	.022	2.697 ^a	1.000	120.000	.103
	Wilks' Lambda	.978	2.697 ^a	1.000	120.000	.103
	Hotelling's Trace	.022	2.697 ^a	1.000	120.000	.103
	Roy's Largest Root	.022	2.697 ^a	1.000	120.000	.103

a. Exact statistic

b. Design: Intercept + PITNV_1 + Condition
Within Subjects Design: time

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
time	Sphericity Assumed	31.920	1	31.920	.117	.733
	Greenhouse-Geisser	31.920	1.000	31.920	.117	.733
	Huynh-Feldt	31.920	1.000	31.920	.117	.733
	Lower-bound	31.920	1.000	31.920	.117	.733
time * PITNV_1	Sphericity Assumed	536.199	1	536.199	1.960	.164
	Greenhouse-Geisser	536.199	1.000	536.199	1.960	.164
	Huynh-Feldt	536.199	1.000	536.199	1.960	.164
	Lower-bound	536.199	1.000	536.199	1.960	.164
time * Condition	Sphericity Assumed	737.862	1	737.862	2.697	.103
	Greenhouse-Geisser	737.862	1.000	737.862	2.697	.103
	Huynh-Feldt	737.862	1.000	737.862	2.697	.103
	Lower-bound	737.862	1.000	737.862	2.697	.103
Error(time)	Sphericity Assumed	32828.784	120	273.573		
	Greenhouse-Geisser	32828.784	120.000	273.573		
	Huynh-Feldt	32828.784	120.000	273.573		
	Lower-bound	32828.784	120.000	273.573		

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	78984.586	1	78984.586	122.701	.000
PITNV_1	163.366	1	163.366	.254	.615
Condition	128.568	1	128.568	.200	.656
Error	77245.666	120	643.714		

T-Tests (as trend level reached)

Paired Samples Statistics

Condition	Mean	N	Std. Deviation	Std. Error Mean
Positive Imagery Pair 1 BADS_1	64.90	63	19.315	2.434
BAS_2	83.25	63	24.331	3.065
Controls Pair 1 BADS_1	66.15	60	16.385	2.115
BAS_2	78.50	60	24.391	3.149

Paired Samples Test

Condition			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Positive Imagery	Pair 1	BADS_1 - BAS_2	-18.349	24.606	3.100	-24.546	-12.152	-5.919	62	.000
Controls	Pair 1	BADS_1 - BAS_2	-12.350	22.244	2.872	-18.096	-6.604	-4.301	59	.000

Negative Imagery

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	PITNL_1
2	PITNL_2

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
time	Sphericity Assumed	.766	1	.766	5.252	.024
	Greenhouse-Geisser	.766	1.000	.766	5.252	.024
	Huynh-Feldt	.766	1.000	.766	5.252	.024
	Lower-bound	.766	1.000	.766	5.252	.024
time * PITNV_1	Sphericity Assumed	1.810	1	1.810	12.404	.001
	Greenhouse-Geisser	1.810	1.000	1.810	12.404	.001
	Huynh-Feldt	1.810	1.000	1.810	12.404	.001
	Lower-bound	1.810	1.000	1.810	12.404	.001
time * Condition	Sphericity Assumed	.000	1	.000	.001	.970
	Greenhouse-Geisser	.000	1.000	.000	.001	.970
	Huynh-Feldt	.000	1.000	.000	.001	.970
	Lower-bound	.000	1.000	.000	.001	.970
Error(time)	Sphericity Assumed	17.660	121	.146		
	Greenhouse-Geisser	17.660	121.000	.146		
	Huynh-Feldt	17.660	121.000	.146		
	Lower-bound	17.660	121.000	.146		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	69.408	1	69.408	114.854	.000
PITNV_1	9.718	1	9.718	16.081	.000
Condition	.014	1	.014	.024	.878
Error	73.122	121	.604		

Multivariate Tests^b

Effect		Value	F	Hypothesis df	Error df	Sig.
time	Pillai's Trace	.000	.001 ^a	1.000	122.000	.975
	Wilks' Lambda	1.000	.001 ^a	1.000	122.000	.975
	Hotelling's Trace	.000	.001 ^a	1.000	122.000	.975
	Roy's Largest Root	.000	.001 ^a	1.000	122.000	.975
time * Condition	Pillai's Trace	.023	2.879 ^a	1.000	122.000	.092
	Wilks' Lambda	.977	2.879 ^a	1.000	122.000	.092
	Hotelling's Trace	.024	2.879 ^a	1.000	122.000	.092
	Roy's Largest Root	.024	2.879 ^a	1.000	122.000	.092

a. Exact statistic

b. Design: Intercept + Condition

Within Subjects Design: time

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	PITNV_1
2	PITNV_2

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
time	Sphericity Assumed	.000	1	.000	.001	.975
	Greenhouse-Geisser	.000	1.000	.000	.001	.975
	Huynh-Feldt	.000	1.000	.000	.001	.975
	Lower-bound	.000	1.000	.000	.001	.975
time * Condition	Sphericity Assumed	.824	1	.824	2.879	.092
	Greenhouse-Geisser	.824	1.000	.824	2.879	.092
	Huynh-Feldt	.824	1.000	.824	2.879	.092
	Lower-bound	.824	1.000	.824	2.879	.092
Error(time)	Sphericity Assumed	34.910	122	.286		
	Greenhouse-Geisser	34.910	122.000	.286		
	Huynh-Feldt	34.910	122.000	.286		
	Lower-bound	34.910	122.000	.286		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	time	Type III Sum of Squares	df	Mean Square	F	Sig.
time	Linear	.000	1	.000	.001	.975
time * Condition	Linear	.824	1	.824	2.879	.092
Error(time)	Linear	34.910	122	.286		

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	2766.927	1	2766.927	3010.844	.000
Condition	2.219	1	2.219	2.415	.123
Error	112.116	122	.919		

Paired Samples Statistics

Condition			Mean	N	Std. Deviation	Std. Error Mean
Positive Imagery	Pair 1	PITNV_1	3.1873	63	.87169	.10982
		PITNV_2	3.3048	63	.69594	.08768
	Pair 2	PITNL_1	3.1254	63	.64232	.08092
		PITNL_2	2.9222	63	.62950	.07931
Controls	Pair 1	PITNV_1	3.4918	61	.75040	.09608
		PITNV_2	3.3787	61	.77570	.09932
	Pair 2	PITNL_1	3.2459	61	.64228	.08224
		PITNL_2	2.9820	61	.67590	.08654

Paired Samples Test

Condition			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Positive Imagery	Pair 1	PITNV_1 - PITNV_2	-.11746	.73497	.09260	-.30256	.06764	-1.269	62	.209
	Pair 2	PITNL_1 - PITNL_2	.20317	.54977	.06926	.06472	.34163	2.933	62	.005
Controls	Pair 1	PITNV_1 - PITNV_2	.11311	.77813	.09963	-.08617	.31240	1.135	60	.261
	Pair 2	PITNL_1 - PITNL_2	.26393	.58024	.07429	.11533	.41254	3.553	60	.001

Analysis of IGT scores at post-OxIGen

Group Statistics

	Condition	N	Mean	Std. Deviation	Std. Error Mean
IGT_Pos_Viv	Positive Imagery	63	4.1368	.85049	.10715
	Controls	61	4.1810	.82537	.10568
IGT_Neg_Viv	Positive Imagery	63	3.7446	.94286	.11879
	Controls	61	4.0197	.92446	.11837
IGT_Pos_Perspective	Positive Imagery	63	1.9479	.80652	.10161
	Controls	61	2.0148	.92774	.11879
IGT_Neg_Perspective	Positive Imagery	63	2.3140	.81546	.10274
	Controls	61	2.4511	1.01031	.12936

Independent Samples Test

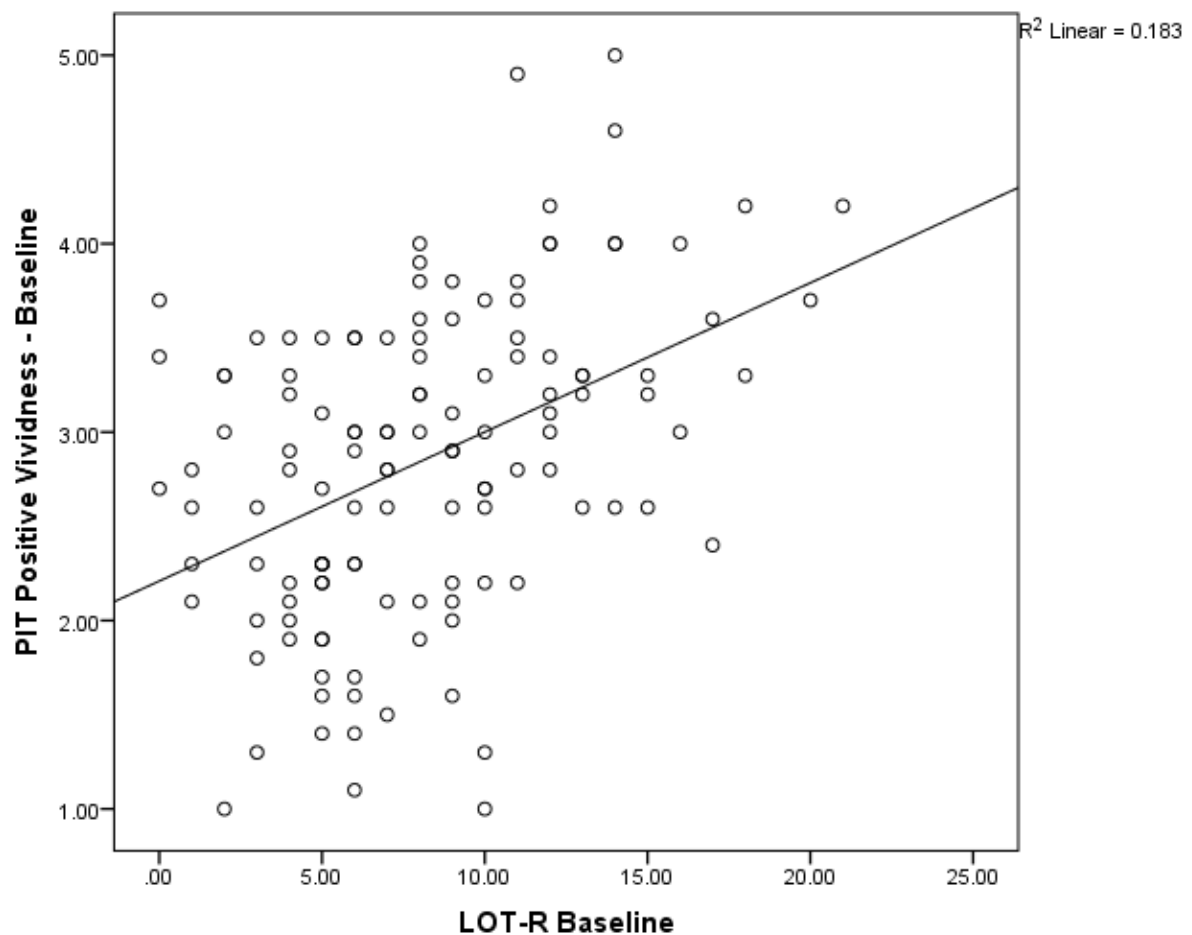
		Levene's Test for Equality of Variances		t-test for Equality			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
IGT_Pos_Viv	Equal variances assumed	.000	.985	-.293	122	.770	-.04416
	Equal variances not assumed			-.293	121.999	.770	-.04416
IGT_Neg_Viv	Equal variances assumed	.196	.659	-1.640	122	.104	-.27507
	Equal variances not assumed			-1.640	121.980	.104	-.27507
IGT_Pos_Perspective	Equal variances assumed	1.417	.236	-.428	122	.669	-.06682
	Equal variances not assumed			-.427	118.522	.670	-.06682
IGT_Neg_Perspective	Equal variances assumed	4.324	.040	-.833	122	.406	-.13718
	Equal variances not assumed			-.830	115.207	.408	-.13718

Correlation between optimism and vividness of positive future imagery

Correlations

		PITPV_1	LOTR_1
PITPV_1	Pearson Correlation	1	.428**
	Sig. (2-tailed)		.000
	N	124	124
LOTR_1	Pearson Correlation	.428**	1
	Sig. (2-tailed)	.000	
	N	124	124

** . Correlation is significant at the 0.01 level (2-tailed).



Correlations

Control Variables			PITPV_1	LOTR_1
BDI_1	PITPV_1	Correlation	1.000	.398
		Significance (2-tailed)	.	.000
		df	0	121
	LOTR_1	Correlation	.398	1.000
		Significance (2-tailed)	.000	.
		df	121	0

Analysis of change scores in optimism

Within-Subjects Factors

Measure: MEASURE_1

time	Dependent Variable
1	LOTR_1
2	LOTR_2

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	time	Type III Sum of Squares	df	Mean Square	F	Sig.
time	Linear	.563	1	.563	.157	.693
time * PITNV_1	Linear	1.329	1	1.329	.370	.544
time * Condition	Linear	1.206	1	1.206	.336	.563
Error(time)	Linear	434.386	121	3.590		

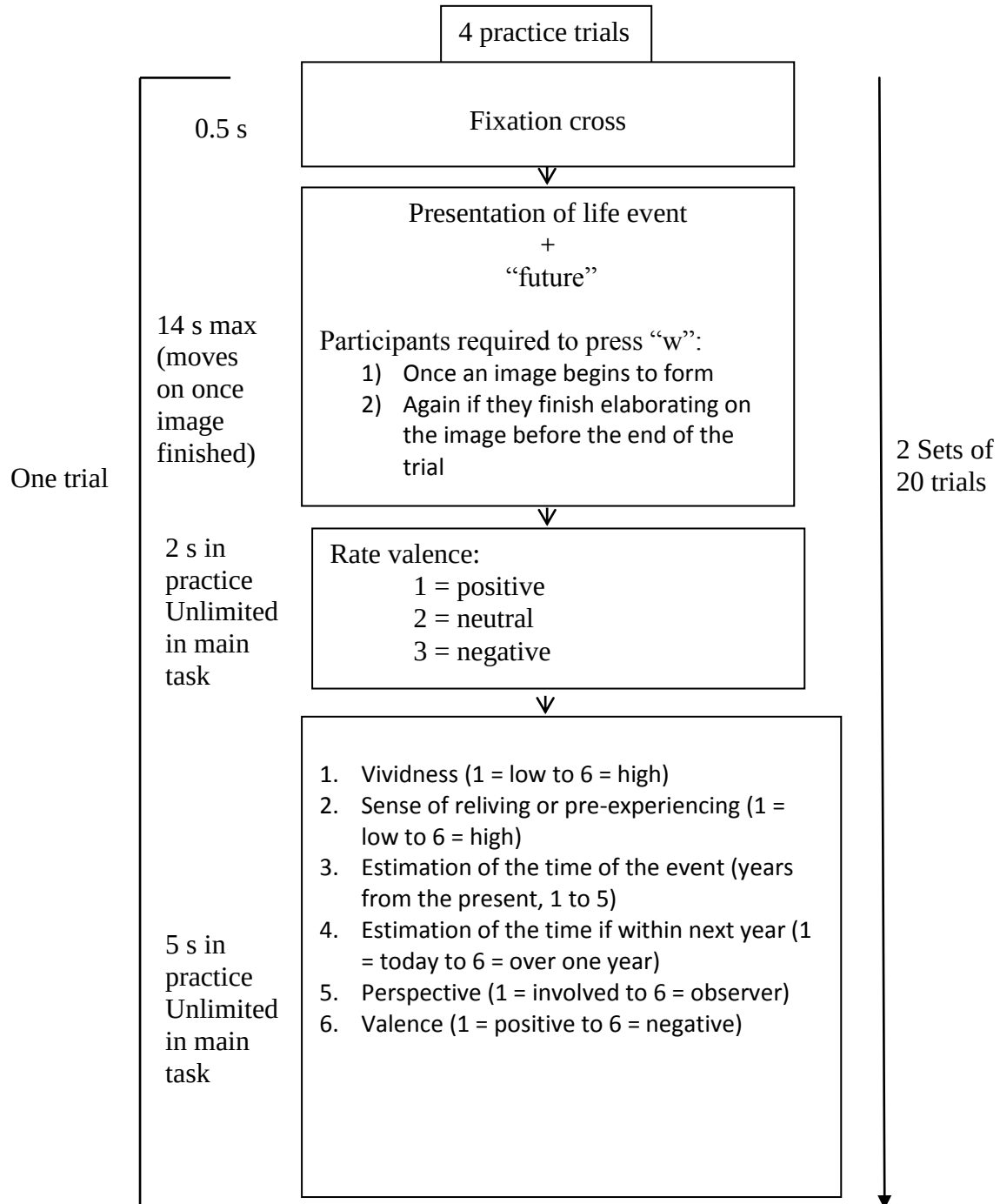
Paired Samples Statistics

Condition		Mean	N	Std. Deviation	Std. Error Mean
Positive Imagery	Pair 1 LOTR_1	8.1587	63	4.31504	.54364
	LOTR_2	9.0000	63	4.95138	.62381
Controls	Pair 1 LOTR_1	8.1311	61	4.67074	.59803
	LOTR_2	9.3115	61	5.34958	.68494

Paired Samples Test

Condition			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Positive Imagery	Pair 1	LOTR_1 - LOTR_2	-.84127	2.38413	.30037	-1.44171	-.24083	-2.801	62	.007
Controls	Pair 1	LOTR_1 - LOTR_2	-1.18033	2.94113	.37657	-1.93359	-.42707	-3.134	60	.003

APPENDIX 5.3: The Image Generation Task used in Experiment 4 and adapted from Sharot, Riccardi et al. (2007)



Practice trials:

- Having lunch
- Looking at old photographs
- Getting a surprise
- Learning a new skill

Main trials:

Going to the theatre
Receiving a large amount of money
Visiting a museum
Taking a day trip
Meeting a significant other for the first time
Car crash
Going to a film the day it opens
Going to a funeral
Visiting a distant relative
Having something stolen /being robbed
Playing a board game
Getting lost
Receiving college/job rejection letter
The death of someone close
Food poisoning
An argument with parents
Having a distant friend/relative visit you
Unemployment/losing a job
Being injured
Winning an award
Going on a mini-road trip
Being harassed
Terrorist attacks
Fighting with your best friend
Playing in the snow
Getting ill
Going to a ball game
Seeing a band in concert
Embarrassing yourself
Getting locked out of your house
Fixing a broken possession
Getting a traffic ticket
Attending a friend's birthday party
Eating an exotic fruit for the first time
Getting rejected by someone
Losing an important possession
Seeing someone famous in person
Going to the zoo