

**An investigation into the effectiveness of a brief imagery-based
“defusion” strategy in reducing nicotine cravings**

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**D.Clin.Psy thesis (Volume 1), 2015
University College London**

UCL Doctorate in Clinical Psychology

Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signature:

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Date: 24.09.2015

Overview

Volume 1 of this thesis is presented in three parts. Part 1 is a systematic review of experimental or quasi-experimental studies that investigate the impact of the strategic adoption of vantage perspective on affect. Vantage perspective describes either adopting a first- or third-person perspective, either in mental imagery or verbal modalities. Part 2 describes a study exploring the impact of two mental imagery craving regulation strategies in cigarette smokers on craving, affect and smoking behaviour. One strategy is based on “defusion,” a technique used within Acceptance and Commitment Therapy, and the other is based on the use of imagery replacement, a cognitive psychology approach. Smoking behaviour is measured explicitly through latency to smoke and number of cigarettes smoked, and implicitly through the use of a stimulus-response task measuring approach and avoidance behaviour. Part 3 is a critical appraisal of three elements of the empirical paper, designing the mental imagery craving regulation strategies, the limitations of the study design, and the difficulties of the recruitment process and the subsequent impact on the empirical study.

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Acknowledgements

Firstly, I would like to thank my participants. I admire their resolve to try to quit smoking, given the challenges they face. Thanks too to friends and family for trying to help me recruit, even if the longed-for influx of participants never arrived. Thanks to my supervisor, Dr Sunjeev Kamboj, who responded to my enthusiasm for designing an Acceptance and Commitment therapy based mental imagery strategy with enormous support and consistent availability throughout. His thoughtful comments and advice have improved the project at all points. My final heartfelt thanks go to my parents, Jo and Andrew Wallace-Hadrill, without whose support, both logistical and emotional, this thesis would not have been possible.

Part 1: Literature Review

The impact of perspective change as a cognitive reappraisal strategy on affect

Abstract

Aims

Adopting a distanced third-person perspective is a cognitive reappraisal strategy argued to be effective in emotion regulation. However, studies of psychological disorders suggest spontaneous adoption of a third-person perspective may be a counter-productive avoidance strategy. This review aimed to identify studies that investigate the deliberate adoption of a third- or first-person vantage perspective and its impact on affect.

Method

A systematic review was conducted across four databases. After exclusion criteria were applied, 40 studies were identified that investigated the impact of vantage perspective, in both imagery and verbal modalities, on self-reported affect, in both clinical and non-clinical samples.

Results

Studies are organized for the purposes of this review into categories of low mood, anxiety, anger, self-conscious emotions such as guilt, positive and negative autobiographical memories, and positive emotions. Use of the third-person perspective was mainly found to be associated with a reduction in both positive and negative affect and affect intensity across these domains. However, a number of studies included measures of semantic change, which appeared to be a key mediator in reduction of affect across a variety of indices.

Conclusions

This review found that strategically adopting a third-person perspective is linked to lower affect intensity regardless of valence. It also indicates that a third-person perspective has the potential to introduce new information that regulates emotion. The subsequent change in meaning may thus differentiate it from an avoidance strategy.

1. Introduction

Effective emotion regulation is an essential ability for managing emotions of varying valence and strength (Gross, 1998b; Koole, 2009). Emotion regulation strategies can be automatically deployed, or may be strategic and require effort. Under- or over-use of certain emotion regulation strategies can be associated with a broad range of psychological difficulties (Berking & Wupperman, 2012; Kring & Werner, 2004). Ochsner and Gross (2005) argue that emotion regulation strategies can be broadly categorised as behavioural and cognitive. Behavioural strategies are intended to reduce the *expression* of emotion and tend not to modulate the felt intensity of emotional experiences. By contrast, cognitive emotion regulation strategies can act as contextual modulators, either altering the situation or context within which emotional cues and resulting affect are experienced (antecedent strategies), or used after the onset of an emotional response (response-focused strategies) (Gross, 1998a).

1.1. Reappraisal

Reappraisal is a response-focused cognitive regulation strategy. Ochsner and Gross (2008) note that reappraisal is typically operationalised in studies in one of two ways. Information can be *reinterpreted*, i.e. a new meaning is ascribed to a situation, usually through verbal means, that alters its affective impact or valence. Research suggests that lower spontaneous use of this type of reappraisal, or lower ability to use reappraisal strategies in response to aversive experiences, is linked to both acute and enduring psychological difficulties (e.g. T. S. Davis et al., 2014; Garnefski et al., 2002; O'Driscoll, Laing, & Mason, 2014).

Alternatively, a third-person, detached perspective can be used to *distance* the self from the stimuli, thereby achieving the same goal of altering the affective impact (Ochsner & Gross, 2008). In this context, 'perspective' refers to the visual vantage point adopted, but can also include verbal distancing strategies. In these reappraisal strategies, the perspective adopted by the individual on their experience permits the introduction of new and/or regulatory information. Nonetheless, the extent to which this is an effective strategy regardless of type of emotion or clinical difficulty is not clear. Thus, this review aims to systematically evaluate experimental studies that examine the impact of the adoption of a third- or first-person perspective on affect, in both non-clinical and clinical populations.

1.2. Vantage perspective in memories

As noted above, one method of operationalising perspective has been to consider the visual 'vantage point.' This refers primarily to a third-person or a first-person perspective (Nigro & Neisser, 1983). Third-person perspectives are those experienced as if from the perspective of an observer (i.e. are allocentric), and first-person perspectives are those experienced as if through one's own eyes (i.e. egocentric). People may habitually experience one perspective predominantly during autobiographical memory recall, or a mixture of both perspectives (Rice & Rubin, 2009).

First-person perspective memories seem to have a stronger relationship with affect (Nigro & Neisser, 1983), and this relationship is true for both positive and negative memories, compared with neutral events (D'Argembeau, Comblain, & Van Der Linden, 2003). First-person memories are linked to greater amounts of

reported emotion at the time of the event, and to current intensity at recall (Siedlecki, 2015). McIsaac and Eich (2002) found that accounts of first-person perspective episodic memories contained more detail about affective reactions, in addition to more sensory information and references to psychological states. By contrast, third-person memories were linked to more detached qualities such as location and visual information.

1.3. Mental imagery and verbal processing

The studies reported above concentrate on memories experienced primarily as visual mental images. Mental imagery can be described as the experience of, for example, ‘seeing with the mind’s eye’ (Kosslyn, Ganis, & Thompson, 2001), and mental imagery manipulations have been shown to have a greater effect on emotion, compared to use of verbal strategies (Holmes & Mathews, 2005; Pictet & Holmes, 2013). Mental imagery has been argued to have strong links with clinical disorders (Hagenaars & Holmes, 2012; Holmes, Iyadurai, Jacob, & Hales, 2015). Thus, further understanding perspective within mental imagery, and its impact, is a key objective in clinical psychology.

However, verbal modalities have also been shown to be important in clinical approaches, for example, ‘self-talk’ (e.g. in eating disorders, Scott, Hanstock, & Thornton, 2014) and the therapeutic use of written forms of expression (Pennebaker & Evans, 2014). The language used mirrors the visual vantage perspective, from the first-person pronoun, “I,” to third-person pronouns, e.g. “she/he.” Further, research is suggestive of a link between reduced use of first-person pronouns in diary writing and an increase in a more distanced style of processing events (Cohn, Mehl, & Pennebaker, 2004) which connects

conceptually to the use of the third-person visual perspective. Thus both mental imagery and verbal (i.e. word-based) modalities could both be important targets for intervention.

1.4. Vantage perspective and symptoms of psychological disorder

A number of studies have explored the phenomenology of the visual vantage perspective adopted, both during spontaneous autobiographical recall and instructed recall, in the context of various psychological disorders. These studies have employed a variety of methodologies, from correlational designs to experimental or quasi-experimental studies. Many studies investigate perspective as a dependent variable, i.e. following instructed recall, or as correlated with other dependent variables such as self-reported affect.

Several studies have shown that adults and adolescents with social phobia tend to experience images of themselves in a social situation from a third-person perspective (D'Argembeau, Van der Linden, d'Acremont, & Mayers, 2006; Hackmann, Clark, & McManus, 2000; Hackmann, Surawy, & Clark, 1998; Schreiber & Steil, 2013; Wells, Clark, & Ahmad, 1998). Indeed, a distorted third-person self image is argued to be a key maintaining factor within the cognitive model of social phobia (Clark & Wells, 1995). Higher degrees of anxiety appear to be linked to increased third-person perspective in social phobia (Coles, Turk, Heimberg, & Fresco, 2001) and one study also demonstrated an *increase* in third-person perspective in social phobic memories over time (Coles, Turk, & Heimberg, 2002).

Other anxiety disorders share a similar pattern of increased third-person perspective, for example, in agoraphobia (Day, Holmes, & Hackmann, 2004; Wells & Papageorgiou, 1999) and body-dysmorphic disorder (Osman, Cooper, Hackmann, & Veale, 2004). The literature for obsessive-compulsive disorder is more mixed. One study showed that obsessive-compulsive traits correlate positively with frequency of third-person memories, which were, however, rated as more emotional than first-person memories (Terry & Barwick, 1998). However, this is contrasted by subsequent research; a later study found that compared to other anxiety disorders, people with OCD reported more first-person memories (Lipton, Brewin, Linke, & Halperin, 2010), and another that people with OCD experienced more first-person images of dirt and contamination compared to a non-clinical control group (Coughtrey, Shafran, & Rachman, 2013). This may link to the hypothesized inflated sense of personal responsibility in OCD (Salkovskis, Shafran, Rachman, & Freeston, 1999).

The presence of post-traumatic symptoms is linked to increased third-person perspective in recall of trauma memories (Berntsen, Willert, & Rubin, 2003). In contrast to OCD and social phobia, trauma memories recalled from this perspective are reported to be less emotional and anxiety provoking (McIsaac & Eich, 2004). However, research has linked higher levels of avoidance to an increased incidence of third-person perspective in trauma memories (Kenny & Bryant, 2007), suggesting that this may be functioning as an avoidance strategy, rather than an adaptive emotional regulation strategy. Indeed, increased recall from a third-person perspective predicts severity of PTSD symptoms both at the time of the trauma and one year later (Kenny et al., 2009). A shift from an initial

first-person perspective to a third-person perspective at twelve months was also associated with higher levels of PTSD symptoms.

Studies on depression have not produced a consistent picture when examining the relationship between symptoms and perspective. Some studies show increased third-person perspective in negative memories (Kuyken & Howell, 2006; Kuyken & Moulds, 2009; Williams & Moulds, 2007), linked to higher use of avoidant strategies such as emotional detachment and rumination as measured by self-report questionnaires (Kuyken & Moulds, 2009; Williams & Moulds, 2007). However, this link between depressive memories and third-person perspective was not replicated in another study (Lemogne et al., 2006). Low mood also appears to be linked with fewer first-person *positive* memories (Bergouignan et al., 2008; Lemogne et al., 2006; Nelis, Debeer, Holmes, & Raes, 2013). Similarly, in another study, although first-person perspective negative memories were linked to increased distress, it was only with *positive* memories that the third-person perspective was linked to experiential avoidance (Moulds, Williams, Grisham, & Nickerson, 2012).

Finally, although the literature describing this relationship between perspective and affect in other disorders is limited, there are similarly studies to suggest that third-person perspective plays a role, for example in schizophrenia (Potheegadoo, Berna, Cuervo-Lombard, & Danion, 2013).

The prevalence of the third-person perspective across so many psychological disorders suggests that this is being adopted as a maladaptive emotion regulation strategy rather than a reappraisal strategy (see e.g. Williams & Moulds, 2007). This is supported by research within a general population sample in which higher

levels of dissociation were associated with a tendency to retrieve memories from a third person perspective (Sutin & Robins, 2010). Thus, spontaneous adoption of the third-person perspective in psychological difficulties appears to function to avoid pain associated with affect. In addition, people with chronic pain who report pain memories from a third-person perspective also report lower pain severity (McNamara, Benson, McGeeney, Brown, & Albert, 2005), indicating that the third-person perspective is effective as a strategy to avoid physical pain.

1.5. The effect of perspective on affect

As noted earlier, emotion regulation strategies such as reappraisal can be employed automatically (unconsciously) or deliberately (through conscious effort). The studies described above describe reports of spontaneously adopted perspectives and the link with affect. However, these designs do not allow for inferences of causality or provide information about the direction of the effect (i.e. whether vantage point influences affect, or vice versa). Thus, while the link between perspective and affect is suggestive of potential future clinical directions in terms of changing perspective, it does not offer information about the ability to adopt either perspective (e.g. whether participants are instructed to adopt a perspective or to change from the perspective spontaneously adopted at recall) or the impact of doing so on affect. Nor do these studies offer insight into whether the third-person perspective is used as an avoidance or reappraisal strategy, or what might differentiate these two strategies. Therefore this review aims to investigate the effect of the deliberate use of perspective (change) on affect. As such, the review concentrates on studies that allow inferences of causality, and therefore suggest potential clinical interventions.

The review addresses the question as to the potential effect of deliberately adopting a certain perspective as an emotion regulation strategy in either mental imagery or verbal modalities. It should be noted that the literature is somewhat hampered by the multiplicity of terms used to describe the same underlying concept (perspective or perspective change). Studies may refer to, for example, “first/third-person” perspective, “field” or “participant/observer” perspective or “distanced”/“immersed” perspectives. Here, the terms first- and third-person perspective will be adopted throughout for consistency. In summary, this review of the literature aims to investigate the associations between vantage perspective, within both verbal and imagery based modalities, and affective experience.

2. Method

A systematic review of the literature was conducted using four databases, PsychInfo, Embase, Medline and Web of Science. The time-frame was limited from 1980 to 2014. The search was conducted on 7th Oct 2014 using terms relating to perspective, affective descriptors and either mental imagery or verbal strategies. For a full list, please see Appendix 1.

Inclusion criteria for the review were (i) peer-reviewed journal articles, (ii) published in English, (iii) relating to adults, (iv) empirical studies in which (v) participants were assigned one of two internal vantage perspectives (first- or third-person; independent variable) using a randomized or quasi-experimental design and had (vi) at least one affect-related outcome measure (dependent variable). Here, an internal vantage perspective was defined in contrast to a change in understanding *another's* perspective (in e.g Theory of Mind).

The initial search produced 2664 articles, and 1469 duplicates were removed, leaving 1195 articles. After a review of titles, 95 articles remained. An abstract and full article text search was conducted, and 39 studies from 30 articles were identified for review. References lists were also searched; one additional article was identified. Thus 31 articles were included in the review, reporting 40 studies (see Figure 1).

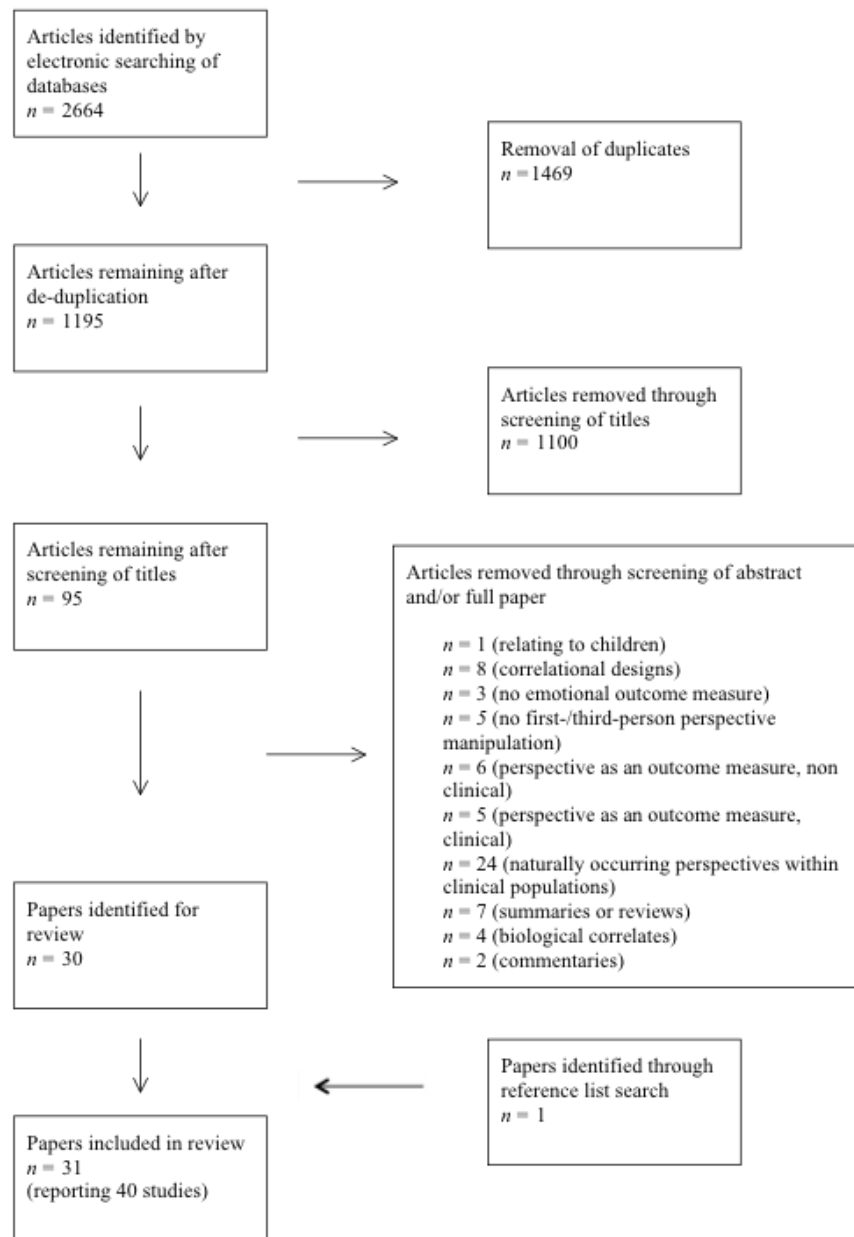


Figure 1. Flowchart of literature search process

3. Results

The 40 studies identified in the search were, for the purposes of this review, organized into six broad categories; low mood, anxiety, anger, self-conscious emotions, positive and negative autobiographical memories and positive

emotions in clinical and healthy populations. All studies are reviewed in detail in Table 1.

3.1. Sadness/low mood

Seven studies were identified which either examined the effect of perspective on recalled sad or depressive experiences and/or included dysphoric/depressed populations (Grisham, Flower, Williams, & Moulds, 2011; Kross & Ayduk, 2008, 2009; Kross, Gard, Deldin, Clifton, & Ayduk, 2012; Williams & Moulds, 2008; Wisco & Nolen-Hoeksema, 2011).

3.1.1. Sample characteristics in sadness/low mood studies

3.1.1.1. Instructed recall of depressive experience in non-clinical samples

Non-clinical student samples were used in three studies, two examining memories of “depressive experiences” (Kross & Ayduk, 2008) and one investigating “sad” memories (Grisham et al., 2011). The Kross and Ayduk (2008) study also included unreported Beck Depression Inventory – II data (BDI-II; Beck, Steer, & Brown, 1996), analysed in a subsequent study reviewed below (Kross & Ayduk, 2009).

3.1.1.2. Instructed recall of depressive experience in subclinical and clinical samples

Four studies reported participant depression levels (Kross & Ayduk, 2009; Kross et al., 2012; Williams & Moulds, 2008; Wisco & Nolen-Hoeksema,

2011), using a clinically relevant measure to establish levels of depression symptomatology, the BDI-II (Beck et al., 1996). Two studies examined negative memories in subclinical dysphoric samples (Williams & Moulds, 2008; Wisco & Nolen-Hoeksema, 2011). One study (Kross et al., 2012) investigated memories of a “depressing life experience” in clinically depressed and control samples, using a validated diagnostic scale to identify depression, i.e. the Structured Clinical Interview for *DSM-IV* (SCID-IV; First, Spitzer, Gibbon, & Williams, 2002). One study investigated the effect of levels of depressive symptomatology, pooling standardised data from five previous studies examining “depressive” and “angry” memories in which BDI-II data had been collected (Kross & Ayduk, 2009).

3.1.2. Nature of perspective manipulation

Most studies (Kross & Ayduk, 2008, 2009; Kross et al., 2012; Williams & Moulds, 2008; Wisco & Nolen-Hoeksema, 2011) contained detailed, clear descriptions of the perspectives to be adopted in their instructions (for more details, see Table 1). For example, explanations were given of how participants might experience these perspectives, e.g. “you can [...] see yourself in the event” (third-person perspective) and “see the experience unfold through your own eyes” (first-person perspective). The instructions in Grisham et al.’s study (2011) only implicitly involve the first-person perspective i.e. “focus on [the negative event] from your own perspective” and the instructions for the third-person include an instruction to consider positive aspects, e.g. “lessons you have learnt” (Grisham et al., 2011, p. 279). Only four studies report a perspective-manipulation check, i.e. whether the participants adopted the required

perspective (Grisham et al., 2011; Kross et al., 2012; Williams & Moulds, 2008; Wisco & Nolen-Hoeksema, 2011).

3.1.3. Affect outcomes

Most studies demonstrated a link between the adoption of the third-person perspective and a reduction in negative affect or affect intensity, although the reduction in negative affect was not universal, and was not seen in an interpretation bias task (Wisco & Nolen-Hoeksema, 2011). It is unclear whether deliberately adopting the third-person perspective has a more potent effect, compared to the first-person, in reducing, or buffering against a rise in negative affect or affect intensity principally when clinically significant levels of depression or dysphoria are present (Kross & Ayduk, 2009; Kross et al., 2012; Williams & Moulds, 2008) or *regardless* of depression (Grisham et al., 2011; Wisco & Nolen-Hoeksema, 2011). Anxiety was also reduced in people with mild dysphoria, when an initially recalled first-person perspective memory was re-recalled from the third-person perspective, and vice versa (Williams & Moulds, 2008).

3.1.4. Methodological limitations

The lack of reported manipulation check in Kross et al's studies (Kross & Ayduk, 2008, 2009) is a limitation. Further, Kross and Ayduk (2008) did not report participant levels of depression prior to the manipulation or the level of negative affect associated with recall of the depressive experience. Thus, potential baseline group differences may have affected the results reported in Study 1. However, the initial results were replicated and extended in Study 2,

which used a different sample and further, measured affect at two time-points, mitigating these concerns.

3.1.5. Additional reappraisal-related measures

Kross and colleagues consistently included measures of semantic change (i.e. a change in meaning) in their studies, e.g. blind ratings of stream of thought essays for “recounting” information and “reconstruing” experience (Kross & Ayduk, 2008, 2009) or Likert scales measuring the same constructs (Kross et al., 2012). Greater reconstrual, as operationalised by a change in understanding for example, was found to be associated with the third-person perspective in all studies, and was found to partially mediate the effect of perspective on levels of affect (Kross & Ayduk, 2008) and emotional reactivity (Kross & Ayduk, 2009).

3.2. Anxiety/threat

Seven studies relating to anxiety or threatening situations (i.e. threats from social rejection or relational conflict) were identified (Kross et al., 2014; Lau, Moulds, & Richardson, 2009; Seih, Lin, Huang, Peng, & Huang, 2008; Wang, Lin, Huang, & Yeh, 2012).

3.2.1. Sample characteristics in anxiety/threat studies

3.2.1.1. Induction of anxiety in non-clinical samples

Five studies reported using anxiety- or threat-inducing experimental paradigms within undergraduate/community samples (Kross et al., 2014; Lau et al., 2009; Wang et al., 2012). One of these (Lau et al., 2009) used an ostracism

paradigm to induce social threat (rejection), and three studies by Kross and colleagues (2014) used different social anxiety-provoking tasks, i.e. social evaluation (Study 2) and social stress induction (Studies 1 and 3). Wang and colleagues (2012) recruited an internet community sample using the Experiences in Close Relationships Scale to measure anxious and avoidant styles of attachment (ECR; Brennan, Clark, & Shaver, 1998) and used a relationship-conflict scenario to induce threat.

3.2.1.2. Anxiety experiences in subclinical samples

One study induced anxiety experimentally in a clinically relevant analogue sample (Spurr & Stopa, 2003). Spurr and Stopa (2003) divided participants into high and low scorers based on responses to the Fear of Negative Evaluation Scale (FNES; Watson & Friend, 1969). One study divided participants into high, moderate and low anxiety groups, and investigated the effect of diary writing on anxiety levels (Seih et al., 2008).

3.2.2. Nature of perspective manipulation

All studies specified the instructions on the perspective to be adopted by participants (see Table 1 for more details). Two studies reported clear and detailed instructions of how first- or third-person perspectives were induced, either through the use of mental imagery instructions (Lau et al., 2009), or a written task (Wang et al., 2012). Three studies using verbal self-talk also provide clear and detailed instructions on how to adopt a first- or a third- (“non-first”) person perspective; the latter refers to instructions to use both second- and third-person pronouns (e.g. “you” and “[name]”/“he/she”) (Kross et al., 2014). Seih

and colleagues (2008) required participants to write using first/second/third-person pronouns. Finally, although they describe the two perspective conditions as “observer” (third-person) and “field” (first-person), only the third-person instructions in Spurr and Stopa’s (2003) study explicitly correspond to instructions used in the other studies reported in this review. The instructions for the first-person condition more closely resemble those required to achieve an ‘external focus of attention’ in which clients are asked to bring awareness to external rather than internal stimuli, a procedure used in the cognitive behavioural treatment of social anxiety (e.g. Wells & Papageorgiou, 1998). Five studies report manipulation checks (Kross et al., 2014; Lau et al., 2009; Spurr & Stopa, 2003).

3.2.3. Affect outcomes

Reductions in anxiety and negative emotions resulting from third-person perspective (compared to the first-person) instructions were only seen in those studies using a verbal or written intervention (Kross et al., 2014; Wang et al., 2012) and in one study (also using a written intervention), only with a high anxious group (Seih et al., 2008). Use of the third-person perspective did not reduce anxiety in a highly socially anxious group, but notably also did not *increase* anxiety, potentially because the high anxiety group would typically already be using this perspective to evaluate themselves (Spurr & Stopa, 2003). The effect of social evaluation appears to be linked to the third-person perspective in an ostracism paradigm (social inclusion/exclusion). For “excluded” participants, the third-person perspective increased perception of threat over time (Lau et al., 2009), suggesting that the first-person perspective

performed a regulatory function. No differences were found for the “included” participants.

When attachment styles were considered (Wang et al., 2012), a third-person perspective reduced negative affect in those with low, but not high scores on a measure of avoidant attachment. Both groups showed lower levels of negative affect when writing in a third-person perspective.

3.2.4. Methodological limitations

Wang and colleagues’ study is the only one identified in this review to consider the interaction between attachment styles and perspective use (Wang et al., 2012). As part of their rationale, the authors hypothesized that higher *avoidant* attachment should be associated with a typical strategic or automatic adoption of the third-person perspective, and that those with higher *anxious* attachment should typically have a first-person perspective. The study would have benefitted from a measure of the perspective typically adopted when considering conflict to help further explain the results.

Although Seih and colleagues’s (2008) study has the advantage of measuring the effect of perspective use on affect over time, it also has several methodological limitations that make interpretation of results difficult. Firstly, the order of perspective taking is not counter-balanced. Additionally, their protocol involved repeated writing about an emotionally charged event. Since repeated writing about the event may have independently changed emotional ratings, the absence of a control for this makes it difficult to attribute change primarily to perspective. Secondly, the second rating of affect occurs a full week

after the completion of the diary; thus confounding variables may have been introduced during that week which could explain the difference in anxiety levels.

Thirdly, Seih and colleagues do not provide an explanation for cut-offs used to divide the groups into high, moderate and low levels of anxiety. Further, the measure used (Fisher, 2000) is not clinically validated or relevant to anxiety assessment; indeed there is no reference to anxiety in Fisher's (2000) paper. It is therefore unclear how anxiety was measured in Seih et al's study. They also do not report results for measurements of positive emotion and sadness. It should be noted that a number of these points were subsequently addressed in a further study by Seih and colleagues (reviewed below, Seih, Chung, & Pennebaker, 2011). However, in common with a number of related studies, neither this study, nor that by Wang and colleagues (2012) reported manipulation checks, i.e. whether participants had adopted the assigned perspective.

Although Spurr and Stopa (2003) used a number of validated measures of anxiety in their study, the study design may have compromised the extent to which participants were able to use the third-person perspective. The study was designed so that participants used the perspective manipulation while performing a secondary speech-task. As participants will have been also thinking of what to say, this additional cognitive load may have affected the third-person condition. The 'first-person' condition involved a relatively simple external focus condition, e.g. "try as much as possible to be aware of the environment rather than of yourself," (p.1017) which likely entailed less cognitive load. Further, it may have been more effective to have an anticipatory perspective manipulation, and to investigate the effect of perspective on memories of the speech once the task was completed.

Although many of the studies addressed anxiety-provoking situations, the emotional measures used did not consistently measure this. Lau and colleagues (2009) used the Primary Needs Questionnaire (Zadro, Williams, & Richardson, 2004) as a proxy measure of negative affective impact. Although it does not measure a particular emotion, it addresses constructs of self-esteem and meaningful existence, which connect to affective experience. Nonetheless, the study could have usefully included a state anxiety measure for example.

3.2.5. Additional reappraisal-related measures

As in previous studies, Kross and colleagues (2014) included measures of semantic processing; either post-event “recounting” or “reconstructing” (Study 3) or challenge and threat appraisals (Study 4). The third-person perspective was associated with more reconstructing, greater perceived challenge and lower threat, indicating that the use of this perspective encouraged a shift in understanding or appraisal of the situation.

3.3. Anger

Six studies relating to anger experiences were identified (Ayduk & Kross, 2008; Kross, Ayduk, & Mischel, 2005; Mischkowski, Kross, & Bushman, 2012; Ray, Wilhelm, & Gross, 2008; Wimalaweera & Moulds, 2008).

3.3.1. Sample characteristics in anger studies

3.3.1.1. Recall of anger experience/induction of anger in non-clinical samples

Five studies asked participants to recall an experience of feeling anger (Ayduk & Kross, 2008; Kross et al., 2005; Ray et al., 2008; Wimalaweera & Moulds, 2008). One study (Mischkowski et al., 2012) induced anger experimentally using a provocation task (Bushman, Bonacci, Pedersen, Vasquez, & Miller, 2005).

3.3.2. Nature of perspective manipulations

All studies specified the perspective to be adopted. Clear and detailed instructions regarding perspective were described in all studies, although only three studies reported a manipulation check (Mischkowski et al., 2012; Ray et al., 2008; Wimalaweera & Moulds, 2008). Two studies differentiated between a “what” and “why” analysis, i.e. either focusing on feelings or the reasons behind the feelings, from both first- and third-person perspectives (Kross et al., 2005, Study 1; Wimalaweera & Moulds, 2008). Two studies had an exclusively “why” focus from both perspectives (Ayduk & Kross, 2008; Kross et al., 2005, Study 2).

In Ray and colleagues’ study, the first-person instructions asked participants to “think about [the “angering event”] from your own perspective” (Ray et al., 2008, p. 135). The third-person (“alternative”) perspective includes a suggestion to think about the event using a *different* perspective, “for example, you might try to see this event from the perspective of an impartial observer” (Ray et al., 2008, p. 135).

3.3.3. Affect outcomes

The third-person perspective was associated with lower levels of anger, emotional reactivity and negative affect in most studies, particularly when a “why” focus was adopted (Ayduk & Kross, 2008; Kross et al., 2005; Mischkowski et al., 2012; Ray et al., 2008). One study (Wimalaweera & Moulds, 2008), however, failed to replicate the initial studies by Kross and colleagues, finding instead that the third-person “why” condition increased anger post-task, and anger/negative affect and intrusions 24 hours later.

3.3.4. Methodological limitations

Kross and colleagues (2005) did not measure state levels of anger/negative affect between groups at baseline, or of the memories themselves, something noted by Wimalaweera and Moulds (2008) who included this in their replication study. However, this latter study, which did not replicate Kross et al.’s (2005) results, may have been insufficiently powered ($n=14-16$ per condition) to detect a medium effect (Ayduk & Kross, 2009).

The third-person perspective instruction in Ray and colleagues’ study (2008) included an example of taking an observer’s perspective, but nonetheless participants may have found an alternative way to think about their experience from a different perspective (e.g. temporally). Further, the first-person instructions are not explicitly a first-person visual perspective (e.g. “through your own eyes”). Thus in this condition participants could have experienced third-person perspective imagery congruent with what they felt to be their own perspective. It is possible that clearer and more specific instructions (including detailed examples) may have resulted in a more consistent adopting of the

required perspective, although manipulation checks suggest that participants complied with their assigned perspective.

Perspective manipulation checks were not reported by Kross and colleagues (Ayduk & Kross, 2008; Kross et al., 2005) which means the possibility that participants did not adopt the assigned perspective cannot be excluded.

3.3.5. Additional reappraisal-related measures

In their second study, Kross and colleagues (2005) also measured concrete and abstract construals of the situation. They found that lower levels of concrete (relative to abstract) understanding mediated the effect of the third-person “why” analysis, i.e. that relatively greater abstract processing was a key element in affect reduction.

3.4. Self-conscious emotion studies

Seven studies related to self-conscious emotions were identified (Hung & Mukhopadhyay, 2012; Katzir & Eyal, 2013; Libby & Eibach, 2011). Self-conscious emotions, e.g. guilt and shame, can be defined as those involving self-reflection and self-evaluation (Tracy & Robins, 2007). Self-conscious emotions are linked to inferences about how (internalized) others may perceive and evaluate the self (Leary, 2007). For example, guilt has been linked to behavioural transgressions, whereas shame has been linked to actions which appear to reflect negatively on a person’s character (Tangney & Dearing, 2003). This is in contrast to global negative evaluations that may be feared in anxiety or low mood.

3.4.1. Sample characteristics in self-conscious emotion studies

3.4.1.1. Induction or recall of self-conscious emotion in non-clinical samples

Two studies asked participants to imagine scenarios in which they might be expected to feel self-conscious emotions (e.g. embarrassment) (Hung & Mukhopadhyay, 2012, Studies 1 and 3) and one study examined recall of memories of resisting or succumbing to temptation, both potentially socially-evaluative situations (Hung & Mukhopadhyay, 2012, Study 2). Two studies (Katzir & Eyal, 2013) compared memories of self-conscious emotions (shame/guilt) to basic emotions (sadness/anger).

3.4.1.2. Induction of self-conscious emotions in subclinical samples

Two studies investigated the relationship between imagined failure experiences, shame, and perspective in participants with high and low self-esteem (Libby, Valenti, Pfent, & Eibach, 2011) measured using the Rosenberg Self-Esteem Scale (Rosenberg, 1965). Although not a direct measure of clinical difficulty, low self-esteem is linked to many mental health problems (e.g. Mann, Hosman, Schaalma, & de Vries, 2004).

3.4.2. Nature of perspective manipulations

All studies specified the perspective to be adopted. Third- and first-person instructions were clear and detailed in all studies, and five studies

reported a manipulation check (Hung & Mukhopadhyay, 2012; Libby et al., 2011).

3.4.3. Affect outcomes

No clear picture emerges relating to self-conscious emotions. Using a third-person perspective increases positive self-conscious emotions (e.g. pride) when “resisting temptation”, and negative self-conscious emotions (e.g. guilt) when “succumbing to temptation” (Hung & Mukhopadhyay, 2012, Studies 1 and 2). This pattern was replicated in an imaginary scenario linked to both excitement and embarrassment (Hung & Mukhopadhyay, 2012, Study 3); thus a third-person perspective increased embarrassment. This would appear to link to the importance of the external observer’s perspective in situations of evaluation of the self; when adopting this perspective, participants experienced either increased pride (when they could have been positively evaluated) or guilt (when they could have been negatively evaluated).

However, in two studies (Katzir & Eyal, 2013), use of the third-person perspective was not shown to have an effect on self-conscious emotions, namely guilt and shame, although these studies replicated previous work on anger (Kross et al., 2005) and sadness (Kross & Ayduk, 2008). Self-esteem appears to have a mediating effect on the impact of the third-person perspective in shame in failure memories (Libby et al., 2011), a construct not measured by Katzir and Eyal, which could explain their null finding.

3.4.4. Methodological limitations

The emotion outcome measures analysed by Hung and Mukhopadhyay (2012) do not investigate the difference between “guilt” and “shame,” which are separate self-conscious emotions (Tangney & Dearing, 2003). In all three studies they only include a measure of “guilt.” It is possible that inclusion of a measure of shame would have further clarified the impact of perspective change. Finally, the sample sizes reported in Hung and Mukhopadhyay’s Studies 2 and 3 may be too small (approx. $n = 18/13$ respectively) to detect an effect in all of the emotional constructs measured (e.g. embarrassment). There was no reported manipulation check in Katzir and Eyal’s (2013) study.

3.4.5. Additional reappraisal-related measures

In their second and third studies, Hung and Mukopadhyay (2012) also included measures of appraisals of the autobiographical memories; those using a third-person perspective were more likely to think of how others might evaluate them than the enjoyable aspects of the experience. This was found to mediate the effect of perspective on affect in both studies.

Katzir and Eyal (2013) also included a written task of the anger/guilt, and sadness/shame memory which was independently coded for self-evaluations. Although they found that self-evaluations were higher in the self-conscious emotion condition compared to the ‘basic’ emotion condition, there was no effect of perspective, suggesting that these appraisals did not mediate the effect of the third-person perspective.

3.5. Studies on negative and positive autobiographical and episodic memory in non-clinical samples

Ten studies were identified relating to autobiographical/episodic memory (Bagri & Jones, 2009; Berntsen & Rubin, 2006; Crawley, 2010; Robinson & Swanson, 1993; Seih et al., 2011; Sekiguchi & Nonaka, 2014; Sutin & Robins, 2010; Terry & Horton, 2007).

3.5.1. Sample characteristics in positive and negative autobiographical and episodic memory studies

3.5.1.1. Recall of autobiographical memories in non-clinical samples

Eight studies addressed autobiographical memories. Four studies investigated negative autobiographical memories (Crawley, 2010; Seih et al., 2011; Terry & Horton, 2007). Two studies investigated both negative and positive autobiographical memories (Berntsen & Rubin, 2006; Sekiguchi & Nonaka, 2014). One study investigated autobiographical memories without pre-specifying valence to participants (Robinson & Swanson, 1993). One study was identified which related to “self-defining” autobiographical memories (Sutin & Robins, 2010).

3.5.1.2. Recall of episodic memories in non-clinical samples

Two studies were identified which investigated recall of experimentally presented material (Bagri & Jones, 2009).

3.5.2. Nature of perspective manipulations

Third- and first-person instructions were clearly described in seven studies (Bagri & Jones, 2009; Berntsen & Rubin, 2006; Seih et al., 2011; Sekiguchi & Nonaka, 2014; Sutin & Robins, 2010). Two studies reported giving descriptions of first-/third-person perspectives but do not provide examples (Crawley, 2010; Terry & Horton, 2007) and two studies (Robinson & Swanson, 1993; Sutin & Robins, 2010) omit reference to perspective descriptions. Three studies reported checking pronoun use as a manipulation check (Crawley, 2010; Seih et al., 2011), and two more studies reported post-task manipulation checks (Berntsen & Rubin, 2006; Sutin & Robins, 2010). For more details of perspective manipulations, see Table 1.

3.5.3. Affect outcomes

There was no consistent picture of the impact of perspective in autobiographical memories. Two studies found no link between the adoption of a third-person perspective and emotional intensity (Berntsen & Rubin, 2006; Sutin & Robins, 2010). However, another study found reduced levels of emotion and nervousness from a third-person perspective (Terry & Horton, 2007). Third person recall was associated with reduced emotional involvement and emotional intensity in three writing studies (Crawley, 2010; Seih et al., 2011), although it was only linked to reduced negative affect in one (Crawley, 2010). Recall of affective material in episodic memory tasks was lower in a third-person condition; in an initial study there was no difference in the reported “emotional richness” of recall, but in a second, potentially more highly powered study, this was lower in the third-person perspective (Bagri & Jones, 2009).

The original (i.e. spontaneous) perspective of a memory appears to have an important role in the effect of using a third- or first-person perspective. In three studies, levels of affect decreased only when first-person memories were recalled from the third-person, and not vice versa (Berntsen & Rubin, 2006; Robinson & Swanson, 1993; Sekiguchi & Nonaka, 2014). This implies that shifting from a third- to first-person memory does not intensify affect during recall.

3.5.4. Methodological limitations

Five studies did not report a manipulation check (Bagri & Jones, 2009; Robinson & Swanson, 1993; Sekiguchi & Nonaka, 2014; Terry & Horton, 2007). Berntsen and Rubin (2006) asked participants to rate the intensity of emotion at recall, and found no difference between perspectives. However, the wording of this measure, “The emotions I have when I recall the episode are intense” (p.1199), could be argued to be ambiguous. The “episode” refers to an event associated with an emotional state e.g. “most angry”. However, it is possible that at recall, different emotions based on retrospective recall were also elicited, e.g. guilt at feeling angry, and that the ratings reflect this, rather than the original emotion.

Sutin and Robins (2010) did not find a difference in affect when perspective was manipulated. However, inspection of the reported means within the paper suggests that the mean emotional intensity of the manipulated first-person perspective is statistically lower than the spontaneously adopted (at recall) first-person perspective ($t(461) = 3.26, p = .001$). This anomaly was not discussed by the authors.

The sample size used in both Seih et al studies (Seih et al., 2011, Studies 1 and 2) was relatively small per condition (approximately $n = 18-21$ per condition), thus their study may not have had sufficient power to detect smaller effect-size reductions in negative affect. Bagri and Jones' first study (2009) failed to find a difference in 'emotional richness' between perspectives; however, their first study too may have been underpowered ($n = 14$ per group), since in their second study ($n = 39$, within-subjects), this effect was found.

3.5.5. Additional reappraisal-related measures

Seih and colleagues (2011) also assessed use of cognitive mechanism words (e.g. “consider,” “understand”) as a measure of cognitive processing, and found that the third-person perspective had lower levels of cognitive processing. This appears to contrast studies such as those reviewed above (e.g. Kross et al., 2014) which have linked the third-person perspective to *increased* “semantic” processing, arguably a related construct. This discrepancy may be explained by the instructions given to participants in Seih et al's studies, i.e. a focus on “what” occurred rather than specifying a focus on “why.” In other studies, only the “why” focused third-person perspective shows increased semantic processing (e.g. Kross et al., 2005).

3.6. Positive emotions

Four studies relating exclusively to positive memories or imagined positive events were identified (Gruber, Harvey, & Johnson, 2009; Holmes, Coughtrey, & Connor, 2008; Nelis, Vanbrabant, Holmes, & Raes, 2012; Vella & Moulds, 2014).

3.6.1. Sample characteristics in positive emotion studies

3.6.1.1. Recall of positive experience/thinking about positive events in non-clinical samples

Two studies investigated experimentally-presented positive scenarios (Holmes et al., 2008; Nelis et al., 2012). Despite focusing on positive emotions, both studies administered clinically relevant measures, the BDI-II (Beck et al., 1996) and the State Trait Anxiety Inventory trait scale (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) to establish levels of depressive and anxious symptomatology within their sample. One study (Vella & Moulds, 2014) investigated positive memories and imagined positive future events.

3.6.1.2. Positive mood in a clinical sample

One study (Gruber et al., 2009) compared the effect of changing perspective on memories of intense happiness using both a healthy control group and a euthymic group with bipolar I, a condition associated with elevated mood (American Psychiatric Association, 2013). The SCID-IV TR (First et al., 2002) was used to confirm bipolar diagnosis, and the healthy control group was screened for lifetime Axis-I disorders. Bipolar participants were euthymic as indicated by the Young Mania Rating Scale (Young, Biggs, Ziegler, & Meyer, 1978) and the Clinician-Rated Inventory of Depressive Symptoms (Rush, Gullion, Basco, Jarrett, & Trivedi, 1996); healthy controls were also screened using these measures and confirmed to be euthymic.

3.6.2. Nature of perspective manipulations

Three studies specified gave clear and detailed instructions were given in three studies (Gruber et al., 2009; Holmes et al., 2008; Nelis et al., 2012). One study used a Likert scale to rate the two perspectives (Vella & Moulds, 2014). For details of perspective manipulation, see Table 1. All four studies reported manipulations checks.

3.6.3. Affect outcomes

A decrease in positive affect linked to a third-person perspective was found in two studies, in both clinical and non-clinical populations (Gruber et al., 2009; Holmes et al., 2008). This was not replicated in another study (Nelis et al., 2012) , in which while imagery increased positive affect compared to verbal processing, there was no difference between the two imagery perspectives. Shifting from the first- to third-person perspective for both positive memories and future imagined positive events, decreased positive emotions such as happiness, whereas the converse shift had no impact (Vella & Moulds, 2014).

3.6.4. Methodological limitations

In their replication study, Nelis and colleagues (Nelis et al., 2012) report a significant difference in levels of depressive symptomatology as measured by the BDI-II, with greater scores for those in the first-person condition. The authors report that when BDI-II is entered as a covariate in their analyses, their null result regarding the two imagery perspectives remains. However, this statistical technique has been advised against (Miller & Chapman, 2001). More importantly, subsequent research (Nelis et al., 2013) has shown dysphoria is

associated with increased use of third-person perspective in positive memories. Thus, it is possible that the first-person condition, with higher levels of depressive symptomatology, may have had a greater tendency to initially experience scenarios from the third-person, even if they then followed first-person instructions. Research reviewed above in autobiographical memories suggests that there is no reduction in affect when moving from a third- to a first-person perspective. This may explain the lack of difference between the conditions.

Table 1.
Characteristics of the 40 included studies

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
Studies in low mood, $n = 7$					
Grisham et al (2011)	Non-clinical student sample	Written task; writing about a recent sad experience	1. First-person (“rumination”) perspective ($n = 40$) 2. Third-person (“reappraisal”) perspective ($n = 41$)	<u>Negative emotion</u> (composite of six emotion words, 0-4 scale) <u>Positive emotion</u> (composite of five emotion words, 0-4 scale)	<u>Third- compared to first-person perspective</u> Negative emotion at recall ↓ Positive emotion at recall ↑
Kross & Ayduk (2008), Study 1	Non-clinical student sample	Mental imagery; autobiographical memory of a depressive experience	1. First-person (“immersed”) analysis of experience ($n = 48$) 2. Third-person (“distanced”) analysis of experience ($n = 48$) 3. Distraction, thinking about affectively neutral information ($n = 45$)	<u>Negative affect index</u> calculated from the valence subscale of the Self Assessment Mannequin (SAM; Bradley & Lang, 1994), and ratings of “sadness” and “depression” (1-5 scale).	<u>Third- compared to first-person perspective</u> Negative affect ↓ <u>Third-person compared to distraction</u> Negative affect ↔ <u>First-person compared to distraction</u> Negative affect ↑
Kross and Ayduk (2008), Study 2	Non-clinical student sample	Mental imagery; autobiographical memory of a depressive experience	1. First-person (“immersed”) analysis of depressive experience, with 1 day follow-up ($n = 56$) and 7 day follow up ($n = 40$) 2. Third-person (“distanced”) analysis of depressive experience with 1 day follow-up ($n = 57$) and 7 day follow up ($n = 38$) 3. Distraction, thinking about affectively neutral information with 1 day follow-up ($n = 58$) and 7 day follow up ($n = 37$)	<u>Negative affect index</u> calculated from the valence subscale of the SAM (Bradley & Lang, 1994), and ratings of “sadness” and “depression” (1-5 scale).	<u>Third- compared to first-person perspective</u> Negative affect ↓ <u>Third-person compared to distraction</u> Negative affect ↔ <u>First-person compared to distraction</u> Negative affect ↑ <i>At follow-up (1/7 day)</i> <u>Third- compared to first-person perspective/distraction</u> Negative affect ↓
Kross and Ayduk (2009)	Subclinical student sample (depression symptoms)	Mental imagery; multiple regression using depression data from five perspective manipulation studies	1. First-person (“immersed”) analysis of depression or anger related experience 2. Third-person (“distanced”) analysis of depression or anger related experience $n = 477$ with Beck Depression Inventory (BDI-II; Beck et al., 1996) data.	<u>Emotional reactivity</u> (various emotion measures, scores standardised for analysis).	<u>First-person compared to distraction</u> Negative affect ↔ <u>Third-person perspective</u> Emotional reactivity ↓ (regardless of depression symptoms) <u>First-person perspective</u> Emotional reactivity ↑ (positively correlated with depression symptoms)

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
Kross et al (2012)	Clinical sample (Adults with major depressive disorder; MDD) and healthy control group	Mental imagery; sad autobiographical memory	1. First-person (“immersed”) analysis of sadness experience, ($n = 25$ MDD, $n = 21$ control) 2. Third-person (“distanced”) analysis of sadness experience ($n = 26$ MDD, $n = 24$ control)	<u>Negative affect</u> ; SAM (Bradley & Lang, 1994). <u>Negative affect index</u> calculated from the SAM and the Negative scale of the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988).	<u>Third person perspective: MDD</u> Baseline-post negative affect ↓ (trend) Negative affect index ↓ <u>First person perspective: MDD</u> Baseline-post negative affect ↑ Negative affect index ↑ <u>First- and third-person perspective: Control</u> Negative affect ↔
Williams and Moulds (2008)	Dysphoric subclinical sample	Mental imagery; intrusive negative memory	1. Spontaneously adopted (at recall) first-person perspective “negative intrusive memories” recalled from the third-person perspective ($n = 78$) 2. Spontaneously adopted (at recall) third-person perspective “negative intrusive memories” recalled from the first-person perspective ($n = 55$)	<u>Distress</u> (0-100 scale) <u>Richness of emotion</u> recollection (1-7 scale) <u>Anxiety</u> at recollection (1-7 scale)	<u>Changing from a first- to a third-person perspective</u> Richness of emotion ↔ Distress ↓ Anxiety compared to converse shift ↓ <u>Changing from a third- to a first-person perspective</u> Richness of emotion ↔ Levels of distress ↔ Anxiety compared to converse shift ↑
Wisco & Nolen-Hoeksema (2011)	Subclinical and control groups (High (≥ 16 BDI-II) or low (≤ 9 BDI-II) dysphoria)	Mental imagery; memory and imagery interpretation bias	1. First-person (“immersed”) analysis of depression experience, and of guided imagery of ambiguous situations ($n = 28$ non-dysphoric, $n = 25$ dysphoric) 2. Third-person (“distanced”) analysis of depression experience, and of guided imagery of ambiguous situations ($n = 30$ non-dysphoric, $n = 27$ dysphoric)	<u>State negative emotion</u> calculated from ratings of sadness and depression (1-9 scale) <u>Emotion re-experiencing extent</u> <u>Emotion re-experiencing intensity</u>	<u>Third- and first-person perspective: memory</u> State negative emotion ↑ (greater increase for dysphoria group) Re-experiencing extent ↔ (no difference between groups) <u>Third- compared to first-person perspective: memory</u> Re-experiencing intensity ↓ (no difference between groups) <u>First- and third-perspective: guided imagery</u> State negative emotion ↑ (no difference between groups) Valence of interpretation ↔ (no difference between groups)
Studies in anxiety/threat, $n = 7$					
Kross et al (2014), Study 2	Non-clinical female student sample	Verbal “self-talk” in a social evaluation task.	1. First-person pronoun analysis of feelings ($n = 44$) 2. Third-person (“non-first”) pronoun analysis of feelings ($n = 45$)	<u>Anxiety</u> (1-5 scale)	<u>Third- compared to first-person perspective</u> Pre-task anxiety ↔ Post-task anxiety faster ↓
Kross et al (2014), Study 3	Non-clinical student sample	Verbal “self-talk” in a social stress induction task	1. First-person pronoun analysis of feelings ($n = 45$) 2. Third-person (“non-first”) pronoun analysis of feelings ($n = 44$)	<u>Negative affect</u> (1-7 scale) <u>Post-task shame</u> Shame and Pride subscale of State Shame and Guilt Scale (Marschall, Sanftner, & Tangney,	<u>Third-person perspective</u> Negative affect pre-post ↔ <u>First-person perspective</u>

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
				1994).	Negative affect pre-post ↑
Kross et al (2014), Study 4	Non-clinical student sample	Verbal “self-talk” in a social stress induction task	<ol style="list-style-type: none"> 1. First-person pronoun analysis of feelings ($n = 37$) 2. Third-person (“non-first”) pronoun analysis of feelings ($n = 38$) 	<u>Anticipatory anxiety</u> (1-7 scale) <u>Task threat</u> (1-7 scale) <u>Task challenge</u> (1-7 scale)	<u>Third- compared to first-person perspective</u> Post-task shame ↓ <u>Third- compared to first-person perspective</u> Anticipatory anxiety ↓ Task threat ↓ Task challenge ↑ <u>Third- compared to first-person perspective (ostracism group)</u>
Lau et al (2009)	Non-clinical student sample	Mental imagery; recall of inclusion or ostracism experience	<ol style="list-style-type: none"> 1. First-person perspective recall of either inclusion or ostracism experience 2. Third-person perspective recall of either inclusion or ostracism experience 	<u>Threatened needs</u> Primary Needs Questionnaire (Zadro et al., 2004) including self-esteem, belonging and meaningful existence.	<u>Third- compared to first-person perspective (ostracism group)</u> Threatened needs at time 1 ↔ Threatened needs at time 2 ↑
Seih et al (2008)	Subclinical sample (divided into high, moderate and low anxiety)	Written task; daily events diary study	<p>N per condition not reported. Sample $n = 56$, approx. $n = 14$ per group.</p> <ol style="list-style-type: none"> 1. 10 day diary writing from first-, then second-, then third-person pronouns ($n = 32$ high anxiety, $n = 29$ moderate anxiety, $n = 27$ low anxiety) 	<u>Positive emotion</u> <u>Anger</u> <u>Sadness</u> <u>Anxiety</u> (as measured by a modified version of general emotional scales (Fisher, 2000)).	<u>First-/third-person perspective (inclusion group)</u> Threatened needs at time 1 and 2 ↔ <u>High anxiety group compared to moderate and low</u> Anxiety ↓ Anger ↓ (trend) Sadness (not reported) Positive emotion (not reported)
Spurr & Stopa (2003)	Subclinical and control groups (high and low social anxiety)	Mental imagery; speech task	<p>Within-subjects design</p> <ol style="list-style-type: none"> 1. First-person perspective adopted while giving filmed presentation 2. Third-person perspective adopted while giving filmed presentation 	<u>Anxiety</u> measured pre- and post each presentation (0-100 scale).	<u>Third-person perspective</u> Both groups, anxiety pre-post ↔ (although trend to ↑)
Wang et al (2012)	Internet-based sample of Taiwan residents, high and low anxious or avoidant attachment	Written task; writing about a conflict scenario	<p>Order counterbalanced ($n = 22$ high anxiety, $n = 22$ low anxiety).</p> <ol style="list-style-type: none"> 1. Writing from first-person perspective ($n = 40$) 2. Writing from third-person perspective ($n = 43$) 	<u>Negative emotion</u> calculated from eight aggregated negative emotion scores, e.g. fear and hostility (1-7 scale). <u>Positive emotion</u> calculated from six aggregated positive emotion scores, e.g. peace and happiness (1-7 scale).	<u>Third- compared to first-person perspective</u> Negative emotion ↓ Positive emotion ↔ <u>Third-person perspective in low compared to high avoidant attachment</u> Negative emotion ↓ Positive emotion ↔
					First-person perspective in low compared to high avoidant

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
					<u>attachment</u> Negative emotion ↔ Positive emotion ↔ <u>Third- compared to first-person perspective in low and high anxious attachment</u> Negative emotion ↓ Positive emotion ↑ (low anxious attachment only)
Studies in anger, n = 6					
Ayduk & Kross (2008)	Non-clinical student sample	Mental imagery; autobiographical memory of feeling anger	1. First-person (“self-immersed”) analysis 2. Third-person (“self-distanced”) analysis <i>N</i> per condition not reported. Sample <i>n</i> = 84 after exclusions, approx. <i>n</i> = 42 per group.	<u>Emotional reactivity index</u> computed from extent to which and intensity with which original emotions were experienced (1-7 scale).	<u>Third- compared to first-person perspective</u> Emotional reactivity ↓
Kross et al (2005), Study 1	Non-clinical student sample	Mental imagery; autobiographical memory of feeling anger/hostility	1. First-person perspective “what” focus on memory (<i>n</i> = 38) 2. First-person perspective “why” focus (<i>n</i> = 39) 3. Third-person perspective “what” focus on memory (<i>n</i> = 39) 4. Third-person perspective “why” focus on memory (<i>n</i> = 39)	<u>Implicit anger</u> measured through a word completion task (Arndt, Greenberg, Solomon, Pyszczynski, & Simon, 1997). <u>Negative affect</u> measured by the Negative Affect subscale of the Positive and Negative Affect Schedule (Watson et al., 1988). <u>Explicit anger index</u> computed from responses to ‘hostile’ and ‘irritable’ in PANAS.	<u>Third-person “why” perspective compared to first-person “why” and first/third-person “what” perspectives</u> Implicit anger ↓ Negative affect ↓ Explicit anger ↓
Kross et al (2005), Study 2	Non-clinical student sample	Mental imagery; autobiographical memory of feeling anger/hostility	1. First-person perspective “why” focus on memory 2. Third-person perspective “why” focus on memory <i>N</i> per condition not reported. Sample <i>n</i> = 133, approx <i>n</i> = 66 per group.	<u>Emotional reactivity index</u> computed from extent to which and intensity with which original emotions were experienced (1-7 scale).	<u>Third- compared to first-person perspective</u> Emotional reactivity ↓
Mischkowski et al (2012), Experiment 1	Non-clinical student sample	Mental imagery; analysis of experimentally provoked anger experience	1. First-person perspective (<i>n</i> = 28) 2. Third-person perspective (<i>n</i> = 30) 3. No perspective manipulation control (<i>n</i> = 36)	<u>Implicit aggression</u> measured through a word completion task (Arndt et al., 1997). <u>Anger index</u> computed from the valence subscale of the SAM (Bradley & Lang, 1994) and four emotion word ratings (e.g. angry/hostile; 1-5 scale).	<u>Third- compared to first-person perspective and control</u> Implicit aggression ↓ Anger ↓
Ray et al (2008)	Non-clinical student sample,	Unresolved angering event (modality not specified)	3. First-person (“rumination”) perspective (<i>n</i> = 34)	<u>Anger</u> (0-4 scale) <u>Negative emotion</u> computed from composite of	<u>Third- compared to first-person perspective</u> Anger at recall ↓

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
Wimalaweera & Moulds (2008)	all female Non-clinical student sample	Mental imagery; autobiographical memory of feeling anger in previous 12 months	<ol style="list-style-type: none"> 4. Third-person (“reappraisal”) perspective ($n = 43$) 1. First-person perspective “what” focus on memory 2. First-person perspective “why” focus on memory 3. Third-person perspective “what” focus on memory 4. Third-person perspective “why” focus on memory <p>N per condition not reported. Sample $n = 60$ after exclusions, approx. $n = 15$ per group.</p>	<p>six emotion words (0-4 scale). <u>Positive emotion</u> computed from composite of five emotion words (0-4 scale). <u>Implicit anger</u> measured through a word completion task (Arndt et al., 1997).</p> <p><u>Explicit anger</u> computed from items (e.g. “anger/hostile/irritable”) from the Positive and Negative Affect Schedule (expanded form) (Watson & Clark, 1994).</p> <p><u>Negative affect</u> subscale of Positive and Negative Affect Schedule (expanded form) (Watson & Clark, 1994).</p>	<p>Anger after rest ↔ Negative emotion at recall and after rest ↓ Positive emotion at recall and after rest ↔ <u>Third-person “why” perspective compared to first-person “why” and first/third-person “what” perspectives</u> Implicit anger ↑</p> <p><u>First-person “what” and “why, and third-person “why” perspectives</u> Explicit anger over time ↑</p> <p><u>Third-person “what” perspective</u> Explicit anger over time ↔</p> <p><u>First-person “why,” and third-person “why” perspectives</u> Negative affect over time ↑</p> <p><u>First-person “what,” and third-person “what” perspectives</u> Negative affect over time ↔</p>
Studies in self-conscious emotions, $n = 7$					
Hung & Mukhopadhyay (2012), Study 1	Non-clinical student sample	Mental imagery; imagining “self-control” scenario of either accepting or declining a party invitation before an exam	<ol style="list-style-type: none"> 1. First-person perspective of self-control 2. Third-person perspective of self-control 3. First-person perspective of non self-control 4. Third-person perspective of non self-control <p>N per condition not reported. Sample $n = 288$, approx. $n = 72$ per group.</p>	<p><u>Negative ‘basic’ emotion</u> computed from average of ratings of “sad”, “distressed” and “sorrowful” (1-4 scale).</p> <p><u>Negative self-conscious emotion</u> computed from rating of “guilty” (1-4 scale).</p> <p><u>Positive ‘basic’ emotion</u> computed from average of ratings of “excited” and “joyful” (1-4 scale).</p> <p><u>Positive self-conscious emotion</u> computed from average of ratings of “proud” and “relieved” (1-4 scale).</p>	<p><u>Third- compared to first-person perspective (self-control)</u> Negative basic emotion ↓ Positive basic emotion ↔ Positive self-conscious emotion ↑ Negative self-conscious emotion ↔</p> <p><u>Third- compared to first-person perspective (non self-control)</u> Positive basic emotion ↓ Negative basic emotion ↔ Negative self-conscious emotion ↑ Positive self-conscious emotion ↔</p>
Hung & Mukhopadhyay (2012), Study 2	Non-clinical student sample	Mental imagery; autobiographical memory of resisting or succumbing to temptation	<ol style="list-style-type: none"> 1. First-person perspective in recall of resisting temptation 2. Third-person perspective in recall of resisting temptation 3. First-person perspective in recall of succumbing to temptation 	<p><u>Sad</u> (1-7 scale) <u>Guilt</u> (1-7 scale) <u>Pride</u> (1-7 scale) <u>Excitement</u> (1-7 scale) <u>Embarrassment</u> (1-7 scale)</p>	<p><u>Third- compared to first-person perspective (resist)</u> Sad ↓ Guilt ↔ Pride ↑ Excitement ↔ Embarrassment ↔</p>

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
			4. Third-person perspective in recall of succumbing to temptation <i>N</i> per condition not reported. Sample <i>n</i> = 75, approx. <i>n</i> = 18 per group.		<u>Third- compared to first-person perspective (succumb)</u> Guilt ↑ Sad ↔ Pride ↔ Excitement ↓ Embarrassment ↔
Hung & Mukhopadhyay (2012), Study 3	Non-clinical student sample	Mental imagery; imagining an embarrassing but exciting scenario	1. First-person perspective of imagined exciting/embarrassing experience 2. Third-person perspective of imagined exciting/embarrassing experience <i>N</i> per condition not reported. Sample <i>n</i> = 26, approx. <i>n</i> = 13 per group.	<u>Excitement</u> (1-7 scale) <u>Embarrassment</u> (1-7 scale) <u>Sad</u> (1-7 scale) <u>Guilt</u> (1-7 scale) <u>Pride</u> (1-7 scale)	<u>Third- compared to first-person perspective</u> Excitement ↓ Embarrassment ↑ Sad ↔ Guilt ↔ Pride ↔
Katzir & Eyal (2013), Study 1	Non-clinical student sample	Mental imagery; autobiographical memory of feeling anger or guilt	1. First-person perspective “why” focus on anger 2. First-person perspective “why” focus on guilt 3. Third-person perspective “why” focus on anger 4. Third-person perspective “why” focus on guilt <i>N</i> per condition not reported. Sample <i>n</i> = 241 after exclusions, approx. <i>n</i> = 60 per group.	<u>Emotional reactivity index</u> computed from extent to which, and intensity with which original emotions were experienced (1-9 scale).	<u>Third- compared to first-person perspective</u> Anger ↓ Guilt ↔
Katzir & Eyal (2013), Study 2	Non-clinical student sample	Mental imagery; autobiographical memory of feeling sadness or shame	1. First-person perspective “why” focus on sadness 2. First-person perspective “why” focus on shame 3. Third-person perspective “why” focus on sadness 4. Third-person perspective “why” focus on shame <i>N</i> per condition not reported. Sample <i>n</i> = 254 after exclusions, approx. <i>n</i> = 63 per group.	<u>Emotional reactivity index</u> computed from extent to which and intensity with which original emotions were experienced (1-9 scale).	<u>Third- compared to first-person perspective</u> Sadness ↓ Shame ↔
Libby et al (2011), Study 4	Subclinical student sample	Mental imagery; imagining possible future failure	1. Imagining scenarios from a first-person perspective (<i>n</i> = 33)	<u>Shame (guilt-free)</u> calculated from the Test of Self-Conscious Affect (TOSCA; Tangney &	<u>Third-person perspective</u> Self-esteem negatively correlated with shame

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
Libby et al (2011), Study 5	(high to low self-esteem)	scenarios	2. Imagining scenarios from a first-person perspective ($n = 33$)	Dearing, 2003).	<u>First-person perspective</u> No relationship between self-esteem and shame
	Subclinical student sample (high to low self-esteem)	Mental imagery; autobiographical memory of failure, success and neutral experiences	1. First-person perspective recall of failure experience 2. Third-person perspective recall of failure experience 3. First-person perspective recall of success experience 4. Third-person perspective recall of success experience 5. First-person perspective recall of neutral experience 6. Third-person perspective recall of neutral experience N per condition not reported. Sample $n = 128$ after exclusions, approx. $n = 21$ per group.	<u>Shame (guilt-free)</u> calculated from “ashamed” and “guilty” items of the Positive and Negative Affect Schedule (Watson et al., 1988)	<u>Third- compared to first-person perspective (failure memory)</u> Self-esteem negatively correlated with shame LSE, Shame ↑ HSE, Shame ↓ <u>Third- compared to first-person perspective (success and neutral memories)</u> No relationship between self-esteem and shame
Studies in positive/negative autobiographical memories, $n = 10$					
Bagri and Jones (2009), Experiment 1	Non clinical student sample	Mental imagery; Memory task, scenario descriptions	1. Recall from a first-person perspective ($n = 14$) 2. Recall from a third-person perspective ($n = 14$)	<u>Emotional richness</u> of memory recall <u>Recall of affective detail</u>	<u>Third- compared to first-person perspective</u> Emotional richness ↔ Recall for affective detail ↓
Bagri and Jones (2009), Experiment 2	Non clinical student sample	Mental imagery; Memory task, scenario descriptions	Within-subjects design 1. Recall from first- and then third-person perspective or vice versa ($n = 39$) Order counterbalanced	<u>Emotional richness</u> of memory recall <u>Recall of affective detail</u>	<u>Third- compared to first-person perspective</u> Emotional richness ↓ Recall for affective detail ↓
Berntsen & Rubin (2006)	Non-clinical student sample	Mental imagery; ten positive and negative autobiographical memories	1. Recall of memories from an instructed first-person perspective, followed by a switch to third-person perspective for two memories ($n = 40$) 2. Recall of memories from an instructed third-person perspective, followed by a switch to first-person perspective for two memories ($n = 42$) 3. Recall of memories from spontaneously adopted perspective, followed by a	<u>Emotional intensity</u> (1-7 scale)	<u>Third- compared to first-person recall (instructed and spontaneously adopted)</u> Emotional intensity ↔ <u>Third- to first-person perspective shift</u> Emotional intensity ↔ <u>First- to third-person perspective shift</u> Emotional intensity ↓

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
Crawley (2010)	Non-clinical student/volunteer sample	Written task; an unpleasant event recalled from a spontaneously adopted first-person perspective	<p>switch to opposite perspective (first and third) for two memories ($n = 40$)</p> <ol style="list-style-type: none"> 1. First-person perspective, writing once about the memory from same perspective. 2. First-person perspective, writing three times about the memory from same perspective. 3. First-person perspective, writing once about the memory from same perspective, and then twice from a third-person perspective. <p>N per condition not reported. Sample $n = 90$, approx. $n = 30$ per group.</p>	<p><u>Emotion at time of event</u> (1-7 scale): Negative Intensity Physical/bodily Positive</p> <p><u>Emotion at recall</u> (1-7 scale): Negative Intensity Physical/bodily Positive</p>	<p><i>At time of event:</i> <u>Repeated third-person perspective</u> Negative ↓ Intensity ↓ Physical/bodily ↓ Positive ↔</p> <p><u>Repeated first-person perspective</u> Negative ↑ Intensity ↔ Physical/bodily ↓ Positive ↔</p> <p><i>At recall:</i> <u>Repeated third-person perspective group</u> Negative ↓ Intensity ↓ Physical/bodily ↓ Positive ↑</p> <p><u>Repeated first-person perspective group</u> Negative ↓ Intensity ↓ Physical/bodily ↓ Positive ↔</p>
Robinson & Swanson (1993), Experiment 2	Non-clinical student sample	Mental imagery; autobiographical memories	<ol style="list-style-type: none"> 1. Twelve autobiographical memories (both perspectives) recalled from a first-person perspective 2. Twelve autobiographical memories (both perspectives) recalled from a third-person perspective <p>N per condition not reported. Sample $n = 56$, approx. $n = 28$ per group.</p>	<p><u>Original intensity</u> (1-7 scale) <u>Current intensity</u> (1-7 scale) <u>Current affect awareness</u> (remembering feelings at time; 1-7 scale) <u>Original pleasantness</u> (1-7 scale) <u>Current pleasantness</u> (1-7 scale)</p>	<p><u>Third- to first-person perspective shift</u> Original and current intensity ↔ Current affect awareness ↔ Original pleasantness ↔ Current pleasantness ↔</p> <p><u>First- to third-person perspective shift</u> Original and current intensity ↓ Current affect awareness ↓ Original pleasantness ↔ Current pleasantness ↔</p>
Seih et al (2011),	Non-clinical	Written task; an upsetting	<ol style="list-style-type: none"> 1. First-person perspective ("I") 	<u>Emotional involvement overall</u> (1-7 scale)	<u>Third- compared to first- and second-person perspectives</u>

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
Study 1	student sample	autobiographical memory	<ol style="list-style-type: none"> Second-person perspective (“you”) Third-person perspective (“he/she”) <p><i>N</i> per condition not reported. Sample <i>n</i> = 55, approx. <i>n</i> = 18 per group.</p>	<p><u>Emotional involvement post-writing</u> (1-7 scale)</p> <p><u>Positive affect</u> calculated from the mean of 5 positive items (1-5 scale) (Diener & Emmons, 1984).</p> <p><u>Negative affect</u> calculated from the mean of 6 negative items (1-5 scale).</p>	<p>Emotional involvement overall ↓</p> <p>Emotional involvement post-writing ↓ (trend)</p> <p>Positive affect ↔</p> <p>Negative affect ↔</p>
Seih et al (2011), Study 2	Non-clinical student sample	Written task; an upsetting autobiographical memory	<ol style="list-style-type: none"> Writing in first-, then second, then third-person perspective. Writing in first-, then third, then second-person perspective. Writing in third-, then second, then first-person perspective. Writing in third-, then first, then second-person perspective. Writing in second-, then first, then third-person perspective. Writing in second-, then third, then first-person perspective. <p><i>N</i> per condition not reported. Sample <i>n</i> = 129, approx. <i>n</i> = 21 per group.</p>	<p><u>Emotional involvement overall</u> (1-7 scale)</p> <p><u>Emotional involvement post-writing</u> (1-7 scale)</p> <p><u>Positive affect</u> calculated from the mean of 5 positive items (1-5 scale) (Diener & Emmons, 1984).</p> <p><u>Negative affect</u> calculated from the mean of 6 negative items (1-5 scale).</p>	<p><u>Perspective switching</u></p> <p>Emotional involvement overall ↔</p> <p>Emotional involvement post-writing ↔ (trend)</p> <p>Positive affect ↔</p> <p>Negative affect ↔</p> <p><u>Third- and second- person compared to first-person perspectives</u></p> <p>Emotional involvement post-writing ↓</p> <p>Positive affect ↔</p> <p>Negative affect ↔</p>
Sekiguchi & Nonaka (2014)	Non-clinical student sample	Mental imagery; positive and negative autobiographical memories	<ol style="list-style-type: none"> Recall of memories from spontaneously adopted perspective (first/third) at time 1 (T1), time 2 (T2) and with no perspective instructions at time 3 (T3). Recall of memories from spontaneously adopted perspective (first/third) at T1, the opposite perspective at T2, and with no perspective instructions at T3. <p><i>N</i> per condition not reported. Sample <i>n</i> = 48, approx. <i>n</i> = 24 per group.</p>	<p><u>Emotional intensity</u> (1-5 scale)</p>	<p><u>Third- to first-person perspective, at T2 and T3, compared to T1</u></p> <p>Emotional intensity ↔</p> <p><u>First- to third-person perspective, at T2 and T3, compared to T1</u></p> <p>Emotional intensity ↓</p>
Sutin and Robins (2010), Study 2	Non-clinical student sample	Mental imagery; self-defining memories	<ol style="list-style-type: none"> Recall from spontaneously adopted perspective (<i>n</i> = 450) Recall from instructed first-person perspective (<i>n</i> = 128) Recall from instructed third-person perspective (<i>n</i> = 128) 	<p><u>Emotion intensity</u> measured on the Memory Experiences Questionnaire (Sutin & Robins, 2007).</p>	<p><u>Third- compared to first-person perspective (spontaneously adopted at initial recall)</u></p> <p>Emotion intensity ↓</p> <p><u>Third- compared to first-person perspective (instructed)</u></p> <p>Emotion intensity ↔</p>
Terry and Horton (2007)	Non clinical student sample	Mental imagery; unpleasant, emotional and self-conscious	Within-subjects design	<p><u>Degree of emotion</u> (1-5 scale)</p> <p><u>Nervous</u> (1-5 scale)</p>	<p><u>Third- compared to first-person perspective</u></p> <p>Degree of emotion ↓</p>

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
		autobiographical memories	1. Recall from either first- and then third-person perspective or vice-versa; followed by participant comparison of the two perspectives ($n = 24$) Order counterbalanced.	<u>Self-consciousness</u> (1-5 scale) <u>Uneasiness</u> (no scale given)	Nervous ↓ Self-consciousness ↓ <u>Participant comparison of third- compared to first-person perspective</u> Degree of emotion ↓ Nervous ↓ Uneasiness ↓
Studies in positive emotions/memories, $n = 4$					
Gruber et al (2009)	Clinical sample (Adults with bipolar I disorder; BP) and healthy control group	Mental imagery; autobiographical memory of intense happiness	Within-subjects design 1. First-person perspective ‘why’ analysis of memory follow by third-person perspective ‘why’ analysis of memory, or vice versa (counterbalanced) ($n = 27$ BP, $n = 27$ control)	<u>Positive affect</u> Positive subscale of the PANAS – Short Form (Mackinnon et al., 1999) <u>Number of positive thoughts</u> (1-6 scale)	<u>Third-person compared to first-person perspective (both groups)</u> Positive affect ↓ Number of positive thoughts ↓
Holmes et al (2008)	Non clinical university sample	Mental imagery or verbal processing of positive imaginary scenarios	1. Imagining scenarios from a first-person perspective 2. Imagining scenarios from a third-person perspective 3. Verbal processing of scenarios N per condition not reported. Sample $n = 78$, approx. $n = 26$ per group.	<u>Positive affect</u> Positive subscale of the PANAS (21 items) (Watson et al., 1988)	<u>Third-person perspective and verbal condition</u> Positive affect ↓ ↔ <u>First-person perspective</u> Positive affect ↑
Nelis et al (2012)	Non-clinical student sample	Mental imagery or verbal processing of positive imaginary scenarios	1. Imagining scenarios from a first-person perspective 2. Imagining scenarios from a third-person perspective 3. Verbal processing of scenarios N per condition not reported. Sample $n = 78$, approx. $n = 26$ per group.	<u>Positive affect</u> PANAS positive subscale (10 items) (Watson et al., 1988)	<u>Third- and first-person perspective compared to verbal condition</u> Positive affect ↑ <u>Third-person compared to first-person perspective</u> Positive affect ↔
Vella & Moulds (2014)	Non-clinical student sample	Positive autobiographical memory and imagined positive future event	1. First-person memory recall switching to third-person perspective ($n = 42$) 2. Third-person memory recall switching to first-person perspective ($n = 32$) And	<u>Happiness</u> (0-100 scale) <u>Optimism</u> (0-100 scale) <u>Hopefulness</u> (0-100 scale)	<u>Memory recall</u> <u>Third- to first-person perspective shift</u> Happiness ↔ Optimism ↔ Hopefulness ↔ <u>First- to third-person perspective shift</u> Happiness ↓

Study	Participants	Primary manipulation	Conditions	Outcome measures	Main findings
			3. First-person imagined event switching to third-person perspective (<i>n</i> = 35) 4. First-person imagined event switching to third-person perspective (<i>n</i> = 38)		Optimism ↓ Hopefulness ↓ <i>Imagined event</i> <u>Third- to first-person perspective shift</u> Happiness ↔ Optimism ↔ Hopefulness ↔ <u>First- to third-person perspective shift</u> Happiness ↓ Optimism ↓ Hopefulness ↓ (trend)

Note. ↑ = increased levels of affect; ↔ = no significant difference between groups or pre-post; ↓ = decreased levels of affect.

4. Discussion

This review aimed to explore the effect of changes in vantage perspective on affect. Overall, most studies identified in this review found that the use of a third-person perspective was associated with reduced negative affect or affect intensity in both clinical and non-clinical populations.

4.1. Perspective change in low mood and anxiety

Several studies investigated the impact of perspective on low mood and depressive experiences. The studies reviewed in this paper indicate that for both non-clinical participants, and those with depressive symptoms, strategic use of the third-person perspective when recalling upsetting memories is generally linked to lower negative affect or emotional intensity. This would appear to indicate that the third-person perspective could be an effective emotion regulation strategy. Indeed, one study showed that this was effective for people diagnosed with major depressive disorder, with concomitant clinical implications (Kross et al., 2012). However, people with depression appear already to show an increased spontaneous tendency to recall negative autobiographical memories from the third-person perspective compared to controls (Kuyken & Howell, 2006). This would seem to indicate that when used spontaneously, for people with depression this strategy does not function to alleviate low mood in the long-term. The perspective of positive memories in depression was not considered by any study in this review, so this cannot be further elucidated.

However, as the third-person perspective appears to be linked to avoidance in clinical populations in both negative and positive memories in depression

(Bergouignan et al., 2008; Kuyken & Moulds, 2009; Lemogne et al., 2006; Williams & Moulds, 2007), this could indicate that when used *spontaneously*, the third-person perspective is being employed as a strategy to reduce or avoid distress rather than to engage with the content of the memory as a form of reappraisal. Lemogne and colleagues (Lemogne et al., 2009) found that higher levels of avoidance on a questionnaire measure were linked to an increased tendency to retrieve negative memories from a third-person perspective for healthy controls, supporting the idea that the third-person perspective can serve an avoidant function. One possible difference in the *strategic* use of a third-person perspective might be that the recall instructions in a number of the studies asked participants to consider “why” the recalled events had happened. It may be that in clinical populations, typical recall involving third-person perspective focuses only on “what” happened, rather than “why.”

Given the number of studies investigating links between anxiety disorders and use of a third-person perspective, there are surprisingly few studies identified in this review that addressed anxiety experimentally. The pattern found, however, is similar to that seen with low mood, i.e. that using the third-person perspective was mostly linked to lower negative affect and anxiety. This contrasts with some anxiety disorders in which there is an increased use of this visual perspective in anxiety disorders, where anxiety levels are by definition higher than non-clinical populations. Indeed, experimental evidence has shown that high levels of worry are linked to increased use of the third-person perspective (Finnbogadóttir & Berntsen, 2014). However, this too is suggestive that people with anxiety disorders may be using a detached perspective to manage affect in the short-term and that this may have a long-term cost.

4.2. Effect of perspective change on individual emotions

The studies reviewed here indicate a potential difference in the impact of the third-person perspective between some “basic” emotions, and those that have a degree of self-consciousness or self-evaluation.

Most of the studies found that basic emotions such as anger reduced when an event was considered from a third-person perspective, provided the focus was on “why” the event happened, not “what” happened (Ayduk & Kross, 2008; Katzir & Eyal, 2013, Study 1; Kross et al., 2005; Mischkowski et al., 2012).

The pattern of a decrease in affect with a third-person perspective was also seen in most of the studies relating to positive emotions and memories (Gruber et al., 2009; Holmes et al., 2008; Vella & Moulds, 2014). The non-replication of this pattern (Nelis et al., 2012) may be due to a failure to consider fully the role of depressive symptoms in perspective of positive memories (Nelis et al., 2013).

However, in studies addressing self-conscious emotions, the third-person perspective did not consistently reduce negative affect, showing no decrease in two studies (Katzir & Eyal, 2013) and increases in others (Hung & Mukhopadhyay, 2012). Two key elements may have an impact on whether a third-person perspective increases self-conscious emotion. Firstly, although the memories elicited in Katzir and Eyal’s study were theoretically linked to self-conscious emotions (guilt and shame), there was no instruction to consider the others’ evaluation of the self as was implicit in the design of Hung and Mukhopadhyay’s three studies. This may also explain why in Katzir and Eyal’s study, the third-person perspective did not *increase* negative affect.

Secondly, low self-esteem, a transdiagnostic difficulty, was shown to be an important factor in whether the third-person perspective increased or decreased shame (Libby et al., 2011). Libby and colleagues link this to the influence of “self-defeating interpretive frameworks” (p. 1171.); this implies that the context within which the self is evaluated interacts with perspective. Thus it may not be that the third-person perspective itself increases negative self-conscious affect but that how people make sense or, or contextualise the situation, which has a significant influence. Vantage perspective has been linked to moral judgments of the self (Agerstrom, Bjorklund, & Carlsson, 2013), indicating that the broader context (e.g. societal or cultural) is also important in the impact of perspective.

4.3. Perspective and autobiographical memories

The third-person perspective in autobiographical memories, regardless of valence, was associated in most of the studies reviewed above with reduced affect, affective details or emotional involvement, with the exception of two studies (Berntsen & Rubin, 2006; Sutin & Robins, 2010). The original (spontaneously adopted) perspective of a memory appears to have an important role in whether a difference in affect is seen when instructions are provided to alter perspective. All studies (including those reviewed in other sections, Vella & Moulds, 2014; Williams & Moulds, 2008) found a reduction in intensity of affect when shifting from an original first-person perspective to the third-person, but no difference with the converse shift. This would appear to indicate that while it is possible to reduce salient affective properties in a first- to third-

person perspective shift, this is not spontaneously increased if the shift is from third- to first-person.

This raises an intriguing point. Few of the studies reviewed above established the original perspective associated with the memories, prior to instructing the recall perspective. If the above pattern is generally true, it may be the case that when participants are instructed to take a third-person perspective regardless of spontaneous perspective, changes in affect tend to be due to changes from the more prevalent first-person memories (Nigro & Neisser, 1983). Participants who spontaneously adopted a third-person perspective at instructed recall, regardless of subsequent perspective manipulation, should therefore tend to show a smaller reduction in affect. As such, larger effect sizes may be seen if the original perspective is included as a variable within experimental designs. Further, if use of the third-person represents avoidance, it raises a clinically relevant question as to whether emotional processing could be enacted through a shift in perspective from third- to first-person, as the affective detail may not be encoded within the memory. Thus an alternative mechanism may be necessary for adaptive emotional processing, such as a change in the meaning of the memory.

4.4. Role of appraisals and changing meaning

Several of the studies identified in this review used a measure of semantic change in addition to emotional outcome measures (e.g. Kross et al., 2014). In these studies, use of the third-person perspective in addition to a consideration of *why* the recalled event occurred was consistently linked to greater degrees of semantic change. This may offer a key insight into the difference between use

of the third-person perspective as an avoidance strategy compared to one which promotes effective emotion regulation. When used to promote *avoidance*, an emotion regulation strategy argued to be ineffective (Hayes, Strosahl, & Wilson, 2011), the third-person perspective may functionally “freeze” the event, such that “what” happened is retained, but new, contextual information is not introduced. Thus in the short-term, experienced affect is minimized by increasing the perceived distance between the affect-provoking event and the individual, without any further engagement or changes, and with potential long-term consequences.

However, when new information is introduced in the third-person perspective through engaging with *why* an event occurred, effective reappraisal may be possible, perhaps because the third-person perspective allows an event to be tolerated for long enough in working memory for regulatory information to be introduced. Neuro-imaging studies indicate that during reappraisal, semantic information relating to emotional stimuli is altered, which attenuates the activity in the amygdala (Buhle et al., 2014), an area of the brain strongly associated with generating emotional responses (Gallagher & Chiba, 1996). Thus adopting a third person perspective (Ochsner & Gross, 2008) may be of utility as a emotion regulation strategy only if this introduces new understanding.

Clinically, the introduction of new and updated information is an important part of several treatment protocols, for example post-traumatic stress disorder and social phobia. The treatment of post-traumatic stress involves the client reliving the most emotionally distressing parts of their trauma and then adding in updated information to this memory (Grey, Young, & Holmes, 2002). Thus the meaning of the memory can change, allowing the memory to be processed

more adaptively. In social phobia treatment, negative images based on early traumatic memories are also relived, and clients invited to update the image with more helpful information and introduce new perspectives into the image (Wild & Clark, 2011).

4.5. General limitations

It is possible that the third-person visual perspective, for example, adopted by those with clinically significant problems may be linked to qualitatively different images compared to controls. Many studies have assumed that the third-person perspective offers a ‘neutral’, observer-like stance, but given the high levels of self-criticism and shame in most clinical populations, it is possible that the images are “distorted” and thus different to third-person images experienced by non-clinical populations. For example, in social phobia, the use of video-feedback is important in helping people to experience a non-distorted image of themselves in the third-person (Harvey, Clark, Ehlers, & Rapee, 2000; Rapee & Hayman, 1996). Qualitative information on the nature of the images in the reviewed studies is lacking.

4.6. Limitations of this review

There are several limitations of this review. The review limited its definition of perspective to that of the first- and third-person. However, different types of perspective manipulation have also been shown to impact affect, for example, imagined increasing spatial distance. When negative scenes are imagined as moving away, this is linked to lower negative affect (J. I. Davis, Gross, & Ochsner, 2011). In addition to this, temporal perspective has been shown to

interact with vantage perspective (D'Argembeau & Van der Linden, 2004, 2012). For example, memories and imagined future events which are further away temporally are more likely to be experienced from a third-person perspective, compared to those which are nearer temporally being experienced from a first-person perspective (D'Argembeau & Van der Linden, 2004).

This review concentrated on the impact of vantage perspective on affect, but other outcomes could have been considered. For example, vantage perspective has been shown to impact behaviour, with a third-person perspective linked to an increase in non-health related behaviours such as voting and academic motivation (Libby, Shaeffer, Eibach, & Slemmer, 2007; Vasquez & Buehler, 2007). By contrast, first-person perspective appears to be linked to an increase in health-related behaviours such as giving up smoking for a day (Rennie, Harris, & Webb, 2014). One study (Uskul & Kikutani, 2014) found that use of perspective was only significant when participants had high levels of concern about the evaluations of others. For these participants, the third-person perspective was linked to greater behavioural intention to complete a public task (buying mouthwash). By contrast, when the task was private (teeth flossing), use of the first-person perspective was linked to greater behavioural intention and completion of the task.

4.7. Implications for future research

Most of the emotion outcome measures used in the studies reviewed here were single item measures. In order to extend the work, future research would benefit from validated emotional measures. This would also permit authors to ensure that groups are matched, and allow more robust conclusions to be

adopted in relation to the effect of any interventions on emotional outcome measures. Further, given the links discussed above with semantic change as a mediator for cognitive change, studies would benefit from a measure of the extent to which semantic or meaning-based change has occurred. Future studies should investigate the effect of perspective change within clinical populations; although some work has already started in this area (Kross et al., 2012), it remains unclear as to the effect in anxious populations for example.

4.8. Clinical implications

The studies identified in this review imply that the perspective adopted when recalling both positive and negative mental images/memories or the verbal reviewing of experiences (e.g. recalling the memory in written or spoken form) has implications for managing affect. The third-person perspective may offer a strategy to regulate emotion, but if used as an avoidance strategy, may perpetuate psychological difficulties. Studies of spontaneously adopted perspective in clinical populations suggest that a habitual tendency to adopt this perspective as an avoidant emotion regulation strategy may play a role in the maintenance of disorders.

The apparent contrast between third-person perspective as an effective emotion regulation strategy and as characteristic of those with mood or anxiety disorders suggests that clinicians should carefully examine the perspective adopted in imagery to consider its effect on a client's ability to engage with or manage affect. Imagery-based assessment in cognitive therapies is an important part of treatment (Hales et al., 2014). Using a micro-formulation, clinicians can investigate in detail the emotional, cognitive and behavioural implications of an

image experienced. This review suggests that exploring the perspective adopted in the image has important emotional consequences, and could represent a target for intervention.

It may also be the case that the impact of perspective interacts with people's perception of their selves, for example either through self-esteem (Libby et al., 2011) or through actions incongruous with self-concept (Libby & Eibach, 2002). To the author's knowledge, no studies have investigated the typical perspective adopted in imagery within, for example, addiction processes, an area which would arguably link both self-esteem processes and, for those attempting to quit, self-concept. Although cognitive strategies have been shown to be effective in reducing craving in smokers (Kober, Kross, Mischel, Hart, & Ochsner, 2010), this has concentrated on a reinterpretation based strategy rather than a perspective based one.

Finally, this review has concentrated on one particular operationalisation of perspective, but other therapies offer alternative and potentially complementary conceptualisations. So-called 'third-wave' cognitive behavioural therapies, such as Acceptance and Commitment Therapy (ACT; Hayes et al., 2011) or mindfulness-based therapies (Segal, Williams, & Teasdale, 2002) encourage clients to become observers of their own experience, echoing Ochsner and Gross's (2008) description of adopting a detached perspective. ACT techniques such as 'defusion,' in which therapeutic attention is shifted from addressing the *content* of thoughts to the *process* of thinking, could thus be argued to reflect a shift in perspective; the perspective accessed is a meta-position on thinking, but nonetheless introduces new information that potentially impacts the emotional experience of the client and/or helps direct behaviour.

The perspective adopted by individuals, whether that is a detached third-person perspective, or a first-person perspective can have important implications for the experience and management of affect. It does not appear to be the case that using either perspective is intrinsically adaptive or maladaptive; instead, the context and function of the perspective use are key components. It is likely that increasing the flexibility with which either perspective is employed will increase its efficacy as an emotion regulation strategy, in addition to ensuring semantic change is introduced. Thus, it may be the case that in some cases, a shift to the third-person perspective aids emotional regulation in the short term, but for longer term adaptive processing, new information also needs to be incorporated.

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Part 2: Empirical Paper

An investigation into the effectiveness of a brief imagery-based “defusion” strategy in reducing nicotine cravings

Abstract

Craving plays an important role in the maintenance of addiction. Cognitive strategies have shown promise in regulating craving. Although research is limited, mental imagery has been linked to craving experiences, and represents a neglected target for intervention. Two craving regulation strategies focussing on mental imagery experienced by smokers were compared. One was drawn from a cognitive psychological approach using alternative imagery and the other from a technique from the third-wave therapeutic approach Acceptance and Commitment Therapy, “defusion.” Effects of these strategies were examined on acute craving, smoking behaviour and approach-avoidance behaviour in a stimulus compatibility task. Both strategies were associated with a reduction in craving, at session 1 and at 24 hr and 1 week follow-up. In addition, mean number of daily cigarettes smoked reduced from baseline in both groups. However, the defusion group appeared to show a greater motivational bias towards smoking stimuli. Nonetheless, the findings suggest that there are no differences in craving and smoking behaviour between an ACT-based defusion strategy and a simple imagery-replacement strategy.

Introduction

Smoking cigarettes is widely acknowledged to be the cause of a major global health problem. Research within the UK alone has suggested there is a £2.7 billion annual cost to the NHS of smoking related diseases (Callum, Boyle, & Sandford, 2011). While developments in pharmacology, psychosocial treatments and health policy have had an impact on smoking rates, further innovation is essential if harms from nicotine addiction are to be minimised. This goal is likely to be achieved by developing a more detailed understanding of the biological and psychological processes underlying addictive behaviour. A key aim is to improve our understanding of the psychological strategies that enhance the ability of the individual to control craving of a substance (nicotine), which offers immediate positive and negative reinforcement but is associated with serious long-term health consequences.

Craving

Craving is considered in many of the major models of addiction (Skinner & Aubin, 2010), although it has only recently been added as a criterion within substance-use disorders within the recent edition of the *Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013)*. Conditioning models of addiction argue that cue-induced craving occurs for those trying to quit and experiencing withdrawal symptoms (Drummond, 2000). Cognitive models of craving posit that craving arises from a combination of socially learnt processes (such as self-efficacy) and cognitive elements such as memory and information processing (Tiffany,

1999). According to this latter model, craving is the result of non-automatic processes (e.g. a decision to not smoke) clashing with an automatic process (e.g. habit-based action-tendencies involved in smoking behaviour) (Tiffany, 1990). Thus given its role in maintaining addictions, craving is an important target for intervention in addictive disorders (Tiffany & Wray, 2012).

Several studies have demonstrated the link between craving and cigarette smoking. Ecological momentary assessment (EMA) studies have found that smoking urges are strongly linked to smoking behaviours (Shiffman et al., 2002), and are the strongest predictor of smoking behaviour (Cronk & Piasecki, 2010). Smokers in this latter study reported smoking in order to manage their cravings, implying a potential vicious cycle of behaviour. Higher craving has been associated with a higher probability of smoking, a shorter latency to smoke and greater number of cigarettes (Shiffman et al., 2013). Thus craving is associated with higher levels of smoking, but has also been implicated in relapse in smokers attempting to quit (Killen & Fortmann, 1997; Van Zundert, Ferguson, Shiffman, & Engels, 2012). Further, experiencing intrusive thoughts about smoking has been shown to be linked both to “slips” during cessation attempts, and urges to smoke (Ginex & O'Connell, 2010), suggesting that addressing cognitive processes linked to craving is also important.

Craving regulation strategies

Psychological interventions in substance misuse form an important part of supporting those who are attempting to quit, for example through application of cognitive-behavioural principles (Miller & Brown, 2009). One

psychological approach based on these principles is Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 2011). There is promising evidence of effectiveness of ACT interventions for smoking, compared to medication (Gifford et al., 2004) and as an adjunct to medication (Gifford et al., 2011). ACT appears to be more effective than traditional Cognitive Behavioural Therapy (CBT) approaches to smoking cessation (Bricker, Bush, Zbikowski, Mercer, & Heffner, 2014) and government-recommended cessation support (Bricker, Mull, et al., 2014; Bricker, Wyszynski, Comstock, & Heffner, 2013).

Experimental studies have investigated specific cognitive techniques for regulating cravings in smoking. For example, considering the long-term consequences of smoking results in lower craving levels compared to thinking about short-term consequences (Kober, Kross, Mischel, Hart, & Ochsner, 2010). Szasz and colleagues (Szasz, Szentagotai, & Hofmann, 2012) compared the effect of suppression of thoughts relating to craving cigarettes, reappraisal of such thoughts in line with traditional CBT techniques or “acceptance” of craving and smoking thoughts in line with ACT techniques. Their study found that reappraisal of thoughts was more effective than the other two techniques in regulating craving, suggesting that the process of “accepting” thoughts does not have as great an effect as changing their meaning. However, the instructions used by Szasz and colleagues only briefly describe the acceptance task, generating concerns that participants would not have had enough context to understand the instructions. Indeed, in a recent meta-analysis, Levin and colleagues (Levin, Hildebrandt, Lillis, & Hayes,

2012) argue that experimental interventions which include an experiential element as well as a rationale are associated with greater effect sizes.

Another core process within the ACT model may be more amenable to introducing in a short-term experimental setting. “Defusion” describes a state in which clients are able to notice their thinking for what it is - the habitual, verbal and imaginal activity of the brain - rather than necessarily representations of facts or truth. In the state of “cognitive fusion” there is a strong link between (verbal and imaginal) thought and action. Behaviour is thus regulated primarily by thought, without input from other sources, e.g. a desire to quit smoking to improve health. Defusion techniques are designed to weaken the link between thought and automatic action, and can be introduced via simple instructions involving basic verbal or imaginal strategies (Hayes et al., 2011). Both defusion and acceptance strategies act as a counterpoint to “experiential avoidance,” which has been shown to be an important mediating factor in addictive disorders (Kingston, Clarke, & Remington, 2010).

Mental imagery

As noted above, thinking can be experienced as verbal, or as imaginal, i.e. in the form of mental images. Mental imagery is the experience of “seeing with the mind’s eye” for example, with perceptual information coming from memory rather than direct sensory experiences (Kosslyn, Ganis, & Thompson, 2001). Research has explored the experience of mental imagery in cravings in food-related craving for example (e.g. Bullins et al., 2013). There is evidence for mental imagery playing a role in addiction-related processes, e.g. in promoting alcohol consumption (Connor et al., 2014; Kavanagh, May, &

Andrade, 2009), and some similar evidence in opiate addiction (Bradley & Moorey, 1988). Research within smoking is limited, but smokers report both smoking related verbal thoughts and mental images (Salkovskis & Reynolds, 1994). Further, smoking imagery scripts intended to prime urges and negative affect have been shown to be effective in increasing urges and decreasing affect (Maude-Griffin & Tiffany, 1996; Tiffany & Drobes, 1990).

Further, mental imagery has a greater emotional impact than verbal thoughts (Holmes & Mathews, 2005; Holmes, Mathews, Mackintosh, & Dalglish, 2008; Mathews, Ridgeway, & Holmes, 2013). Thus there may be an increased impact of addressing mental imagery experienced in craving in smoking. Negative affect has been associated with increased “approach” behaviours, e.g. smoking, whereas positive affect has been linked to higher levels of “avoidance” behaviour e.g. not smoking (Schlauch, Gwynn-Shapiro, Stasiewicz, Molnar, & Lang, 2013).

Thus, imagery appears to be an important part of the experience of craving (May, Andrade, Panabokke, & Kavanagh, 2004). Andrade and colleagues have proposed the Elaborated Intrusion Theory of Desire, an account that draws heavily on cognitive understandings of cravings and emphasises the role of mental imagery (Andrade, May, & Kavanagh, 2012; Kavanagh, Andrade, & May, 2005; May, Kavanagh, & Andrade, 2015). Cravings are argued to be in the form of intrusive thoughts or images that are then elaborated, often with imagery (Kavanagh et al., 2005), an elaboration which is argued to use the visuospatial sketch-pad, a sub-system of working memory (VSSP; Baddeley, 1986).

Support for these predictions has been obtained through studies using visuo-spatial tasks which disrupt cravings, e.g. experimentally-induced food cravings (Andrade, Pears, May, & Kavanagh, 2012) and naturally occurring cravings for e.g. food, caffeine or nicotine (Skorka-Brown, Andrade, & May, 2014). Smokers who created mental visual imagery of neutral scenes or objects, such as a rose-garden or rainbow, reported reduced levels of craving, compared to those creating neutral auditory imagery (May, Andrade, Panabokke, & Kavanagh, 2010). These results replicate and extend those found by Versland and Rosenberg (2007) who found that guided imagery was superior in reducing craving compared to a distracting cognitive verbal task.

Another conceptualisation of the relationship between craving and imagery is offered using an Acceptance and Commitment Therapy formulation. In this account, cognitive fusion to craving-related thoughts in addictive disorders is likely to reflect fusion to vivid and elaborated imagery. Further, as imagery is likely to be more affect-provoking than verbal thoughts, defusion from this imagery is likely to decrease affect, perhaps through an increase in distress tolerance, in which unpleasant affect can be endured in the pursuit of a broader behavioural goal (Brown, Lejuez, Kahler, Strong, & Zvolensky, 2005). An increased willingness to stay in contact with aversive experiences is a key tenet of ACT, and may paradoxically have the effect of reducing their unpleasant affective properties (Harris, 2009). Further, repeated practice of a defusion technique over time should increase experiential understanding and thus increase in effectiveness.

The current randomised experimental study compared the effectiveness of a “defusion-from-imagery” strategy and a standard imagery replacement

procedure on cravings for cigarettes and smoking-related behaviour (cigarettes smoked and approach-avoidance behaviour in a stimulus-response compatibility task) in non-treatment-seeking smokers with a degree of motivation to quit. As the strategies focus on the idiosyncratic mental imagery experienced by smokers, rather than using an imagery induction script (Maude-Griffin & Tiffany, 1996; Tiffany & Drobes, 1990), a novel imagery cue-induction, tailored to participants' idiosyncratic smoking-related imagery, was used to induce craving. This was followed by the use of one of the two craving regulation strategies.

The main study hypothesis was that the defusion from imagery strategy would be associated with reduced experiential avoidance of smoking-related experiences that would be at least equally effective in reducing smoking craving compared to an alternative imagery condition (Beadman et al., 2015). A second exploratory hypothesis was that the defusion strategy would produce a significantly greater reduction in negative affect, in line with an increase in distress tolerance, compared to the alternative imagery. An additional exploratory hypothesis was that use of the defusion strategy over a 7 day period would have a greater effect on reducing craving and number of cigarettes smoked compared to the alternative imagery strategy as participants gain familiarity with a strategy that involves relating to their thoughts in an unfamiliar way (unlike, perhaps, the imagery replacement strategy).

Method

Research design

This study used a between-groups design. The original design contained three conditions: “suppression,” defusion and imagery replacement (“alternative imagery”). However due to recruitment difficulties, a decision was made at an early stage to concentrate recruitment efforts on the two conditions that seemed most closely matched (only 2 participants were recruited to the suppression condition). The remainder of this section therefore only outlines the methodology as it relates to the latter two conditions.

Participants were randomly assigned to one of two experimental conditions: Alternative Imagery or Defusion. The experimenter was blind to condition until after the pre-task questionnaires had been completed, after which, participant allocation to group was determined according to a random code contained in a sealed manilla envelope which was prepared by the research supervisor.

Participants

Participants were recruited through posters and websites such as Gumtree and Facebook in two locations, London and Cambridge. Of 319 who replied to advertisements, 67 were identified as eligible (see Figure 1). Of these, 50 attended their initial study appointment and gave informed consent. 45 provided 24 hour follow-up data, and 36 provided 7 day follow-up data.

Inclusion criteria for participants were: 18-60 years old, fluency in English, smoking at least five cigarettes a day, a score of ≥ 4 on the Fagerstrom Test of Nicotine Dependence (i.e. at least mild dependence) and ≥ 4 on the Motivation to Stop Smoking scale (which indicated a strong desire to stop smoking). Exclusion criteria included current mental health problems,

current psychotropic medication use, current addiction to a substance other than nicotine, enrolment on a structured smoking cessation programme and use of nicotine replacement therapy for smoking cessation.

Power analysis for this study was informed by previous work within craving reduction. For example, Szasz and colleagues (Szasz et al., 2012) found an effect size of $\eta_p^2=0.13$ (medium-large effect size). However, as no work within smoking imagery has been conducted previously, sample size was estimated using a more conservative small-medium effect size. Assuming equal group sizes, power calculation was carried out using “G*Power 3” (Faul, Erdfelder, Lang, & Buchner, 2007), with alpha specified at 5% and power at 80%. The sample reported in this study of $N = 24$ in two groups would have the power to detect a small-medium effect size of $f = 0.21$.

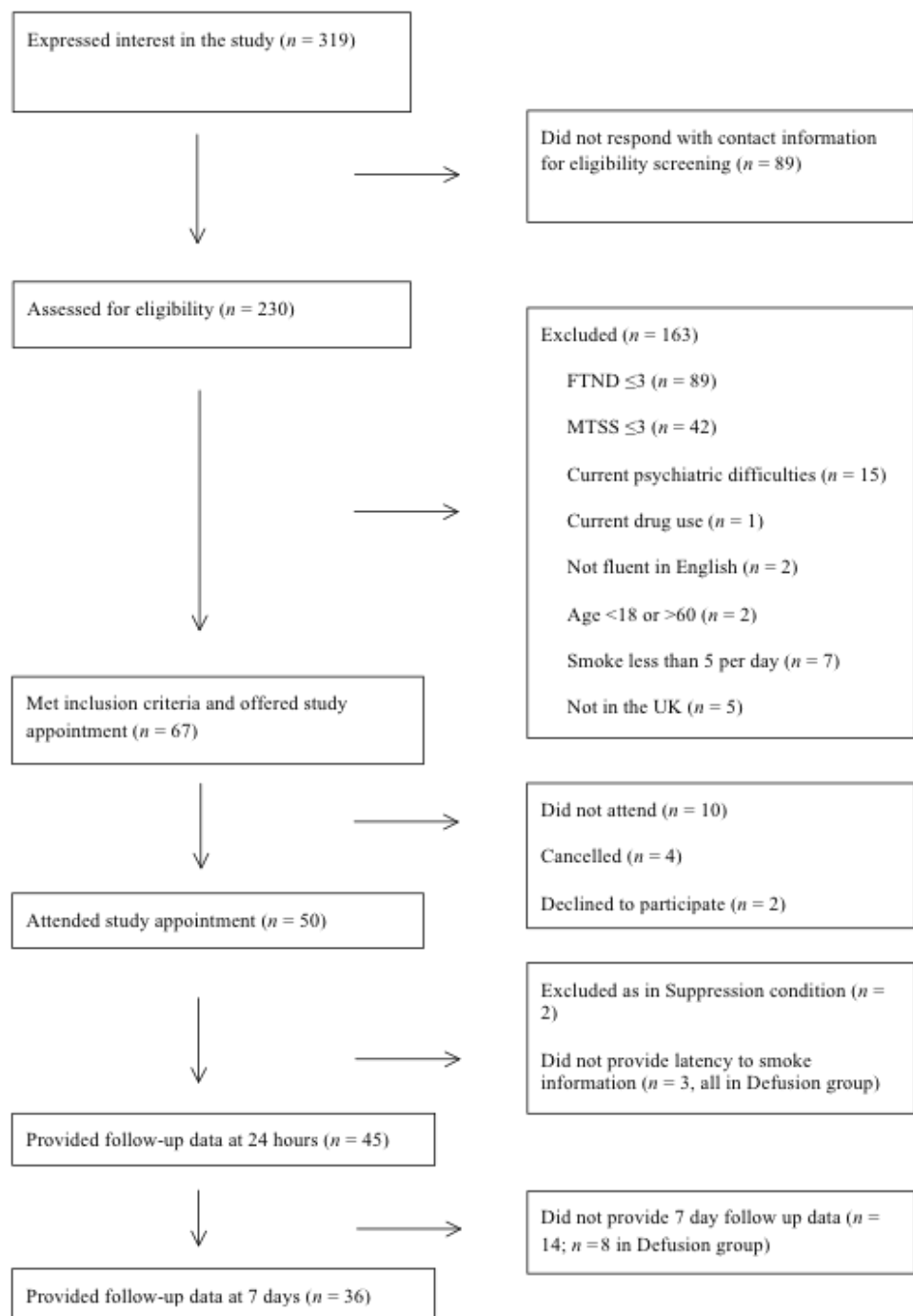


Figure 1. Recruitment flow diagram.

Ethics

This study received ethical approval from the UCL Research Ethics Committee (Project ID Number: 0760/002) and is part of a wider research programme on the effects of visuo-spatial tasks on smoking and drinking (see Appendices 2-3).

Measures

Smoking-related measures.

Motivation to Stop Smoking Scale (MTSS; Kotz, Brown, & West, 2013).

The MTSS measures motivation to stop smoking on a seven-point scale. Each point is anchored to statements relating to increasing levels of motivation, from 1 (“I don’t want to stop smoking”) to 7 (“I REALLY want to stop smoking and intend to in the next month”). This measure shows good predictive validity and acceptable accuracy ($ROC_{AUC} = 0.67$ [95% CI = 0.65–0.70]) in identifying smokers who quit.

Fagerstrom Test of Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). The FTND is a six-item measure of smoking behaviours (e.g. latency to first cigarette after waking) with a maximum possible score of 10. Higher scores indicate higher levels of nicotine dependence. This widely-used measure has acceptable internal consistency (Cronbach’s $alpha = .61$).

Timeline Follow Back Instrument (TLFB; Sobell & Sobell, 1992; Sobell & Sobell, 1996). The TLFB (adapted for cigarettes) is a self-report calendar-based retrospective method for estimating number of cigarettes smoked. In this study, participants reported numbers for either the preceding seven days, providing a daily mean, or twenty-four hours. The TLFB has been shown to have a good correlation ($r = 0.85$) with other methods of assessing number of cigarettes smoked (e.g. Gariti, Alterman, Ehrman, & Pettinati, 1998) and excellent ($r = 0.73-0.93$) test-retest reliability in cigarette smokers (Robinson, Sobell, Sobell, & Leo, 2014).

Mood and Physical Symptoms Scale (MPSS; West & Hajek, 2004). The MPSS measures five withdrawal symptoms (depression, irritability, restlessness, hunger and poor concentration) on a 5-point Likert scale (1= “Not at all”, 5 = “Extremely”). It also includes two 6-point urge scales measuring strength of urges (0= “No urges”, 5 = “Extremely strong”), and time spent with urges to smoke (0= “Not at all”, 5 = “All of the time”). These are averaged to provide a single urge score. In this study, the urge items of the MPSS was anchored at either “the past eight hours or since waking” or “the past few minutes,” however this data were part of a separate validation study and are therefore not reported here. The MPSS has good internal consistency (Cronbach’s alpha = .78).

Brief Questionnaire of Smoking Urges (QSU-brief; Cox, Tiffany, & Christen, 2001). The QSU-brief is a ten-item measure of current craving, e.g. “I would do anything for a cigarette right now.” Items are rated on a seven

point Likert scale (1 = “Strongly disagree” to 7 = “Strongly agree”), with a maximum possible score of 70. It has excellent internal consistency (Cronbach’s $\alpha= 0.97$).

Trait measures.

Spontaneous Use of Imagery Scale (SUIS; Reisberg, Pearson, & Kosslyn, 2003). The SUIS is a twelve-item measure of spontaneous use of mental imagery in everyday settings. Items (e.g. “When I first hear a friend's voice, a visual image of him or her almost always springs to mind”) are rated on a five point Likert scale (from 1 = “Never”, 5 = “Always”). The mean score is reported. The SUIS has acceptable reliability (Cronbach’s $\alpha= 0.72-76$; Nelis, Holmes, Griffith, & Raes, 2014) and is correlated with other measures of vividness such as the Vividness of Visual Imagery questionnaire (Marks, 1973) providing convergent validity.

White Bear Suppression Inventory – Smoking Version (WBSI-S; Nosen & Woody, 2013). The WBSI-S measures tendency to suppress thoughts of smoking. Using a 5 point Likert scale (1= “Strongly disagree, 5 = “Strongly agree”), participants rate ten items (e.g. “I tried not to think about smoking”), with a total possible score of 50. It has strong internal consistency (Cronbach’s $\alpha = 0.81$) and good convergent and discriminant validity with other measures of suppression (Nosen & Woody, 2013).

Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). The CFQ is a measure of tendency to experience fusion with thoughts. Participants rate 7

items (e.g. “I tend to get very entangled in my thoughts”) using a seven-point Likert Scale (from 1 = “Never true”, 7 = “Always true”). It has excellent internal consistency (Cronbach’s $\alpha = 0.88$) and good test-retest reliability ($r = .81$).

National Adult Reading Test (NART; Nelson, 1982). The NART is a commonly used proxy measure of premorbid IQ. Participants are presented with fifty irregularly spelt words (e.g. “Gaoled”) and asked to read them aloud. Error scores are recorded, and converted ($127.7 - 0.826 \times \text{NART error score}$) into an estimated Wechsler Adult Intelligence Scale – Revised Full Scale IQ score (WAIS-R; Wechsler, 1981).

State measures.

International Positive and Negative Affect Schedule Short Form (IPANAS-SF; Thompson, 2007). This ten item measure asks participants to rate five negative and five positive items (e.g. “upset”, “inspired”) on a five-point Likert scale (1 = “not at all,” 5 = “very much), providing a negative and positive affect score; each subscale has a total possible score of 25. The IPANAS-SF has been shown to have good internal consistency (Cronbach’s $\alpha = 0.87$) and good convergent and discriminant relationships with longer, validated measures of mood.

Avoidance and Inflexibility Scale (AIS; Gifford et al., 2004; Gifford et al., 2011). The AIS is a thirteen-item measure of experiential avoidance linked to smoking. Using five point Likert scales (1= “not at all”, 5 = “very

likely/much”), participants rate how likely their smoking-related thoughts, feelings and bodily sensations are to lead them to smoke, and aspects of their experience (e.g. “How much are you struggling to control these feelings?”). The mean score is reported. For this study, the scale was amended to replace “thoughts” with “mental images.” The AIS has excellent internal consistency (Cronbach’s *alpha* = 0.93).

Imagery questionnaire. Participants were asked to rate how vivid, pleasant, compelling and unwanted their smoking mental imagery was on seven-point Likert scales, ranging from 1 (“not at all”) to 7 (“extremely”). An additional item measured the extent of mind-wandering using this seven point scale.

They indicated from which perspective they experienced their mental imagery (first/third/mixture of both) and the content of any verbal thoughts noticed during the imagery exercise (see Appendix 7.)

Credibility and manipulation checks.

Credibility and Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000). The CEQ is a six-item measure which asks participants to rate statements on nine-point Likert scales (1= “Not at all” to 9 = “Very”; items 1-3 and 5) or from 0-100% (items 4 and 6). The scale was adapted for this study to reflect instructions relating to smoking/cravings e.g. “At this point, how successful do you think these instructions will be in reducing your cravings?” and items 4 and 6 were standardized to a nine-point Likert scale. A credibility score is calculated from the mean of items 1-3, and an expectancy score from the mean of items 4-6.

Comprehension and manipulation checks. Participants were presented with six questions to check their understanding of and engagement with the strategy. The first three questions related to general use of the strategy and were scored on seven-point Likert scales; how complicated were the instructions (1 = “Not at all complicated” to 7 = “Very complicated”), how clearly did you understand the instructions (1 = “Understood completely” to 7 = “Did not understand at all”) and prior use of the strategy (1 = “Never” to 7 = “All the time”). As these three questions were introduced later in the study, data is absent for the first six participants. The next three questions, answered by all, asked the extent to which participants tried to “replace” their image with a different image, to “get distance” from their image, or to “erase” their image, rated on seven-point Likert scales (1= “Not at all” to 7 = “Extremely”).

Craving regulation tasks.

For the imagery defusion condition, a novel craving regulation task was designed, based on and adapted from that reported by Beadman and colleagues (Beadman et al., 2015). The task consists of three sections (an introduction regarding imagery, an explanation of the strategy and an active strategy use section). Equivalent instructions were also designed for the Alternative Imagery condition.

The instructions for the two conditions were matched for length, smoking and emotion related words, Flesch-Kincaid Grade Level and Reading Ease. Further, each condition was matched as closely as possible word for word (see Appendices 8-13 for full instructions). Instructions were given to

participants in printed form and were also presented in audio format, recorded by a non-psychologist volunteer blind to hypotheses who rated all instructions as equally credible as rated by the CEQ.

The first section is an introductory rationale on links between visual mental imagery and smoking. The second section of the task is an explanation of the strategy and a brief instructional practice of the strategy. In the third section, participants following only audio-recorded instructions, complete the imagery cue-induction, and then practice using the strategy over a two-minute period. Compliance is assessed verbally. Participants who indicate they have not understood or who have completed the task in an idiosyncratic manner are provided with clarification and asked to follow the strategy as described in the printed/recorded instructions. Participants then repeat the imagery cue-induction and complete the main task of using their strategy.

Imagery cue-induction task.

Initially, participants are asked to focus on their craving experiences and report if any spontaneous mental imagery relating to smoking comes to mind. Those who do not experience spontaneous imagery are asked to create a scenario in mental imagery of a situation in which they have a strong urge to smoke and can smoke. For the imagery-cue induction, participants are asked to close their eyes and immerse themselves in their smoking imagery for two minutes, with instructions to return to the smoking imagery if they noticed their mind had wandered.

Stimulus-response compatibility task

The SRC task was based on that described by Mogg et al (Mogg, Bradley, Field, & De Houwer, 2003) and was programmed in Experiment Builder (SR Research Experiment Builder 1.10.165, 2011). A manikin is presented on a computer screen above or below either neutral or smoking images and participants are required to move the manikin towards or away from the images. “Toward” or “away” moves relate to symbolic behavioural approach or avoidance tendencies and provides an implicit measure of affective or motivational valence of smoking stimuli (Mogg et al., 2003). Two blocks, each with 20 practice trials and 80 experimental trials, are presented; in one block participants must approach smoking-images and avoid neutral images, in the other, the order is reversed. Blocks were presented in a counterbalanced order. 10 smoking and 10 neutral images were presented 5 times each in each block (see Appendix 14); the manikin was presented an equal number of times above and below the image and the order of trials was randomised. Latency to respond (response time) is recorded in addition to whether the initial response was correct (regardless of subsequent self-correction).

Procedure

Participants were screened for eligibility via a telephone interview; if eligible, they asked to refrain from smoking for two hours before study participation. Written informed consent was obtained.

Participants completed the MPSS (with urges anchored at “past eight hours or since waking”) and provided socio-demographic and smoking history

information. CO levels were measured to determine compliance with the 2 hr abstinence instructions, and latency since last cigarette recorded. After completion of the NART, SUIS, WBSI-S and CFQ, baseline measures of craving and mood were taken (QSU-brief, MPSS Urge frequency and strength, IPANAS).

Following the introductory rationale regarding mental imagery and smoking, participants then completed the craving cue induction, followed by the QSU-brief, MPSS urge frequency and strength (“past few minutes”), IPANAS, and the questionnaire about their mental imagery. The craving regulation task was then completed, with the CEQ administered following the second section of the task (strategy explanation).

Post-craving regulation strategy measures were then completed: QSU-brief, MPSS urge frequency and strength (“past few minutes”), IPANAS, the questionnaire about their mental imagery and the Avoidance and Inflexibility Scale. Finally, participants completed the SRC task.

Participants were then asked to practice their assigned strategy over the course of 7 days; a cue-card was given with a reminder of strategy (see Appendix 15). Strategy use, helpfulness, intention to continue use, current craving, latency since last cigarette and number of cigarettes smoked since the study (QSU-brief, MPSS urge frequency and strength “in past 8 hours/since waking”, TLFB) were assessed via telephone interview at 24 hours and 7 day follow-up.

Statistical analysis

Mixed within-between subjects analyses of variance (ANOVA) will be conducted to examine changes in score over time and between groups.

Planned contrasts will be Bonferoni corrected. Current craving measures pre- and post-imagery cue induction and post-strategy use will be compared using repeated mixed ANOVAs and t-tests to establish whether craving rose as a result of the cue-induction, and fell as a result of strategy use.

Data found to have a non-normal distribution (through visual inspection of histograms, calculation of skewness and kurtosis and Kolmogorov-Smirnov tests) will be either analysed using non-parametric tests (with medians reported) or data will be log-transformed. Figures will display non-transformed data. All analyses will be conducted using SPSS Version 22 (IBM Corp, Released 2013). The two participants recruited into the Suppression condition will be excluded from the analyses.

Results

Descriptive statistics

48 participants (age $M = 30.48$, $SD = 10.94$; 73% male; 75% White, 18.8% Asian, 6.2% all other) were included in the analysis. There were no differences between groups on any demographic or smoking baseline variables, or trait measures; see Table 1. There were no differences between Cambridge and London participants on any baseline measures (all $ps > .1$, except for more pre-rolled cigarettes in the London group, $X^2(2, N = 48) = 5.98$, $p = 0.05$). One participant provided no 24 hour data, but did provide 7

day follow-up data. This is reflected in the differing degrees of freedom reported below.

Table 1.
Demographics and Trait Measures

	Alternative Imagery	Defusion
	<i>n</i> = 24	<i>n</i> = 24
	Mean (SD)	Mean (SD)
Age	32.25 (11.07)	28.71 (10.75)
Years of education	15.33 (2.26)	14.29 (2.16)
WAIS FSIQ	103.46 (9.74)	99.08 (7.31)
SUIS	3.35 (0.73)	3.33 (0.59)
WBSI-SV	37.17 (7.58)	33.92 (7.91)
CFQ	28.38 (8.18)	27.33 (9.91)
	<i>N</i> (%)	<i>N</i> (%)
Gender		
Male	18 (75)	17 (70.8)
Female	6 (25)	7 (29.2)
Ethnicity		
White	20 (83.3)	16 (66.7)
Asian/Asian British	3 (12.5)	6 (25)
Mixed/Multiple Ethnic Groups	1 (4.2)	0
Black/Black British	0	1 (4.2)

Note. WAIS, Wechsler Adult Intelligence Scale; FSIQ, Full Scale IQ; SUIS, Spontaneous Use of Imagery Scale; WBSI-SV, White Bear Suppression Inventory- Smoking Version; CFQ, Cognitive Fusion Questionnaire

* No difference between groups, all *ps* ≥ .09

Smoking baseline characteristics

Of the 48 participants, 37.5% (*N* = 18) smoked pre-rolled cigarettes, 54.2% (*N* = 26) smoked hand-rolled cigarettes and 8.3% (*N* = 4) smoked both; there were no differences between groups, $X^2(2, N = 48) = 1.15, p = .56$. The groups did not differ on CO level (Alternative Imagery *M* = 8.00, *SD* = 3.01, Defusion *M* = 7.33, *SD* = 2.82, $t(46) = .79, p = .43, d = .23$) or on any baseline or smoking history variables (see Table 2).

Table 2.
Baseline smoking variables and smoking history

	Alternative Imagery	Defusion
	Mean (SD)	Mean (SD)

MTSS	5.21 (1.14)	5.13 (1.00)
FTND	5.29 (1.04)	5.33 (1.31)
Mean daily cigarettes (TLFB)	13.49 (5.34)	14.15 (6.60)
MPSS Withdrawal	9.71 (3.00)	9.50 (2.70)
MPSS Urge	2.40 (0.83)	2.69 (0.84)
Years smoked	15.08 (10.22)	11.68 (9.85)
Years smoked 5+ cigarettes	13.42 (9.87)	9.62 (8.97)
Number of quit attempts**	5.95 (10.42)	5.21 (5.15)
Maximum time not smoking (months) **	5.43 (7.53)	4.38 (6.74)

Note. MTSS, Motivation to Stop Smoking Scale; FTND, Fagerstrom Test for Nicotine Dependence; TLFB, Timeline Follow Back Instrument; MPSS; Mood and Physical Symptoms Scale.

*No difference between groups, all $ps \geq .10$

** Alternative Imagery $n = 21$, Defusion $n = 19$.

Imagery-cue induction

58.3% ($N = 28$) participants reported spontaneous imagery while craving; there was no differences between groups, $X^2(1, N = 48) = .34, p = .77$. All participants were able to identify imagery relating to smoking, and these did not differ on imagery characteristics reported below (e.g. vividness, all $ps \geq .11$).

Manipulation check and compliance

Following the compliance check, $N = 6$ per group required the instructions clarifying. As expected, participants in the Alternative Imagery condition scored higher on the item relating to “replacing your smoking image” ($M = 5.67, SD = 1.34$) compared to those in the Defusion group ($M = 3.5, SD = 1.95$), $t(46) = 4.48, p > 0.001, d = 1.53$. Additionally, those in the Defusion group scored higher on the item relating to “getting distance from your smoking image” ($M = 5.33, SD = 1.31$) compared to those in the Alternative Imagery group ($M = 4.17, SD = 1.88$), $t(46) = -2.50, p = .02, d = 1.24$. There was no difference between groups on the “suppression” item, $p > .9$.

Credibility and use of strategy

Independent samples t-tests and Mann-Whitney tests showed that there were no differences in strategy credibility, expectancy, how complicated their instructions were deemed to be or how clearly they were understood, (all t values $\geq -.32$, U values ≥ 211 , $ps \geq .75$). There was, however, a difference between groups regarding prior use, Mann-Whitney $U = 145$, $p = .01$, $r = .41$, with the Alternative Imagery group more likely to report having used their strategy before.

Craving

A mixed between-within subjects ANOVA was conducted to assess the impact of strategy on craving as measured by QSU-brief over three time points (baseline, post imagery cue-induction, post-strategy use). There was a main effect of condition $F(1, 46) = 5.00$, $p = .03$, $\eta_p^2 = .10$, with the Defusion group reporting higher craving across time points (see Figure 2). There was a significant main effect of Time, $F(2, 92) = 18.86$, $p > .001$, $\eta_p^2 = .29$. Contrasts revealed a significant increase from baseline to post cue-induction, $F(1, 46) = 5.09$, $p = .03$, $\eta_p^2 = .10$, indicating that the cue-induction had successfully raised craving levels. There was also a significant decrease from post imagery cue-induction to post-strategy use, $F(1, 46) = 33.86$, $p > .001$, $\eta_p^2 = .42$. The groups did not differ in the level of increase or decrease in craving over Time as there was no interaction effect, $F(2, 92) = .67$, $p = .52$, $\eta_p^2 = .01$.

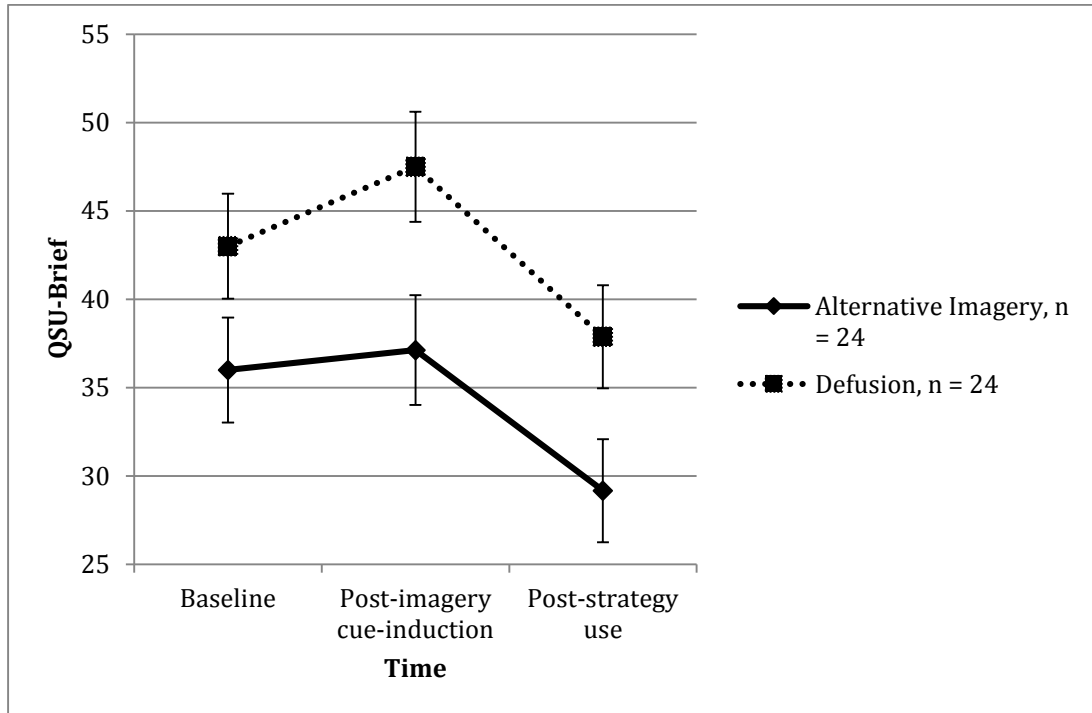


Figure 2. Mean QSU-brief scores (with standard error bars) between groups within session.

35 participants provided follow-up data at both 24 hour and 7 day follow-up. As the data at both 24 hour and 7 day follow-up was not normally distributed, all data was log transformed. To investigate whether craving levels continued to fall following strategy use for these participants, a 2 (Condition) x 5 (Time) mixed within-between subjects ANOVA was conducted. There was a significant main effect of Condition $F(1, 33) = 4.86, p = .035, \eta_p^2 = .13$, with the Defusion group reporting higher craving scores at all time points. There was a significant main effect of Time on urge score, $F(4, 132) = 27.52, p > .001, \eta_p^2 = .46$. Contrasts revealed a significant decrease from post-strategy use to 24 hour follow-up, $F(1, 33) = 11.88, p = .002, \eta_p^2 = .27$. There was no difference between 24 hour and 7 day follow-up craving score $F(1, 33) = 2.61, p = .12, \eta_p^2 = .07$, indicating craving levels

stayed low (see Figure 3). There was no interaction effect, $F(24, 132) = .40$, $p = .81$, $\eta_p^2 = .01$.

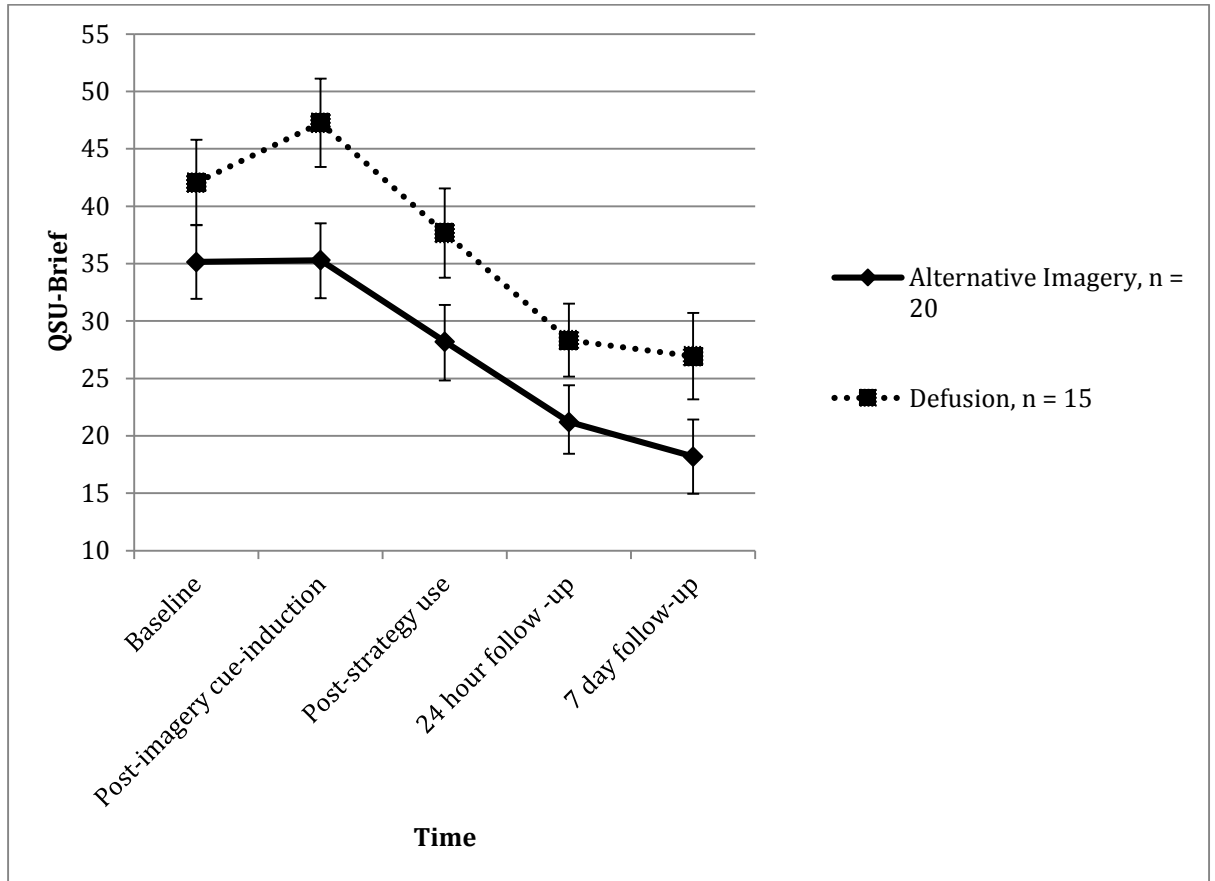


Figure 3. Mean QSU-brief scores (with standard error bars) between groups over time.

Negative and positive affect

A mixed between-within subjects ANOVA was conducted to assess the impact of condition on positive and negative affect as measured by IPANAS-SF at three time points (baseline, post-imagery cue-induction, post-strategy use). Scores on the negative scale were log-transformed due to non-normal distribution. There was no main effect of Condition for negative affect, $F(1, 46) = .40$, $p = .53$, $\eta_p^2 = .01$. There was a significant main effect of Time on negative affect, $F(2, 92) = 8.41$, $p > .001$, $\eta_p^2 = .16$. Contrasts revealed a

significant increase from baseline to post-imagery cue-induction, $F(1, 46) = 5.63, p = .02, \eta_p^2 = .11$, and a significant decrease from post imagery cue-induction to post-strategy use, $F(1, 46) = 13.32, p > .001, \eta_p^2 = .23$. There was no interaction effect between Condition and Time, $F(2, 92) = .76, p = .47, \eta_p^2 = .02$.

There was no main effect of either Condition $F(1, 46) = .004, p = .95, \eta_p^2 > .001$, or Time, $F(2, 92) = 1.07, p = .35, \eta_p^2 = .02$, on positive affect. There was no interaction effect, $F(2, 92) = 1.29, p = .28, \eta_p^2 = .03$.

Smoking behaviour

One participant had not smoked in the 24 hour period following the study, and therefore was coded as the maximum period i.e. 24 hours latency. There was no difference in latency to smoke between Distraction ($Md = 109, N = 23$) and Defusion ($Md = 115, N = 22$), Mann-Whitney $U = 244, p = .84, r = -.03$.

Mean TLFB score for the week preceding the study, the total cigarettes smoked at 24 hour follow up and the daily mean TLFB at 7 day follow-up were used to assess change in smoking. As the data for 24 hour and 7 day follow up were not normally distributed in the Defusion group, all data were log transformed. There was no main effect of Condition $F(1, 33) = 1.19, p = .28, \eta_p^2 = .04$. There was a significant main effect of Time on mean number of cigarettes smoked, $F(2, 66) = 15.28, p > .001, \eta_p^2 = .32$. Contrasts revealed a significant decrease from pre-strategy to 24 hour follow-up, $F(1, 33) = 11.88, p = .002, \eta_p^2 = .27$. There was no difference between 24 hour and 7 day follow-up mean daily TLFB score, $F(1, 33) = .35, p = .56, \eta_p^2 = .01$, indicating

the reduction of mean daily cigarettes was maintained. There was no interaction effect, $F(2, 66) = .40, p = .67, \eta_p^2 = .01$.

Imagery characteristics following strategy use

Mixed between-within subjects ANOVA tests were conducted to assess differences in imagery scores (vividness, pleasantness, unwantedness, compellingness and mind-wandering) between Conditions and over Time (pre- and post-strategy use).

For vividness scores, there was no main effect of Time $F(1, 46) = .99, p = .32, \eta_p^2 = .02$ or of Condition $F(1, 46) = 1.97, p = .17, \eta_p^2 = .04$. There was no interaction effect of Time and Condition, $F(1, 46) = .35, p = .56, \eta_p^2 = .01$. For scores of how unwanted the imagery was, there was no main effect of Time, $F(1, 46) = 2.06, p = .16, \eta_p^2 = .04$ or of Condition, $F(1, 46) = .14, p = .72, \eta_p^2 = .003$, and no interaction effect of Time and Condition, $F(1, 46) = 2.06, p = .16, \eta_p^2 = .04$.

For pleasantness scores, there was no main effect of Time, $F(1, 46) = 3.00, p = .09, \eta_p^2 = .06$ or of Condition, $F(1, 46) = .52, p = .48, \eta_p^2 = .01$. There was, however, a marginal interaction between Time and Condition, $F(1, 46) = 3.92, p = .05, \eta_p^2 = .08$. Figure 4 suggests that this effect is accounted for by a decrease in pleasantness ratings over time in the Defusion group. Bonferroni corrected pairwise comparisons were conducted, revealing a significant reduction in pleasantness score in the Defusion group, from pre- to post-strategy use, $t(23) = 2.63, p = .01, d = .58$.

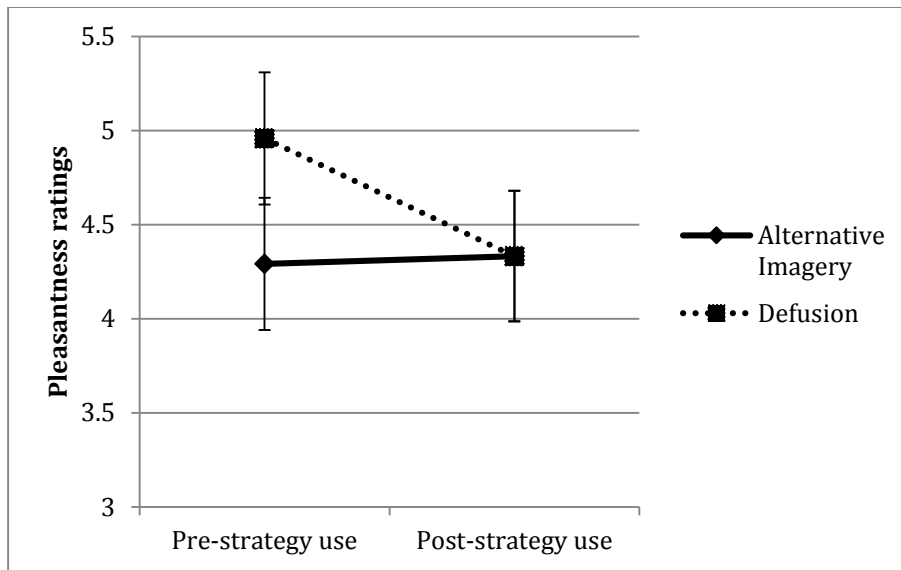


Figure 4. Mean pleasantness of imagery scores between groups at pre- and post strategy use.

For compellingness scores, there was no main effect of Time $F(1, 46) = 1.56, p = .22, \eta_p^2 = .03$ and no main effect of Condition $F(1, 46) = .148, p = .23, \eta_p^2 = .03$. However, there was a trend interaction effect of Time and Condition, $F(1, 46) = 3.52, p = .07, \eta_p^2 = .07$; the Defusion group rated their imagery as less compelling on the second occasion compared to the Alternative Imagery group. Bonferroni corrected pairwise comparisons were conducted, revealing a significant reduction in compellingness score in the Defusion group, from pre- ($M = 4.54, SD = 1.06$) to post-strategy ($M = 3.92, SD = 1.14$), $t(23) = 2.21, p = .03, d = .56$. There was no difference in the Alternative Imagery group, $p = .86$.

For mind-wandering scores, there was no main effect of Condition, $F(1, 46) = 6.44, p = .37, \eta_p^2 = .02$ and no interaction effect of Time and Condition, $F(1, 46) = .13, p = .72, \eta_p^2 = .003$. However, there was a main effect of Time, $F(1, 46) = .99, p = .02, \eta_p^2 = .12$, i.e. both groups reported increased mind-wandering over time.

Imagery perspective and verbal thoughts

Imagery perspective was assessed twice, post-imagery cue-induction and post- strategy. Post-imagery cue-induction, 46% ($N = 22$) reported a first person perspective, 29% ($N = 14$) a third person, and 25% ($N = 12$) a mixture of both. Post- strategy use, 58% ($N = 28$) reported a first person perspective, 27% ($N = 13$) a third person, and 15% ($N = 7$) a mixture of both. There were no differences between groups on the visual perspective reported in the imagery post-induction, $X^2(2, N = 48) = .52, p = .77$ and post-strategy use, $X^2(2, N = 48) = .22, p = .90$.

Verbal thoughts were reported during the first ($N = 16$) and second ($N = 7$) imagery cue-induction; there were with no differences between groups, $X^2 \leq .17, ps \geq .54$

Experiential avoidance

There was no difference between Alternative Imagery and Defusion on mean scores of the AIS, which was assessed post-strategy use (Alternative Imagery $M = 3.55, SD = .63$, Defusion $M = 3.42, SD = .74$), $t(46) = .94, p = .52, d = 1.18$.

Strategy use at Follow-up

At 24 hour follow-up, there was no difference in the time since last cigarette smoked between Alternative Imagery ($Md = 82.5, N = 24$) and Defusion ($Md = 30, N = 21$), Mann-Whitney $U = 188.5, p = .15, r = -.22$.

There was also no difference in frequency of strategy-use between groups, X^2

(1, $N = 45$) = .37, $p = .55$, or in the amount strategy was used (Alternative Imagery $M = 3.58$, $SD = 1.38$, Defusion $M = 3.19$, $SD = 1.43$), $t(43) = .94$, $p = .35$, $d = 0.89$. For those who reported using the strategy, there was no difference in how helpful they found it, (Alternative Imagery $M = 4.90$, $SD = 1.22$, Defusion $M = 4.47$, $SD = 1.59$), $t(43) = .95$, $p = .35$, $d = 1.10$. There was no difference between groups regarding intention to use the strategy in the future, Alternative Imagery $Md = 1$, $N = 24$, Defusion $Md = 3$, $N = 21$, Mann-Whitney $U = 182$, $p = .09$, $r = -.15$.

At 7 day follow up, there was no difference in the time (minutes) since last cigarette smoked between Alternative Imagery ($Md = 75$, $N = 20$) and Defusion ($Md = 60$, $N = 16$), Mann-Whitney $U = 135$, $p = .44$, $r = -.33$. There was also no difference in strategy use between groups, $X^2(1, N = 36) = 1.69$, $p = .19$, or in the amount strategy was used (Alternative Imagery $M = 3.67$, $SD = 1.18$, Defusion $M = 4.25$, $SD = 1.39$), $t(32) = -1.32$, $p = .20$, $d = 0.78$.

However, for those who reported using the strategy, there was a significant difference in how helpful they found it, (Alternative Imagery $M = 4.83$, $SD = 1.66$, Defusion $M = 3.75$, $SD = 1.34$), $t(32) = 2.08$, $p = .046$, $d = 1.13$ (large effect size, Cohen, 1988). Nonetheless, there was no difference in intention to use the strategy in the future, Alternative Imagery $Md = 2$, $N = 20$, Defusion $Md = 1$, $N = 16$, Mann-Whitney $U = 151.50$, $p = .78$, $r = -.11$,

SRC

Due to a technical fault, data from one participant (Defusion group) was not fully recorded, and therefore this participant was excluded from further analyses. For response latency analysis, data from eight participants

($N = 6$, Defusion group) were excluded due to high error rates for the first response (i.e. initial button press) (>23% of first responses incorrect; Mogg et al., 2003); thus data from 39 participants was analysed. Analyses were also conducted with the full dataset; all p s were the same or decreased. Initial response times (RTs) from the approach/avoidance task from correct trials were excluded if RTs were < 200ms (1% of data), or +/- 3 SDs from the mean for that condition (2% of data).

Reaction time for correct responses.

Approach/avoidance data were analysed using a 2 (Behaviour) \times 2 (Stimulus) \times 2 (Condition) mixed ANOVA, with initial RT on the SRC task as the dependent variable, behaviour (approaching or avoiding stimuli) and stimulus (smoking-related or neutral images) as within-subject factors and condition as the between-subjects factor. Post-hoc pair-wise comparisons are reported as Bonferroni corrected t-tests.

A main effect of Behaviour (approach, avoid) on RT was found, $F(1, 37) = 18.66, p < .001, \eta_p^2 = .34$, indicating participants were faster to approach stimuli than avoid them. There was also a main effect of Stimulus, $F(1, 37) = 89.08, p < .001, \eta_p^2 = .71$, indicating faster response times to smoking images compared to neutral images, suggesting that both groups show a motivational bias towards smoking images, as expected. There was a trend main effect of Condition on response time, $F(1, 37) = 3.87, p = .057, \eta_p^2 = .10$, with those in the Defusion strategy group responding faster across behaviours and stimuli (see Figure 5).

A Condition x Stimulus interaction was also found, $F(1, 37) = 5.19, p = .03, \eta_p^2 = .12$ such that participants in the Alternative Imagery group were slower to respond to neutral stimuli, compared to those in the Defusion group, $t(37) = 2.07, p = .046, d = .67$, however the groups did not differ in response times to smoking images, $t(37) = 1.83, p = .08, d = .59$ (see Figure 5). The Behaviour x Stimulus x Condition interaction did not reach significance, $F(1, 37) = 2.641, p = .11, \eta_p^2 = .07$

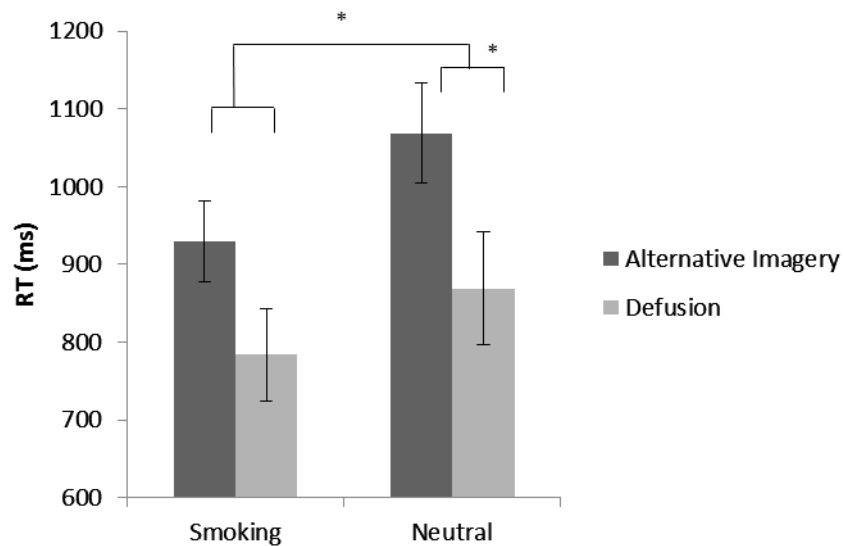


Figure 5. Mean RTs (in ms with standard error bars) for Stimulus type (Smoking/Neutral) by group.

Proportion of correct responses.

All participants' response data were analysed using a 2 (Behaviour) \times 2 (Stimulus) \times 2 (Condition) mixed ANOVA, with initial response (correct/incorrect) on the SRC task as the dependent variable, behaviour (approaching or avoiding stimuli) and stimulus (smoking-related or neutral images) as within-subject factors and condition as the between-

subjects factor. Post-hoc pair-wise comparisons are reported as Bonferroni corrected t-tests.

There was no main effect of Behaviour, $F(1, 45) = 2.95, p = .09, \eta_p^2 = .06$ and no main effect of Stimulus, $F(1, 45) = .89, p = .35, \eta_p^2 = .02$. There was a Behaviour x Stimulus x Condition interaction, $F(1, 45) = 4.72, p = .035, \eta_p^2 = .10$. When the task was to approach, the Defusion group made the correct first response more to smoking than neutral images, $t(22) = 2.33, p = .03, d = .47$. The opposite effect was found when the task was to avoid smoking, $t(22) = 2.46, p = .02, d = .51$, i.e. there were more incorrect first responses to smoking stimuli, indicating that the Defusion group demonstrated a greater automatic approach bias to smoking than the Distraction group (see Figure 6).

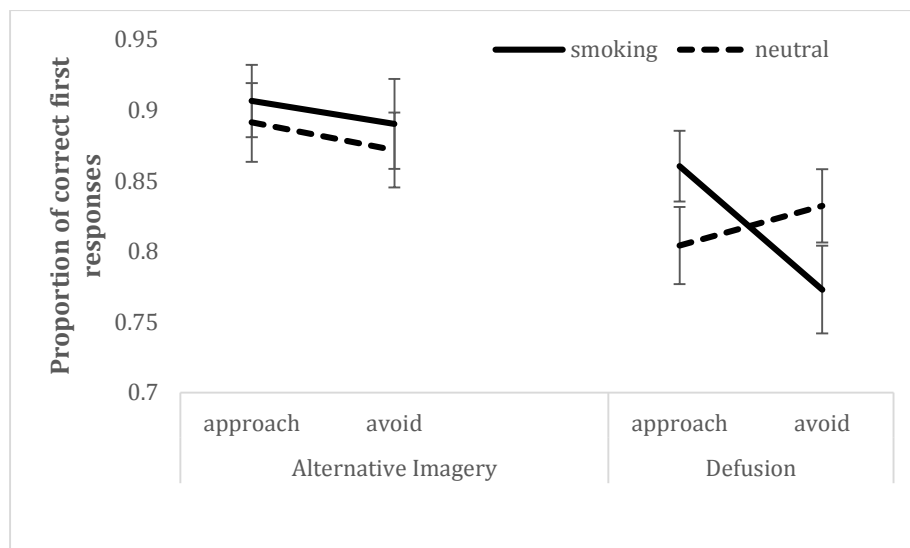


Figure 6. Proportion of correct responses (with standard error bars) for Task (Approach/Avoid) and Stimulus type (Smoking/Neutral) by group.

There were, however, no correlations between craving at baseline, post-imagery cue-induction and post-strategy use and RTs or proportion of first correct response regardless of task or stimulus, all $ps > .2$. There were

also no correlations between the AIS measure of experiential avoidance and RTs or proportion of first correct response, all $ps > .39$.

Discussion

This study aimed to investigate the impact of two experimental craving regulation strategies, Defusion and Alternative Imagery, on craving, affect and smoking-related behaviour. Both were associated with reduced craving over time, negative affect, and the number of cigarettes smoked. There was a reduction in how pleasant the Defusion group found their imagery following strategy use, and a trend reduction in how compelling they found it. The stimulus-response compatibility task revealed a motivational bias towards smoking stimuli in the Defusion group in terms of first correct responses, but not for response times. In addition, the Alternative Imagery group were slower to respond to neutral stimuli.

Few studies have investigated mental imagery among smokers, and in this respect, the current study makes a preliminary novel contribution. Over half of the sample in this study reported spontaneous visual mental imagery of smoking when asked to focus on their craving experiences. This adds support to the argument that mental imagery plays a role in craving experiences for nicotine addiction, and that it represents an accessible potential target for intervention. The study also showed that a novel imagery-based cue-induction procedure, tailored to idiosyncratic smoking imagery, was effective in eliciting craving. This has the advantage of greater ecological validity compared to script-base imagery cue-inductions (e.g. Maude-Griffin & Tiffany, 1996). Experimental cue-induced craving methods often use external stimuli to raise

craving, but this study shows that internal stimuli can also be elicited and elaborated to induce higher craving levels.

As predicted, both craving regulation strategies were associated with a reduction in craving over time, and the mean number of cigarettes smoked at 7 day follow-up. However, unexpectedly there was no difference on a measure of experiential avoidance. Although both strategies were as effective as each other on subjective measures, further conclusions must be limited due to the lack of a control condition (e.g. suppression or “no treatment”). However, in similar research focusing on verbal thoughts, defusion and reappraisal were also found to be equally effective at reducing craving but more effective than suppression (Beadman et al., 2015).

The SRC task suggests that the Defusion group displayed some motivational bias towards smoking stimuli compared to the Alternative Imagery group, although this was only seen in “first” responses and not in response times. Mogg and colleagues (2003) argue that stimuli evaluated as positive should be linked to a faster approach responses. This suggests that there was a difference in how smoking stimuli were evaluated between groups, with the Defusion group evaluating them more positively or as more appetitive. A possible explanation could be the higher levels of craving in this group, however there were no correlations between craving and response times which does not support this explanation. Thus it is unclear why this difference occurred. A tentative explanation could be that this behaviour could represent an extinction burst, in which there is an increase in a behaviour following a reduction of typical reinforcement (Cooper, Heron, & Heward, 2007). It may have been that attempting to get distance from

smoking images provoked a type of extinction burst in which once smoking stimuli were explicitly presented, there was an increase in approach behaviour. Unexpectedly, the Alternative Imagery group were slower to respond to neutral stimuli compared to the Defusion group. It is also unclear why this occurred.

Neither strategy had an impact on positive emotion; negative emotion, however, increased during the imagery cue-induction and decreased following strategy use for both groups. Negative affect has been shown to have a causal link with desire to smoke (Heckman et al., 2013; Schlauch et al., 2013). Strategies, such as those in these study, which promote the reduction of negative affect may thus be a beneficial part of effective smoking cessation programs (Heckman et al., 2013). This result is in contrast to work by Szasz et al (2012) who found an increase in negative affect over time when an acceptance strategy was used. The results from the current study may reflect the relatively greater time participants spent performing the strategy, as well as provision of a more detailed rationale for the strategy. Alternatively the difference in findings may reflect a greater impact of imagery on affect than verbal strategies (Mathews et al., 2013).

Contrary to the exploratory hypotheses, the Defusion strategy was no more effective than the Alternative Imagery strategy at reducing affect, or at reducing craving or changing smoking behaviour at follow-up. There may be a number of possible explanations for the lack of difference between the two. The Defusion group reported experiencing higher levels of craving at all time-points. Although both groups showed similar and significant reductions over time, it may be that the overall higher levels of craving in the Defusion group

affected their ability to concentrate on the task. Nicotine appears to confer cognitive benefits in terms of concentration (Heishman, Kleykamp, & Singleton, 2010) and nicotine deprivation has been linked to self-reported levels of low concentration (Giannakoulas, Katramados, Melas, Diamantopoulos, & Chimonas, 2003; McEwen, Hajek, McRobbie, & West, 2006).

It is also possible that the Alternative Imagery condition may have represented a more simple and familiar strategy. Indeed, those in the Alternative Imagery condition were more likely to have reported using the strategy before the experiment. In addition, the Alternative Imagery group reporting finding it a significantly more helpful strategy. The Defusion condition may have required participants to undergo a paradigmatic shift in understanding thinking processes which may have been harder to adhere to and less motivating. This may be reflected in the lower rates of 7 day follow-up data in the Defusion group. This has been a weakness in other studies investigating ACT related processes, such as acceptance techniques, in which acceptance appears to have been harder to understand than other conditions (Litvin, Kovacs, Hayes, & Brandon, 2012).

The Defusion strategy may only have been effective because, as the Alternative Imagery strategy is hypothesised to, it was taking up visuospatial resources within working memory. However, the suggestive effects of Defusion on pleasantness and compellingness of the visual imagery may indicate that these reflect a different mechanism of action on smoking-related imagery relative to image replacement. Although these results must be interpreted with caution, it would appear that reductions in how compelling

and pleasant smoking images were experienced in those in the Defusion may reflect a process of relating differently to their mental imagery. Recent work by Beadman and colleagues (Beadman et al., 2015) showed a reduction in experiential avoidance relating to pre-and post-verbal defusion strategy. Although there was no difference between groups in this study, this was only measured post-strategy use. Measuring this at baseline and at follow-up would allow a greater understanding of any process change within the Defusion group.

The design of the Defusion strategy may have also limited its effectiveness. This is the first experimental study that the author is aware of that uses a defusion from imagery technique. Most research in this area has focused on verbal thoughts using a verbal technique, the “milk, milk, milk” exercise, in which words are repeated to draw attention to their non-symbolic properties and thus gain distance from them (e.g. De Young, Lavender, Washington, Looby, & Anderson, 2010; Masuda, Hayes, Sackett, & Twohig, 2004; Watson, Burley, & Purdon, 2010). The defusion technique used in this study was designed to have minimal visual properties, but it may need to be further refined to be effective.

This design is closest to the “Leaves on the Stream” technique (Hayes et al., 2011). Hayes and colleagues argue that metaphors can draw attention to functions not present in the current behavioural functional repertoire, and help transfer these functions. Leaves on the stream includes two metaphorical elements; the water moving, and leaves moving on the water. The defusion technique used here only contains one function (i.e. that water moves). It may be that having both elements in the strategy would better support people’s

ability to experience their thoughts differently, e.g. “my smoking images can move on the water as leaves move, coming and going at their own pace.” Further, it may have been more effective to ask participants to do something differently to their imagery before placing it on the water, for example, imagining putting a frame around it. This would have further drawn attention to the intrinsic properties of the mental imagery experience, thus supporting defusion, compared to a fusion with the symbolic properties, i.e. imagery-as-real.

Limitations

The study had some limitations that should be considered when interpreting the results. As noted above, the lack of a control condition is a key limitation. Suppression has been used as a comparison craving regulation condition in a number of studies relating to cigarette craving (Beadman et al., 2015; Litvin et al., 2012; Rogojanski, Vettese, & Antony, 2011). If recruitment to this condition had been possible, it would have allowed more robust conclusions to be drawn regarding the relative effectiveness of the two strategies investigated in this study. Further, the rationales for all three strategies presented an explanation of the link between mental imagery and behaviour; in order to increase adherence and credibility, this was presented as factual. The study may have benefitted from a more in-depth exploration of how participants experience responding to their mental imagery.

This study focused exclusively on *visual* mental imagery, but this may have limited the effectiveness of the intervention. Some participants spontaneously mentioned olfactory and gustatory imagery, and including these

within the strategy may have reflected more fully the experience of craving. Both groups indicated an increase in mind-wandering over time and thus results may have been affected by reduced concentration. Strategies to maintain concentration may be useful to include.

Further, the power to detect an effect at follow-up will have been limited by the reduced sample size, particularly in the Defusion group. Compliance with the follow-up and strategy use could have been increased with reminders during the week, for example. In addition, selecting a sample which intended to quit smoking imminently may have increased adherence. The Timeline Follow-back instrument may also not be the most accurate measurement of number of cigarettes compared to e.g. ecological momentary assessment (EMA; Shiffman, 2009). Although beyond the scope of this study, EMA may have provided more accurate data and in addition served as an implicit reminder to use the strategy, thereby potentially increasing compliance.

Future research

This study would have benefited from a control condition, in order to understand better to what extent the craving regulation strategies were effective and to what extent study attendance influenced the outcome. More work is needed to refine defusion from imagery techniques in experimental settings. As discussed above, a refinement of or alternative defusion from imagery technique may have been more comprehensible, e.g. imagining the smoking image projected against a wall, or on a television screen. Given the potential limitations of presenting defusion in this short experimental context,

future research may benefit from a more extensive explanation of the context and rationale for defusion.

Clinical implications

The present study suggests that mental imagery is an important part of the craving experience for cigarettes, and indicates that cognitive strategies which address the impact of this imagery may form a key part of smoking cessation attempts. The two strategies investigated here, Defusion and Alternative Imagery, were both effective at reducing cravings and number of cigarettes smoked at follow-up, despite this being a short experimental intervention. Although research is limited, mental imagery has also been shown to play a role in other substance misuse disorders (e.g. Bradley & Moorey, 1988), and thus the craving regulation strategies developed here may have clinical utility in wider contexts.

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Part 3: Critical Appraisal

This critical appraisal will focus on three main areas of reflection on the Empirical paper; designing the novel intervention, the limitations of the study design, and the recruitment difficulties and the subsequent impact on the study.

1. Designing a novel intervention

The imagery craving regulation task developed for this study was a novel experimental approach. The principles (and practicalities) of the design were based on those developed in a previous related project (Beadman et al., 2015) and this made the design considerably easier. In Beadman et al's study, three craving regulation conditions were designed; a suppression condition, a reappraisal condition and a verbal defusion condition. However, my study differed in a key domain; the use of mental imagery. This reflected my research experience prior to being accepted onto the course (Holmes et al., 2011; Pearson, Deeproose, Wallace-Hadrill, Burnett Heyes, & Holmes, 2013). Addressing mental imagery rather than verbal thoughts had a number of consequences for how the conditions were designed. The study was designed in close consultation with my supervisor, and in addition, experts in the fields of mental imagery and smoking were consulted regarding the instructions.

1.1. Consulting with experts

Expert reviewers made a number of extremely helpful points that were incorporated into the instructions where appropriate. However, as noted and discussed below, some of the comments were not included. For example, one reviewer argued that calling the conditions "cognitive" distancing/distraction/elimination was too jargonistic. This was retained, however the

choice of this terminology was deliberate and was designed in order to increase the credibility of the description. A question was also raised as to whether asking participants about the perspective of their image was a form of distancing in itself. While this is an interesting theoretical point, we retained this, as this was both an exploratory measure of interest, and as all participants receive this instruction, it would be consistent across conditions.

1.2. Selection of the type of smoking mental imagery to address

Mental imagery can be experienced in any of the five senses (Kosslyn, Ganis, & Thompson, 2001). Several of the expert reviewers of the task instructions noted that craving would be involved with multisensory imagery, e.g. taste and sound. The decision taken to concentrate on the visual imagery aspects for experimental simplicity, and because asking participants to use a novel technique to “defuse” from olfactory imagery for example, may simply be too complex a procedure for such a short experimental time setting. However, the instructions were amended in the introduction to reference the fact that while imagery can be in all five senses, this study would concentrate on visual imagery. Nonetheless, this may have limited the effectiveness of the strategies, as it did not address key aspects of participants’ experience.

1.3. Designing the three conditions

1.3.1. Designing the Defusion condition

To my knowledge, no previous studies have investigated in an experimental setting either using an imagery technique for defusion, or any

technique to defuse from imagery (Levin, Hildebrandt, Lillis, & Hayes, 2012).

As a result, the design of this technique necessitated careful consideration.

There were at least two possible ways for it to be designed. The intervention could be a “defusion using an imagery technique”, i.e. using an imagery technique to defuse from any arising smoking-related thoughts, images, feelings etc. Alternatively, and this was the design chosen for the study, the intervention could be a “defusion from imagery” condition, i.e. using a defusion technique to defuse from images that arise. Thus, the intervention is designed to help participants defuse from their imagery of craving, not to use imagery to defuse from verbal thoughts.

However, just as verbal defusion techniques are often used to defuse from verbal thoughts (e.g. “I notice I am having the thought that...” or repeating a word so that attention is drawn to its intrinsic functions, e.g. sound, rather than its symbolic functions of the words, e.g. the link between a word and what it describes), so images that arise can be addressed using imagery defusion techniques. This is a clinical technique described by Russ Harris (Harris, 2008, 2009). One imagery defusion technique commonly used is that of “Leaves on a Stream” (Hayes, Strosahl, & Wilson, 2011) or an alternative suggested by Harris is a “moving blackness” (Harris, 2009, p.114). However, this imagery technique can be used to defuse from *any* internal experiences, i.e. verbal-thoughts, images, feelings etc so is not exclusively a technique for imagery.

This lead to a question over which type of defusion intervention would be most effective, i.e. whether we should select a verbal or imagery technique to defuse from images. Potential verbal techniques could have been asking participants to say “I notice my mind is showing me a picture of...”, or asking

them to name the ‘television station’ these images are associated with, i.e. the “name the story” technique (Harris, 2009). However, although there was no specific evidence that I was able to identify of the importance of matching modality (i.e. verbal techniques for verbal thoughts, imagery techniques for images), it seemed reasonable to argue that for the purposes of this study, it may be clearer and more comprehensible for participants to link their images to an imagery technique.

The pilot study design asked participants to imagine a "moving blackness." The technique of imagining placing an image on a moving blackness was piloted with several different people from a range of professions (i.e. not simply psychology students/professionals) to verify whether this was something that could be achieved. All eight professionals (ranging from telecoms engineers to a garage mechanic) were asked if they were able to imagine a moving blackness; all were able to, with descriptions varying from a black moving cloud to an oil slick. They were then asked to imagine their own front door, and when they indicated they had this image in mind, they were asked to place this image onto the moving blackness and let it float away. All reported being able to do this, and described for example, seeing it "bobbing away."

However, in the instruction review stage, it was felt that a moving blackness may cue participants into a negative frame of mind, and hence the instructions were changed to a “moving liquid” to be more affectively neutral. In addition, the order of imagining the image and the moving substance was changed, in order to closer match the other instructions' wording. Thus participants were asked to imagine "placing their smoking image onto a moving liquid" rather than imagining the moving liquid first and then imagining placing

their image on it. This is arguably an extremely minor difference, but it may be that it conflated two instructions in an unhelpful way; participants are both being asked to imagine a new and previously unmentioned type of image, and to do something unusual, i.e. place an image on an image.

1.3.2. Designing the Alternative Imagery condition

A review of the literature indicated that a number of studies investigating craving regulation used visual cues as a prompt to imagine the appearance of, for example, a rainbow or hot air balloon (e.g. Harvey, Kemps, & Tiggemann, 2005). Other studies included guided visual imagery scripts (e.g. Versland & Rosenberg, 2007). As the conditions needed to be carefully matched, it was decided to specify the imagery (i.e. a river-side scene), but allow participants to create further detail in their imagination.

Commentary from the expert reviewers suggested that participants may not find the defusion instructions as compelling, due to the alternative imagery condition being more pleasant and detailed. However, we continued to keep the alternative imagery more visually detailed than the defusion condition. This meant the defusion condition was visually ‘under powered;’ if a difference between these two conditions had been found, this would have added further support for this difference not being due to visuo-spatial details only.

1.3.3. Designing the Suppression condition

In Beadman et al’s (2015) study, suppression was rated as significantly less credible than the other two conditions. Attention was therefore paid to the language used in this condition. For example, the decision was taken to replace

the word “suppression” with the word “elimination.” This was intended to increase credibility. Nonetheless, the suppression instructions remained to some degree circular, i.e. control your thoughts by controlling them. As this condition was not used in the final study (see below for further discussion), it was not possible to know whether this strategy would have been rated as equally credible. This condition was also a verbal condition, i.e. there were no instructions to use imagery. This was chosen because if participants were asked to suppress their imagery using an imagery technique, it would cease to be a control for the other two strategies, and represent another type of imagery strategy.

One expert reviewer suggested adding instructions to 'please try to push away the cigarette image but do not try to bring to mind something else' to avoid overlap with the alternative imagery condition. This is a valid point and may have reduced potential confounding factors. However, following discussion with my supervisor, it was decided that this could also represent a confounding factor, i.e. introducing the idea that bringing to mind something else was possible. It was also thought that this could be too demanding for participants.

1.3.4. Matching the three conditions

The task instructions were designed so that all three matched as closely as possible on as many parameters as possible, to control for confounding variables. For example, the three sets of instructions matched on word count, number of times the word smoking or other related words were used, and grade level and readability as measured by Fleisch-Kincaid scores. See Appendices 8-13 for full instructions. The instructions were also matched as closely as possible word for word. The result of this was three almost identical sets of

instructions with the exception of key words and phrases pertaining to each condition. Thus, the rationale for each condition was in as many ways as possible identical. The aim of this was in part to control for possible experimenter bias but also to ensure that no one condition was more persuasive and credible than the others. The two conditions reported in the study were perceived by participants to be equally credible.

The process of matching these instructions was a particular challenge, to ensure that the rationales and task instructions still reflected the individual strategies as stand-alone tasks. In particular, the wording for the suppression condition limited what it was possible to say in the other two strategies, and at times this was frustrating. However, other studies investigating craving regulation strategies report only limited rationales and instructions; this study was able to more fully describe rationales and provide experiential elements as recommended by Levin and colleagues (Levin et al., 2012)

I was also mindful of my strong clinical interest in Acceptance and Commitment Therapy (Hayes et al., 2011). This guided the study design throughout. However, I was also aware that, despite best intentions, this might induce experimenter bias. The careful matching of the instructions was in part designed to counteract this possible effect. As far as was possible, I was blind to condition, i.e. when administering the baseline questionnaires. However, after this point I was not blind to condition as I had to select the correct strategy instructions, and this could theoretically have influenced my administration of questionnaires for example. This is a limitation of the design of this study as it introduces further possibility for experimenter bias. Ideally, at the least, follow-

up calls should have been completed by someone blind to condition, but given the parameters of this research, this was not possible.

2. Limitations of the study design

As discussed above, the instructions for all three conditions were as closely matched as possible. However, it is possible that designing the instructions in this way may have compromised the effectiveness of the interventions, in particular, the Defusion condition. This represents a very different approach to thinking about how to experience and manage thoughts, compared to what participants are likely to have encountered before. This is likely to have been the first time that participants have been introduced to ideas of defusion, and thus perhaps the design of the experiment may have benefitted from explanations tailored to the condition, rather than concentrating on matching them so closely.

As part of the compliance check for both conditions, participants were asked to describe whether they had been able to use the strategy and what they did during the practice. This allowed for the experimenter to establish whether instructions had been followed and provide clarification where necessary. The majority of participants indicated that they had been able to follow the task instructions. However, 25% of the defusion group did not follow the instructions exactly and appeared to struggle to take a non-literal understanding of these instructions. For example, one participant reported that he had been unable to imagine placing the image of himself buying cigarettes at his local supermarket on a river as there was no actual river by this supermarket geographically. Another said, on clarification that the smoking image should be placed on the

moving liquid, “that would be hard because what if that were the last cigarette available to me? I’d have to get it out,” indicating a potential conflation between a mental image of a cigarette and the cigarette itself.

It was difficult for me not to provide detailed feedback on how to follow the task exactly, using examples from my clinical experience. I was aware of this as a temptation, and attempted to remain as neutral a researcher as possible in both conditions to avoid experimenter bias.

By contrast, the Alternative Imagery condition may well reflect a more commonly used strategy and is more intuitive. This strategy, as one participant suggested, can easily be summarised in one sentence, e.g. "imagine something else", whereas conceptually defusion requires much more explanation. Although 25% of the Alternative Imagery group also required clarification at the compliance check, this tended to be because they had spontaneously imagined another scene (e.g. playing cricket).

The compliance check was followed by a post-task manipulation check, using three Likert scales to rate the extent to which participants had used three strategies, defusion, image replacement and suppression. The manipulation check wording was designed by myself and my supervisor, and was intended to differentially describe each of the three strategies. The wording was tailored for each strategy: “How much did you try to replace your smoking image with a different image?” (Alternative Imagery), “How much did you try to get distance from your smoking image by letting it come and go freely?” (Defusion) and “How much did try to you erase your smoking image?” (Suppression). These descriptions were designed to closely align with the directions participants would have received in the experimental booklets. The expectation was that

participants would score highly in their particular condition and much lower in the other two conditions, as these represented instructions they had not received.

The manipulation checks for the two strategies of interest, Defusion and Alternative Imagery, did show ratings in the expected direction. However, qualitative information from the rating of these items suggests that participants did not necessarily understand the statements to reflect very different strategies. Some participants scored highly on all three measures, including the Suppression item, despite having received no instructions to erase the image. Participants appeared to interpret these statements in idiosyncratic ways. For example, participants in the Defusion condition endorsed the higher end of the “replacing” Likert scale; on questioning, this was for example because they were “trying to think of something happy” or they had imagined doing something other than smoking in their image, neither of which matched my expectations for how people would interpret this question. Similarly, participants in the Alternative Imagery condition endorsed the higher end of the “getting distance” Likert scale, because they explained their mind had wandered, they had pushed their image away or they had tried to focus on the river, none of which related to my understanding of defusion. This was obtained as *ad hoc* feedback, but the study may have benefitted from a more detailed qualitative question about what participants did during the task.

The difference between my expectations and participant responses may be in part potentially due to my giving insufficient context for these items. For example, if participants had been told that there are several different strategies which can be used, of which these are three representative strategies, it is likely that they would have identified their own strategy more readily, reducing the

potential overlap due to misunderstanding of the statements. It is also possible that the statements themselves could have been worded in more clearly.

However, it may also reflect the extent to which participants employ multiple approaches to managing their imagery, particularly when it is unwanted. The relatively high scores on the suppression item may indicate that this is a natural strategy used by people to manage their craving imagery.

3. Recruitment process

Recruitment is a crucial part of experimental research but is also anecdotally an area of particular difficulty. My experience of recruitment for this study was no different. The original recruitment plan had been to advertise the study across a range of platforms, the most important of which was a university-wide email. In previous years, this email had successfully attracted up to 40% of eligible study participants. However, at the beginning of my recruitment process, it was unexpectedly announced that after years of this email being available to researchers within the university, it had been discontinued. Despite attempts at negotiation with the university, this decision remained in place. Therefore a major source of recruitment was unavailable.

3.1. Recruitment strategies

Thus, the process of recruitment was a particularly difficult experience for me. I tried a number of different strategies to recruit participants, including the university's participant pool, handing out leaflets to people who were smoking, putting up posters, joining London-based online social media groups to post to their pages and asking friends and family to forward my study details.

These strategies yielded very few participants. The most successful recruitment strategy was to recruit in another city, Cambridge, where my parents are based, and where I had access to a room in which I could complete testing. Seventeen of the study's participants came from Cambridge; without this, the study would have been underpowered.

Most of my participants were recruited from online advertising sites such as Gumtree. This reaches a broad section of the population but my experience was that they were also variably motivated to attend their study appointments (despite confirmation and reminders). Of the 67 eligible participants identified, 14 did not arrive for their appointments or respond to an offer to rearrange; 12 of these were from Gumtree.

In addition, the study retained its relatively stringent exclusion criteria. This focused on participants having a particular level of motivation to quit smoking as measured by the Motivation to Stop Smoking Scale (Kotz, Brown, & West, 2013) and a certain level of nicotine dependence as measured by the Fagerstrom test for nicotine dependence (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). 42 people were not eligible based on their smoking-cessation motivation score and 89 on their nicotine dependence score. If these criteria had been moved, it may have been possible to recruit more people; however, retaining these ensured that the study was as clinically relevant as possible. Indeed, if the participants had had *higher* levels of motivation to quit smoking, adherence to strategy use at follow-up may have been greater.

3.2. Suspension of recruitment to the suppression condition

Unfortunately, due to the cancellation of the university-wide email, and despite using the same alternative recruitment strategies used by other researchers in the department, my recruitment was extremely slow in the first couple of months. As a result of this, a pragmatic decision was taken not to recruit further to the suppression condition. The two participants who had completed this condition were excluded from the analyses.

As a result, I was unable to compare the two imagery conditions to another "control" condition. This has severely limited the conclusions that can be drawn from the study. The defusion and alternative imagery strategies were as effective as each other at reducing craving, number of cigarettes smoked and negative affect. Data from the suppression condition would have allowed further conclusions to be drawn, e.g. whether these two conditions were more effective than a control. Without this, it is possible that the explanation for the reduction in craving etc is due to having participated in the experiment (i.e. discussing smoking, learning a strategy to manage cravings and receiving a follow-up telephone call).

The suppression condition also, as noted above, represented a verbal condition. This would have provided a contrast to the imagery-strategies used, which has been shown to be of interest in other empirical studies (Nelis, Vanbrabant, Holmes, & Raes, 2012).

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Appendices

Appendix 1: Literature review search terms

Web of Science search terms:

“Vantage Perspective” OR “Vantage point” OR “Field perspective” OR
“Observer perspective” OR “Observer’s perspective” OR “Field-observer
perspective” OR “Observer perspective-taking” OR “First person perspective”
OR “1st person perspective” OR “Third person perspective” OR “3rd person
perspective” OR “Perspective taking” OR “Psychological distanc*” OR
“Visual perspective” OR “Self distanc*” OR “Self immer*”

AND

Emotion* OR “psychological well-being” OR “psychological wellbeing” OR
Stress* OR Trauma* OR Anxiety OR anxious OR Depress* OR Dysphori* OR
Anger OR angry OR phobi* OR fear OR disgust OR worry

AND

“Self-imag*” OR “Mental Image*” OR Image* OR Imagin* OR Memor* OR
“Verbal process*” OR “Self-talk*” OR “Self-evaluat*” OR Analy\$* OR
Ruminat* OR avoid* OR evaluat* OR repetitive OR intru* OR future OR
prospect*

PsychInfo search terms:

1. (Vantage adj Perspective)
2. (Vantage adj point)
3. (Field adj perspective)
4. (Observer adj perspective)
5. ("Observer's" adj perspective)
6. (Field-observer adj perspective)
7. (Observer adj perspective-taking)
8. (First adj (person adj perspective))
9. (1st adj (person adj perspective))
10. (Third adj (person adj perspective))
11. (3rd adj (person adj perspective))
12. (Perspective adj taking)
13. (Psychological adj distanc*)
14. (Visual adj perspective)
15. Self-distanc*
16. Self-immer*
17. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16
18. emotion*
19. ((Psychological adj well-being) or (Psychological adj wellbeing))
20. Stress*
21. Trauma*
22. (Anxiety or anxious)
23. Depress*
24. Dysphori*
25. (Anger or angry)
26. Fear
27. Phobi*
28. Disgust*
29. Worry
30. exp Emotional Regulation/
31. exp Emotions/

32. exp Emotional Disturbances/
 33. exp mental disorders/
 34. 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33
 35. (self adj image*)
 36. (mental adj image*)
 37. image*
 38. imagin*
 39. memor*
 40. exp Memory/
 41. exp Imagination/
 42. exp Self Concept/
 43. (verbal adj process*)
 44. self-talk*
 45. self-evaluat*
 46. Analy\$*
 47. ruminat*
 48. avoid*
 49. evaluat*
 50. evaluat*
 51. repetitive
 52. intrus*
 53. future
 54. prospect*
 55. exp Cognitive Processes/
 56. exp Self Talk/
 57. exp Self Evaluation/
 58. 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or
 51 or 52 or 53 or 54 or 55 or 56 or 57
 59. 17 and 34 and 58
 60. limit 59 to (human and english language and journal article and yr="1980 -Current")

Medline search terms:

1. (Vantage adj Perspective)
 2. (Vantage adj point)
 3. (Field adj perspective)
 4. (Observer adj perspective)
 5. ("Observer's" adj perspective)
 6. (Field-observer adj perspective)
 7. (Observer adj perspective-taking)
 8. (First adj (person adj perspective))
 9. (1st adj (person adj perspective))
 10. (Third adj (person adj perspective))
 11. (3rd adj (person adj perspective))
 12. (Perspective adj taking)
 13. (psychological adj distance)
 14. (Visual adj perspective)
 15. "Self-distanc\$"
 16. (Self adj immer\$)
 17. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16
 18. Emotion\$
 19. psychological well-being
 20. psychological wellbeing
 21. stress\$
 22. Trauma\$
 23. (anxiety or anxious)
 24. Depress\$
 25. Dysphori\$
 26. (Anger or angry)

27. phobi\$
28. fear
29. disgust\$
30. worry
31. exp Emotions/
32. exp Mental Disorders/
33. exp Depression/
34. exp Stress, Psychological/
35. exp affective symptoms/ or exp aggression/
36. exp Mental Health/
37. 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36
38. Self-imag\$
39. (Mental adj Image\$)
40. Image\$
41. Imagin\$
42. memor\$
43. exp Memory/
44. exp Imagination/
45. exp "Imagery (Psychotherapy)"/
46. (Verbal adj process\$)
47. Self-talk\$
48. Self-evaluat\$
49. Analy#\$
50. Ruminat\$
51. avoid\$
52. evaluat\$
53. repetitive
54. intru\$
55. future
56. prospect\$
57. exp Self Concept/
58. exp Cognition/
59. exp Communication/
60. 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57 or 58 or 59
61. 17 and 37 and 60
62. limit 61 to (english language and humans and yr="1980 -Current" and journal article)
63. (psychological adj distanc\$)
64. 17 or 63
65. 37 and 60 and 64
66. limit 65 to (english language and humans and yr="1980 -Current" and journal article)

EMBASE search terms

1. (Vantage adj Perspective)
2. (Vantage adj point)
3. (Field adj perspective)
4. (Observer adj perspective)
5. (Field-observer adj perspective)
6. (Observer adj perspective-taking)
7. (First adj (person adj perspective))
8. (1st adj (person adj perspective))
9. (Third adj (person adj perspective))
10. (3rd adj (person adj perspective))
11. (perspective adj taking)
12. (Psychological adj distance)
13. (visual adj perspective)
14. Self-distanc\$
15. (Self adj immer\$)

16. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15
17. Emotion\$
18. ((Psychological adj well-being) or (Psychological adj wellbeing))
19. stress\$
20. Trauma\$
21. (anxiety or anxious)
22. Depress\$
23. Dysphori\$
24. (Anger or angry)
25. phobi\$
26. fear
27. disgust\$
28. worry
29. exp emotion/
30. exp mental disease/
31. exp emotionality/
32. exp mental health/
33. exp stress/
34. exp social stress/
35. (Psychological adj distanc\$)
36. 16 or 35
37. 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
38. Self-imag\$
39. (Mental adj Image\$)
40. Image\$
41. Imagin\$
42. memor\$
43. exp thinking/
44. exp cognition/
45. (Verbal adj process\$)
46. Self-talk\$
47. self-evaluat\$
48. Analy#\$
49. Ruminat\$
50. avoid\$
51. evaluat\$
52. repetitive
53. intrus\$
54. future
55. prospect\$
56. exp verbal behavior/
57. exp self concept/
58. 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 52 or 53 or 54 or 55 or 56 or 57
59. 36 and 37 and 58
60. limit 59 to (human and english language and yr="1980 -Current" and journal)

Appendix 2: Research Ethics Committee Approval Letter



Dr Sunjeev Kamboj
Research Department of Clinical, Educational and
Health Psychology
UCL

19 March 2013

Dear Dr Kamboj

Notification of Ethical Approval

Project ID: 0760/002: Craving changes? How do verbal and visuo-spatial strategies modify craving experiences in heavy smokers and drinkers

I am pleased to confirm that in my capacity as Chair of the UCL Research Ethics Committee I have approved your study for the duration of the project i.e. until March 2014 on condition that the Information Sheet is amended to include reference to the fact that a breathalyser test will be administered following the consumption of the alcoholic drink.

Approval is also subject to the following conditions.

1. You must seek Chair's approval for proposed amendments to the research for which this approval has been given. Ethical approval is specific to this project and must not be treated as applicable to research of a similar nature. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of 'continued ethical approval' by completing the 'Amendment Approval Request Form'.

The form identified above can be accessed by logging on to the ethics website homepage: <http://www.grad.ucl.ac.uk/ethics/> and clicking on the button marked 'Key Responsibilities of the Researcher Following Approval'.

2. It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. Both non-serious and serious adverse events must be reported.

Reporting Non-Serious Adverse Events

For non-serious adverse events you will need to inform Helen Dougal, Ethics Committee Administrator (ethics@ucl.ac.uk), within ten days of an adverse incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Chair or Vice-Chair of the Ethics Committee will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

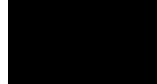
Reporting Serious Adverse Events

The Ethics Committee should be notified of all serious adverse events via the Ethics Committee Administrator immediately the incident occurs. Where the adverse incident is unexpected and serious, the Chair or Vice-Chair will decide whether the study should be terminated pending the opinion of an independent expert. The adverse event will be considered at the next Committee meeting and a decision will be made on the need to change the information leaflet and/or study protocol.

On completion of the research you must submit a brief report (a maximum of two sides of A4) of your findings/concluding comments to the Committee, which includes in particular issues relating to the ethical implications of the research.

With best wishes for the research.

Yours sincerely,



Professor John Foreman
Chair of the UCL Research Ethics Committee

Cc: Professor Peter Fonagy, Head of Department

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Appendix 3: Research Ethics Committee amendment



Amendment Approval Request Form

1	ID Number: Re: 0760/002	Name and Address of Principal Investigator: Dr Sunjeev Kambaj, Research Dept Clinical, Educational and Health Psychology
2	Project Title: Craving changes? How do verbal and visuospatial strategies modify craving experiences in heavy smokers and drinkers	
3	Information about the amendment:	
	(a) Is the amendment purely administrative?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
	(b) Has the Participant Information Sheet/Consent Form been changed as a result of the amendment?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
	If yes, please enclose a copy.	(changes to info sheet are in bold)
4	Summarise the issues contained in the amendment:	
	<p>The studies in this programme of research examine the effects of various psychological coping strategies on craving and other addiction-related behaviours. Specifically we examine the effects of threat-related images and mental imagery on craving and smoking and drinking behaviour. We seek to extend the current studies in the following ways:</p> <ol style="list-style-type: none"> 1) To extend the projects to July 2015 to accommodate data collection for three current 2nd year DClinPsy and one MSc students' theses. 2) One of the 'verbal' (cognitive) conditions we wish to test entails 'self-affirmation' which involves participants writing about cherished value. The control condition involves completing a neutral task (writing about how a least-important value may be important to someone else). Participants are given up to 10 minutes. We will determine whether self-affirmation reduces the processing of threatening health information. It is predicted that the boost to global 'self-image' (Steele, 1988) produced by self-affirmation will reduce defensive processing of threatening health information. This will be assessed, as in previous studies (Sheeran, Harris & Epton, 2013) using personal and comparative risk estimates (e.g. "How much do you believe you will be affected by an alcohol (or smoking)-related cancer at some point in the future" and "Compared to the average person who drinks as much as you, are you more or less at risk of an alcohol(or smoking-)-related cancer," rated on a continuous Likert scale). These are aimed at assessing optimism bias. Behaviour will also be a focus of these studies: number of drinks or cigarettes consumed will be monitored at 24 hr, 7 days and 28 Days by remote questionnaire completion (either telephone follow up or via Qualtrics, a web-based questionnaire tool) along with intention to reduce drinking/smoking and confidence in reducing consumption. Because of the additional time required for completion of the follow-up questions we will pay participants £10 instead of the currently approved £7.50. <p>The threatening health information will be presented in in the form of likelihood estimates of contracting a smoking/alcohol-related illness in the future according to demographic characteristics of the participant (Parkin, 2011). In experiments involving heavy drinkers, an additional video will be displayed (see http://reducemyrisk.tv/).</p> <ol style="list-style-type: none"> 3) For experiments involving heavy drinkers, the inclusion criteria will be based on objective assessment of harmful/hazardous drinking (AUDIT scores or >8) and/or binge drinking 	

(drinking more than twice recommended daily amount of alcohol more than once a week).

- 4) In addition to the lab-based experiments, we wish to perform these same experiments online, using the same stimuli and questionnaire format as used in the face-to-face experiments but delivered by Qualtrics, a survey instrument which is currently used to administer questionnaires in face-to-face experiments. The same verbally and written instructions, will simply be translated to online instructions/questionnaires. In these experiments, the only measure of drinking and smoking behaviour will be self reported (rather than objective, as in the lab-based studies which use breathalysers and CO monitor to assess alcohol and cigarette consumption). To increase the likelihood of retention and for ease, these participants will be compensated using Amazon vouchers of up to £7.50 rather than cash.

5 Please give any other information you feel may be necessary:

Participants in the online study will be asked to provide consent by endorsing a statement indicating that they have read the study information and that they consent to taking part.

Signature of Principal investigator:

Date of Submission:

13/12/2013



FOR OFFICE USE ONLY:

Amendments to the proposed protocol have been *approved* by the Research Ethics Committee.

Chair's Signature:



Date: 16/12/2013

JOHN WICKMANN (PROF.)

Please return completed form to:

Secretary of the UCL Research Ethics Committee
Graduate School, North Cloisters, Wilkins Building
Gower Street, London WC1E 6BT

Appendix 4: Information Sheet

**Information Sheet for Smokers Involved in Verbal and Visuospatial Stimulus-
Processing Research Studies**

You will be given a copy of this information sheet.

Title of Project: **Craving changes. How do verbal and visuospatial strategies modify craving experiences in heavy smokers and drinkers?**

This study has been approved by the UCL Research Ethics Committee (Project ID Number): 0760/002

Name Sophie Wallace-Hadrill

Work address Research Department of Clinical, Educational and Health Psychology
University College London, Gower Street, London. WC1E 6BT

Contact details Email: sophie.wallace-hadrill.12@ucl.ac.uk Telephone: [XXXXXX]

Details of Study: This study examines the effects of psychological task performance on craving experiences in smokers. We are interested in whether experiences of craving change when people engage in either visuospatial tasks (those involving images, shapes and object locations) or verbal tasks (those involving memory or instructions to use attention in a particular way). It is not currently known if performing these psychological tasks increases or decreases craving; whether they simply act as a distraction or can have a genuine and direct effect on craving itself. By learning more about the mental activities that increase or decrease craving we may be able to develop strategies for managing craving or identify activities that people should avoid to prevent cravings from increasing, especially if they are trying to avoid smoking. More generally, these experiments will help us discover more about the psychological processes that underpin the experience of craving, which in the long-term, may help in the development of psychological treatments for addictions.

Who can take part? If you are generally healthy and smoke eight or more cigarettes per day and are between 18-60 years old, fluent in English, have normal or corrected to normal vision, have no current serious psychological illness, no current alcohol or drug dependence (apart from tobacco-related products) and have not taken part in a similar study, you may be eligible to take part.

What will happen to me if I take part?

We will arrange for you to attend an appointment at UCL at a time convenient for you. **You will need to refrain from smoking for at least 2 hours prior to this appointment. Your researcher will give you more specific instructions.** You should not eat or drink any caffeinated drinks for three hours and any alcohol in the 12 hours prior to the appointment. Also you should not have used any recreational drugs in the last 24 hours. When you arrive we will take a measurement of the carbon monoxide in your breath.

You will then be given some questionnaires to measure your cravings, mood, attitudes about smoking, smoking history and use of other drugs. Next you will take part in computerized and pen and paper tasks before filling out the questionnaire measuring levels

of craving again. The tasks will involve asking you to look at videos related to smoking. While you do this, we will measure your reaction times. We may also measure your bodily reactions, such as heart rate, blood pressure and skin conductance. Depending on the task you are randomly assigned to, you will also receive instructions to think about your mental and physical experiences in a different way, to think about future consequences to your health if you continue to smoke, or to perform a memory task. All of this will take up to one and a half hours. After this you will be paid for your time. We will ask you to email/text us to let us know how much time passed before you smoked your next cigarette. We would also like to contact you again: once after 24 hours, and again a week later to ask you some very brief (up to 5 minutes) additional questions about your experience since the appointment. During this time, you may also be asked to give us another measurement of your breath carbon monoxide. You may contact the researcher at any time after the study if you experience any difficulties.

Are there any risks in taking part?

There are no known risks in completing the questionnaires or tasks but looking at videos related to smoking and thinking about negative consequences of smoking can be temporarily mildly distressing. The request that you do not smoke for at least 2 hours prior to the session may mean that you experience some stress or agitation but this will be short-lived.

Are there any benefits to taking part?

You will not benefit directly from taking part in this research but your participation will help us gain a better understanding of the experience of craving which may lead to better strategies for managing these challenging experiences. In addition, some of the tasks involved in the experiment can be interesting and enjoyable.

Please discuss the information above with others if you wish or ask us if there is anything that is not clear or if you would like more information.

It is up to you to decide whether to take part or not; choosing not to take part will not disadvantage you in any way. If you do decide to take part you are still free to withdraw at any time and without giving a reason.

All data will be collected and stored in accordance with the Data Protection Act 1998.

All information which is collected about you during the course of the research will be kept strictly confidential and will be securely stored electronically, using a numbered code so that you cannot be identified. Only researchers directly involved in the study will have access to the data. All data will be stored in accordance with the Data Protection Act 1998. The data will be used only for informing the research question in this study and the results of the research will be disseminated in peer-reviewed scientific journals, but you will in no way be identifiable from such publications.

Appendix 5: Consent Form

Informed Consent Form for Smokers Involved in Verbal and Visuospatial Stimulus-Processing Research Studies

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Project: **Craving changes? How do verbal and visuospatial strategies modify craving experiences in heavy smokers and drinkers**

This study has been approved by the UCL Research Ethics Committee (Project ID Number): 0760/002

Thank you for your interest in taking part in this research. Before you agree to take part, the person organising the research must explain the project to you.

If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Participant's Statement

I

- have read the notes written above and the Information Sheet, and understand what the study involves
- understand that if I decide at any time that I no longer wish to take part in this project, I can notify the researchers involved and withdraw immediately.
- consent to the processing of my personal information for the purposes of this research study.
- understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.
- agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study.

Signed:

Date:

Appendix 6: Confirmation of study appointment

Sona email to be sent following screening:

Dear Xxx,

Thank you very much for expressing interest in participating in our research project entitled 'Craving changes; how do verbal and visuospatial strategies modify craving experiences in heavy smokers and drinkers?' I am emailing to confirm that your appointment is (date, time, location).

Just to remind you, a condition of participation is that you will need to abstain from smoking for at least eight hours prior to the appointment. This will be assessed through administration of a Carbon Monoxide measurement.

Participation will take approximately one hour and you will be paid £10. If you consent to be called on two occasions during the following week for two brief phone calls you will receive an extra £2.50. Each telephone call will take approximately five minutes.

Please note that failure to attend this appointment will result in this being fed back to the Sona administrators.

I look forward to meeting you. Please remember to bring photo ID to your appointment or you may not be able to gain access to the building.

With very best wishes, SWH

General email to be sent following screening:

Dear Xxx,

Thank you very much for expressing interest in participating in our research project entitled 'Craving changes; how do verbal and visuospatial strategies modify craving experiences in heavy smokers and drinkers?' I am emailing to confirm that your appointment is (date, time, location).

Just to remind you, a condition of participation is that you will need to abstain from smoking for at least eight hours prior to the appointment. This will be assessed through administration of a Carbon Monoxide measurement.

Participation will take approximately one hour and you will be paid £10. If you consent to be called on two occasions during the following week for two brief phone calls you will receive an extra £2.50. Each telephone call will take approximately five minutes.

I look forward to meeting you. Please remember to bring photo ID to your appointment or you may not be able to gain access to the building.

With very best wishes, SWH

Appendix 7: Imagery questionnaire

Mental Imagery Questionnaire – All questions refer to your smoking image

How vivid was the mental image you were experiencing?

Not at all vivid			Moderately vivid			Extremely vivid
1	2	3	4	5	6	7

How pleasant was the mental image you were experiencing?

Not at all pleasant			Moderately pleasant			Extremely pleasant
1	2	3	4	5	6	7

How much did you NOT want to have the image you were experiencing?

Not at all			Moderately			Extremely
1	2	3	4	5	6	7

How compelling was the mental image you were experiencing?

Not at all compelling			Moderately compelling			Extremely compelling
1	2	3	4	5	6	7

How much did you zone-out (i.e. find your mind wandering) during that exercise?

Not at all			Moderately			Extremely
1	2	3	4	5	6	7

What perspective was your image?

Sometimes we “see” an image from a first-person perspective. Other times we “see” an image from a third-person perspective. In other cases there may be a mixture of both. What was the main perspective of your image? Please circle.

Mostly first person (i.e. as if through your own eyes)	Mostly third person (from an observer’s perspective)	An equal mixture of the two
--	--	-----------------------------

Did you notice any verbal thoughts? What were they?

Verbal thought(s):

Appendix 8: Booklet/audio recorded instructions for craving regulation strategies: Defusion

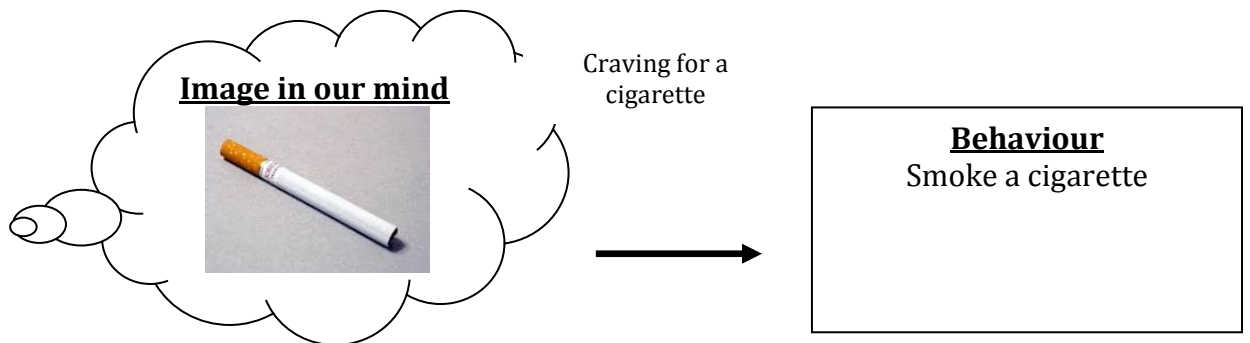
Introduction

Our behaviours are generally motivated by beliefs and thoughts that run through our minds like a mental story. These thoughts are activated by events or cues in the environment and can sometimes cause unhelpful actions. Thoughts can come in the form of words (“verbal thoughts”) like “that’s a lovely sunset”. But they can also come in the form of pictures in our mind’s eye (“mental images”) like *imagining* a lovely sunset. Mental images can be in any of our five senses but in this study we will be concentrating on visual images. These can be still, like a picture, or moving, like a film and they can be very vivid or clear, or they can be vague and produce only flashes of a scene. They are often of things that have happened, or things that could happen.

It is thought that these mental images can intensify certain feelings, like cravings for cigarettes and lead us to do things we would rather not do. For example, a person who is keen to stop smoking might experience a picture in their mind’s eye of what it would be like to have a cigarette, which prompts them to smoke, virtually automatically.

Please turn to the next page.

Do you see this pattern? First, there is the image and then the problematic behaviour, because we simply 'do what we're told' by our mental images, thoughts and feelings.



One way to prevent this automatic pattern is to use a technique called cognitive distancing. You will learn more about this technique during this session. But first we'd like to know more about your own experiences of having mental images, particularly those related to smoking.

Feel free to ask any questions. Now let the experimenter know you're ready to continue.

You'll now complete an exercise led by the experimenter.

Strategy explanation

The last exercise may have shown you how imagery can cause urges to smoke.

As mentioned before, one way to prevent this automatic pattern is to use a strategy called cognitive distancing. Cognitive distancing refers to a strategy for deliberately distancing from unhelpful mental images by simply noticing them.

By using cognitive distancing, we can avoid the negative consequences of this kind of thinking by focussing mental effort on noticing the images as *just* pictures and allowing ourselves some space from them. In this way, we are less likely to become entangled or hooked by our mental images, so that we can allow them to come and go of their own accord.

This is hard to do because we grow used to listening to our thoughts and doing what they tell us, especially when they are self-defeating or unhelpful.

For example, having a mental image of a cigarette or cigarette box, or seeing a picture in our mind's eye of ourselves smoking would usually make it more likely we smoke a cigarette. This is because we tend to act on the automatic thoughts that pop into our minds. By using cognitive distancing, we can begin to get some space from our unhelpful mental images, and change our relationship to our thoughts by deliberately noticing that mental images naturally come and go.

Please turn to the next page.

So if we want to stop smoking but experience a craving, one response is to get some distance from our mental images. That way, rather than taking a smoking image as a trigger for having a cigarette, you can learn that it's not real, but *just* a picture your mind is showing you which you can get distance from. The more we can learn to step back from the images, the less power they have over us. Then the less automatically we will act on them, and we can deliberately decide what we want to do.

Practicing this strategy will help this become easier for you to do, even if it is hard at first.

Please let the experimenter know when this recording has ended.

Task Instructions

To see how this might work, it is helpful to try the strategy with your smoking image. Please bring this image to mind in as much detail as you can.

Now, until you hear the beep that lets you know to stop, I would like you to imagine placing your smoking image on a kind of moving fluid or liquid, like a flowing river. You can watch the image float by, moving away from you at its own pace. Allow the image to drift along with the flow. If your smoking image or another image comes back, just imagine placing it on the moving liquid again. Watch it move away at its own pace.

You don't need to get rid of your images. Just let them float on the liquid at their own speed.

If you get distracted, please return to the strategy.

Please let the experimenter know when you have been asked to stop on the recording.

Appendix 9: Audio recorded instructions: Defusion

Audio recorded instructions: Defusion

Strategy use: practice

“Now we’d like you to return to your smoking image. Please really concentrate on the image, get caught up in it, bring it to life, as if it’s happening now and give it your full attention until you are given further instructions. Immerse yourself in the image, as if you are participating in the scene but do not use the strategy you were just taught while you are imagining your smoking image. Please start now and continue until you are asked to stop.

[two minutes silence]

Please stop. Now, if the image or any other smoking related image pops into your mind please use the cognitive distancing strategy. Please start now and continue until you are asked to stop. If you become distracted during this time, please return to using the strategy.

[two minutes silence]

Please stop.”

Main task

“Again, return to your smoking image. Please really concentrate on the image, get caught up, bring it to life, as if it’s happening now and give it your full attention until you are given further instructions. Immerse yourself in the image, as if you are participating in the scene but again do not use the strategy you were taught. Please start now and continue until you are asked to stop.

[two minutes silence]

Continue to focus on your image, but now if the image or any other smoking related image pops into your mind please use the cognitive distancing strategy again. Please start now and continue until you are asked to stop. If you become distracted during this time, please return to using the strategy.

[two minutes silence]

Please stop.”

Appendix 10: Booklet/audio recorded instructions for craving regulation strategies: Alternative Imagery

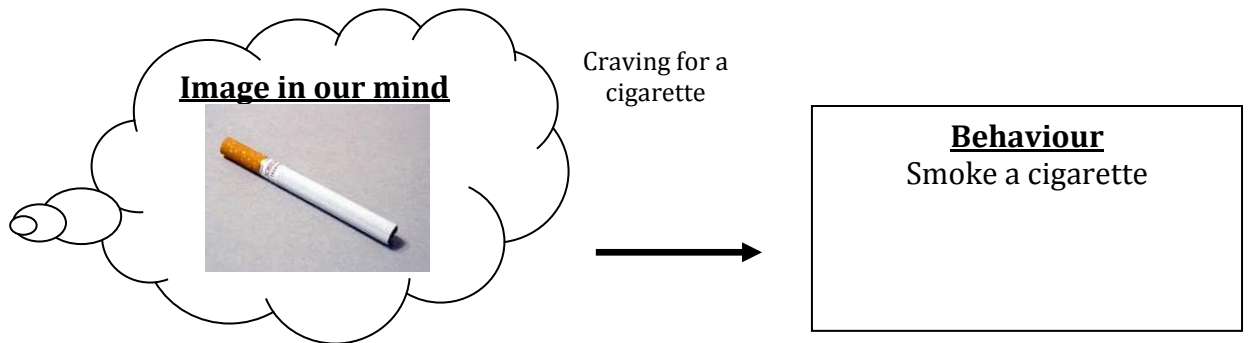
Introduction

Our behaviours are generally motivated by beliefs and thoughts that run through our minds like a mental story. These thoughts are activated by events or cues in the environment and can sometimes cause unhelpful actions. Thoughts can come in the form of words (“verbal thoughts”) like “that’s a lovely sunset”. But they can also come in the form of pictures in our mind’s eye (“mental images”) like *imagining* a lovely sunset. Mental images can be in any of our five senses but in this study we will be concentrating on visual images. These can be still, like a picture, or moving, like a film and they can be very vivid or clear, or they can be vague and produce only flashes of a scene. They are often of things that have happened, or things that could happen.

It is thought that these mental images can intensify certain feelings, like cravings for cigarettes and lead us to do things we would rather not do. For example, a person who is keen to stop smoking might experience a picture in their mind’s eye of what it would be like to have a cigarette, which prompts them to smoke, virtually automatically.

Please turn to the next page.

Do you see this pattern? First, there is the image and then the problematic behaviour, because we simply 'do what we're told' by our mental images, thoughts and feelings.



One way to prevent this automatic pattern is to use a technique called cognitive distraction. You will learn more about this technique during this session. But first we'd like to know more about your own experiences of having mental images, particularly those related to smoking.

Feel free to ask any questions. Now let the experimenter know you're ready to continue.

You'll now complete an exercise led by the experimenter.

Strategy explanation

The last exercise may have shown you how imagery can cause urges to smoke.

As mentioned before, one way to prevent this automatic pattern is to use a strategy called cognitive distraction. Cognitive distraction refers to a strategy for deliberately distracting from unhelpful mental images by focusing on an unrelated image.

By using cognitive distraction, we can avoid the negative consequences of this kind of thinking by focussing mental effort on changing the images and substituting them for other ones. In this way, we are less likely to be controlled by our mental images so that we can chose to do what we want, not what they tell us to do. This is hard to do because we grow used to listening to our thoughts and doing what they tell us, especially when they are self-defeating or unhelpful.

For example, having a mental image of a cigarette or cigarette box, or seeing a picture in our mind's eye of ourself smoking would usually make it more likely we smoke a cigarette. This is because we tend to act on the automatic thoughts that pop into our minds. By using cognitive distraction, we can begin to replace our unhelpful mental images and change the content of our thoughts by deliberately thinking about some different images instead.

Please turn to the next page.

So if we want to stop smoking but experience a craving, one response is to imagine a different scenario in a lot of detail. That way, rather than taking a smoking image as a trigger for having a cigarette, you can use a different mental image to try to distract your mind and fill it up with some different images instead. The less space the images take up in our minds, the less power they have over us. Then the less automatically we will act on them, and we can deliberately decide what we want to do.

Practicing this strategy will help this become easier for you to do, even if it is hard at first.

Please let the experimenter know when this recording has ended.

Task Instructions

To see how this might work, it is helpful to try the strategy with your smoking image. Please bring this image to mind in as much detail as you can.

Now, until you hear the beep that lets you know to stop, I would like you to replace your smoking image with an image of being beside a river. Imagine you can see light brown leaves on the surface of the river. You can see the trees by the bank, and blue sky with a few white clouds. If your smoking image or another image comes back, please replace it with this riverside scene. The water is clear and you can see the reflections of the clouds in the water.

You need to be able to look around this scene at the different things you can see.

If you get distracted, please return to the strategy.

Please let the experimenter know when you have been asked to stop on the recording.

Appendix 11: Audio recorded instructions: Alternative Imagery

Audio recorded instructions: Alternative Imagery

Strategy use: practice

“Now we’d like you to return to your smoking image. Please really concentrate on the image, get caught up in it, bring it to life, as if it’s happening now and give it your full attention until you are given further instructions. Immerse yourself in the image, as if you are participating in the scene but do not use the strategy you were just taught while you are imagining your smoking image. Please start now and continue until you are asked to stop.

[two minutes silence]

Please stop. Now, if the image or any other smoking related image pops into your mind please use the cognitive distraction strategy. Please start now and continue until you are asked to stop. If you become distracted during this time, please return to using the strategy.

[two minutes silence]

Please stop.”

Main task

“Again, return to your smoking image. Please really concentrate on the image, get caught up, bring it to life, as if it’s happening now and give it your full attention until you are given further instructions. Immerse yourself in the image, as if you are participating in the scene but again do not use the strategy you were taught. Please start now and continue until you are asked to stop.

[two minutes silence]

Continue to focus on your image, but now if the image or any other smoking related image pops into your mind please use the cognitive distraction strategy again. Please start now and continue until you are asked to stop. If you become distracted during this time, please return to using the strategy.

[two minutes silence]

Please stop.”

Appendix 12: Booklet/audio recorded instructions for craving regulation strategies: Suppression

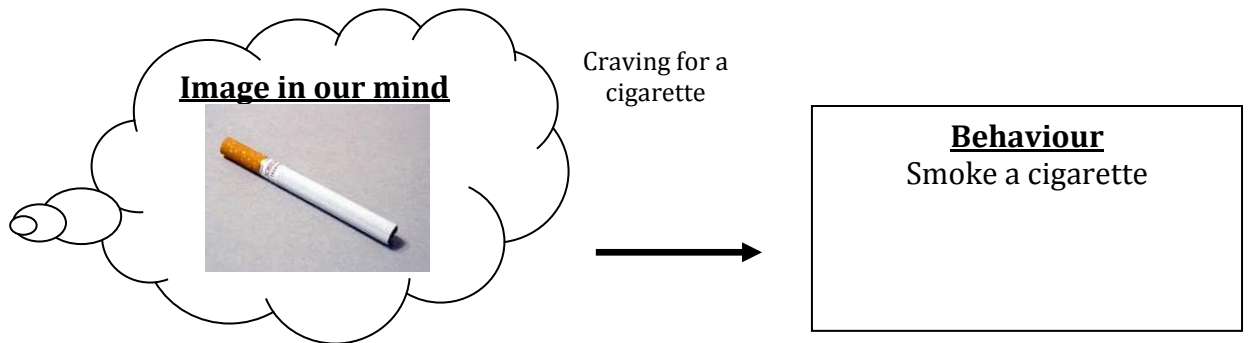
Introduction

Our behaviours are generally motivated by beliefs and thoughts that run through our minds like a mental story. These thoughts are activated by events or cues in the environment and can sometimes cause unhelpful actions. Thoughts can come in the form of words (“verbal thoughts”) like “that’s a lovely sunset”. But they can also come in the form of pictures in our mind’s eye (“mental images”) like *imagining* a lovely sunset. Mental images can be in any of our five senses but in this study we will be concentrating on visual images. These can be still, like a picture, or moving, like a film and they can be very vivid or clear, or they can be vague and produce only flashes of a scene. They are often of things that have happened, or things that could happen.

It is thought that these mental images can intensify certain feelings, like cravings for cigarettes and lead us to do things we would rather not do. For example, a person who is keen to stop smoking might experience a picture in their mind’s eye of what it would be like to have a cigarette, which prompts them to smoke, virtually automatically.

Please turn to the next page.

Do you see this pattern? First, there is the image and then the problematic behaviour, because we simply 'do what we're told' by our mental images, thoughts and feelings.



One way to prevent this automatic pattern is to use a technique called cognitive elimination. You will learn more about this technique during this session. But first we'd like to know more about your own experiences of having mental images, particularly those related to smoking.

Feel free to ask any questions. Now let the experimenter know you're ready to continue.

You'll now complete an exercise led by the experimenter.

Strategy explanation

The last exercise may have shown you how imagery can cause urges to smoke.

As mentioned before, one way to prevent this automatic pattern is to use a strategy called cognitive elimination. Cognitive elimination refers to a strategy for deliberately eliminating unhelpful mental images by “willing them away.”

By using cognitive elimination, we can avoid the negative consequences of this kind of thinking by focussing mental effort on ignoring the images and pushing them out of our awareness. In this way, we are less likely to be controlled by our mental images so that we can chose to do what we want, not what they tell us to do. This is hard to do because we grow used to listening to our thoughts and doing what they tell us, especially when they are self-defeating or unhelpful.

For example, having a mental image of a cigarette or cigarette box, or seeing a picture in our mind’s eye of ourselves smoking would usually make it more likely we smoke a cigarette. This is because we tend to act on the automatic thoughts that pop into our minds. By using cognitive elimination, we can begin to avoid our unhelpful mental images and change the content of our thoughts by deliberately erasing these mental images from our mind.

Please turn to the next page.

So if we want to stop smoking but experience a craving, one response is to erase or push our mental images away. That way, rather than taking a smoking image as a trigger for having a cigarette, you can stay in control of your mental images by trying to stop yourself thinking about them. The more we take control of the images and push them away, the less power they have over us. Then the less automatically we will act on them, and we can deliberately decide what we want to do.

Practicing this strategy will help this become easier for you to do, even if it is hard at first.

Please let the experimenter know when this recording has ended.

Task Instructions

To see how this might work, it is helpful to try the strategy with your smoking image. Please bring this image to mind in as much detail as you can.

Now, until you hear the beep that lets you know to stop, I would like you to push your smoking image out of your mind. Erase the image, really try to push it out of your mind and don't think about it. If your smoking image or another image comes back, make sure you stop thinking about it. Concentrate on eliminating the image so that you don't experience it. Try not to have this image and aim to push the image out of your mind.

You need to be able to get rid of these images, to make sure they are not in your mind.

If you get distracted, please return to the strategy.

Please let the experimenter know when you have been asked to stop on the recording.

Appendix 13: Audio recorded instructions: Suppression

Audio recorded instructions: Suppression

Strategy use: practice

“Now we’d like you to return to your smoking image. Please really concentrate on the image, get caught up in it, bring it to life, as if it’s happening now and give it your full attention until you are given further instructions. Immerse yourself in the image, as if you are participating in the scene but do not use the strategy you were just taught while you are imagining your smoking image. Please start now and continue until you are asked to stop.

[two minutes silence]

Please stop. Now, if the image or any other smoking related image pops into your mind please use the cognitive elimination strategy. Please start now and continue until you are asked to stop. If you become distracted during this time, please return to using the strategy.

[two minutes silence]

Please stop.”

Main task

“Again, return to your smoking image. Please really concentrate on the image, get caught up, bring it to life, as if it’s happening now and give it your full attention until you are given further instructions. Immerse yourself in the image, as if you are participating in the scene but again do not use the strategy you were taught. Please start now and continue until you are asked to stop.

[two minutes silence]

Continue to focus on your image, but now if the image or any other smoking related image pops into your mind please use the cognitive elimination strategy again. Please start now and continue until you are asked to stop. If you become distracted during this time, please return to using the strategy.

[two minutes silence]

Please stop.”

Appendix 14: Stimuli used in Stimulus-Response Compatibility task

Stimuli for the Stimulus-Response Compatibility task

Stimuli for the Stimulus-Response Compatibility task were the same as those used in Mogg, K., Bradley, B. P., Field, M., & De Houwer, J. (2003). Eye movements to smoking-related pictures in smokers: Relationship between attentional biases and implicit and explicit measures of stimulus valence. *Addiction*, 98(6), 825-836. doi: 10.1046/j.1360-0443.2003.00392.x

These were kindly provided as .BMP electronic files by the corresponding author, Professor Mogg, to Dr Tom Freeman, UCL, who programmed the task.

Appendix 15: Reminder cue cards

Cue card: Defusion

How to manage your cravings

Imagine placing your smoking image on a kind of moving fluid or liquid, like a flowing river. You can watch the image float by, moving away from you at its own pace. Allow the image to drift along with the flow. Watch it move away at its own pace.

Cue card: Alternative Imagery

How to manage your cravings

Replace your smoking image with an image of being beside a river. Imagine you can see light brown leaves on the surface of the river. You can see the trees by the bank, and blue sky with a few white clouds reflected in the water.

Cue card: Suppression

How to manage your cravings

Push your smoking image out of your mind. Erase the image, really try to push it out of your mind and don't think about it. Concentrate on eliminating the image so that you don't experience it. Try not to have this image.