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Involuntary Autobiographical Memories in Dysphoric Mood: A Laboratory Study

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Involuntary autobiographical memories in dysphoria

Abstract

The frequency and characteristics of involuntary autobiographical memories were compared in 25 stable dysphoric and 28 non-dysphoric participants, using a new laboratory-based task (Schlagman & Kvavilashvili, 2008). Participants detected infrequent target stimuli (vertical lines) in a simple vigilance task and recorded any involuntary autobiographical memories that came to mind, mostly in response to irrelevant words presented on the screen. Dysphoric participants reported involuntary memories as frequently and as fast as non-dysphoric participants and their memories were not repetitive intrusive memories of negative or traumatic events. Additional content analysis showed that dysphoric participants did not recall more memories of objectively negative events (e.g., accidents, illnesses, deaths) than non-dysphoric participants. However, significant group differences emerged in terms of a mood congruency effect whereby dysphoric participants rated their memories as more negative than non-dysphoric participants. Moreover, the proportion of negatively rated involuntary memories was related to lower mood ratings at the end of the session in the dysphoric but not in the non-dysphoric group. Finally, groups did not differ on several memory characteristics such as vividness, specificity (high in both groups) and rates of rehearsal (low in both groups). Theoretical and practical implications of these findings for research on depression and autobiographical memory are discussed.

Key words: dysphoria, depression, intrusive memories, involuntary autobiographical memories, mood congruency, over-general memory.

Involuntary Autobiographical Memories in Dysphoric Mood: A Laboratory Study

Autobiographical memories involve remembering personal episodes from one's past and are important for maintaining self-identity and psychological well being across the life-span (Conway & Pleydell-Pearce, 2000; Walker, Skowronsky & Thompson, 2003). Therefore, research has often focused on autobiographical memories in depressed and dysphoric people. This work has primarily examined voluntary memories that are deliberately recalled in response to cue words provided by the researcher (the Autobiographical Memory Test, AMT; Wenzel, 2005; Williams & Broadbent, 1986), and has resulted in important findings concerning mood congruency and over-general memory effect (see below).

However, in everyday life, memories can also come to mind spontaneously, without deliberately trying to recall anything (Berntsen, 1996; 2009; Mace, 2007). Interestingly, research on depression has concentrated on spontaneous intrusive memories of negative events, which repeatedly intrude on consciousness, and are accompanied by high levels of distress and avoidance (e.g., memory of a recent car crash may come to mind many times and be difficult to control/get rid of). In contrast, research with the non-clinical population has concentrated on involuntary memories that are neither repetitive nor necessarily negative (e.g., remembering a first driving lesson when seeing a TV advert). However, similar to intrusive memories, their emotional valence can be affected by one's current mood and, once recalled, the involuntary memories themselves can have an impact on mood (Berntsen, 1996; Berntsen & Hall, 2004).

This feature of ordinary non-repetitive involuntary autobiographical memories may be particularly important for people with depression and dysphoric mood. Indeed, if they do have such memories as frequently as non-depressed people, and if these memories are more negative than in non-clinical samples (Watkins, Grimm, Whitney & Brown, 2005), this could worsen their depressed mood. In turn, the reduced mood may further increase the number of negative involuntary memories, leading to a vicious cycle that will be difficult to break due to the

number and unpredictable nature of involuntary memories. Unfortunately, there is virtually no information on these ordinary involuntary memories in depressed and dysphoric samples (as an exception see Watkins et al., 2005), and whether they can negatively impact on one's current mood. The aim of the present study was to fill this gap by studying the frequency and nature of non-repetitive involuntary memories in dysphoric participants using a new laboratory method recently developed in non-clinical samples (Schlagman & Kvavilashvili, 2008).

Voluntary autobiographical memories in depression and dysphoric mood

Research on voluntary memories has shown strong mood congruency effects whereby depressed people tend to recall less positive and more negative events than non-depressed samples, and this increased accessibility of negative memories has been shown to maintain and even exacerbate depressive symptoms (Blaney, 1986; Christianson & Safer, 1996; Williams, 1988; Williams, Watts, MacLeod & Mathews, 1997). Results also show that depressed people experience particular difficulties when asked to recall specific memories (e.g., *I felt lonely at my friend's party last week*) in response to word cues in the AMT, and often end up recalling general memories of repeated events instead (*I always feel lonely at parties*). This over-general memory effect has been obtained in numerous studies with depressed and dysphoric samples (see van Vreeswijk & de Wilde, 2004; Williams, 2006; Williams, Barnhofer, Crane, Hermans, Raes, Watkins, & Dalgleish 2007), and has also been shown to predict later levels of depression (e.g., Brittlebank, Scott, Williams & Ferrier, 1993; Dalgleish, Spinks, Yiend, & Kuyken, 2001).

Current theoretical explanations of over-general memory in depression rely on a hierarchical model of Conway and Pleydell-Pearce (2000). In this model, autobiographical knowledge incorporates information at different levels of specificity, from very abstract lifetime periods (*when I was a PhD student*) to general repetitive and extended events (*attending weekly seminars*), and from these to specific sensory-perceptual details of a particular event (*having a heated discussion with John*). When one tries to deliberately recall a

memory (like in the AMT), it takes time and effort to access the bottom of the hierarchy and construct a particular memory from available fragments of event-specific knowledge.

According to Dalgleish et al., (2007) people with depressed or dysphoric mood have limited executive resources which makes it difficult to consciously direct the search through the hierarchy. In addition, they may be unable to inhibit the task inappropriate general memories that get activated while searching through the hierarchy for a specific memory. In contrast, according to Williams' (1996) affect regulation model, recalling a specific memory of a past traumatic event will have a greater emotional impact on the individual than recalling a more general memory of the same event. Therefore, depressed and dysphoric people may learn to avoid this negative impact and regulate their emotions by aborting the memory retrieval process at an early stage and retrieve less detail in the form of general memories. Available empirical evidence, however, indicates that both affective regulation and executive functioning may be involved in the over-general memory effect in depression (Williams et al., 2007).

Intrusive memories in depression and dysphoric mood

Despite their ability to abort deliberate search processes through the hierarchy in response to cue words in the AMT, depressed people seem to be unable to use the same strategy when it comes to repetitive intrusive memories (Hauer, Wessel, Geraerts, Merckelbach, & Dalgleish, 2008; Golden, Dalgleish, & Mackintosh, 2007). There is growing evidence to show that the majority of depressed and dysphoric participants (60-90%) report experiencing intrusive memories of negative events such as illness/death/injury to family members or oneself and interpersonal problems (Birrer, Michael, & Munsch, 2007; Brewin, Phillips, Carrol & Tata, 1996; Kuyken & Brewin, 1994; Reynolds & Brewin, 1999; Spenceley & Jerrom, 1997; Williams & Moulds, 2007a).

Although depressed people might experience intrusive memories less frequently than people with Post Traumatic Stress Disorder (PTSD) (e.g., Reynolds & Brewin, 1999), the

phenomenological qualities of their intrusive memories are fairly similar to those with PTSD in terms of the memory duration, vividness, re-experiencing and physical sensations. Moreover, their intrusive memories can be highly distressing and elicit the same levels of avoidance as in patients with PTSD (Birrer et al., 2007; Reynolds & Brewin, 1999; Patel, Brewin, Wheatley, Wells, Fisher, & Myers, 2007).

Apart from suppressing memories, avoidance also involves attempts to avoid triggers that can elicit intrusive memories. Indeed, in a study of Williams and Moulds (2007a), 60% of dysphoric participants reported that intrusive memories occurred in response to identifiable triggers. Birrer et al. (2007) compared the frequency and the content of triggers in depressed and PTSD samples and found that in both groups the most frequently endorsed triggers were ruminative thoughts (70%), other people (57%), locations (50%) and feelings (43%), indicating that triggers were more likely to be of internal (thoughts and feelings) than external origin.

Finally, the negative maladaptive appraisals of intrusive memories were the strongest predictor of depression in dysphoric samples (Starr & Moulds, 2006; Williams & Moulds, 2007b), while the avoidance of intrusive memories in depressed psychiatric patients predicted depressive symptoms after 6 months even when the baseline depression and anxiety were controlled (Brewin, Reynolds & Tata, 1999). Taken together, the available evidence supports the idea that the repetitive intrusive memories and their negative appraisal or avoidance can exaggerate, prolong and even predict the outcome of depression (Brewin, 1998; Patel et al., 2007).

Involuntary autobiographical memories in non-clinical samples

Such negative intrusive memories occur less frequently in non-depressed samples (Berntsen & Rubin, 2008, Study 2; Bywaters, Andrade, & Turpin, 2004; Reynolds & Brewin, 1998). Nevertheless, they do experience spontaneous involuntary memories on a daily basis. The major difference between these memories and intrusive memories is that they do not occur

repeatedly. Indeed, ratings of rehearsal (i.e., repeated remembering of the same event) are generally low with many participants reporting that they have never had this memory before (Berntsen, 1996; see also Ball & Little, 2006; Berntsen & Hall, 2004).

Results of initial diary studies have consistently shown that these involuntary memories are more likely to occur when one is engaged in automatic activities that require little attention concentration (e.g., walking, making a cup of tea), and have easily identifiable triggers that are mostly external as opposed to internal (i.e., in one's thoughts) (Berntsen, 1996; Berntsen & Hall, 2004; Kvavilashivili & Mandler, 2004; Schlagman, Kvavilashvili, & Schulz, 2007). [1] External triggers often refer to peripheral aspects of the environment that are not directly related to one's current activity (Berntsen, 2007). The triggers also tend to be linguistic (e.g., written or spoken words) rather than perceptual (i.e., objects, colors, smells) (Mace, 2004; Schlagman et al., 2007). Moreover, involuntary memories have been repeatedly found to be of specific rather than general events (Ball & Little, 2006; Berntsen, 1996; 1998; Berntsen & Hall, 2004), and the few studies that directly compared involuntary and voluntary autobiographical memories in the same sample showed that the percentage of specific memories was reliably higher for involuntary than voluntary memories (Berntsen & Hall, 2004; Mace, 2006).

Recently, Schlagman and Kvavilashvili (2008) fully replicated and extended these findings by using a new laboratory method that allows the retrieval times of involuntary memories to be measured. The method was designed to emulate the conditions in which involuntary memories occur in everyday life: (1) when one's attention is not focused on the current ongoing activity, and (2) in the presence of easily identifiable triggers. Participants carried out an undemanding monotonous vigilance task of detecting occasional target cards with vertical lines in a continuous stream of cards with horizontal lines. In addition to lines, participants were also presented with irrelevant words in the centre of each card, some of which could potentially trigger involuntary autobiographical memories. If an involuntary memory did

occur, the participant stopped the vigilance task by clicking a button and recorded some details of the memory (e.g., a brief description, the specificity, rehearsal rates, emotional valence). In a second session, one-week later, participants recalled memories deliberately with the word-cue method—the AMT (Wenzel, 2005).

The majority of participants (89% and 93% in Studies 1 and 2) reported on average six to seven involuntary memories, and these memories were primarily elicited by the irrelevant word cues. Moreover, involuntary memories were more specific and were retrieved on average five seconds faster than voluntary memories. Schlagman and Kvavilashvili (2008) interpreted these findings as showing that in involuntary memories, the top-down spread of activation from lifetime periods to event-specific knowledge occurs automatically. If there is a good match between a trigger and the key aspects of a certain event, a specific memory is formed that pops to mind (*cf*. Berntsen, 2009; 2010). In contrast, Conway's (2005) "direct retrieval" hypothesis suggests that retrieval of involuntary memories is a fast and automatic process whereby an incidental cue directly activates a specific memory from a pool of very recent memories that have not yet been consolidated into the hierarchical structure of autobiographical memory.

Despite growing research on involuntary autobiographical memories (e.g., Ball & Little, 2006; Berntsen, 1996; 1998; 2001; 2007; 2009; 2010; Berntsen & Hall, 2004; Berntsen & Rubin, 2002; Kvavilashvili & Mandler, 2004; Mace, 2004; 2006; 2007; Schlagman, Schulz & Kvavilashvili, 2006; Schlagman et al., 2007), there is only one published study that has examined these non-repetitive involuntary memories in dysphoric participants (Watkins et al., 2007). In this study, dysphoric and non-dysphoric students had to think aloud for 30 minutes while being exposed to different cues (music, pictures, scents). Any thoughts considered to be autobiographical memories were noted by the researcher and participants had to retrospectively acknowledge these as involuntary autobiographical memories. Two important findings were obtained: dysphoric participants reported more involuntary memories (M=3.02) than non-

dysphoric participants (*M*=1.76) and they rated these memories as more negative than non-dysphoric participants (the mood congruency effect). However, the number of recorded memories was fairly low and it is unclear whether some memories were repetitive intrusive memories as ratings of rehearsal were not obtained. The content of memories was also not analysed to see if the recalled memories were about objectively negative events (e.g., accidents, illnesses) or were just rated as more negative. Most importantly, Watkins et al. (2005) did not assess participants' current mood to investigate the possibility that, similar to intrusive memories, non-repetitive negative involuntary memories can also worsen dysphoric mood.

The present study

In the present study, involuntary memories were elicited in a group of dysphoric and non-dysphoric participants with the laboratory method of Schlagman and Kvavilashvili (2008). Participants also rated their current mood at the start and end of the vigilance task, in addition to being pre-screened for their mood status with the Beck Depression Inventory (BDI).

The study addressed three main issues: (1) the nature and frequency of non repetitive involuntary memories in dysphoric participants, (2) mood congruency effects, and (3) the specificity of these memories. In relation to the first question we wanted to see if the ordinary involuntary memories do occur in dysphoric mood. If people with depression experience only repetitive intrusive memories then the ratings of rehearsal in the dysphoric group should be higher than in the non-dysphoric group, and the same involuntary memory may be recalled more than once during the session. Predictions in relation to frequency of involuntary memories were less clear. According to Dalgleish et al. (2007) depressed people should experience more involuntary memories during cognitively demanding ongoing tasks because they will have fewer executive resources available to inhibit involuntary memories in response to incidental triggers. Although dysphoric students in the Watkins et al. (2005) study did report more involuntary memories than non-dysphoric students during a cognitively demanding think aloud

task, it is unclear whether dysphoric participants will report more involuntary memories during a simple vigilance task used in this experiment.

In relation to mood congruency, it was predicted that dysphoric participants would rate their memories as more unpleasant than non-dysphoric participants (see Watkins et al., 2006). However, an additional content analysis was conducted to examine if mood congruency extended to the contents of involuntary memories. In particular, we wanted to see if dysphoric participants simply rated their memories as more negative than non-dysphoric participants or whether their memories were more likely to depict objectively negative events (e.g., accidents, illness) and/or less likely to depict positive events (e.g., holidays, celebrations) than memories of non-dysphoric participants. Most importantly, if dysphoric participants do recall more unpleasant memories than non-dysphoric participants, then this may impact negatively on their current mood at the end of the session. It was therefore predicted that there would be a negative correlation between the proportion of negative memories reported and mood scores at the end of the session and that this would be stronger in dysphoric than non-dysphoric participants.

Finally, if involuntary memories are recalled via automatic spread of activation in the autobiographical memory system in response to incidental cues (Berntsen, 2009; Sclagman & Kvavilashvili, 2008), then there should be no difference in the proportion of specific involuntary memories reported by dysphoric and non-dysphoric participants (for similar predictions, see Berntsen & Hall, 2004; Williams et al., 2007). In addition, dysphoric participants should retrieve involuntary memories as fast as non-dysphoric participants.

Method

Participants

Participants were undergraduates recruited via a university-wide e-mail requesting volunteers to take part in a study of mood and concentration. A total of 82 participants (aged 18 to 27 years) completed the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock &

Erbaugh, 1961) twice, first on-line (at pre-screening stage) and then during the testing session with a minimum delay of 3 weeks between the tests. The final sample consisted of 25 dysphoric participants (12 females, 13 males) who consistently scored 16 or above on the BDI on both occasions [2] and 28 non-dysphoric participants (17 females, 11 males) who consistently scored 6 or below. The mean BDI score on the day of testing was 23.76 (*SD*=7.24, range 16-42) in the dysphoric group and 2.46 (*SD*=2.01, range 0-6) in the non-dysphoric group. In addition, the ratings of current mood on a 9-point scale (1=extremely negative, 5=neutral, 9=extremely positive) obtained at the beginning and end of the vigilance task were reliably lower in the dysphoric group (M_1=4.96, *SD*=1.72 and M_2=4.88, *SD*=1.67) than those of the non dysphoric group (M_1=6.79, *SD*=1.03 and M_2=6.64, *SD*=1.25) as revealed by a strong main effect of group ($F(1,51)=30.31$, $p<.0001$, $\eta_p^2=.37$) in a 2 (group: non-dysphoric, dysphoric) x 2 (time: start, end) mixed ANOVA on the mean ratings of mood as the dependent variable (no other effects were significant, $F_s<1$).

Materials

Mood Questionnaire. The BDI (Beck et al., 1961) is a 21-item self-report measure of depression. The participant reads a series of statements and has to circle any they feel apply to them (e.g., “I feel discouraged about the future” or, “I don’t feel disappointed in myself”). Scores can range from 0 to 63 with higher scores indicating greater levels of depression.

The Involuntary Memory Session. The vigilance task was a 15-minute program created with SuperLab software and presented on an Apple Macintosh laptop. The program consisted of 600 trials each showing a card (21.5 cm by 12.5 cm) depicting either a pattern of black horizontal lines (non-target stimuli) or vertical lines (target stimuli). Target stimuli appeared on 11 trials and non-target stimuli on 589 trials. In addition to the line-pattern, a word-phrase (e.g., Relaxing on a beach; Missed opportunity; Crossing the road) was shown on each trial. Phrases were presented in size 18 Arial font and placed in the middle of each card. The 600 trials were

shown in a fixed random order and continuously with each trial remaining on the screen for 1.5 seconds. Target line-patterns occurred in every 40 to 60 trials (i.e., between every 60 to 90 seconds) to ensure they came at fairly long and irregular intervals.

To control the emotional valence of cue-phrases, a total of 1492 phrases were generated by the authors and were given to eight independent coders to rate as either negative, neutral or positive. Only phrases with an agreement of 75% or above were included, giving a pool of 1176 cue-phrases. Out of this pool, 600 phrases were randomly selected and equal numbers (N=200) of negative, neutral and positive phrases were used (see Schlagman & Kvavilashvili, 2008, for a more detailed description of the stimuli and their development).

Autobiographical memory questionnaire. For each memory, participants completed a pre-structured two-page questionnaire. On Page 1, participants wrote a brief description of the content of the memory, rated the vividness (1=very vague, almost no image at all; 7=very vivid, almost like normal vision) and indicated whether the memory was triggered by something (in one's thoughts or in the environment) or whether there was no trigger. If there was a trigger, they wrote a description of it. Finally, they rated how much they concentrated on the vigilance task when the memory came to mind (1=not at all concentrating; 5=fully concentrating). On Page 2, participants indicated whether their memory was of a specific or general event and rated its pleasantness (1=very unpleasant; 3=neutral; 5=very pleasant), how often the memory had been thought of or rehearsed before (1=never; 2=once or twice; 3=a few times; 4=several times; 5= many times), and indicated their age in memory.

Procedure

All participants were tested individually and told they were taking part in a study examining mood and concentration. Participants read an information sheet explaining that they would be required to carry out a vigilance task in which they had to detect a randomly presented target stimuli (consisting of a pattern of vertical lines) from a large number of non-

target stimuli (consisting of a pattern of horizontal lines). Each time a target stimulus was detected participants had to say 'yes' out loud. They were also asked to ignore the words in the centre of the pattern. It was explained that the condition they were taking part in was looking at how people could keep their concentration on the patterns, and in another condition participants would have to concentrate on the words and ignore the lines. At this point, participants completed a practice trial, which lasted for one minute and contained three target stimuli.

Once the experimenter was assured that the requirements of the vigilance task were fully understood, participants continued to read the information sheet, which explained that due to the task being quite monotonous they could find themselves thinking about other things, which was quite normal. Thoughts unrelated to the vigilance task could concern many things (e.g., a current project, future goals, daydreams). It was pointed out that some unrelated thoughts might be past memories that spontaneously 'pop' to mind, and the nature of involuntary autobiographical memory was explained: "involuntary memories may be from the very recent past or from some time ago. They may vary in detail and specificity. A specific memory refers to a single episode in your life (e.g., '*visiting a relative in hospital*' or '*when a member of your family was born')*. A general memory may refer to an extended event (e.g., '*a trip to Paris')* or a single event that occurred repeatedly over an extended period (e.g., '*visits to the dentist'* or '*going to the seaside every summer during your childhood*'). Furthermore, it maybe that you have thought of the memory many times before or never before. The only criterion we have is that your past memory came to mind spontaneously without you trying to remember anything".

Participants were instructed that their main task was to continue to respond by saying 'yes' each time they saw the target vertical lines, and if, in addition, an involuntary autobiographical memory came to mind they should click the mouse to stop the presentation and record their memory. Before starting the vigilance task, participants were asked to rate their current mood on a 9-point scale (1=extremely negative, 5=neutral, 9=extremely positive).

If participants clicked the mouse to report a memory, the vigilance task stopped and was replaced by a feedback screen (which read: *Record your memory and then click the mouse to return to the vigilance task)* for an unlimited time while participants completed Page 1 of the questionnaire. The experimenter explained each question in detail for the first memory reported by each participant. After completing Page 1, participants clicked the mouse again to return to the vigilance task, repeating this procedure for each involuntary memory that came to mind. At the end of the vigilance task participants were asked to complete Page 2 of the questionnaire for each recalled memory. The experimenter explained the questions carefully, especially the question concerning the memory specificity. After completing the questionnaires, participants rated their overall concentration during the vigilance task (1=not at all concentrating, 5=fully concentrating) and their current mood on a 9-point scale. Finally, participants completed the BDI (for the second time) before being fully debriefed.

Data analysis

Before conducting any analyses, all memories were read to check that they were autobiographical in nature. Coding was carried out by two independent raters with good inter-rater reliability (*Kappa*=.69, *SE*=.08).[3] Memories that were discarded were clearly not autobiographical and were examples of future intentions (i.e., prospective memory), current thoughts/daydreams or the contents of general knowledge.

For those involuntary memories that were reported by participants as being triggered by cue phrases on the screen, the retrieval times were calculated by counting from the present (clicked on) trial back to the trial with the words that was reported to have triggered the memory. For example, if a participant clicked on trial 23 and the reaction time for that trial was 0.84 seconds, and the word which triggered the memory was two trials back, 3 seconds would be added (1.50 sec per trial) to make a retrieval time of 3.83 seconds (Schlagman & Kvavilashvili, 2008).

In line with previous research in this area, the majority of analysis involved using aggregated data (Berntsen & Hall, 2004; Schlagman & Kvavilashvili, 2008). For each participant, we calculated means (e.g., mean vividness or rehearsal rating) that were then entered into the ANOVA. When the data were dichotomous (i.e., specific vs. general), mean proportions of specific memories were calculated for each participant and then entered into the analysis in the same fashion. Unless otherwise specified the rejection level for all analyses was set at 0.05 and the magnitude of effects was measured by partial eta-squared (η_p^2) with small, medium and large effects defined as 0.01, 0.06 and 0.16, respectively (Cohen, 1977).

Results

All participants successfully completed the vigilance task with the dysphoric group detecting on average 10.38 (*SD*=1.24) and the non-dysphoric group 10.43 (*SD*=1.67) targets out of 11 ($F<1$). The groups also did not differ in the mean ratings of overall concentration that were 3.52 (*SD*=.83) in dysphoric and 3.82 (*SD*=.67) in non-dysphoric participants ($F<1$).

Number of involuntary memories, their triggers and retrieval times

Three dysphoric and 2 non-dysphoric participants did not record any involuntary memories. After discarding 28 non-autobiographical memories (11 in the dysphoric and 17 in the non-dysphoric group), the non-dysphoric participants recorded a total of 178 memories with a mean of 6.36 (*SD*=6.14, range=0-26) and the dysphoric group reported a total of 189 with a mean of 7.56 (*SD*=7.70, range=0-30), which did not differ from each other ($F<1$).

In both groups, the majority of memories were reported to have identifiable triggers (95%) compared to no triggers (5%), and the reported triggers were predominantly the cue-phrases (83%) presented on the computer screen (see Table 1). However, there was an effect of dysphoric mood $\chi^2(3)=20.17$, $p<.001$. Examination of the adjusted residuals showed that compared to the non-dysphoric group, the dysphoric group reported fewer memories triggered

by cue-words (90% vs. 76%, respectively) but more memories triggered by internal thoughts (4% vs. 15%) and other external cues (e.g., lines on the screen, outside noise, etc.) (1% vs. 4%).

The mean retrieval time for those memories that were reported to have been triggered by a word cue was 5.78 sec (*SD*=4.67) in the dysphoric group and did not differ from the non-dysphoric group mean of 5.42 sec (*SD*=6.06) (*F*<1).

Mood-congruency

Pleasantness of memories. The analysis of pleasantness ratings showed that dysphoric participants rated their involuntary memories as more negative (*M*=2.86, *SD*=.67) than non-dysphoric participants (*M*=3.26, *SD*=.61) (*F*(1,46)=4.75, *p*=.035, η_p^2=.09).[4] To examine whether this mood congruency effect was caused by dysphoric participants recalling events of objectively negative nature (e.g., deaths, accidents, illnesses), we conducted a thematic content analysis (Smith, 2000) of memory descriptions using a set of 17 categories devised from a previous content analysis of involuntary autobiographical memories (for a full description of the method used see Schlagman et al., 2006).

Two independent coders read each memory description and assigned it to one of the 17 content categories that best described its main topic or theme (e.g., being on holiday, chores/leisure activities, accidents/illnesses). The inter-rater reliability between the coders was good **(***Kappa*=.74, *SE*=.07**)**. Table 2 shows that the percentage of memories falling into each of the content categories is fairly similar in dysphoric and non-dysphoric participants. However, when we examined the frequency of memories falling into content categories that represent predominantly negative events (accidents/illnesses, stressful events, deaths/funerals), predominantly positive events (special occasions, holidays, romantic involvement, and going out) and all the remaining 10 categories pooled together (e.g., chores/leisure activities,[5] conversations, persons, etc.), a significant group difference emerged, χ^2(*df*=2, *N*=367)=7.41, *p*=.025 (see Table 3). The examination of adjusted standardized residuals showed that groups

did not differ in the percentages of negative memories but dysphoric participants were less likely to report memories of predominantly positive events and more likely to report memories falling into the remaining 10 categories of more neutral 'other memories'.

Correlations of negative memories with mood scores. To examine if the recall of unpleasant involuntary memories during the vigilance task had a negative effect on participants' mood ratings at the end of the session, we calculated partial correlations between the proportion of memories rated as negative by participants (points 1 and 2 on the 5-point scale) and their mood ratings at the end of the session while controlling for initial mood ratings obtained at the beginning of the session. While this correlation was not significant for non-dysphoric participants ($r(26)$=-.15, p=.48) it was highly significant for dysphoric participants ($r(22)$=-.64, p=.002) indicating that memories rated as unpleasant had more deleterious effect on the current mood ratings of dysphoric than non-dysphoric group.[6]

Specificity and other characteristics of involuntary memories

Overall mean ratings of dysphoric and non-dysphoric participants for memory characteristics and the results of one-way ANOVAs on these means are presented in Table 4. There were no main effects of group for rehearsal, vividness, and age of memories. Moreover, in line with our predictions, groups also did not differ in the mean proportion of specific memories which were fairly high in both dysphoric (M=.70, SD=.22) and non-dysphoric participants (M=.75, SD=.20) ($F<1$).[7] To see if specific memories recorded by dysphoric and non-dysphoric participants differed in any way, ratings of vividness, rehearsal and pleasantness were examined for all specific memories. In the dysphoric group the mean vividness rating of specific memories was 5.06 (SD=1.27) and not statistically different from the mean of the non-dysphoric group 5.01 (SD=1.27) ($F<1$). Mean rehearsal ratings for specific memories were 2.45 (SD=.82) for the non-dysphoric group and 2.48 (SD=.78) for the dysphoric group, which did not differ ($F<1$) but do indicate fairly low rehearsal rates in both groups. However, in line with

results reported in the previous section on 'Pleasantness of memories', mean ratings of pleasantness were lower in dysphoric group (M=2.85, SD=.75) than in non dysphoric group (M=3.25, SD=.64) (F(1,45)=4.05, p=.05, η_p^2=.08).

Discussion

The aim of the present paper was to examine the nature and frequency of ordinary non-repetitive involuntary autobiographical memories in dysphoric participants. The main hypothesis was that these memories would be rated negatively and that they would further exacerbate one's already negative mood in dysphoria.

Main findings

First, results showed that involuntary memories reported by dysphoric participants were not repetitive intrusive memories of negative or traumatic events. If this were the case, dysphoric participants would indicate that a memory had occurred to them many times before (point 5 on the rating scale), and at least some memories would occur more than once during the session with identical or somewhat similar content (*cf*. Berntsen & Rubin, 2008). However, ratings of prior rehearsal were fairly low when averaged across all memories (see Table 4) or specific memories only. In addition, the content analysis showed that memories of the dysphoric group did not re-occur during the task and referred to random unconnected events.

Additional support for the idea that we studied ordinary involuntary memories comes from the finding that in dysphoric participants only 15% of memories were reported as being triggered by internal thoughts and the majority of memories (79%) were triggered by external cues (75% by word-cues and 4% by other external cues) (see Table 1). This is in line with previous studies on involuntary autobiographical memory (Berntsen, 1996; Mace, 2004; Schlagman & Kvavilashvili, 2008) but contradicts the results of Birrer et al. (2007) who showed that repetitive intrusive memories of negative events were reported by patients with depression as being triggered predominantly by internal thoughts and feelings. However, there

has been very little research on what triggers intrusive memories and comparing the triggers of involuntary and intrusive memories in dysphoric mood and depression is clearly one interesting avenue for future research.

Another set of important findings concerns mood congruency. Thus, a significant mood congruency effect was obtained for participants' own ratings of memory pleasantness with dysphoric participants rating their memories as more unpleasant than the non-dysphoric participants (for similar findings see Watkins et al., 2005). It is also interesting that dysphoric participants were not more likely to recall memories of objectively negative events, such as accidents or illnesses, than non-dysphoric participants as shown by the additional content analysis of memory descriptions. They did, however, recall fewer memories of positive events such as holidays or special occasions (see also Dozois & Dobson, 2001). It, thus, appears that dysphoric individuals do not recall higher number of negative events but evaluate and appraise their memories as more negative.

The most important finding obtained in the present study concerns the correlation between the proportion of negatively rated memories and mood scores at the end of the session. Thus, the higher proportion of reported negative memories was related to lower mood ratings in the dysphoric but not in the non-dysphoric group. This is a novel finding that merits further investigation and, if replicated in clinical samples, can have implications for clinical practice and the treatment of depressed mood. Indeed, it suggests that ordinary negative involuntary autobiographical memories may worsen dysphoric people's mood in addition to the adverse effects of intrusive memories reported in the literature. One possible mechanism behind this negative correlation in the dysphoric sample is that their negatively rated involuntary memories trigger depressive ruminative thoughts which then reduce one's current mood. This may not be the case in non-dysphoric participants and, hence, the absence of a correlation in the latter group. This is clearly an interesting avenue for future research.

The final set of results concerns the absence of any effects of dysphoric mood on the specificity of involuntary autobiographical memories. Thus, both dysphoric and non-dysphoric participants reported experiencing predominantly specific involuntary memories in the course of the undemanding vigilance task. This finding is in sharp contrast with the results of many studies of voluntary autobiographical memory, which show that depressed and dysphoric individuals have particular difficulties in deliberately retrieving specific memories and often recall more general events than non-depressed samples (see 'Introduction').

This discrepancy in findings is particularly striking when taking into account the different instructions given to participants. In typical research using the voluntary AMT, participants are explicitly asked to retrieve a specific memory to a number of cue-words (Debeer, Hermans & Raes, 2009; Wenzel, 2005). Practice cue-words are given and the task does not begin until the researcher is sure the participants understand that they are to retrieve specific memories. In contrast, in the present study, participants were given examples of both specific and general memories and it was highlighted that both were autobiographical. Nevertheless, dysphoric participants still recalled mostly specific involuntary memories. It is important that differences in specificity of involuntary and voluntary memories obtained in the present study and previous research with the AMT is not due to these different instructions. Indeed, when Debeer et al. (2009) used the so called minimal instructions AMT, which does not stress the importance of recalling specific memories (like in our study), the percentage of specific voluntary autobiographical memories dropped to 53% even in non-dysphoric participants.

Theoretical implications

The findings regarding the specificity of involuntary autobiographical memories in dysphoric mood have theoretical implications for research on depression as well as for autobiographical memories in general. They provide further support for the view that involuntary memories are recalled automatically whereby the activation spreads through the

hierarchy of autobiographical knowledge and accesses the event specific knowledge from the bottom of the hierarchy without the need for deliberate search processes (see Berntsen, 2009; Schlagman & Kvavilashvili, 2008). Given that on average these memories were about 3 years old (see Table 4), it is also unlikely that they were retrieved from a separate pool of very recent memories that had not been incorporated into autobiographical memory system (see Conway, 2005). Further support for the idea that involuntary memories were automatically recalled comes from the data on retrieval times, which were not longer in the dysphoric than non-dysphoric group, and were almost identical to retrieval times obtained by Schlagman and Kvavilashvili (2008) in non-clinical samples.

Furthermore, the results have implications for Williams' (1996) affect regulation hypothesis, which suggests that depressed people learn to abort the retrieval of specific negative memories by recalling more general (and hence less painful) memories instead. However, our results show that in the case of involuntary memories, dysphoric people may have automatic access to specific memories, which does not enable them to use the same retrieval strategy that is in operation when memories are deliberately recalled. As these specific memories were also rated as relatively more negative and seemed to worsen dysphoric participants' mood at the end of the session, it is possible that they also contribute to the maintenance of the depressed mood in dysphoric participants. Future research should examine in more detail whether these negatively rated non-repetitive involuntary memories affect current mood directly or via ruminative thoughts.

Some limitations

Despite the interesting and encouraging findings certain caution is needed when interpreting the results. First, a non-clinical sample was used and it is not clear whether the findings will generalize to clinical samples. However, we used a fairly stringent criteria for defining a dysphoric group whereby participants had to score at least in the moderate range on

BDI (16 and above; Beck, 1967; Vredenburg et al., 1993) not only on the day of testing but also at pre-screening stage few weeks earlier. This procedure ensured that participants in the dysphoric group had consistently rather than transiently elevated depressed mood on the day of testing (Kendall, Hollon, Beck, Hammen & Ingram, 1987; Vredenburg et al., 1993; Zimmerman, 1986). Nevertheless, it is important that the present set of findings is replicated with clinically depressed participants, which is clearly an interesting avenue for future research.

Another potential criticism of the study is that the cues used to elicit involuntary autobiographical memories were more detailed and elaborate than single word-cues such as 'happy', 'sorry' or 'guilty' used in the research on voluntary memories with the AMT. Therefore, one could argue that the increased recall of specific memories in the dysphoric group was not due to the involuntary nature of retrieval but due to increased specificity of the cue words (see Dalgleish et al., 2007, Study 6). However, Rekart, Mineka, and Zinbarg, (2006) conducted a study with a dysphoric and non-dysphoric sample and compared the specificity of voluntary memories retrieved to very similar phrases to those used in the present study (e.g., making a new friend, celebrating a birthday, making a mistake, getting a bad grade) and single cue words. The over-general memory effect was evident for both elaborate phrase- and single word-cues (see also Williams, 1988). Nevertheless, future research would benefit from directly comparing voluntary and involuntary autobiographical memories using a within-subjects design and clinically depressed patients (see e.g., Kuyken & Brewin 1995).

Finally, one may question whether involuntary memories recalled in the laboratory were truly involuntary and representative of involuntary memories experienced by depressed and dysphoric people in their everyday life. Our results suggest that participants were not trying to deliberately recall memories. Had this been the case, the retrieval times would have been much longer for dysphoric participants and we would have obtained a standard over-general memory effect observed in dysphoric samples with voluntary AMT (see Rekart et al., 2006). The

question about representativeness of memories can not be answered on the basis of the present data. However, Schlagman and Kvavilashvili (2008, Study 2) did address this issue by asking participants to keep a diary of everyday involuntary autobiographical memories in addition to recalling involuntary and voluntary memories in the laboratory. Their results showed that there were no differences between involuntary memories recalled in the laboratory and in everyday life in terms of triggers and memory characteristics but both laboratory and diary involuntary memories were more specific than voluntary memories recalled by the same participants. Although these findings are encouraging, it is obvious that future research needs to compare the laboratory and diary involuntary memories in dysphoric and depressed samples.

Conclusions

The present study emphasizes the importance of a distinction between repetitive intrusive memories and involuntary autobiographical memories, and shows that dysphoric mood can be worsened by these ordinary non-repetitive involuntary memories. Results also suggest that the over-general memory effect, typically observed in depressed and dysphoric samples with the AMT, may not necessarily generalize to involuntary autobiographical memories. These are novel findings that have important implications for research on autobiographical memory and depression and open up several interesting avenues for future research. Moreover, if these initial findings are replicated in clinically depressed participants, this will enhance our understanding of causes and maintenance of depression and will ultimately require the development of therapeutic techniques specifically aimed at reducing the negative effects of these non-repetitive involuntary memories on the depressed mood.

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Footnotes

[1] The presence of cues indicates that involuntary memories are "not spontaneous in the sense of being cue-independent, but only in the sense of being unintended" (p. 441, Berntsen, 1996).

[2] Although it is customary to use a cut off point of 9 and above on BDI to class participants as dysphoric or depressed (see Cox, Enns, Borger, & Parker, 1999), we followed the recommendation of Vredenburg, Flett and Krames (1993) and used a cut off point of 16 and above, which corresponds to moderate depression (Beck, 1967) and reduces the chances of participants being classed as non depressed when tested second time (see Zimmerman, 1986).

[3] There is some variability in guidelines as to what counts as good reliability in case of Cohen's Kappa. However, as a rule of thumb, reliability between 0.60 and 0.80 is considered as good. For example, Landis and Koch (1977) consider reliability between 0.60 and 0.80 as substantial and between 0.81 to 1.00 as perfect agreement.

[4] We also calculated the mean number of involuntary memories that were triggered by negative, positive and neutral cues and entered them into a 2 (group) x 3 (cue-valence) mixed ANOVA with repeated measures on the last factor. This resulted in a significant main effect of cue-valence $F(2,84)=11.46$, $p<.005$, $\eta_p^2=.21$ with the number of memories triggered by negative cues ($M=3.25$) being reliably higher than the number of memories triggered by either neutral ($M=1.18$) or positive cues ($M=1.80$) (both $p_s<.001$), which did not differ from each other ($p=.24$). There was no main effect of group ($F<1$) or group by cue-valence interaction ($F=1.22$), indicating the absence of mood congruency effect for the valence of cues.

[5] This was a fairly large category encompassing a variety of everyday activities such as shopping, gardening, watching TV, exercising, playing chess, etc.

[6] Similar results were obtained when we calculated correlations between the proportion of negative memories and participants' mood-change scores. These were obtained by subtracting

mood rating at the start of the session from the mood rating at the end of session. A score of '0' would indicate no change, a negatively signed mood score would indicate the worsening of the mood and a positively signed score an improvement of mood over the session. For the dysphoric group, there was a significant negative correlation between mood-change and the proportion of negative memories ($r(22)$=-.46, p=.03). Thus, the higher the proportion of negative memories reported, the lower the mood-change score (i.e., the more negative the mood became). For the non-dysphoric group, the correlation was not significant ($r(26)$=-.11, p=.61).

[7] Relevant previous research does not usually require participants to self-rate the specificity of their memories, the memories are coded by independent raters. Therefore, to further support the analysis of participants' own ratings, two independent coders also rated each memory as to whether it concerned a general or specific event and inter-rater reliability was high **(***Kappa*=.90, *SE*=.04**)**. The mean proportion of memories rated as specific were .82 (*SD*=.20) for the non-dysphoric group and .77 (*SD*=.21) for the dysphoric group and did not differ (F<1).

Table 1

Frequencies (Percentages) of Memories as a Function of Type of Trigger (No-Trigger, Internal Thoughts, External Word-Cues, External Other) and Group (Non-Dysphoric, Dysphoric).

Group	Type of Trigger				Total
	No Trigger	Internal Thoughts	External Word-cues	External Other	
Non-Dysphoric	7 (4%)	7 (4%)	161 (91%)	1 (1%)	176 (100%)*
Dysphoric	10 (5%)	29 (15%)	142 (75%)	8 (4%)	189 (100%)
Total	17 (5%)	36 (10%)	303 (83%)	9 (2%)	365 (100%)

* Lower memory number due to missing values for 2 memories

Table 2

Percentages (Frequencies in Parenthesis) of Memories by Content Category and Group.

Content Category	Group			
	Non-Dysphoric		Dysphoric	
Psychologically Stressful events	19%	(34)	17%	(32)
Accidents including injuries and illnesses	8%	(14)	9%	(17)
Chores/Leisure activities (including sports, hobbies & games)	13%	(23)	19%	(35)
Special occasions (birthdays, weddings, engagements, parties)	10%	(18)	4%	(8)
Holidays	7%	(12)	3%	(5)
Conversations	9%	(16)	6%	(11)
Persons (i.e. primarily about other people)	5%	(9)	10%	(18)
Work/university	6%	(11)	7%	(14)
School	5%	(9)	7%	(13)
Romantic involvement (e.g. being intimate, romantic dinners, receiving gifts for valentine day)	4%	(7)	6%	(12)
Going out (e.g. going to the pub/dancing)	3%	(5)	0%	(1)
Objects/places	1%	(2)	2%	(3)
Deaths/funerals	2%	(3)	0%	(1)
Miscellaneous	4%	(7)	3%	(6)
Travelling/journeys	2%	(4)	2%	(4)
Personal (memory descriptions not given)	2%	(3)	5%	(9)
Births	0%	(1)	0%	(0)
Total memories	100%	(178)	100%	(189)

Table 3

Frequencies (Percentages) of Memories as a Function of Content Category (Negative, Positive, Other) and Group (Non-Dysphoric, Dysphoric).

	Content Categories			
Group	Negative	Positive	Other	Total
Non-Dysphoric	51 (29%)	42 (23%)	85 (48%)	178 (100%)
Dysphoric	50 (26%)	26 (14%)	113 (60%)	189 (100%)
Total	101 (27.5%)	68 (18.5%)	198 (54%)	367(100%)

Note – The Negative Memory Category is Comprised of Psychologically Stressful Events, Accidents/Illnesses, and Deaths/Funerals.
The Positive Memory Category is Comprised of Events Referring to Special Occasions, Holidays, Romance and Going Out.
The Category of 'Other' Memories is Comprised of Chores/Leisure Activities, Conversations, Persons, Work/University, School, Objects/Places, Travelling, Births, Miscellaneous and Personal.

Table 4

Overall Mean Ratings (Standard Deviations in Parenthesis) of Memory Characteristics as a Function of Group (Non-Dysphoric vs. Dysphoric) and Results of One-Way ANOVAs on These Means (F Values and Effect Sizes – Partial Eta-Squared).

	Group			
	Non-Dysphoric (N=26)	Dysphoric (N=22)	F value (1,46)	Effect Size (partial η^2)
Specificity [a]	0.75 (0.19)	0.70 (0.22)	0.67	0.01
Vividness [b]	5.00 (1.21)	4.89 (0.99)	0.12	0.00
Rehearsal [c]	2.66 (0.68)	2.79 (0.83)	0.34	0.00
Age of memory [d]	3.37 (2.85)	2.62 (2.43)	0.76	0.02

[a] Memories were Rated as Specific or General. Means Represent Mean Proportions of Specific Memories Averaged across Participants.

[b] Ratings were Made on a 7-Point Scale (1=Very Vague, Almost No Image At All; 7=Very Vivid, Almost Like Normal Vision).

[c] Ratings were Made on a 5-Point Scales (1=Never, 2=Once or Twice, 3=A Few Times, 4=Several Times, and 5=Many Times).

[d] For Each Memory, Age was Calculated by Subtracting Participants' Age in Memory from Their Current Chronological Age.

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