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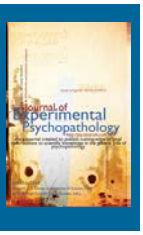

Choking Under Pressure: Degrading Flashforwards Related To Performance Anxiety

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Abstract

Intrusive vivid images of future catastrophe ("flashforwards") are important in social fears, like performance anxiety. Previous studies in healthy volunteers found that eye movements reduce vividness and emotionality of negative mental images of past events and future–oriented events. This study tested whether eye movements reduce image vividness and emotionality in students with performance anxiety. Participants (*N* = 29) imagined two feared future events related to performance anxiety during six 24 s blocks per image: one image was accompanied by eye movements, the other was not. Image vividness and emotionality were assessed before and after these blocks. Relative to the eyes stationary condition, eye movements resulted in a significant decrease in image vividness, and a trend was observed for reduced emotionality. The findings add to earlier experimental findings on the benefits of dual-tasks during mental imagery, and suggest that eye movements and related procedures may be helpful in the treatment of performance anxiety.

Keywords: intrusive images; eye movements; EMDR; working memory; performance anxiety, social phobia

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Introduction

Anxiety can help focus one's attention and enhance performance. For some people, however, anxiety becomes so intense that it takes the form of performance anxiety. They may suffer, for instance, from public speaking anxiety (Hofmann, Ehlers, & Roth, 1995), stage fright (Kenny, Davis, & Oates, 2004), test anxiety (Ramirez & Beilock, 2011), or athletic performance anxiety (Hardy & Parfitt, 1991). Performance anxiety is usually placed in the spectrum of social fears (Bogels et al., 2010), and has been increasingly recognized as a common and often disabling condition. The fear of public speaking is particularly common: its prevalence is 20.6% in a sample of US residents (Pollard & Henderson, 1988). It is the topic of “The King’s speech” –winner of best picture Oscar 2011. Stage fright is common among musicians: 24% of 2,212 professional classical musicians reported a problem with stage fright, and 16% described the problem as severe (see Clark & Agras, 1991), and test anxiety affects about 25-30% of students (see Orbach, Lindsay, & Grey, 2007).

Performance anxiety is characterized by intrusive cognitive activity (thoughts and images) related to potential future catastrophe, accompanied by arousal and distress. Ironically, this causes people to perform below their ability on cognitive and motor tasks – called “choking under pressure” (e.g., Beilock & Carr, 2005; Hill, Hanton, Matthews, & Fleming, 2010). An influential explanation for choking in cognitive tasks is that cognitive activity and unpleasant emotional states increase demands on working memory resources, thus depleting the resources needed to complete the task, which impairs the performance (Beilock & Carr, 2005). Interestingly, Ramirez and Beilock (2011) demonstrated that expressive writing about one’s worrisome thoughts related to test performance before an important test significantly improved test scores, especially for students habitually anxious about test taking. Performance anxiety is, however, not only characterized by negative verbal thinking, but also by imagery about performing badly and being negatively evaluated (e.g., Hackmann, Surawy, & Clark, 1998; Hirsch, Mathews, Clark, Williams, & Morrison, 2006; Putwain, 2007; Wild, Hackmann, & Clark, 2007). Examples are: a woman who imagines looking odd with a mouth that moves with no words coming out (Wild et al., 2007), someone who imagines looking “really put-on-the-spot and nervous” (Hackmann et al., 1998), or a test-anxious student who imagines going blank during a test. These images may manifest as vivid, detailed, and distressing “flashforwards”, like “flashbacks” in PTSD. Involuntary images about future catastrophe are related to several types of psychopathology, including PTSD, OCD, depression, panic disorder, and health anxiety (see Engelhard, van den Hout, Janssen, & van der Beek, 2010a). For example, a person with agoraphobia may imagine collapsing and being ignored (see Hackmann et al., 1998), and a person with healthy anxiety may imagine dying in a hospital bed (Muse, McManus, Hackmann, Williams, & Williams, 2010). Research shows that imagery may evoke greater emotional responses than related verbal cognitions (see Brewin, Gregory, Lipton, & Burgess, 2010; Holmes &

Mathews, 2010). Thus, intrusive images may fuel distress and avoidance behavior, and decrease performance by distraction, which maintains the anxiety symptoms. How can such images be degraded?

Eye Movement Desensitization and Reprocessing (EMDR) is a treatment method originally developed to treat adults with PTSD. One of its core elements is a dual-task approach to reduce vivid emotional memories (see Maxfield, Melnyk, & Hayman, 2008), in which the patient focuses on the traumatic memory and (at the same time) on an external stimulus. This external stimulus is typically the therapist's finger making alternating left-right movements in front of the person, who visually follows the finger. Series of eye movements are repeated until the patient reports low subjective ratings of distress. Studies have shown that EMDR is an effective form of treatment for adults with PTSD (e.g., Bisson et al., 2007), and eye movements seem to add to the treatment's effectiveness (Lee & Cuijpers, 2012). This is consistent with analogue experimental studies showing that horizontal eye movements while thinking of unpleasant autobiographical memories decreases the vividness and/or negative emotions associated with these memories, compared to recall alone (see Engelhard, van den Hout, & Smeets, 2011; van den Hout et al., 2011).

The effects of eye movements can be explained by working memory theory. That is, eye movements and visual imagery both disrupt the function of the visuospatial sketchpad (Andrade, Kavanagh, & Baddeley, 1997) and central executive (Gunter & Bodner, 2008) of working memory, which impairs imagery, and reduces the vividness and emotional intensity of images. As predicted by this theory, analogue studies have shown that other taxing tasks while imagining a distressing past event also reduce image vividness and/or emotionality, like vertical eye movements, drawing a complex figure (Gunter & Bodner, 2008), verbal arithmetic (Kemps & Tiggemann, 2007), mental arithmetic (Engelhard, van den Hout, & Smeets, 2011b; van den Hout et al., 2010; but see a clinical study by Lilley, Andrade, Turpin, Sabin-Farrell, & Holmes, 2009), and playing Tetris (Engelhard, van Uijen, & van den Hout, 2010). Interestingly, Holmes and colleagues (2010) found that playing Tetris after viewing a film with traumatic content reduces flashbacks over one week, while a verbal task did not, which suggests that a competing visual task can impede memory consolidation. Studies have also demonstrated that less working memory capacity or more taxing is associated with more benefits from dual-tasks (Gunter & Bodner, 2008; van den Hout et al., 2010).

Working memory theory implies that competing dual-tasks should affect any type of vivid mental image, not just images of past distressing events. Experimental evidence confirms this for mental images about feared *future* events. Engelhard et al. (2010a) asked healthy students to imagine two visual images about an event they feared might happen to them in the future, and that had not happened to them in the past. These images were assigned randomly to two conditions: (1) imagining the event while making eye movements (visually tracking a white circle moving from side to side across a computer screen), and (2) imagining the event without eye movements (looking at a stationary white circle). Before and after each condition, participants were asked to retrieve the image and rate its vividness and emotional intensity. As predicted, eye movements reduced image vividness and emotional intensity, and imagining the event without eye movements did not. This experiment was recently partially replicated in a sample of students who suffered from intrusive images related to all kinds of idiosyncratic events (Engelhard et al., 2011a). It is unclear whether the findings may be extended to encompass performance anxiety and generalized to a clinical population. Accordingly, as a next step towards clinical research, the aim of the current study was to examine whether eye movements reduce vividness and emotionality of future-oriented images of catastrophic performances in participants with sub-clinical levels of performance anxiety.

Method

Participants and procedure

A total of 524 students from Utrecht University and Hogeschool Utrecht (higher vocational school) were administered a 4-item screening-scale for performance anxiety in classrooms or lecture halls. First, they were given a short verbal explanation about the background and purpose of the scale. Next, they were given the rating scale that included the following items (1) I feel very anxious before giving a presentation or having a test, (2) I think I forgot everything or don't know enough to perform well, (3) During presentations or tests, I feel very tense, and (4) During a presentation or test, I'm afraid to fail. A 4-point scale was used: 1 = (almost) never, 2 = sometimes, 3 = often, 4 = (almost) always. At least three questions had to be rated at least 3 to be invited to the experiment. Of those meeting these criteria (n = 90; 18%), a random subsample was invited by email or telephone to participate, and 32 students enrolled in the study for course credit or a financial reward. Exclusion criteria were: knowledge of EMDR (n = 1) and not being able to report two vivid images related to performance anxiety (n = 2). (See below for a description of the experimental procedure). The final sample consisted of 29 participants (27 females) with a mean age of 23 years (SD = 4.7).

In the laboratory session, participants were tested individually. First, they received verbal and written information about the study, and then they signed an informed consent form. Next, they completed questionnaires, the experiment, and carried out a relaxation exercise. Finally, they were debriefed and given a reward.

Measures

A *background scale* included questions about demographics and whether participants had been treated by a psychologist in the past. The *Symptom Checklist* (SCL-90; Arrindell & Ettema, 2003) was used to obtain a single score for general distress. Participants were asked to rate how much each of the 90 symptoms had bothered them during the past week on a 1 (not at all) to 5 (very often) scale (range 90-450). The SCL-90 is a reliable and valid scale (Arrindell & Ettema, 2003). The short version of the *Eysenck Personality Questionnaire* (EPQ; Eysenck & Eysenck, 1975; Sanderman, Arrindell, Ranchor, Eysenck, & Eysenck, 1991) was used to measure neuroticism (EPQ-N; range 0-22). A 10-item performance anxiety scale included six performance anxiety items of the *Monitor Studiemotivatie* ('Monitor Study Motivation'; Schouwenburg, 1994) and 4 performance anxiety items of the *Vragenlijst Studieproblemen* ('Questionnaire Study Problems'; Schouwenburg, 1996). Examples of items are: "I'm afraid to panic during a test" and "I suffer from performance anxiety". Each item was rated on a 1 (never) to 5 (always/strongly applies) scale, yielding a total sum score (range 10-50; Cronbach's α was .82 in this study).

Mental imagery experiment

The mental imagery protocol was based on the protocol for unpleasant memories designed by van den Hout et al. (2001) and modified by Engelhard et al. (2010a) to future-oriented images. Engelhard et al. (2010a) used four 24 s mental imagery phases separated by 10 s breaks, but the current subclinical study used six 24 s phases separated by 10-s breaks.

Participants were asked to select two mental images of unpleasant events related to performance anxiety which they feared might happen to them in the future but had not happened to them in the past. They were instructed to write down 3 to 5 words to describe each of the two images. Then the experimenter tried to clarify the image and wrote down a more elaborate description ("Can you form a

clear image of this situation and briefly describe it to me? What do you see? What do you do? What's happening? What does it look like? What else do you see?"). The experimenter made sure the participant did not find these images too upsetting for use in the experiment, and asked participants to point out which image was the most unpleasant. Half of the images were randomly assigned to the experimental condition and half were assigned to the control condition, with equal number of the most unpleasant images. The order of conditions was counterbalanced across participants.

The experimental condition involved six 24 s phases of imagery with eye movements, separated by 10 s breaks in which participants were asked to think of something else. These intervals parallel those used in prior studies with the same paradigm (e.g., van den Hout et al., 2001; Gunter & Bodner, 2008; Engelhard et al., 2010a; Engelhard et al., 2011a). Participants sat about 45 cm in front of a computer monitor. Stimulus presentation was controlled by a PC running E-prime software. They were told to keep the image in mind while visually tracing a 1 cm light gray circle as it moved horizontally from one side of the screen 21 cm across to the other side at a rate of one movement per s, without moving their head (cf. Gunter & Bodner, 2008). The control condition involved imagery while looking at a stationary circle. Before each condition, participants were asked to retrieve the image, and to rate two computer-based vividness and emotional intensity visual analogue scales that ranged from 0 (not at all) to 100 (extremely). They were also asked to rate how difficult it was for them to retrieve the image, using the same scale. After each condition, participants imagined the memory again, and rated vividness and emotional intensity again using the computer-based visual analogue scales (cf. van den Hout et al., 2001).

The experiment ended with the 5-min relaxation exercise (based on mindfulness-based attentional breathing; Gijzen, 2010) to reduce possible distress as a result from the imagery procedure, and the debriefing, in which participants were also asked whether they were familiar with several treatments, including EMDR, and, if so, whether they could describe them.

Results

The mean SCL-90 score was 145.7 (*SD* = 42.5), which was higher relative to a general population sample (*M* = 118.3, *SD* = 32.4), but lower relative to a sample of psychiatric patients (*M* = 203.6, *SD* = 61.6; Arrindell & Ettema, 2003). The mean EPQ-N score was 11.2 (*SD* = 4.8), which was similar to a large sample of outpatients with anxiety disorders (*M* = 13.2 *SD* = 5.4; Sanderman et al., 1995). Five participants (17%) said they had been treated by a psychologist in the past (three for performance anxiety). This suggests that participants constitute a sub-clinical sample. The mean score on the performance anxiety subscale was 29.3 (*SD* = 6.7); 48% indicated they panic (score ≥ 3) while studying for a test, 69% felt that other students have more knowledge than them, and 66% doubted their own capacities.

All participants indicated that they had distressing vivid future-oriented images related to performance anxiety that did not represent memories for actual past events, and they produced a detailed description of two images. About half of these images involved *public speaking* (e.g., During my presentation my voice starts shaking, I stutter, and my face gets red), about 40% involved *test-taking* (e.g., I get a black-out during the test, and hand in an empty page), 10% involved *sports performance* (e.g., during a soccer game my performance is very bad, which makes us lose the game), and about 10% involved *another type of performance* (e.g., I host a party, but people don't like the way I organized it and don't enjoy themselves).

Table 1: Vividness and emotionality scores before and after imagery only and imagery with eye movements (EM)

	Imagery only		Imagery with EM	
	Vividness	**Emotionality**	**Vividness**	**Emotionality**
Pre-test	75.73 (12.33)	68.97 (13.57)	76.66 (11.23)	69.77 (19.57)
Post-test	78.60 (13.14)	66.95 (19.22)	70.84 (11.27)	59.35 (21.20)

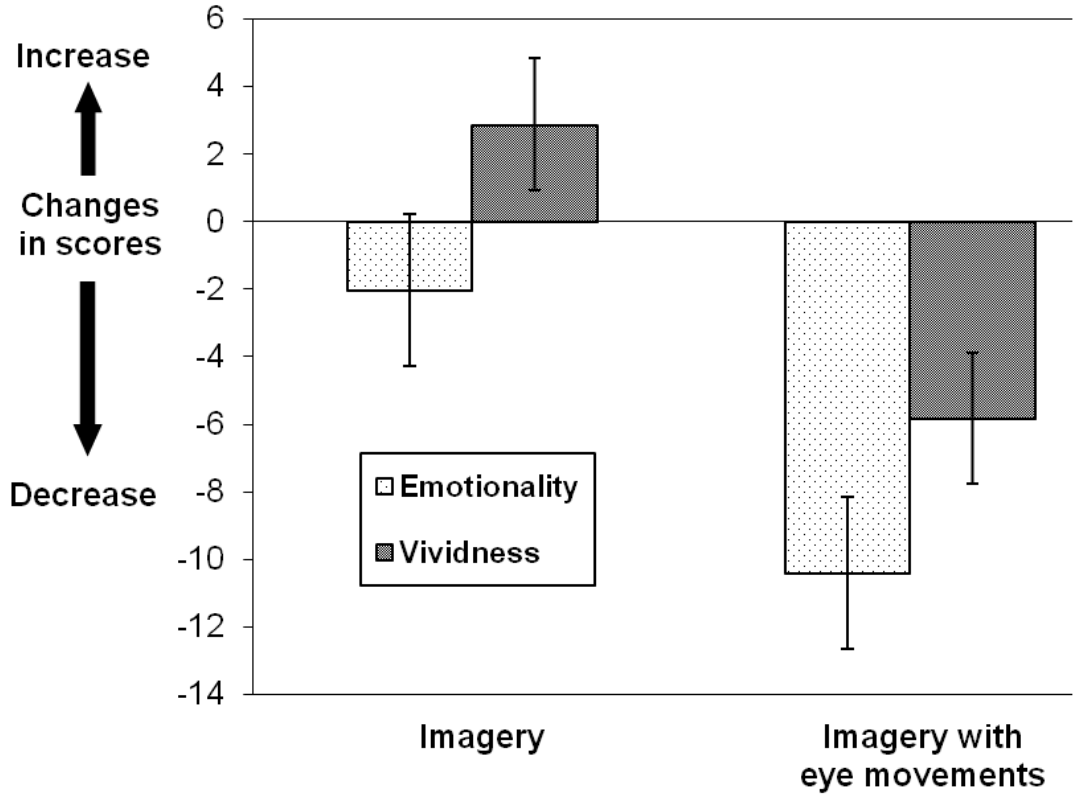

Figure 1: Mean decreases in vividness and emotionality (with adjusted standard errors) for imagery with eye movements and imagery only.

There was no difference in difficulty retrieving the image between the eye movement condition (M = 28.38, SD = 20.85) and control condition (M = 24.26, SD = 19.49), $t(28) < 1$. Table 1 shows the mean (SD) vividness and emotional intensity scores, and Figure 1 shows the changes in vividness and emotionality intensity scores (error bars are within-subject SEM; Loftus & Masson, 1994). Vividness scores were analyzed by two-way ANOVA with Condition (imagery with eye movements, imagery alone) and Time (pre-test, post-test) as within-subjects factors. The main effects of condition, $F(1, 28) = 3.05$, $p = .09$, $\eta_p^2 = .10$, and time, $F(1, 28) < 1$, were not significant. As predicted, the interaction between condition and time proved significant, $F(1,28) = 4.96$, $p = .03$, $\eta_p^2 = .15$. Paired t-tests showed that vividness ratings did not differ significantly between the conditions at the pre-test, $t(28) < 1$. Vividness decreased significantly from the pre-test to the post-test for the eye movements condition, $t(28) = 2.04$, $p = .025$, one-tailed, but not for the control condition, $t(28) = 1.06$.

For emotional intensity scores, the condition effect was not significant, $F(1, 28) = 1.22$, $p = .28$, but the time effect was, $F(1, 28) = 4.26$, $p = .04$, $\eta_p^2 = .14$. There was a trend for the predicted interaction between condition and time, $F(1, 28) = 3.47$, $p = .07$, $\eta_p^2 = .11$. To explore this trend, paired t-tests were carried out. There was no significant difference in emotionality ratings at the pre-test between the two

conditions, $t(28) < 1$., The emotionality decreased significantly from the pre-test to the post-test for the eye movements condition, $t(28) = 2.40$, $p = .01$, one-tailed, but not for the control condition, $t(28) < 1$.

Discussion

The aim of this study was to test whether a dual-task during mental imagery would degrade flashforwards related to performance anxiety. The main findings were that imagery with eye movements decreased image vividness and tended to decrease emotional intensity of future-oriented mental images related to performance anxiety. The findings are consistent with previous research indicating that eye movements causes reductions in vividness and/or emotional intensity of mental images for past negative events (Andrade et al., 1997; Engelhard et al., 2010a; Gunter & Bodner, 2008; van den Hout, et al., 2001), and positive events (van den Hout et al., 2001; Engelhard et al., 2010b). The present study replicates the study of Engelhard et al. (2010a) that found that eye movements also affect future-oriented mental images about catastrophes in healthy participants, and extends it to persons suffering from performance anxiety. It also demonstrates the value of dual-tasks for vivid and emotional future-oriented images related to several forms of psychopathology.

The findings reject the possibility that vividness and emotionality ratings are reduced by extinction due to exposure, since the decrease was absent in the imagery control condition, this hypothesis is not underscored by the current findings. It also has been argued that the effects of eye movements during mental imagery can be explained by the similarity to "what occurs naturally during dreaming or REM sleep" (http://www.emdria.org/displaycommon.cfm?an=1&subarticlenbr=2, accessed March 6, 2011). This explanation, however, does not explain the observation that other dual-tasks (like vertical eye movements, mental arithmetic, playing the computer game Tetris, drawing a complex figure, auditory shadowing, etc.) are also effective (see Introduction). A prominent explanation for the findings is the working memory theory, which suggests that demanding dual-tasks during mental imagery influence vivid and emotional mental images due to a competition of limited-capacity working memory resources. This competition is thought to interfere with visual imagery, which reduces image vividness and emotional intensity (Gunter & Bodner, 2008). Many studies have found that eye movement reduces vividness and emotionality ratings (but for exceptions see Engelhard et al., 2010a). An assumption of the working memory theory is that decreased vividness cascades into decreased emotionality of the image (Gunter & Bodner, 2008). If this is true, a decrease in vividness ratings should be associated with decreased emotionality ratings. However, in the current study, there was only a trend for the predicted interaction between condition and time for emotionality. This might be due to a power problem resulting from the small sample size. The similarity in vividness and emotion ratings is consistent with previous research from Andrade et al. (1997) onwards.

It is unclear whether visual processing specifically increases the effects of working memory loads on visual imagery (e.g., Andrade et al., 1997) or whether load per se is the important factor (e.g., Gunter & Bodner, 2008), or both. This issue was beyond the scope of the current study. However, future studies may include a non-visuospatial control condition (e.g., Lilley et al., 2009; Kemps & Tiggemann, 2007) to elucidate this issue further.

A limitation of the study is its focus on the short-term effects of eye movements within one testing session. Therefore, caution is needed in interpreting the results as long-term or even clinical effects. There is evidence that effects of eye movements on negative memories using the same protocol are maintained over a one-week period (Gunter & Bodner, 2008), but such longer-term research is scant. Further studies are needed to determine potential long-term effects of dual-tasks.

Current findings, past findings, and the working memory theory seem to provide a rationale for using demanding dual-tasks during imagery to modify future-oriented vivid images. EMDR therapists are usually advised to focus on the processing of *past* events, which follows from the view that "incomplete processing and incomplete integration of memories of trauma and/or disturbing life experiences are a primary basis of psychopathology," and the core of the treatment involves activating components of these memories (http://emdr.nku.edu/docs/DefinitionofEMDR.pdf; accessed on March 6, 2011). For example, an earlier study examined the effect of single-session EMDR treatment of test anxiety, but primarily focused on earlier experiences with test anxiety (Maxfield & Melnyk, 2000). There is, nevertheless, no theoretical reason or empirical evidence that memories for past stressful events should be processed to reduce anxiety associated with *future*-oriented mental images.

The current findings suggest an important avenue for future research. An interesting implication of the distraction theory of performance anxiety ("choking under pressure") is that degraded flashforwards may not only reduce performance anxiety, but may also enhance performance on cognitive tasks. Future research should address this issue. In addition, studies have shown that distressing images can be effectively modified by imagery rescripting. During imagery rescripting, emotion-inducing imagery is directly modified into a more benign form (see Holmes & Mathews, 2010). It would be interesting to examine the relative effects of imagery rescripting and the dual-task approach.

In summary, in a sample of students with performance anxiety, vividness and emotionality of visual images about potential catastrophes tended to be lower after imagery with eye movements, compared to imagery alone. Given the role of future-oriented imagery in psychopathology, there is a need for studies of long-term effects and clinical effects of the dual-task approach.

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