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Visual mental imagery in psychopathology — Implications for the maintenance and treatment of depression

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HIGHLIGHTS

- Negative mental images can influence the onset and maintenance of depression.
- Distressing images are common and occur in 32 to 100% of depressed individuals.
- Flash-forwards to suicide or self-harm can potentially influence future behavior.
- Depressed patients suffer from a lack of vivid positive future-directed imagery.
- Imagery rescripting and imaginal exposure are effective in treating depression.

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ABSTRACT

Negative mental images are a common feature in a range of mental disorders as well as in healthy subjects. Intrusive negative mental images have only recently become a focus of attention in clinical research on depression. Research so far indicates that they can be an important factor regarding the onset and chronicity of affective disorders. This article is the first to provide an extensive overview of the current state of research in the field of visual mental images in depression. It aims to investigate disorder-specific characteristics, as well as the role of imagery as a maintaining factor. A detailed definition and description of empirical results about mental images in depressive disorders is followed by a presentation and analysis of treatment studies using imagery techniques in depressed samples. Additionally, methodological issues like small sample sizes and the lack of control groups are pointed out and implications for future research are discussed. Case vignettes are included in the appendix to exemplify the importance of negative mental images in patients suffering from depression.

Contents

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1. Introduction

According to the World Health Organization, by 2030, depressive disorders will be among the three leading causes of health impairment (Mathers & Loncar, 2006). With a lifetime prevalence of approximately 16.6% (Kessler et al., 2005), the major depressive episode (MDE) is more common than all other mental disorders (Mueller et al., 1999; Torpey & Klein, 2009). Many of those affected suffer from relapses or persisting symptoms, accompanied by high levels of psychiatric comorbidity and disability — often despite "state-of-the-art" treatment. Identifying psychopathological factors that contribute to the development or maintenance of depressive disorders is therefore important. Negative mental images may be one possible contributor that has so far been understudied. This review aims to provide an overview of the existing literature on negative mental images in depression to facilitate future research and treatment development.

2. General characteristics of imagery in psychopathology

Negative mental images are a transdiagnostic feature of a number of mental disorders (Brewin, Gregory, Lipton, & Burgess, 2010; Krans, 2011). They can be characterized by their vividness and distressing character (Brewin et al., 2009). Vivid intrusions are usually accompanied by strong negative emotions (Newby & Moulds, 2011a) that exceed the intensity of emotions evoked by verbal cognition (Holmes & Mathews, 2005; Holmes, Mathews, Mackintosh, & Dalgleish, 2008). Negative imagery can occur as involuntarily and spontaneously retrieved memories (Deeprose, Malik, & Holmes, 2011) that usually lack contextual information (Karatzias, Power, Brown, & McGoldrick, 2009) and lead to a sense of current threat due to a "here and now" experience (Ehlers, Hackmann, & Michael, 2004). Scientific knowledge about the role of negative mental images remains vague, and a sufficiently large amount of reliable data only seems to exist for posttraumatic stress disorder (PTSD).

Negative mental images may be an important factor in the onset of mental disorders, contribute to their maintenance, lead to an exacerbation of existing symptoms, or be a core symptom in themselves. However, intrusive thoughts and images can also be observed in non-psychiatric healthy populations (Brewin, Christodoulides, & Hutchinson, 1996; Rusch, Grunert, Mendelsohn, & Smucker, 2000). It is therefore advisable to assess clinical as well as non-clinical groups to prevent an overestimation of the prevalence of negative mental images in psychopathology. To improve knowledge of this phenomenon, a clear definition for the term "mental images" is needed.

2.1. Definitions of imagery

In "Cognitive Therapy of Depression", Beck, Rush, Shaw, and Emery (1979, p. 147) stated that a cognition can be "either a thought or a visual image". Imagery itself has been described in various ways in the literature. The Collins English Dictionary ("imagery," n.d.) defines imagery as "mental images" and those images as an "experience of something that is not immediately present to the senses, often involving memory" or "a mental representation or picture […] produced by the imagination" ("images," n.d.). Some authors note that different forms of mental images share a lack of connection to a direct sensory input; they are "brought to life from memory or imagination (Hackmann & Holmes, 2004)" (Krans, 2011, p. 117). Kosslyn, Ganis, and Thompson (2001, p. 635) state that "mental imagery occurs when perceptual information is accessed from memory […]. By contrast, perception occurs when information is registered directly from the senses". Kosslyn (2005, p. 338) describes imagery as an experience of "seeing with the mind's eye". Hackmann (1998, p. 301) defines images as "contents of consciousness that possess sensory qualities, as opposed to those which are purely verbal or abstract". She refers to the fact that these images may be accompanied not only by visual but also by auditory, olfactory, or haptic sensations (see also Holmes & Mathews, 2010; Speckens, Hackmann, Ehlers, & Cuthbert, 2007). In a later study, Hackmann, Clark, and McManus (2000) used the following characterization based on Horowitz (1970) for their discussion of imagery in social phobia: "Images […] [are] mental representations with sensory (not necessarily visual) components". Definitions vary significantly, ranging from constructs including verbal elements to those that are purely visual. This raises the question whether the scientific community is discussing the same research topic.

In our view, mental images – whether positive or negative – are cognitive events that are not contingent upon presently perceived sensory information but are either based on memories of actual events or alterations of those, or entirely fictional, or they may depict imagined future scenarios. We favor a definition focusing on visual qualities and therefore focus our review on mental events that are visual in nature (e.g., the person has to see the scene in their mind's eye in the form of a non-moving picture, a movie-like sequence, or a combination of both). Other sensory components, such as smells, sounds, or haptic sensations, as well as verbal thoughts may be present as well, but the visual aspect is the necessary and sufficient condition. In the current review, we use this definition, which might contrast with broader descriptions of imagery in the literature, to delineate imagery from other forms of cognitive phenomena, like purely verbal intrusive thoughts or voice-hearing (e.g. Reynolds & Brewin, 1998).

3. Negative mental images in depression — current state of research

3.1. Images about stressful or traumatic life-events in depression

In addition to the classic symptoms of depression, many depressed patients report intrusive images (Brewin, Watson, McCarthy, Hyman, & Dayson, 1998; Newby & Moulds, 2011a; Patel et al., 2007) when directly asked about them. More than 15 years ago, Kuyken and Brewin (1994) already reported that women with major depression who had experienced childhood sexual or physical abuse suffered from intrusive memories. Patients with high levels of intrusions and avoidance were significantly more depressed than those with low levels. It is however unclear whether these intrusive memories were independent features of depression or symptoms of (subclinical) PTSD. The connection between child abuse, intrusions, their avoidance and depression was later replicated (Brewin, Hunter, Carroll, & Tata, 1996). A limiting factor is that these studies did neither include clinical nor healthy control participants. Brewin (1998) pointed out that studies on the role of imagery in depression should include depressed and non-depressed samples,

matched on negative life events and stress, and ask whether intrusive images had been present before the first depressive episode. Following Kuyken and Brewin's (1994) study, further research on the differences in prevalence, severity and avoidance of traumatic intrusions between depressed and recovered as well as never-depressed controls was conducted. Spenceley and Jerrom (1997) found significantly higher levels of intrusions in the currently depressed group than in both comparison groups, and higher levels of avoidance than in the never-depressed participants. Severely depressed individuals reported intrusion levels more than twice as high as those who were only moderately depressed.

3.2. Impact on emotions

Mental imagery can have an impact on positive as well as negative emotions. Until recently, research on depression has primarily focused on negative mental images (Holmes, Lang, Moulds, & Steele, 2008). Newer theories increasingly consider the concept of a lack of positive mental imagery, its vividness, or an imbalance of positive and negative mental images in psychopathology (see e.g. Moscovitch, Gavric, Merrifield, Bielak, & Moscovitch, 2011). Compared with non-depressed controls, depressed individuals show lower levels of vividness when imagining positive future events (Morina, Deeprose, Pusowski, Schmid, & Holmes, 2011). The ability to generate positive future-related mental images was found to be associated with optimism, which has been linked to general wellbeing and lower levels of depression (Blackwell et al., 2012).

For bipolar disorder (BD), Holmes, Geddes, Colom, and Goodwin (2008) hypothesize that imagery acts as a key mechanism in amplifying emotions in (hypo)manic phases and times of heightened anxiety alike, contributing to mood intensity and rapid mood changes. Holmes et al. (2011) demonstrated that intrusive future imagery plays an important role in mood instability in BD. Unstable participants had higher depression and anxiety scores than did those with a more stable mood. This also poses the question whether imagery is related to mood instability in BD and/or higher levels of depression in general — the latter could be a link to mechanisms of imagery in unipolar depression.

A connection was found between emotional reactions such as sadness, fear, helplessness, and numbness following intrusive images and the level of depressive symptoms (Williams & Moulds, 2007). In comparison with non-depressed individuals, currently depressed patients experience significantly more sadness and helplessness associated with imagery than recovered–depressed individuals (Newby & Moulds, 2011a). Patel's et al., (2007) depressed sample reported sadness and anger as the emotions that were most frequently associated with intrusive images and memories (out of sadness, guilt, shame, anxiousness, anger, and helplessness), in contrast to Reynolds and Brewin (1999), who reported anger and sadness in the inverse order. Brewin, Hunter, et al., (1996) reported predominant associations with sadness, guilt, anger, and helplessness. Patel's and Brewin's studies did not use a control group to compare emotional valence or intensity associated with mental images between depression and other disorders or healthy controls. Neglecting to include control groups makes it difficult to answer questions about imagery and its role in the remission and following recurrence of depressive episodes or distinctive features of non-clinical versus pathological imagery.

Overall, sadness, helplessness, and anger are common affective responses to distressing imagery. Mental imagery seems to have a significantly greater influence on emotions than verbal processing (Holmes, Mathews, et al., 2008; Mathews, Ridgeway, & Holmes, 2013), which emphasizes its importance in psychopathology and its role in the maintenance and treatment of depression.

3.3. Images based on reality vs. imagination

Mental images can either clearly refer to memories or alterations of memories (Krans, 2011), to possible future events, or they can be based entirely on imagination (Holmes, Lang, & Deeprose, 2009). These images are based on fantasies or daydreams and may be completely unrealistic (Hackmann, Bennett-Levy, & Holmes, 2011). Kosslyn et al. (2001, p. 635) note that "mental images need not result simply from the recall of previously perceived objects or events; they can also be created by combining and modifying stored perceptual information in novel ways". In most previous studies, intrusive memories have been the main focus of interest (Brewin et al., 2009; Hackmann, Ehlers, Speckens, & Clark, 2004; Moulds, Williams, Grisham, & Nickerson, 2012; Newby & Moulds, 2011a; Williams & Moulds, 2007). This focus may underestimate negative mental images in clinical populations by omitting non-memory-based intrusions and intentionally retrieved images. So far, only a few studies have examined future-directed imagery (Crane, Shah, Barnhofer, & Holmes, 2012; Holmes, Crane, Fennell, & Williams, 2007; Selby, Anestis, & Joiner, 2007).

3.4. Intentional vs. unintentional retrieval

Mental images can be brought into mind deliberately or involuntarily. The voluntary production of mental images can include everything from daydreams (Holmes & Mathews, 2010) to suicidal ideation functioning as an escape strategy (for clinical case examples, see Crane et al., 2012; Holmes, Crane, et al., 2007) and can have positive as well as negative contents. Intentional imagery may increase the likelihood of the actual execution of the imagined events in healthy subjects (Libby, Shaeffer, Eibach, & Slemmer, 2007). This remains to be verified in clinical samples, but intentionally produced images could be of importance regarding suicidal acts in depressed individuals.

3.5. Flash-backs vs. flash-forwards

Flash-backs to traumatic events are characterized by a "sense of reality" that causes the person to feel as if an adverse event was currently happening instead of seeing it as a memory (Hackmann et al., 2004). Besides PTSD, flash-backs can also occur in other disorders, such as depression (Bryant, O'Donnell, Creamer, McFarlane, & Silove, 2011; Reynolds & Brewin, 1998). A higher level of the feeling of a "here-and-now" experience seems to differentiate PTSD from depression (Birrer, Michael, & Munsch, 2007).

Holmes, Crane, et al. (2007) suggested using the term "flash-forward", corresponding with flash-backs related to past events, to describe future-directed imagery (here: suicidal ideation), saying that there is some overlap regarding sensory qualities and realness. Higher levels of intrusive future-related images seem to be a distinguishing feature of depression as well as anxiety disorders in relation to healthy controls (Morina et al., 2011). Flash-forwards may occur in times of distress in which patients picture self-harm, their own suicide or funeral, or the consequence of their passing (Crane et al., 2012; Holmes, Crane, et al., 2007). In patients with a history of depression and suicidality, images related to death or suicide were more common than verbal thoughts about the same topics (Holmes, Crane, et al., 2007). Associated emotions ranged from sad and frightened to relieved and comforted, depending on whether the images were intrusive or deliberately produced. Because patient reports indicate that they might use these images as an escape strategy to end distressing emotions (Crane et al., 2012), they are not necessarily intrusion-like; they may very well be intentionally produced and lead to positive emotions.

In our view, the importance of suicidal ideation in the form of images should not be underestimated. It has been demonstrated by research that mental imagery may direct future behavior by increasing the probability of action (Libby et al., 2007), amplifying affective reactions (for a theoretical account see Holmes & Mathews, 2010), and making the imagined event seem more probable, as have been discussed by Crane et al. (2012). Specific imagery characteristics (such as the image reality) of suicide-related flash-forwards seem to be significantly connected to the severity of suicidal ideation in recovered patients with a

history of depression (Holmes, Crane, et al., 2007). Despite the possible impact on suicide attempts and symptom severity, studies on flash-forwards regarding suicide or other negative scenarios are scarce. As research indicates that visual suicidal ideation may be an indicator of an aggravated risk of de facto (para)suicide, therapists should ask their patients about mental images regarding self-harm.

3.6. Prevalence, frequency and duration of negative mental images in depression

In depressed patients, visual autobiographic memories may occur weekly to daily (Patel et al., 2007; Wheatley & Hackmann, 2011) and may lead to strong negative emotions as well as to impairments in day-to-day life. Between 32% and nearly 100% of depressed individuals suffer from negative mental images. Studies have shown that the presence or absence of these images may be independent of current distressing life events, such as severe illnesses. Assessing patients with similar types and degrees of stressors allows for a distinct assessment of the influence of depression apart from environmental factors (Brewin, 1998). In comparison with non-depressed cancer patients, those with depression reported a higher prevalence of intrusive memories (32% of the mildly depressed and 43% of the severely depressed patients), primarily of injury, death, and illness, even when matched on variables such as age, sex, type of cancer, and stage of disease (Brewin et al., 1998). Of these memories, approximately 9% lasted seconds, half lasted minutes, and 17% lasted several hours, with 66% intruding once a week or less and the rest intruding several times a week or more. Images not based on actual events were not included in this study. Interestingly, less than one quarter of the cancer patients reported intrusive memories in general, with depression being the only distinguishing feature. A comparably low frequency was found in 39 patients with moderate to severe MDE (Patel et al., 2007), including three individuals with comorbid PTSD. Only 44% reported one or more intrusive visual memories, with an average of 1.71 memories that intruded between once/twice and several times a week (Patel et al., 2007). A distinction was made between intrusive autobiographical memories ("a visual image, complete with surrounding context, of a specific event that had actually taken place", p. 2575) and intrusive images, defined as "sensory representation of part of a memory, without surrounding context, or of an imagined event" (p. 2576). 10% described additional intrusive images as well, but their mean number was significantly lower (1.25).

Frequent intrusive visual memories of distressing life events were reported in a study with currently depressed patients — 87% reported one or more memories in the past week, with 2.6 different intrusions (Brewin, Hunter, et al., 1996). In a group of depressed patients without comorbid PTSD (Reynolds & Brewin, 1999), 73% experienced intrusive memories (a visual image of an actual event) with an average of 1.1 different memories in the previous week. Others have found even higher prevalence rates when comparing depressed, recovered depressed, and never-depressed individuals (Newby & Moulds, 2011a): 96% of currently depressed patients reported a negative intrusive memory (depressed > recovered depressed > never-depressed; non-significant), 32% reported a "visual image only", and 49% reported visual plus other sensory elements. The study revealed significant differences regarding frequency within a day between currently depressed (3.6 times) and never-depressed (1.43 times) individuals as well as higher levels of avoidance in depression. For 72% of the currently depressed participants, the intrusive memories lasted 5 min or less, but four patients experienced intrusive memories for more than an hour. Individuals with sub-threshold PTSD symptoms were excluded, but only memories were targeted, omitting non-biographical negative images. Ignoring the latter might lead to an underestimation of the prevalence of intrusive images in depressed patients, which might have contributed to the absence of group differences regarding intrusion characteristics (frequency as well as sensory elements). Furthermore, not all the intrusive memories were primarily visual.

Birrer et al. (2007) took a closer look at the differences and similarities of PTSD and depression in terms of intrusive memories. A strength of this study is that the authors excluded explicit verbal thoughts and included patients with PTSD, depression with trauma, and depressed patients without a traumatic event. These groups were chosen to assess differential characteristics of intrusive images with regard to diagnostic status. No significant differences regarding the presence of intrusions between the groups were found: 90% of the depressed participants without trauma and all the PTSD patients as well as the depression plus trauma group reported intrusive images. Moreover, there was no significant difference regarding frequency, duration, or distress.

3.7. Sensory characteristics and vividness

Depressed individuals fairly often experience visual images along with further sensory experiences, such as physical sensations (Newby & Moulds, 2011a) or a combination of thoughts and sensory elements (Newby & Moulds, 2012). For example, images about past sexual abuse may be accompanied by "the smell of [the] abuser's hair oil" (Wheatley et al., 2007, p. 377). It is likely that a multitude of sensory components could make a mental image seem more "real" and more threatening for the person affected. The proportion of visual components in depression might be lower than that described by PTSD-patients (Parry & O'Kearney, 2013). Additionally, higher ratings of imagery vividness were found in depressed participants as compared with never-depressed participants (Newby & Moulds, 2011a). Patients with a current MDD rated their visual intrusive memories as significantly more vivid than other autobiographical memories (82.35 out of 100, $SD = 15.62$; Patel et al., 2007). Interestingly, no significant differences were found concerning intrusion vividness between patients with PTSD and depression with and without trauma (Birrer et al., 2007). Research shows that vivid imagery is common in MDD (Reynolds & Brewin, 1999).

3.8. Content of negative mental images in depression

Because depressed patients are more likely to have experienced traumatic events than a non-depressed population (Carlier, Voerman, & Gersons, 2000), intrusive memories of those events may also be part of a visual re-experiencing in depression and should not be considered a symptom relevant only to PTSD. Patients suffering from depression without comorbid PTSD often experience intrusive visual memories regarding traumatic events (64%) such as actual/threatened death, serious injury, or threat to the physical integrity of oneself or others (Reynolds & Brewin, 1999), similar to those of patients with PTSD; however, the former group reports images of non-traumatic events as well (36%). In both PTSD and depression, almost all the memories reported belonged to one of the following four categories: "death, illness or injury to family members", "illness or injury to the patient", "assault on the patient", and "interpersonal problems" (p. 207). However, the depressed-only sample reported significantly more memories in the first and last categories. Patel et al. (2007) identified similar topics in depression.

Experiencing traumas seems to lead to event-specific visual intrusions in depressed individuals. In traumatized depressed patients without PTSD, the most frequent intrusion was related to a trauma in 55% of the cases and to a critical life event in 45% of the cases (Birrer et al., 2007). In contrast, all major intrusions of depressed patients without trauma referred to critical life events, whereas intrusions in the PTSD group were all trauma related.

Newby and Moulds (2011a) found no significant differences in the contents of intrusive memories between currently depressed, recovered, or never-depressed participants. This leads to the question of whether the categories used in previous studies can distinguish

between depressed, remitted, and non-depressed individuals or whether there are no detectable differences at all. Another possible explanation is that distressing life events and traumas are the main predictors of the development of negative mental images. This may be the main reason why patients with PTSD and those with depression often suffer from visual intrusions. In the future, larger sample sizes are needed to refine content classification and to gather information on possible psychopathology-specific differences.

Both future-directed and fantasy-based images may also be present in depression. Suicidality is a common phenomenon in depressed individuals, and images of possible feared or "desired" future events are a part of mental imagery in depression as well. The most prominent images include an "image of future suicidal action with behavioral consequence", "sensory images of dead self and funeral", or a "comforting image of location providing opportunity for suicide" (Holmes, Crane, et al., 2007, p. 428). These images are often distressing and comforting at the same time, and they occur even if patients have not attempted to commit suicide in the past. More detailed examples of this type of mental image are presented in the case vignette section in this article (see Appendix A).

Regarding the link between mental imagery and mood, it has been shown that bipolar patients experience different types of images during different mood states: In depression, intrusions are often memories of negative experiences or distressing future-related images whereas in hypomania, imagery mostly represents positive future-oriented events (Gregory, Brewin, Mansell, & Donaldson, 2010). Interestingly, no differences were found regarding vividness, realness or frequency of intrusive images between both states.

In summary, it can be said that mental images in depression can be based on stressful and even traumatic life-events, reflect cognitive schemas or depict future scenarios. These images can include a variety of sensory characteristics besides the visual component. Research has shown that they are often very distressing and lead to a higher emotional activation than equivalent verbal cognitions. Intrusive negative imagery is common among depressed individuals but also occurs in healthy populations — content, imagery distress or frequency could be distinguishing features.

4. The role of imagery in the maintenance of depression: a model

There is currently no integrative approach explaining the role of mental images in the maintenance of depression. We therefore aim to present a preliminary model regarding potential mechanisms. Distressing life events as triggering factors, in combination with dysfunctional coping strategies such as suppression or avoidance seem to be important factors. A vicious circle may be initiated in which distressing life events and negative thinking styles may cause negative imagery and subsequent depressed mood, which, in turn can lead to more rumination and intrusions. As noted by Morina et al. (2011), if dysfunctional cognitions are an important maintaining factor in depression and mental images are one type of cognition in addition to verbal thoughts (Beck et al., 1979), negative imagery, a lack of positive images, and flash-forwards to suicide or self-harm may play a significant role.

In 1997, Spenceley and Jerrom already emphasized the link between negative life events, intrusive memories, and depression. Depressed mood might exacerbate the recall of an already greater number of distressing memories stored. In turn, intrusive autobiographical memories could also facilitate the recall of additional negative material such as automatic thoughts or general negative beliefs and even alter information processing by drawing more attention toward negative stimuli (Brewin, Reynolds, & Tata, 1999).

Emotions triggered by these intrusions might then lead to patients suppressing mental images or avoid cues that could cause negative images (Brewin et al., 2010). The distress caused by negative mental images may have an effect on key depression symptoms such as sadness or hopelessness. Imagery suppression could lead to similar paradoxical effects like thought suppression sensu Wegner (Wenzlaff & Wegner, 2000) as suppressive coping styles are found to lead to an exacerbation of cognitive and emotional symptoms (Horn & Hautzinger, 2003). Newby and Moulds (2011b) hypothesize that avoidance might be maladaptive primarily in clinically depressed patients and potentially beneficial in individuals who have depression scores below the clinical threshold. Intrusions and their avoidance were found to be more predictive of the course of depression over 6 months than imagery distress, and made significant contributions even when controlling for initial symptom severity (Brewin et al., 1999).

In depression, ruminative thinking styles are common and they can lead to more severe and persistent symptoms over time (Nolen-Hoeksema & Morrow, 1993). Rumination might trigger intrusive images (Birrer et al., 2007; Pearson, Brewin, Rhodes, & McCarron, 2008) and make further distressing images more salient (Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998). In contrast, rumination without accompanying dysphoria is neither associated with mood changes nor an increased recollection of negative life events (Lyubomirsky et al., 1998).

Additionally, differences in the processing of those memories within the group of individuals vulnerable to depression could be central to the onset and maintenance of depression. Negative appraisals of intrusive memories seem to be more prominent in depressed individuals as compared to never-depressed individuals (Newby & Moulds, 2010). These interpretations can predict depression severity over and above other imagery characteristics (Starr & Moulds, 2006). In addition, a very stable link was found between avoidance of intrusions, the occurrence of overgeneral memory deficits, and depression (Brewin, 1998; Williams et al., 2007). In depression, a history of traumatic experiences and dysfunctional coping strategies such as avoidance are closely related to overgeneral memory (Williams et al., 2007) and the level of overgeneral memory was found to predict subsequent depressive symptoms (Sumner, Griffith, & Mineka, 2010). This phenomenon might also lead to impaired (specific) future-directed imagery and delayed recovery from depressive episodes (Williams et al., 2007). It is important to note that these processes might still be present in remission and could add to future vulnerability. Apposite to Teasdale (1983), Brewin et al. (1999) hypothesize that distressing memories might be somewhat dormant during remission and can be easily reactivated — vulnerability to depressive relapses might be based on patients' efforts to avoid these intrusions to be triggered once more.

When investigating the role of positive images, Joormann, Siemer, and Gotlib (2007) have demonstrated that even though depressed individuals are able to access positive memories if instructed to, their recall does not lead to an improvement of mood (like in healthy individuals) but rather to an increased level of sadness. In addition, a depressed mood may hamper spontaneous access to positive images and may prevent dysfunctional beliefs from being falsified by experience. Intrusive memories or their suppression might also draw from working-memory resources, interfering with the voluntarily access of positive autobiographic memories (Brewin et al., 1999).

If depressed individuals suffer from frequent intrusive mental images that lead to strong negative emotions, they may tend to use methods such as suppression or rumination to regulate their affect. Thoughts about the meaning of these images can also influence perceived distress. These processes may lead to a "rebound" of depressive cognitions or emotions. Thus, imagery can be seen as a central aspect of the aggravation and chronicity of depression. This situation illustrates the importance of further exploration of this phenomenon and its impact in depressed patients.

5. Treatment of negative mental images in depression

5.1. Reducing the frequency of negative images

Thought suppression has long been hypothesized to produce paradoxical effects regarding intrusion frequency with a negative impact

on mood (Wenzlaff & Wegner, 2000). This leads to the assumption that reducing the suppression of mental images could be used to treat depression, as mental images can be seen as the visual counterpart to verbal cognitions (Segal, Williams, & Teasdale, 2012). Training "acceptance" of cognitive contents through Mindfulness-Based Cognitive Therapy (MBCT) could be a way of achieving this. One goal of MBCT for depression (Segal et al., 2012) is the dis-identification with one's own cognitions — to regard them as mental events and not as facts. MBCT for suicidality (Hepburn et al., 2009) leads to a significant reduction in self-reported thought suppression, which is associated with a significant reduction in depression severity. Prospectively, cognitive interventions could also be administered to specifically target the suppression of negative imagery (see e.g. Beevers, Wenzlaff, Hayes, & Scott, 1999). Behavioral experiments (such as the "white bear experiment"; Wegner, Schneider, Carter, & White, 1987) can be used to demonstrate the adverse effects of suppression on the patient.

Preliminary clinical results have shown that imaginal exposure (IE) to intrusive memories can also be an effective intervention to reduce depression (Kandris & Moulds, 2008). IE uses the mechanism of habituation in sensu, which is well established in the treatment of PTSD (Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010) or chronic nightmares (Hansen, Höfling, Kröner-Borowik, Stangier, & Steil, 2013). Habituation could counteract the effects of intrusion suppression by helping the patient to allow himself or herself to experience distressing mental images and to let go of unnecessary cognitive control. However, because exposure often leads to a great amount of emotional distress, it may cause patients to discontinue psychotherapy prematurely. Future studies should assess the applicability of IE to intrusive memories or intrusive mental images in depressed individuals.

5.2. Changing the content and meaning of negative images

Imagery Rescripting (IR) can be defined as "the imagined change of the course of events in memories or fantasies of aversive experiences" (Arntz, 2012, p. 190). It may be one way to reduce the burden on the patient caused by IE without diminishing treatment success. Targeting the qualitative characteristics of negative mental images may also allow for more "schema"-relevant changes. IR can challenge negative key self-defining (traumatic) images and create competitive positive ones that are representative of more adaptive schemas (Wheatley et al., 2007). One idea behind this approach is the "retrieval competition hypothesis" (Brewin, 2006), which suggests the creation of pleasant images that are easier to access due to intensive rehearsal and are therefore favored in terms of retrieval compared with negative images (Brewin et al., 2009). Wheatley and Hackmann (2011) and Arntz (2012) have described in detail the theoretical framework of IR as an approach to treat mental disorders, including major depression.

Brewin et al. (2009) used IR in a brief stand-alone treatment to target intrusive memories in 10 patients with MDD and achieved a pre-post effect size of $d = 1.92$ (BDI scores) and a significant reduction in rumination ($d = 1.60$) with an average of 8.1 therapy sessions. The results were stable, including further reduction of the depression scores in a 12-month follow-up. Wheatley et al. (2007) reported on case examples from the Brewin et al. (2009) study with two patients suffering from MDD without comorbid PTSD using IR. The participants had "to relive the event reflected in their intrusive memory in as much detail as they were able" and "were then asked what they needed to happen in the memory to change their feelings in a positive direction" (2007, p. 374). One of the patients experienced a decrease in her BDI score from 44 (at baseline) to 9 over the course of the nine-session treatment. After 13 treatment sessions, the second patient also no longer met the criteria for MDD. Both reported a meaningful positive change regarding imagery characteristics (frequency, interference with daily life, distress, uncontrollability).

In addition to memory-based imagery, future-directed images of suicide or self-harm may be a target for IR because they may function as a form of dysfunctional emotion regulation (Selby et al., 2007) and increase the likelihood of future suicidal behavior (Crane et al., 2012). Ideas regarding the course of change include creating a non-suicidal outcome, reducing the comfort associated with these flash-forwards, or working with imagery characteristics, such as realness ("rather than just a mental event"; Holmes, Crane, et al., 2007, p. 430). It must be considered, however, that depressed individuals often initially experience these images as positive because they lead to emotions such as relief or to the thought of an escape strategy. Changing the content to a completely different script may leave the patient "empty-handed". The therapist should explore which needs of the patient (such as control, security, or stress relief) are met by these images and should generate images that are less harmful but contain similar concepts.

In addition to the modification of existing negative mental images, it is also possible to address the negative core beliefs of depressed patients by first giving them a visual form (i.e. creating an image representing dysfunctional cognitions) and subsequently changing its content via IR. This approach of visualizing and then modifying negative schematic beliefs has been used in schema therapy (see Holmes, Arntz, & Smucker, 2007 for a detailed description of different types of IR). Because depressed patients often suffer from negative beliefs about themselves, the world, or their future, the alteration of distressing images and dysfunctional verbal cognitions through IR should be incorporated into psychological interventions. Visual intrusions are often accompanied by depressive cognitions (Wheatley et al., 2007), such as "I am worthless", "I am powerless", "I was being punished […]" (p. 375), and feelings of being bad/dirty/powerless/weak (p. 377). IR could perhaps change associated beliefs and emotions without direct verbal dispute. Consequently, IR can be used to target negative depressive schemas in addition to Socratic dialogue in CBT or function as a substitute for cognitive interventions for depression if patients are unable or unwilling to engage in this type of restructuring. IR for depressed patients has rarely targeted negative mental images that are not based on actual events and which can therefore not be classified as memories. Because ideas about one's own negative future or representations of dysfunctional beliefs about personal qualities or the lack thereof often have important effects on depressive symptoms, they should be addressed as well.

It can be concluded from previous research that IR is highly effective in changing imagery characteristics and in reducing depression, and other comorbid symptoms, even in severely affected patient samples (see for example Arntz, Sofi, & van Breukelen, 2013; Grunert, Weis, Smucker, & Christianson, 2007; Jung & Steil, 2013). Treatment duration is usually relatively short and includes only a few treatment sessions, which has important implications for cost effectiveness and rapid symptom reduction for patients. Sample sizes in previous studies have been relatively small, and follow-up periods have been limited. Future research should focus on RCTs to generate verifiable information on the effectiveness, efficacy, and generalizability of IR as a stand-alone or additive treatment approach.

5.3. Fostering positive imagery

Depressed individuals often suffer from insufficient access to vivid, positive future-directed imagery (Holmes, Lang, Moulds, & Steele, 2008; Morina et al., 2011). In addition to changing the frequency, meaning, or emotional impact of negative mental images, the promotion of positive imagery seems to be indicated. Recently, researchers have successfully used "cognitive bias modification" (CBM) to change the negative interpretation bias in depression via computerized imagery tasks (Blackwell & Holmes, 2010; Lang, Blackwell, Harmer, Davison, & Holmes, 2012). In a single case series with patients suffering from MDD, Blackwell and Holmes (2010) targeted this phenomenon by promoting positive mental images through CBM for interpretation bias (CBM-I) and found improvements regarding depression and general psychological distress. Similar results were obtained in a comparison

of currently depressed individuals receiving CBM-I with a control group (Lang et al., 2012) with a higher rate of clinically significant change in the treatment condition (46.2% vs. 7.7%). In addition to this cognitive approach, meditation-based imagery techniques using self-compassion (Gilbert & Irons, 2004) can be used to generate positive images in depressed individuals. For instance, patients can be instructed to imagine a being that exemplifies compassion for them (a friend, a family member, a spiritual being, or the like) to counteract the tendency toward self-criticism in depression.

All in all, a variety of imagery-focused interventions can be explored in the future for their applicability and usefulness in the treatment of depression. IE to negative mental images is still in its infancy when it comes to depression, but a number of studies with small sample sizes showed promising outcomes. The content of negative images can be targeted using IR — an intervention which might be able to transform the meaning of mental images without causing high levels of distress, like in IE. Additionally, research on interventions to promote positive imagery also yields encouraging results. CBM and compassion meditation can be used for depressed individuals in addition to classical rescripting techniques that address negative mental images.

6. Conclusions and implications for the future

Negative mental images are a common feature of pathological and non-pathological experiences. Studies have demonstrated the importance of these images regarding symptom onset and the maintenance of several psychological disorders. They occur frequently, are eminently vivid, and are often linked to critical life events or traumas. These are highly prevalent phenomena in clinical populations, especially in PTSD and depression, two disorders that have been linked to frequent negative mental images. It has been shown that traumatic events often give rise to visual intrusions specific to a person's negative experiences, and this process seems to be independent of diagnostic status; trauma-related mental images can occur in depressed individuals as well as in patients with PTSD. In non-traumatized depressed groups, negative life events seem to play an important role in defining image content. Depressed patients often experience feelings of sadness, anger, guilt, or hopelessness caused by images involving topics such as illness, death, or interpersonal problems.

Like cognitive biases, negative mental images may play an important role in sustaining depressive symptoms over a long period of time. Rebound effects through suppressive processes, rumination, and downward mood changes as well as the subjective irrefutability of dysfunctional assumptions represented in the negative images may be fundamental maintaining factors of the disorder. In addition to negative imagery, a lack of positive imagery may be another piece in the puzzle regarding depression. Lower levels of vividness, an unfavorable ratio of positive vs. negative images, or a reduced ability to recall positive visual memories may be important contributing factors. The study of mental images can contribute to a deeper understanding of the psychopathology of different mental disorders and can enhance treatment development. These findings also underline the importance of memory processes in connection to intrusive as well as intentional imagery in the maintenance of depression. Consequently, future research could benefit from a detailed analysis of intrusion content in large samples to assess whether depressed individuals and those in remission tend to experience overgeneral, 'category-like' images.

However, the literature is lacking a clear and uniform definition of negative mental images. Methodological differences between assessments and studies often make it difficult to compare results. Some clinical studies suffer from poor methodological quality, including missing control groups and unclear distinctions between patient groups due to a lack of rigorous exclusion criteria. In studies using depressed samples only, no valid assumptions can be made on possible distinguishing features of non-clinical versus pathological imagery. Often, either non-clinical or clinical control groups are not included and it seems important to assess formerly depressed individuals to determine possible opportunities of mental imagery to influence remission and relapse in between episodes. Small sample sizes and a lack of longitudinal studies make it difficult to formulate a clear and reliable statement about causal relationships or etiological differences and similarities regarding different psychological disorders.

Notwithstanding the scientific obstacles that must be overcome, the results of clinical studies are promising, and a broad spectrum of possible treatments addressing negative mental images in depression has been developed. IR has proven to be an effective and successful intervention for visual intrusions in depression. Despite the already promising research, underlying mechanisms have not yet been understood entirely. Arntz (2012, p. 200) describes the current state and future challenges quite fittingly: IR, "although a powerful technique, seems to be a technique in need of a theory". In addition, classical interventions, such as IE, can be used and modern approaches such as CBM and MBCT may be applicable to enhance positive mental images, an area that is of particular importance in the case of depression. A combination of the imaginal modification of negative mental images and the promotion of positive imagery seems to be appropriate in the treatment of depressive disorders.

In addition to images related to distressing traumatic or non-traumatic life events, non-memory-based mental images should receive greater attention. These images seem to be common among patients suffering from mental disorders and may allow for a differentiation between clinical and non-clinical groups. Researchers should keep in mind that patients may fail to mention non-memory-based visual intrusions, which often have rather bizarre and shameful content. The same applies to deliberately imagined future events, which may have objectively negative content (such as self-harm or even suicide) but that do not lead to subjective distress but rather to emotional relief. These so-called flash-forwards might be used by patients as a cognitive escape strategy. This possibility should be considered for disorders with severe tendencies toward self-injury or suicide, such as borderline personality disorder or chronic depressive disorders.

In addition to rumination and repetitive intrusive thoughts, negative mental images in depression may be a marker of this specific psychopathology if looming differences between depressed and non-depressed individuals can be scientifically substantiated in the future. Future research in the field of depression should therefore focus on intrusions in the form of mental images, future-related and other non-memory-based negative images. Questions that remain to be answered conclusively include how negative mental images differ between patient populations and healthy controls in terms of, for example, recurrence, vividness, or distress. More information is required to assess how these negative mental images are related to symptom severity or the chronicity of psychological disorders in general and how the modification of these images might contribute to a reduction of depressive symptomatology in particular. Studies should be conducted with both currently depressed individuals and those in remission, as well as chronically depressed patients compared with other clinical and non-clinical groups using reliable diagnostic instruments and a clear definition of mental images.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.cpr.2014.03.001.

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