

Research Paper

Chilling and Blurring Negative Memories: An Experimental Memory Training Study

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ABSTRACT

Introduction: The present study examined the extent to which broadening attentional scope (BAS) during acquisition and working memory interference (WMI) during reconsolidation could influence the memory formation process.**Methods:** A total of 95 participants were randomly assigned to inactive control (n=30), BAS (n=33), and WMI (n=32) groups. While watching a traumatic film, the participants in the BAS group were instructed to allocate their attention to the peripheral details of the film. In contrast, participants in the WMI group performed certain spatial working memory tasks. Memory vividness and emotionality were assessed before and after the intervention using a visual analogue scale (VAS). Valence, arousal, and dominance were measured by the self-assessment manikin (SAM) immediately after watching the film. Moreover, all participants were asked to record their intrusive memories for 3 days after the experiment. Statistical software package SPSS, version 24.0 was used for group comparisons.**Results:** Our results suggested that interfering with visuospatial working memory during the retrieval of emotionally valenced memories could significantly reduce the level of vividness of mental images from pre- to post-assessments ($P=0.004$). However, in terms of emotionality, arousal, dominance, and the number of intrusive memories, we found no significant differences between the three groups.**Conclusion:** Participants in the WMI group outperformed those in the control group in blurring the negatively valenced memory at the post-assessment. In contrast to our primary assumption, BAS did not result in any significant changes compared to the other two groups. Future studies with larger sample sizes and objective measurements may provide additional evidence on the efficacy of these methods, particularly in the context of clinical implications.

Keywords:

Working memory interference (WMI), Emotional memory, Broadening attentional scope (BAS), Vividness

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Highlights

- The WMI method could significantly reduce the vividness of negatively valenced memory.
- The BAS led to a higher level of emotional arousal and a higher number of intrusive memories than the WMI.
- WMI outperformed BAS in the later stages of memory formation.

Plain Language Summary

This research tested two methods for changing difficult memories. We showed volunteers a film with distressing scenes. One group was asked to pay close attention to details while watching (broadening attentional scope). Another group did a distracting mental task when they wanted to recall the film the next day (working memory interference). We found that working memory interference successfully reduced the vividness of negatively valenced memories. However, broadening attentional scope made people feel more aroused when they remembered the film later.

Introduction

Although a negative emotional event may occur only once in a person's life, it is stored in long-term memory and contributes to longer-lasting effects on memory-related mechanisms (Yonelinas & Ritchey, 2015). By retrieving the emotionally laden memories, people may experience physiological (i.e. respiratory sinus arrhythmia, impaired autonomic modulation, and sleep quality) (Beauchaine, 2015; Chopko et al., 2021; Cohen et al., 1998; Lukowski et al., 2017; Shah et al., 2013), cognitive (i.e. impaired time estimation and learning) (Schuitevoerder et al., 2013; Vicario & Felmingham, 2018), and emotional difficulties (i.e. depressive symptoms, social anxiety, health anxiety) (Muse et al., 2010; Payne et al., 2019; Slofs-tra et al., 2017; Wild et al., 2007), that lead to reduced performance over time (Visser et al., 2018). To mitigate the adverse impacts of negative memories, many studies have focused on manipulating the stages of memory and hindering the formation of emotional memories, a technique known as memory training (Koster et al., 2021).

Memory is a cognitive process with multiple stages of encoding/acquisition, storage, and retrieval/reconsolidation (Stern & Alberini, 2013). Following the acquisition of information through sensory receptors, it can be stored in long-term memory through a process called "consolidation" (Stern & Alberini, 2013). Each time we recall the stored memories, they become fragile and prone to change. It is suggested that this process, referred to as reconsolidation, lasts between 1 and 6 hours (Nader et al., 2000; Rafei et al., 2021). Several studies have revealed

that different stages of memory can be affected by various factors, including emotionally-charged events (Yonelinas & Ritchey, 2015).

During the first stage of memory (acquisition/encoding), individuals allocate their attentional resources to an object and learn new information (Stern & Alberini, 2013). Affective information, particularly that with negative valence, engages attention more than positive information and is shown to be detected more quickly and automatically by individuals (Dijksterhuis & Aarts, 2003; Gable & Harmon-Jones, 2012). This phenomenon has been known as the "treat superiority effect" or a similar term, the "weapon bias effect" (Rivera-Rodriguez et al., 2021). Therefore, individuals may ignore the peripheral information that is more neutral in the face of a negatively valenced event (Chipchase & Chapman, 2013). Previous studies applied different methods to manipulate the acquisition stage and subsequently affect later recalls. These methods include reappraisal training (Woud et al., 2013), concrete processing training (White & Wild, 2016), cognitive interferences with visuospatial tasks (Badawi et al., 2020; Lau-Zhu et al., 2019; Tabrizi & Jansson, 2016), and verbal tasks (Tabrizi & Jansson, 2016). However, despite the key role of attention, there has been a limited focus on the effect of orienting and expanding attention on later recall of emotional memories, thus far.

Ever since the fragile nature of memory in the reconsolidation stage has been explored (Nader et al., 2000), this stage has become the focus of both experimental and clinical studies, specifically for patients who have posttraumatic stress disorder. Several studies aim to

intervene in the reconsolidation stage to mitigate the negative responses to recalled memories. They explain that working memory tasks compete with the memory for limited resources in working memory (Andrade et al., 1997; Engelhard et al., 2011). Some studies support the effectiveness of blocking the reconsolidation process by interfering with working memory after presenting a retrieval cue. These studies used multiple tasks, including imagery/written rescripting (Rijkeboer et al., 2020), linguistic tasks (Hagenaars et al., 2017; Jongeneel et al., 2020), visuospatial tasks (Hagenaars et al., 2017; James et al., 2015; Kessler et al., 2018), and spatial tasks without visual feedback (Cuperus et al., 2019). In contrast, some studies report conflicting findings regarding whether interfering with visuospatial working memory during the reconsolidation stage can dampen emotional responses in later recalls (Cuperus et al., 2016; Jansson & Dylman, 2021; Mertens et al., 2018).

Given the importance of the negative effects that follow recalling negative emotional memories, the present experimental study aimed to compare the impact of two interventions on emotional responses (vividness, emotionality, valence, arousal, and dominance) to the voluntarily recalled memory of a negatively valenced event. To manipulate the scope of attention during the acquisition stage, we instructed a group of participants to broaden their attentional scope by reallocating their attention to attend to peripheral and neutral stimuli, rather than central and negative ones (Gable & Harmon-Jones, 2012). For the other group, we employed a visuospatial interference intervention to target the stage of reconsolidation (Cuperus et al., 2019). We assumed that compared to the inactive control group, using these two methods (broadening attentional scope (BAS) and working memory interference (WMI) could significantly reduce the emotional responses after recalling the negative event. To examine the lasting effects of the interventions on the involuntary retrievals, we followed up the participants over 3 days using a diary method that requires participants to record the number of intrusive memories related to the traumatic film they had watched during the experimental session (Hagenaars et al., 2017; James et al., 2015; Kessler et al., 2018).

Materials and Methods

Study participants

One hundred students enrolled in this study through advertising on online academic networks and distributing posters on the campuses of the University of Tehran and Islamic Azad University in Tehran, Iran. The

inclusion criteria were being 20 to 30 years of age, self-reporting normal vision and hearing, and being a native Farsi speaker. All recruited participants signed an informed consent form, indicating that they understood the purpose and procedures required for the study. The participants were randomly allocated into three groups: BAS (n=34), WMI (n=33), and an inactive control group (n=33). Five participants (n=5) dropped out after allocation: Two participants intentionally terminated the study due to the sensitive content of the film, two participants did not attend the second session, and one participant did not focus on the film and asked irrelevant questions while watching it. Finally, data from 95 participants were entered into our final analysis.

Study procedure

Participants were invited to come to our lab for two experimental sessions. They were also compensated for the time they spent in the study. The present experimental study was conducted in two sessions: The first session involved watching a traumatic film (session 1), while the second session involved reactivating the memory and performing assessments (session 2). Participants were also asked to keep a daily intrusive memory diary for the following three days (after session 2), and these diaries were collected via a 5-minute phone interview by the first author (Fatemeh Azar). Memory vividness and emotionality were assessed at two time points in session 2, while the self-assessment manikin (SAM) was administered only at the end of session 2. All assessments were taken by a research team member who was a trained clinical psychologist (Fatemeh Azar). Figure 1 depicts the procedure of the study.

The experimental sessions were as follows:

Session 1: Participants signed a written informed consent form and completed a demographic questionnaire that included their age, gender, education level, history of diseases (e.g. cardiovascular disease or multiple sclerosis), smoking status (cigarettes and other tobacco products), and alcohol and drug consumption, as well as their phone number for follow-up contact. To control for potential problems with attention and impulsivity at baseline, we used the integrated visual and auditory continuous performance test. Following the baseline screening, all participants watched a traumatic film that included distressing scenes. Before watching the movie, the BAS group was instructed to attend to the neutral and peripheral details of the film (e.g. the setting, the colors of the costumes worn by the actors), as they would be asked to recall them later. The other two groups (control and

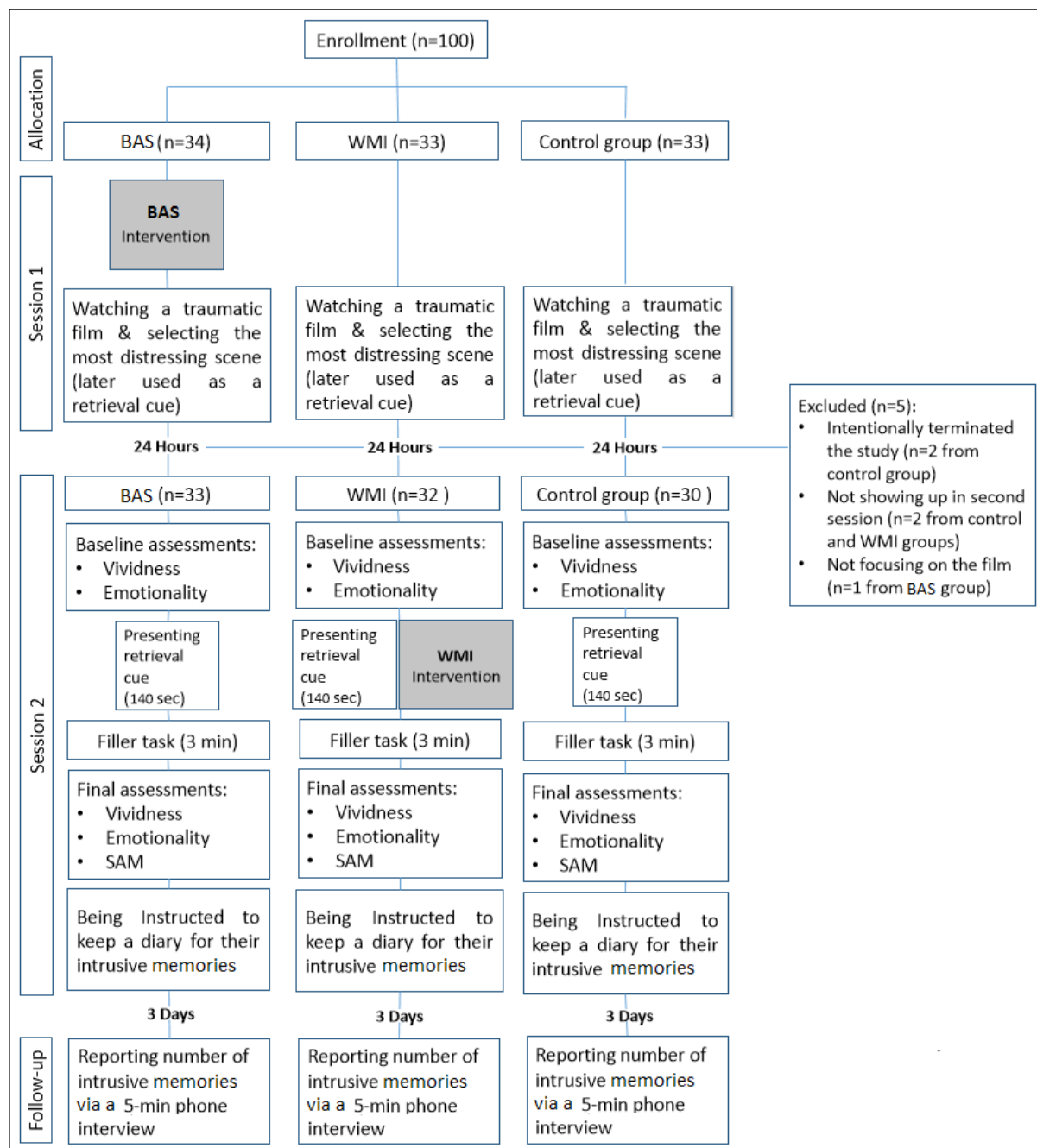


Figure 1. The procedure conducted over three sessions

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WMI) were invited to watch the film without any prior instruction. After watching the movie, each participant was asked to describe the most distressing scene they had witnessed. A static picture of the selected scene was then provided for use as a personalized retrieval cue in the next session (session 2). The first experimental session lasted approximately 30 minutes, and participants left the lab for the next 24 hours.

Session 2: Twenty-four hours after the first session, participants returned to the lab and were asked to imagine the most distressing scene from the film for 10 seconds with their eyes closed. They scored the vividness and emotionality of this mental image on two 200-mm visual scales, ranging from 1 to 10. After that, each participant was presented with their retrieval cue. Participants in the WMI group were asked to perform a spatial working memory task during this time. In contrast, the other two groups were required to retrieve the memory

using the retrieval cue (Cuperus et al., 2019). The spatial memory task used in this study was the manikin match-stick shapes (e.g. a house, an airplane). Following the retrieval phase, all participants performed a 3-minute filler task (simple verbal questions, e.g. “Spell your first school name backward.”) to eliminate the residual visual details of the previous retrieval. At the end of this session, memory vividness and emotionality were assessed again, and participants also rated their subjective emotional responses (valence, dominance, and arousal) using a pictorial test of the SAM. The second experimental session took approximately 15 minutes to complete, and participants left the lab after being instructed on the intrusive memory diary for a 3-day follow-up.

Follow-up: During a 3-day follow-up after the second experimental session, participants were asked to keep a diary of film-related intrusive memories and report the number of their experiences in a telephone interview conducted by one of our research team members.

To manipulate the acquisition phase, BAS intervention was performed in session 1, immediately before watching the traumatic film. WMI intervention is performed during session 2, while the retrieval cue is presented.

Study materials

Demographics form: Age, gender, education level, history of diseases, illicit drug/alcohol/cigarette consumption, and phone number were collected using a demographic form.

Integrated visual auditory (IVA-2) test: IVA is a kind of continuous performance test, measuring several factors involved in cognitive performance, including attention and response control. To take this test, participants should click the mouse when they see or hear the number “1” and withhold a response when they see or hear the number “2” (Niazmand-Aghdam et al., 2021). To control for the potential of disproportionate effects of cognitive problems, we used the Persian version of the IVA-2 test to measure sustained visual attention and full-scale response control at baseline.

Traumatic film: A Persian film was trimmed, and 5 minutes of it were used for the present experiment. Based on the traumatic film paradigm (James et al., 2016), we selected an episode featuring surgery and injury, set in a hospital with cool hues. Participants watched this film on a 13-inch MacBook Air in session 1.

Retrieval cue: Similar to the study by Cuperus et al. (2019), each participant described the most distressing scene immediately after watching the film in the first session. A static picture of this scene was provided for use as a personalized retrieval cue in session 2. The selected static picture appeared four times on the screen and was presented for 25 seconds on a black screen (with time intervals of 10 seconds). The static pictures and black screens were presented automatically on a 13-inch MacBook Air for a total of 140 seconds.

Visual analogue scale (VAS): Two 200-mm VAS, ranging from 0 (not at all) to 10 (completely), were used to measure memory vividness (How much do you think that your created mental image of the film was clear and vivid?) and emotionality (How much do you believe that your created mental image of the film was negative?) before and after the interventions in session 2.

SAM: At the end of the second session, participants were asked to rate their emotional experience by scoring on three pictorial scales related to the retrieved memory of the traumatic film. Each scale was presented by a manikin depicting different levels of valence (ranging from 1=most unpleasant to 9=most pleasant), arousal (ranging from 1=lowest to 9=highest), and dominance (ranging from 1=lowest to 9=highest) (Bradley & Lang, 1994). No verbal explanation was given by the assessor (Fatemeh Azar) regarding the subscales.

Intrusive memory diary: We employed the diary method (Vredeveltdt et al., 2018) to record the number of film-related intrusive memories that participants experienced over a 3-day follow-up period. At the end of session 2, they were informed about intrusive memories. They were then asked to keep a paper-based diary to record their experiences, whether they were voluntary or involuntary. Participants were told that they would receive a phone call after 3 days to report the total number of their intrusions.

Statistical analyses

One-way between-subjects analysis of variance (ANOVA), the chi-squared test, and the Kruskal-Wallis test were first performed on all screening and baseline variables to assess potential differences between the three groups. We then used general linear model (GLM) repeated measures ANOVA (RM-ANOVA) and pairwise comparisons adjusted by the Bonferroni correction to investigate the effects of interventions on vividness and emotionality. The model included the main effects for time and group, as well as the interaction effect between

time and group. To explore within-group changes, three paired sample t-tests were conducted. To compare SAM scores and the number of intrusive memories (during follow-up), we used the Kruskal-Wallis nonparametric test. All analyses were performed using IBM SPSS software, version 24.0, and statistical significance was assumed for a $P < 0.05$.

Results

Ninety-five participants (65 females, 30 males; Mean $\pm$ SD age=23.58 $\pm$ 2.53 years) were randomized into three groups: An inactive control group (n=30), a BAS group (n=33), and a WMI group (n=32). The groups were the same in terms of screening variables, including age ($F=2.91$, $P>0.05$), gender ($\chi^2=0.083$, $P>0.05$), visual sustained attention ($F=0.547$, $P>0.05$), and full-scale response control ($F=0.226$, $P>0.05$). Comparison of vividness and emotionality at baseline also showed no differences between the study groups ($\chi^2=0.546$, $P>0.05$; $\chi^2=0.355$, $P>0.05$, respectively). The screening and baseline variables are described in Table 1.

Results of GLM repeated-measures ANOVA for emotionality scores indicate that the main effect of group (mean square=4.42, $df=2$, $F=0.43$, $P=0.65$, $\eta^2=0.009$, observed power=0.12), main effect of time (mean square=2.7, $df=1$, $F=1.69$, $P=0.20$, $\eta^2=0.02$, observed power=0.25) and the impact of time $\times$ group interaction (mean square=1.11, $df=2$, $F=0.69$, $P=0.50$, $\eta^2=0.015$, observed power=0.16) were not significant. In case of vividness scores, the GLM repeated-measures ANOVA showed that the main effect of group (mean square=2.4, $df=2$, $F=0.52$, $P=0.59$, $\eta^2=0.011$, observed power=0.13)

and the main effect of time was not statistically significant (mean square=4.12, $df=1$, $F=2.72$, $P=0.10$, $\eta^2=0.029$, observed power=0.37). In contrast, the effect of time $\times$ group interaction is statistically significant (mean square=6.24, $df=2$, $F=4.12$, $P=0.019$, $\eta^2=0.082$, observed power=0.72). Figure 2 illustrates the estimated marginal means of emotionality and vividness scores across the two time points and different conditions graphically.

To explore within-group differences, pairwise comparisons with the Bonferroni adjustment showed no significant differences in vividness scores within the control group (mean difference [T2-T1]=-0.067, $P=0.82$), and the BAS group (mean difference [T2-T1]=0.182, $P=0.56$). However, within the WMI group, a significant change was found (mean difference [T2-T1]=-1, $P=0.004$). Table 2 shows the time, group, and interaction effects of interventions on vividness and emotionality scores.

Moreover, the results of the Kruskal-Wallis test indicated no significant differences between groups in terms of valence ($\chi^2=2.56$, $P=0.28$). However, in the case of arousal ($\chi^2=5.2$, $P=0.074$), the dominance subscale ($\chi^2=5.14$, $P=0.076$), and the number of intrusive memories ($\chi^2=5.35$, $P=0.069$), a marginally significant difference between groups was found ($0.05 < P < 0.10$).

The Mann-Whitney test showed that the BAS group (mean rank=36.03) experienced significantly higher levels of arousal compared to the control group (mean rank=27.03) and the WMI group (mean rank=28.27). Regarding the dominance subscale, the BAS group (mean rank=27.52) experienced significantly lower

Table 1. Descriptive data of participants in screening and baseline variables (n=95)

Variables	Mean $\pm$ SD/No. (%)			Between-conditions Comparison
	Control (n=30)	BAS (n=33)	WMI (n=32)	F/ χ^2 (p)
Age (y)	23.07 $\pm$ 2.67	23.21 $\pm$ 2.64	24.44 $\pm$ 2.09	2.91 (0.06)**
Gender (female)	21(70)	22(66.7)	22(68.8)	0.083 (0.95)*
Visual sustained attention	89.67 $\pm$ 28.38	90.67 $\pm$ 24.68	95.56 $\pm$ 17.95	0.547 (0.58)**
Full-scale response control	98.60 $\pm$ 16.31	96.06 $\pm$ 14.86	98.19 $\pm$ 17.47	0.226 (0.79)**
Baseline vividness	7.30 $\pm$ 1.55	6.94 $\pm$ 2.13	7.38 $\pm$ 1.07	0.546 (0.76)***
Baseline emotionality	6.23 $\pm$ 2.31	6.45 $\pm$ 2.7	6.22 $\pm$ 2.6	0.355 (0.84)***

BAS: Broadening attentional scope; WMI: Working memory interference.

*The chi-squared test, **One-way analyses of variance test, ***The Kruskal-Wallis test.

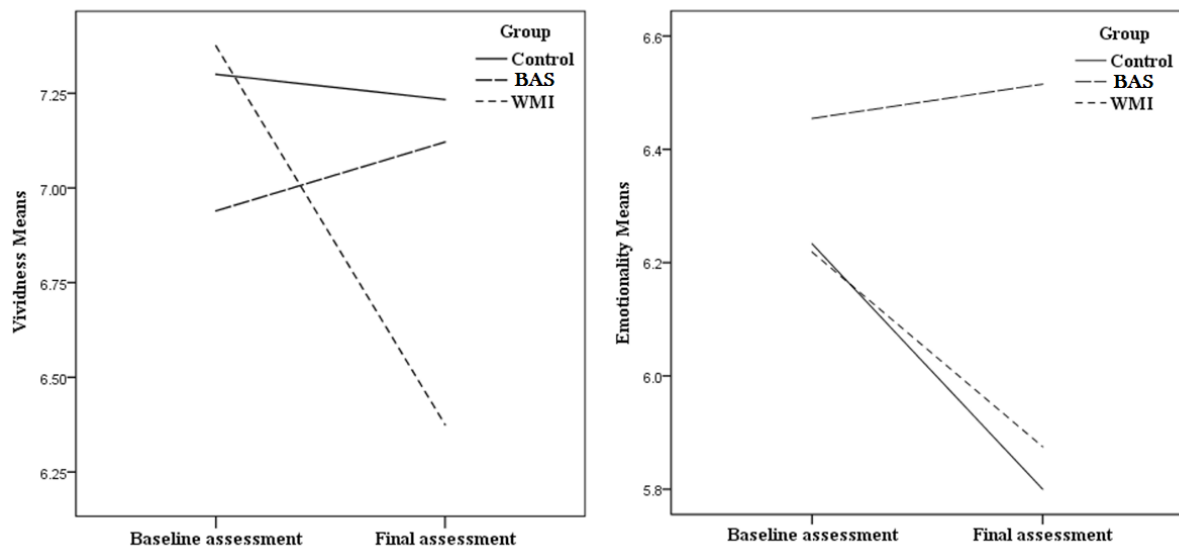


Figure 2. Estimated marginal means of emotionality and vividness scores

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BAS: Broadening attentional scope; WMI: Working memory interference.

levels of dominance compared to the control group (mean rank=36.93). In terms of intrusive memories, the BAS group (mean rank=36.15) reported a significantly higher number of intrusive memories than the control group (mean rank=27.43) and the WMI group (mean rank=28.22). To perform a Bonferroni correction, we di-

vided the critical P value by the number of comparisons being made and used this as the adjusted significance level ($0.05/3 \approx 0.016$). These results did not remain significant after the Bonferroni correction (Figure 3).

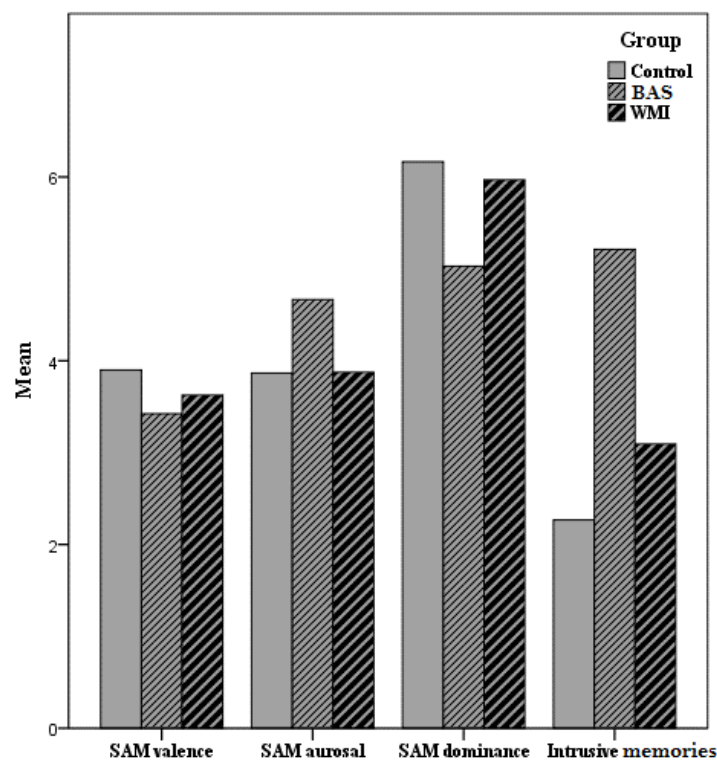


Figure 3. The mean values of the dependent variables by groups

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Table 2. Comparison of dependent variables between three groups (control, BAS, and WMI)

Variables	Mean±SD						Time F (P)	Group F (P)	Interaction F (P)
	T1			T2					
	Control (n=30)	BAS (n=33)	WMI (n=32)	Control (n=30)	BAS (n=33)	WMI (n=32)			
Vividness	7.3±1.55	6.94±2.13	7.38±1.07	7.23±1.9	7.12±1.98	6.38±1.62	2.72±0.1*	0.52±0.59*	4.12±0.019*
Emotionality	6.23±2.31	6.45±2.74	6.22±2.59	5.8±2.09	6.52±2.42	5.88±2.29	1.69±0.2*	0.43±0.65*	0.69±0.5*
SAM-valence	-	-	-	3.9±1.12	3.42±1.45	3.63±1.38	-	2.56±0.28**	-
SAM-arousal	-	-	-	3.87±1.45	4.67±1.79	3.88±1.7	-	5.2±0.074**	-
SAM-dominance	-	-	-	6.17±1.84	5.03±2.16	5.97±1.85	-	5.14±0.076**	-
Intrusive memories	-	-	-	2.27±2.29	5.21±7.25	3.09±5.7	-	5.35±0.069**	-

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Abbreviations: BAS: Broadening attentional scope ; WMI: Working memory interference; SAM: Self-assessment manikin; T1: Baseline assessment; T2: Final assessment.

*GLM repeated-measures ANOVA test, **The Kruskal-Wallis test.

Discussion

In the present study, we employed BAS and WMI methods to intervene in the acquisition and retrieval stages of memory formation. We examined their effects on subsequent voluntary and involuntary retrievals. Voluntarily retrieved memories were assessed by their vividness and emotionality, as well as the subjective experience in the valence, arousal, and dominance subscales of the SAM. Involuntary retrievals were measured by the number of intrusive memories (mental images) over three days after the experimental sessions. Compared to BAS, our results showed that WMI is efficient in blurring negatively valenced memories by reducing vividness. At the same time, no changes were found in terms of emotionality, SAM subscales, and the number of intrusions.

Our results showed that memory vividness during retrieval was reduced as a consequence of WMI. As previous studies have explained (Andrade et al., 1997; Engelhard et al., 2011), a working memory task (building shapes with matches, with no visual feedback) would compete with the memory for limited working memory resources, leading to a blurred and less vivid image of the emotional memory. The insignificant differences in terms of memory, emotionality, and the number of intrusive memories reported in the current study could be

explained by the study of Leer et al. (2014). They suggested that eight periods of 24-second interventions are required to affect both memory, emotionality, and vividness. Therefore, the duration of our task might not be sufficient to produce such an effect on emotionality. Another explanation could be that there is a linear relationship between the difficulty of the task and degrading negative emotional memories (Littel & van Schie, 2019). Hence, it is plausible that our task has not been demanding enough to reduce emotionality or intrusions. Unlike many studies (Cuperus et al., 2019; Hout et al., 2010; Jongeneel et al., 2020; Matthijssen et al., 2019), a similar manner of vividness and emotionality was not found in this study, likely due to the use of WMI. This dissociation between emotionality and vividness has been reported by a few studies (Cuperus et al., 2016; Jansson & Dylman, 2021; Mertens et al., 2018). Jansson and Dylman (2021) discussed factors such as “physical context, type of material to be processed and/or emotional states at the time” that may contribute to the differences in emotionality and vividness, but further research is required to provide more detailed descriptions of the underlying processes and factors.

Unlike our expectation, BAS resulted in an increased level of arousal and the number of intrusive memories compared to the control and WMI groups, as well as a

reduced effect level of dominance compared to the control group. As these results were marginally significant before the Bonferroni correction, it is worthwhile to discuss a few points with caution. These results are likely due to the content of the selected traumatic film in our experiment. As the film contained a limited variety of contextual details, it is plausible that the peripheral and the central aspects of the trauma are similar to each other in terms of their variation across hue and saturation. Hence, participants could not efficiently distribute their attention to acquire novel information while inspecting the scene. Therefore, we can conclude that in the absence of various neutral or positive valence details, asking participants to broaden their attention to capture peripheral details not only provides an opportunity for acquiring new information to alleviate their emotional state but also heightens their arousal and reduces their emotional dominance. Besides the film's features, another plausible explanation for the unwanted results could be attributed to the stress condition caused by the testing expectations experienced by participants while they were encoding the information (Marks et al., 2018; Schultebrucks et al., 2019). They knew that they would be asked to recall the details of the film, so they might have sharpened their attention, which could lead to an increase in arousal.

Our study has several limitations worth noting. First, we used self-report measures of emotionality, vividness, valence, arousal, dominance, and intrusive memories, which may be influenced by subjective judgment errors. Future studies could thus enhance their reliability by employing objective measures (i.e. skin conductance response, heart rate, blood pressure) in conjunction with subjective ones. Second, some of our participants were recruited from the university where our lab was located; therefore, they might make mistakes while recording intrusive memories, as they may have had multiple exposures to the experimental setting several times during the follow-up period. Consequently, it is recommended to minimize unwanted retrieval cues as much as possible by using an unfamiliar or isolated experimental setup. Finally, we could detect potential changes in the scores of arousal, valence, and dominance if we had assessed these variables before the interventions.

Despite these limitations, a strength of the present study is considering BAS as a novel method for reallocation of attention during acquisition and examining its effect on later retrievals. To our knowledge, the present study is among the first experiments to compare interventions at two different stages of memory. Our findings indicate that WMI outperformed BAS in the later stages of memory formation, specifically in terms of blurring

emotionally valenced memories. Future studies with objective measurements could add more evidence on the efficacy of these methods, specifically in the context of clinical implications for patients who suffer from traumatic memories.

Conclusion

This study demonstrates that WMI during memory recall can successfully reduce the vividness of a negative memory. In contrast, BAS can increase emotional arousal and the number of intrusive thoughts upon later retrieval. Neither approach reduced the negative feelings associated with the memory or the number of intrusive thoughts. These findings highlight the potential of post-recall interference for blurring traumatic memories, while suggesting that BAS during a stressful event may not be an effective strategy and can even intensify some emotional reactions.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Research Ethic Committee of [University of Tehran](#), Tehran, Iran (Code: IR.UT.PSYEDU.REC.1398.032).

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Authors' contributions

Conceptualization and supervision: Tara Rezapour and Javad Hatami; Methodology: Fatemeh Azar, Tara Rezapour, and Javad Hatami; Investigation, resources, and data curation: Fatemeh Azar; Data analysis: Hossein Karsazi; Formal analysis: Tara Rezapour; Writing: Fatemeh Azar, Tara Rezapour, and Hossein Karsazi.

Conflict of interest

The authors declared no conflict of interest.

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