

'They flash upon that inward eye'

Emily A. Holmes (Spearman Medal winner), Ella L. James, Simon E. Blackwell and Susie Hales look at mental imagery in the lab and the clinic

Seeing mental pictures of what has been and what could be is a fundamental human experience, and carries with it particularly compelling emotional effects. However, in psychological disorders, mental imagery can become part of the problem, from vivid recollections of trauma to attractive images of the future which may drive self-destructive behaviour. In order to better understand mental imagery, its impact on emotion and so forth, the field of experimental psychopathology offers a creative space for innovation in theory and treatment.

For oft, when on my couch I lie
In vacant or in pensive mood,
They flash upon that inward eye
Which is the bliss of solitude;
And then my heart with pleasure fills,
And dances with the daffodils.
William Wordsworth, 'Daffodils', 1804

We experience mental imagery when we see with our mind's eye, hear with our mind's ear, and so on (Kosslyn et al., 2001). Imagery has fascinating properties, allowing us to remember or to make creative leaps. It can also cause profound distress. Involuntary memories can be pleasant (e.g. the daffodils in Wordsworth's poem), but flashbacks are a hallmark feature of post-traumatic stress disorder (PTSD) – involuntary images of 'hotspots' from a trauma (Grey & Holmes, 2008). Intrusive, affect-laden images cause distress across a range of psychological disorders, not only PTSD but also in social phobia, depression, agoraphobia, and so forth (Holmes & Hackmann, 2004)

It would be strange if there were one type of memory that was only for patients, and another type of 'flashing' memory for non-clinical cases. Taking a continuum approach allows us to use experiments in healthy volunteers in the laboratory to inform observations about mental imagery in the clinic, and vice versa.

In this article we will be considering

mental imagery's relationship to emotion, how mental imagery can pull us back into the past and push us into the future, and how focusing on the mechanisms of imagery could be a crucial way to develop ever more effective treatments of psychological disorders.

Mental imagery and emotion

It has long been assumed that if we imagine something (rather than just think about it in words) it has a particularly strong impact on our emotions. However, while images are striking to clinicians, surprisingly little scientific research had directly addressed this assumption about mental imagery. We tested this hypothesis with a series of experiments using both a 'cognitive bias modification' paradigm (Holmes & Mathews, 2005; Holmes et al., 2006) and an 'evaluative conditioning' paradigm (Holmes, Mathews et al., 2008). The former delivers repeated exposure to scenarios stimuli in order to train individuals to resolve ambiguous information in say a positive, rather than anxiety provoking, manner. In the latter, ambiguous pictures are paired with word captions which can make them positive or negative, and the emotional shift is assessed. Using both types of paradigm allowed us to show that the pattern of findings held up even when tested in different ways.

Across paradigms, results pointed to the conclusion that compared to verbal thought, mental imagery has a more powerful impact on emotion. This was the case for both negative and positive emotion. Thus, our work was the first to demonstrate experimentally that mental images have a more powerful impact on emotion than their verbal counterpart. Moving from the lab to the clinic, this is an interesting matter given the historical focus on the verbal in psychotherapy such as cognitive behaviour therapy (CBT). It suggests that it is indeed important to

"mental imagery can pull us back into the past and push us into the future"

assess and work with imagery in emotional disorders (Holmes & Mathews, 2010). Focusing on imagery can also lead to suggestions for treatment innovation.

Reducing flashbacks

An interesting aspect of involuntary trauma memory is that it typically takes the form of mental imagery. In the clinic we refer to these involuntary memories as 'flashbacks'. For example, after a car crash a victim may have flashbacks of the sight and sounds of a red car looming towards them.

Experimental studies of intrusive memory formation have used films with traumatic content as an analogue for trauma. This allows us to study flashback formation using healthy volunteers and test hypotheses. Over several years, we systematically dissected the nature of trauma flashbacks, using a concurrent task methodology, designed to probe sensory from verbal features. We found, for example, that when cognitive tasks that interfered with someone's ability to hold a mental image in mind (e.g. tapping a specific complex pattern on a keypad concealed from view) were performed

during viewing of a traumatic film, flashbacks were reduced over the subsequent week (Holmes, Brewin & Hennessy, 2004). In contrast concurrent verbal tasks (such as counting backwards in increments from a predetermined number) appeared to increase flashback frequency (Bourne et al., 2010).

In translating such experimental findings to the clinic, it would clearly be unlikely that people would be able to perform a concurrent task during a real world trauma! Therefore we were curious to find out if we could administer the tasks after rather than during the trauma stimulus. We found that, when given half an hour post-trauma (the traumatic film), an imagery-competing task – the visuospatial computer game Tetris – protected against flashback development; (Holmes, James et al., 2009). In contrast, a verbal task half an hour afterwards actually increased flashbacks (Holmes, James et al., 2010). The beneficial effects of Tetris were still seen when it was played four hours after the event. This is consistent with the idea that there is a biological time window during which memories are being consolidated after an event, and that targeting intrusive

memory during this time window may be beneficial. For an overview of the latter experiment see Figure 1.

Overall, this is the first demonstration that visuospatial tasks presented soon after a trauma can reduce pathological flashback formation. We lack evidence-based interventions for the aftermath of trauma e.g. a bombing/car accident/rape (see, for example, the Cochrane Review by Rose et al., 2002). Perhaps simple visuospatial tasks, such as Tetris, could be further researched as a 'cognitive vaccine' against trauma flashbacks; that is to help reduce the impact of stressful events in the early aftermath of trauma (see Holmes, James et al., 2010). Moreover, since our results show that relatively simple laboratory tasks can effect our intrusive memories, this makes us curious to better understand how the everyday tasks we engage as we go about our routine activities may actually be influencing our later memories.

'Flashforwards'

Much of the literature on intrusive imagery has focused on 'flashbacks' to past events. However, another function of mental imagery is to allow us to simulate possible future events: we can combine 'never-experienced' images to create potential future scenarios. Imagining a future action has been found to be causally linked to increased likelihood of carrying out the imagined action (Libby et al., 2007). This may be very useful in some contexts, for example seeing oneself revising for an exam, but in a clinical setting could also be potentially toxic if the image is of self-harm.

In fact, a flashforward can be even more traumatic. In the visual arts, there are several striking examples of romantic, vivid depictions of suicide, for example in Henry Wallis's painting entitled 'The Death of Chatterton' (1856). This type of image may be like the type of scene that might be imagined in a suicidal

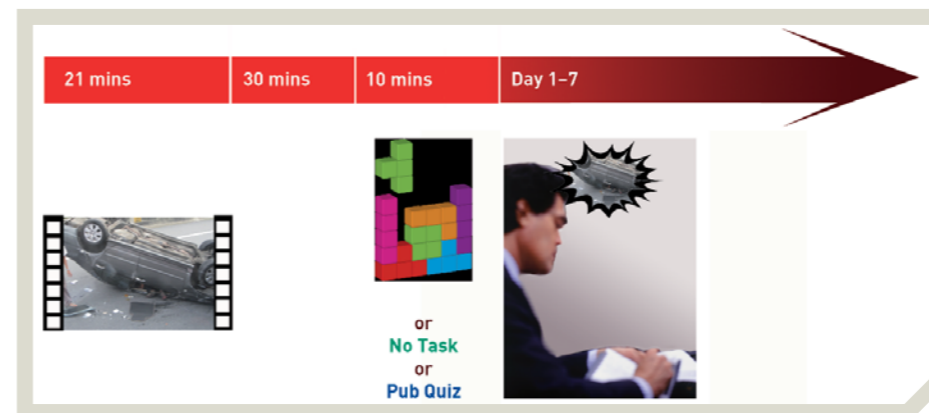


Figure 1 Non-clinical participants watch a traumatic film designed to induce image-based intrusions analogous to PTSD flashbacks. We then look at the impact of 'Tetris' (visuospatial task), 'pub quiz' (verbal task) or no task on flashbacks recorded over the following week in a diary.

question

If mental imagery has a powerful impact on emotion, beliefs and behaviour etc - should we be doing more research on imagery across the many branches of psychology?

resources

Experimental Psychology and Cognitive Therapy (EPaCT) website: www.psychiatry.ox.ac.uk/epct
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flashforward. Strikingly the way the image is depicted may contain positive in addition to negative emotional overtones. Recent research has provided evidence that individuals with depression may experience intrusive 'flashforward' images of suicide at times of suicidal ideation. In an exploratory study, Holmes, Crane et al. (2007) interviewed 15 patients with a history of depression and suicidality to investigate their experience of images and verbal thoughts at the time of greatest despair or suicidal ideation. All patients reported intrusive, repetitive images related to suicide. For example, one described seeing themselves repeatedly jumping from a specific cliff. This image was associated with a feeling of salvation and, in fact, the patient had often tried to reach the cliff with the intention of acting on the image. Recently, these findings have been extended using a larger community sample (Crane et al., 2011). If images are influential in terms of future behaviour, then it suggests that asking about imagery during clinical risk assessments for suicidality may be of use.

Imagery as an amplifier in bipolar disorder

Bipolar disorder is characterised by manic episodes of elevated mood interspersed

with episodes of depression. In between full-blown episodes, emotional instability is common and disabling. Given the impact of imagery on emotion, we have suggested that imagery may act as an 'emotional amplifier' in bipolar disorder (Holmes, Geddes et al., 2008) (see Figure 2). For example, we noticed in the clinic that some of our patients reported having flashforwards in mania of vivid, exciting future events.

We found that those at risk for bipolar disorder, as indicated by the Mood Disorders Questionnaire (Hirschfeld et al., 2003) score higher on a measure of intrusive prospective imagery called the Impact of Future Events Scale (IFES: Deeproose et al., in press). An example of how prospective imagery can fuel mood can be taken from our clinic: a patient described having such exciting positive images of new design projects that he stayed up all night filling notebooks with ideas from his imagination. Though initially useful, as his mood elevated and mania took over these intrusive images became incoherent, unfeasible and detrimental. On a related note, imagery may also help explain the



The Death of Chatterton

well-documented link between bipolar disorder and creativity, perhaps the very 'advantage' that the disorder confers (Murray & Johnson, 2010).

Bipolar disorder has long been thought of from a biological perspective and as a challenging frontier for psychological treatments. Existing psychological treatments appear to show limited effects compared to say treatments for psychosis, a comparably severe disorder. By taking a new approach to bipolar disorder based on experimental science it may be possible to develop novel, and

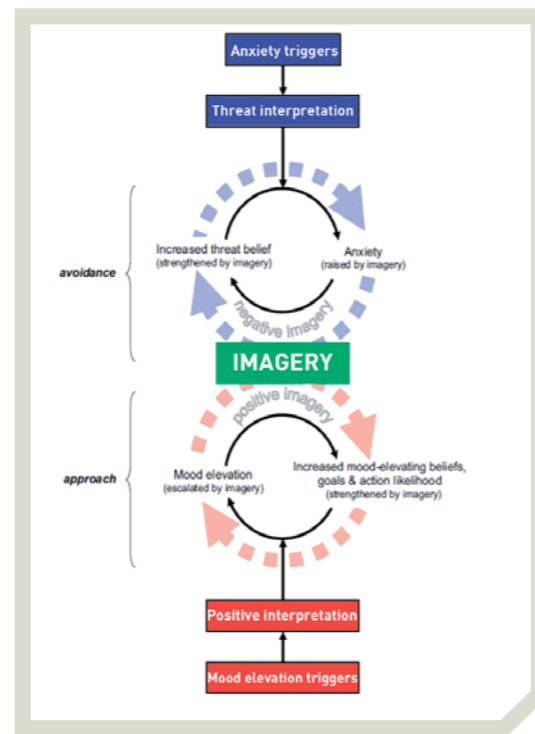


Figure 2 - Emotional amplifier?

potentially imagery-based, augmentative treatments to help improve quality of life.

Imagining a rosier future

We noted earlier the concept of developing a cognitive vaccine against flashbacks. We also use the term 'cognitive vaccine' in our development of computerised paradigms involving cognitive bias modification. One bias modification we have been working on for depression encourages participants to generate more positive mental images of future situations.

Imagine that you are walking down the road and someone you know passes by without acknowledging you. How do you feel? Perhaps you would shrug it off, assuming that their mind was elsewhere and they had simply not seen you. If you were depressed, you would be more likely to think 'They're ignoring me - they don't like me', sparking a downward spiral of low mood and self-critical thoughts.

Because ambiguity is inherent in most of the small everyday occurrences that make up our lives, the negative thinking style, or 'cognitive biases', that characterise depression can have a major impact on mood. Identifying and modifying these biases is therefore a major focus of psychological therapies such as CBT.

What if it were possible to develop a more positive cognitive bias by using a computer program that you could access from your own home? Cognitive bias modification (CBM), which originated in work by Mathews and Mackintosh (2000), aims to modify cognitive biases directly using simple training procedures (for a recent overview see MacLeod et al., 2009). In one such paradigm the participant listens to a series of scenarios that start out ambiguous as to their potential outcome, but then all resolve positively. For example, 'You ask a friend to look over some work you have done. They come back with some comments which are *all very positive*' (resolution in italics). Note that the scenario did not have to end this way; the friend could have returned with comments that were highly critical. Participants are instructed to imagine themselves in the scenarios, as if actively involved and seeing them through their own eyes. We have demonstrated in a series of studies that this positive 'field perspective' imagery is important for the effectiveness of the positive interpretation bias training (Holmes, Coughtrey et al., 2008). Thinking about the positive scenarios verbally does not have the same impact on mood, and in fact can even make people feel worse (Holmes, Lang et al., 2009; Holmes, Mathews et al., 2006). Our CBM paradigms for depression have therefore been developed in order to encourage positive, field perspective imagery whether by providing people with short scripts or photographs (see Figure 3). Thus, in positive-imagery CBM, participants are trained to generate both positive interpretations and positive imagery in response to ambiguity. This could be useful not only in improving mood but also in offering protection against mood deterioration in the face of stress - acting as a cognitive vaccine against depressed mood (Holmes, Lang, et al., 2009).

In an initial case series investigating positive-imagery CBM in a clinical sample of people with depression, seven participants completed a session of CBM at home each day for one week (Blackwell & Holmes, 2010). The CBM had significant effects in reducing symptoms of depression, instilling a more positive cognitive bias, and improving general mental health. Although this research is

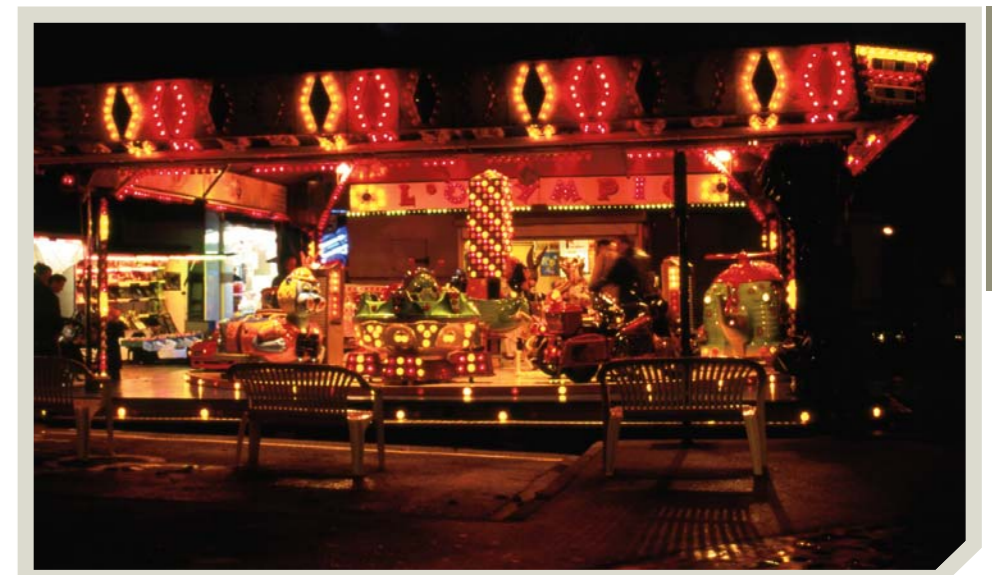


Figure 3 - an example of the type of picture used. The image's ambiguity allows it to be captioned 'Vibrant' or 'Lonely'

currently in the early stages of making the transition from lab to clinic, these initial results are encouraging. They suggest that CBM has potential as a novel computerised intervention to tackle negative cognitive biases, helping people with depression to overcome low mood and hopelessness through imagining a rosier future. Moreover, with the continued development of the CBM technology - for example, through translation to an internet platform - perhaps we can be optimistic about the prospects for an innovative and accessible intervention for at least aspects of depression.

A cognitive science/clinical psychology interweave

Research in experimental psychopathology informs our understanding of the mechanisms underlying psychological disorders. The leading therapies in CBT have been informed by cognitive science. Treatment innovation is still required since there are areas where we lack treatments (e.g. PTSD prevention) and even the best treatments do not yet work

for everybody (e.g. for bipolar disorder). Basic cognitive science is required for treatment innovation in mental health. We are particularly curious about mental imagery and it presents many opportunities for future research since we now know that images occur across psychological disorders beyond PTSD e.g. depression, agoraphobia and bipolar disorder (Holmes, Arntz, & Smucker, 2007).

Returning to the daffodils that 'flash upon that inward eye' - flashes may occur that are positive as well as negative. The field of involuntary memory is in its infancy (Mace, 2007). Areas such as this in cognitive science may be informed both by clinical studies (e.g. regarding intrusive imagery in patients) as well as by experimentally addressing these 'flashes' of involuntary memory by using analogue and non-clinical studies. In summary, both treatment innovation across psychological disorders, and theory regarding mental imagery for basic cognitive science, will benefit from a curiosity-fuelled interweave between lab and clinic. Experimental psychopathology offers us just this opportunity.



Emily A. Holmes leads the Experimental Psychopathology and Cognitive Therapy Research Group in the Department of Psychiatry, University of Oxford. She is a Wellcome Trust Clinical Fellow (WT088217). emily.holmes@psych.ox.ac.uk

I Ella James is a PhD student at EPaCT ella.james@psych.ox.ac.uk

I Simon Blackwell is a Clinical Psychologist with EPaCT simon.blackwell@psych.ox.ac.uk

I Susie Hales is a Clinical Psychologist with EPaCT susie.hales@psych.ox.ac.uk

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