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The Method of Loci Improves Longer-Term Retention of Self-Affirming Memories and Facilitates Access to Mood-Repairing Memories in Recurrent Depression

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Abstract
The Method-of-Loci (MoL) is a mnemonic strategy that individuals with a history of depression can use to facilitate access to self-affirming memories. In the current study, we investigated (a) the utility of the MoL to enhance access to a preidentified set of personal memories and (b) the ability of the MoL to facilitate the recollection of memories to regulate emotion. Participants in remission from chronic depression used a MoL or rehearsal procedure to facilitate memory recall. Participants using the MoL showed superior retention of this material at both a 1-week and 3-month follow-up memory test, relative to the rehearsal group. For both groups, memory recall effectively repaired mood after a mood induction procedure. Using a diary measure, participants trained to use the MoL reported greater use of the memory repository to offset downturns in mood in day-to-day life, indicating that this could be a useful strategy for mood regulation.

Keywords
depression, autobiographical memory, emotion regulation, mood repair

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Everyday downturns in mood in those with recurrent depression tend to trigger dysfunctional negative cognitions that further exacerbate negative mood in a vicious cycle that can precipitate a new depressive episode (Teasdale, 1988). Accordingly, strategies to counter day-to-day fluctuations in mood have therapeutic promise for previously depressed individuals. One candidate strategy is promoting the recollection of positive autobiographical material to alleviate negative affect (Josephson, Singer, & Salovey, 1996; Rusting & DeHart, 2000), something those with depression find difficult (Joormann, Siemer, & Gotlib, 2007). We know that those with a depression history retain the *capacity* to derive affective benefits from suitably enriched positive or self-affirming memories (Werner-Seidler & Moulds, 2011, 2012). The current study considers how we facilitate *access* to such memories. We recently evaluated the Method-of-Loci (MoL) as a mnemonic aid to improve access to positive and self-affirming memories in those with a depression history (Dalgleish et al., 2013) with a view to developing it as a tool for day-to-day mood regulation. The MoL relies on spatial relationships between easily remembered familiar locations (e.g., the daily commute) to facilitate recollection of target information (e.g., positive memories). Target information is linked to salient locations ("loci") along the route using a series of vivid images that integrate the information with each locus. The information can be later retrieved by mentally navigating along the route, using the loci and their associated images as recall cues. Findings from the learning and memory literature have established that the MoL consistently improves memory performance (Bellezza & Reddy, 1978; Groninger, 1971).

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In a proof-of-principle study, we showed that remitted-depressed participants were better able to recall preselected self-affirming memories over a 1-week period following MoL training versus a chunking-and-rehearsal technique (Dalgleish et al., 2013). The present study sought to replicate this finding and extend it in three important ways by examining (a) retention using the MoL (versus rehearsal) over a longer time period (3 months), (b) whether retrieved positive memories (using either MoL or rehearsal versus a no-training control condition) can be used to repair mood under laboratory conditions, and (c) whether the MoL (versus rehearsal) can facilitate mood repair in daily life. Because of the focus on mood repair, we employed exclusively remitted-depressed samples.

We hypothesized that the MoL would produce superior memory retention over short- and long-term intervals, relative to rehearsal. This prediction was based on evidence that recall strategies involving imagery, such as the MoL, can improve the accessibility of memories, relative to strategies that do not have an imagery component, such as rehearsal (Groninger, 1971). We expected that both groups would better repair their mood following a sad mood induction relative to a no-training control group under laboratory conditions, but that participants trained with the MoL would report greater spontaneous day-to-day use of the technique to regulate mood.

Method

Participants

A total of 43 participants (age $M = 46.02$, $SD = 17.13$; 38 females) in full remission (e.g., no significant symptoms for >2 months) from recurrent major depressive disorder (MDD), with two or more previous episodes, were recruited for the study. Of these participants, 30 were randomly allocated to one of the two training groups and an additional 13 acted as no-training controls for the laboratory mood induction session. Participants were recruited from our departmental volunteer panel of respondents to local advertisements requesting volunteers with depression to assist with research. MDD diagnosis and history and other Axis I psychiatric diagnoses were determined by the Structured Clinical Interview for the *DSM-IV*–Clinician Version (SCID-IV; First, Spitzer, Gibbons, & Williams, 1996). The current study commenced several years after the initial SCID-IV had been administered, so potential participants were readministered the mood module of the SCID-IV to assess whether they were in episode or remission. This occurred within 2 weeks of the first experimental session. Only those in remission were eligible. Interrater reliability for 30% of the sample showed complete agreement. Participants were not assessed for comorbidity at the time of study entry. For remaining descriptive data, see Table 1.

Study procedure overview

See the Supplemental Materials available online for a study flow diagram (SU1). The memory training component involved attending two individual face-to-face sessions. After providing informed consent (Time 1; 90–120 min), memory training participants completed questionnaires and then generated their positive/self-affirming memories, prior to random allocation to either the MoL or rehearsal condition, and induction into the corresponding training protocol (including homework). One week later, participants received a surprise short-term retention test (over the phone) and further homework tasks were outlined (Time 2). Four weeks after the phone call, participants returned to the lab for the second face-to-face session (Time 3; 45 min). For this session, an additional group of remitted-depressed individuals was invited to participate as the no-training controls. During this session, participants first completed the questionnaires, followed by the mood induction procedure, and then the memory recall task. Participants were thanked for their time, debriefed, and reimbursed £6/hour and consent was obtained to recontact them about future research. Three months later (Time 4), participants in the training groups received a surprise phone call for the long-term retention test. At each point of contact, mood was assessed and, if necessary, the mood module of the SCID was administered. One participant lapsed into a major depressive episode (MDE) during the course of the study (see the Participant Characteristics section for details).

Components of the study

Initial memory training session. Participants first completed the Beck Depression Inventory–II (BDI-II; Beck, Steer, & Brown, 1996) and the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) to quantify current symptoms; the Subjective Use of Imagery Scale (Reisberg, Pearson, & Kosslyn, 2003), which examines everyday use of imagery; and the National Adult Reading Test (Nelson, 1991), a proxy for verbal IQ that is relatively immune to changes in mental state.

Participants then completed a visual analogue scale (VAS) to assess current mood (Joormann et al., 2007) on dimensions of "sad," "happy," "excited," "bad," "content," "worried," and "hopeful" (1 = *not at all* and 9 = *very*). Positive affectivity and negative affectivity composites were then calculated for each participant (cf. Watson, Clark, & Tellegen, 1988).

Table 1. Sample Characteristics, Memory Qualities, and Positive Affectivity

Characteristic	Method-of-Loci (n = 14)	Rehearsal (n = 14)	No-training control (n = 13)
Age (years)	41.85 (15.64)	44.21 (18.30)	52.46 (16.80)
Gender (male:female)	2:12	2:12	1:12
Education	6:3:3:2	7:2:2:3	6:4:0:2
NART error score	13.71 (5.12)	18.35 (10.29)	12.76 (4.83)
Employment (employed:unemployed)	12:2	12:2	6:7
Median number of previous MDEs	8	4.5	5
Antidepressant medication (yes:no)	7:7	8:6	3:10
Psychological therapy (yes:no)	3:11	3:11	1:12
BDI-II (Time 1)	13.29 (10.10)	13.36 (10.59)	—
BDI-II (Time 3)	14.08 (11.09)	11.36 (9.56)	12.92 (9.87)
STAI-S	39.93 (13.98)	36.36 (11.40)	43.92 (11.62)
STAI-T	50.23 (13.34)	48.14 (13.67)	49.46 (12.79)
SUIS	2.83 (0.85)	3.51 (0.73)	3.38 (0.65)
Memory age (years)	7.41 (4.40)	8.25 (7.71)	9.34 (10.02)
Memory positivity rating	8.07 (0.75)	8.10 (0.85)	7.92 (1.53)
Memory happiness/satisfaction rating	8.05 (0.85)	8.31 (0.79)	7.82 (1.78)
Memory vividness rating	7.46 (1.03)	7.55 (1.17)	7.81 (1.91)
Rating of how often memories are recalled	2.83 (0.50)	2.86 (0.44)	2.87 (0.28)
Minutes spent recalling memories during homework (across all seven sessions)	64.5 (27.34)	76.71 (31.21)	—
Rating of homework difficulty	6.17 (0.96)	5.66 (1.53)	—
Positive affectivity preinduction	4.71 (1.62)	4.73 (1.54)	4.50 (1.70)
Positive affectivity postinduction	3.54 (1.56)	3.48 (2.11)	4.02 (1.75)
Positive affectivity post–memory recall	5.73 (1.40)	5.32 (2.23)	4.75 (1.82)

Note: Data are means (and *SD*s) unless specified. Education categories: high school, bachelor's degree, postgraduate degree, other. Participants rated several memory dimensions (positivity, happiness/satisfaction, vividness) on a 10-point scale where 1 = *neutral* and 10 = *extremely*. Ratings of memory frequency were on a 4-point scale where 1 = *not at all* and 10 = *often*. Homework difficulty was scored on a 7-point scale with 1 = *not at all difficult* and 7 = *very difficult*. For affectivity ratings, a higher score reflects a greater level of affectivity. BDI-II = Beck Depression Inventory–II; MDE = major depressive episode; NART = National Adult Reading Test; STAI-S/T = State-Trait Anxiety Inventory–State/Trait version; SUIS = Subjective Use of Imagery Scale.

Participants generated in their own time 15 positive or self-affirming memories that they would want to access at times of low mood (see Dalgleish et al., 2013, for details). Using 10-point scales (1 = *neutral* to 10 = *extremely*), participants rated each memory on dimensions of positivity, vividness, and how happy or satisfied they felt when thinking back to the original event. They also reported how frequently they thought about the memory (1 = *not at all* to 4 = *often*) and identified memory age in years. Participants summarized each memory with one or two written keywords. This gave them a "cheat sheet" to refer to during the memory training. It also provided a memory record for the experimenter, as a set of minimum criteria for memories to be considered "successfully recalled" throughout the study. Participants were then randomly allocated to either the MoL or the psychoeducation and rehearsal training group.

Psychoeducation and rehearsal group. We enhanced the rehearsal training regimen, beyond that used in Dalgleish et al. (2013), through the addition of psychoeducation around common autobiographical memory biases associated with depression (mood-congruent recall; the impact of memories on emotion). This provided the rationale for developing a memory bank of positive material to counter low mood at times when it is most difficult to retrieve such material. Participants were informed that repetition leads to better recall and were encouraged to use repetition and any other useful strategies to assist recollection of their 15 memories. In Session 1, participants recalled as many of their 15 memories as they could without looking at their notes (e.g., preidentified keywords) to identify those memories that were hardest to retrieve. Participants were then given 15 min to rehearse their memories using their sheet in preparation for the subsequent recall test (Time 1).

MoL group. The MoL technique was described to participants as previously (see Dalgleish et al., 2013). In brief, participants chose a familiar journey (e.g., the route from home to work), identifying 15 loci along the way. They were asked to mentally journey along the route until they could identify their loci confidently. With the researchers' help, participants then associated their preidentified memories with the loci using bizarre and evocative images to link the two.

Participants recalled as many memories as they could without using their notes using this method. This drew attention to the specific memories that were harder to retrieve, and participants were then given 15 min to practice using the MoL to retrieve their memories in preparation for the subsequent recall test (Time 1). The only difference between the training groups was the retrieval method used to aid recall.

Homework

Homework Task 1: Practice only. This was explained at the end of the first session and comprised three 15-min recall exercises over the following week in which participants reviewed their memories using their learnt strategy (MoL or rehearsal) with the assistance of notes, before testing themselves. At the end of each exercise, they recorded the time spent revising the material, and task difficulty (from 1 = *not at all* to 7 = *very*).

Homework Task 2: Practice and diary. This second task was described over the phone 1 week after the first training session (homework materials had been previously provided in a sealed envelope). Homework involved continued practice identical to the first task, but using a reduced schedule of once per week. The novel aspect of the second task was a daily diary in which participants were asked to record instances where they spontaneously brought their preselected memories to mind for the purpose of regulating mood (outside of formal homework practice). For each entry, they rated mood before and after using their memories (from 1 = *not at all upset* to 10 = *very upset*) and indicated whether the memories came to mind unbidden or were retrieved deliberately.

Short-term and long-term retention tests. Participants in the two training groups were phoned 1 week after the first face-to-face session under the guise of explaining the second homework task contained in sealed envelopes. Before discussing the homework, participants received a surprise recall test of their 15 memories on the spot without access to their notes (Time 2). The experimenter recorded the responses verbatim. Approximately 4 months later (3 months after the study had ostensibly finished) participants were recontacted via phone and administered a second and identical surprise recall test (Time 4).

Laboratory mood induction session. The second face-to-face session (Time 3) occurred approximately 5 weeks after the first (the memory training session). For this session, an additional remitted MDD control group who did not undergo memory training was recruited, allowing us to evaluate the benefits of prior memory training (regardless of training protocol) on ability to repair mood. Without this group, there would be no way to determine if any mood benefits that emerged were due to the recall of positive memories on the spot, or whether previous training facilitated or enhanced improved repair ability. This group completed the same questionnaire battery that the two training groups had received in the memory training session.

Participants in the three groups were administered the BDI-II prior to a sad mood induction, using a combination of sad music ("Russia under the Mongolian Yoke"; Prokofiev) and the Velten Induction Procedure (Velten, 1968) for which they read a series of negative self-statements. Participants in all groups rated mood using the VAS before and after the induction. Participants in the nontrained group were asked to generate specific positive or self-affirming memories as a way to repair mood and to briefly describe these memories on a sheet of paper. The two groups that had received prior memory training were asked to recall as many of their positive memories as they could. All groups (trained and untrained) were given 5 min to recall their memories, before rating mood on a VAS one final time.

Results

Participant characteristics.

Our final training sample comprised 28 participants (n = 14 per condition). One participant (rehearsal condition) could not be contacted at Time 2, and one participant (MoL condition) relapsed into a MDE between the phone screening and the first session. An additional 13 participants were recruited to the no-training control group. The three groups were well matched on demographic and depression variables (Table 1: ps > .05), although the no-training controls were more likely to be unemployed (p = .039).

Memory characteristics and learning in the two training groups

Groups did not differ on memory age, frequency, memory positivity, emotional impact, or vividness (Table 1: Fs < 1, ps > .05). Descriptive data suggest that participants could

identify a set of vivid, positive memories that made them feel happy or satisfied upon recall and, as indicated by emotional impact ratings, confirm that recalling memories in a vivid and elaborate manner was emotionally beneficial. The two training groups also did not differ in time spent on homework or perceived homework difficulty (Fs < 1.76, all ps > .05).

Short- and long-term memory retention in the training groups

Data on memory recall across the four assessment points are presented in Figure 1. There was no group difference at baseline, $t < 1$, with recall at ceiling in both conditions. To examine memory retention at the surprise recall test 1 week later (Time 2), a 2 (Group: MoL, Rehearsal) × 2 (Time: Time 1, Time 2) mixed-model ANOVA with repeated measures on Time and number of memories recalled as the dependent variable, found a significant main effect of Time, $F(1, 26) = 11.02$, $p = .003$, $\eta_p^2 = .30$, and Group, $F(1, 26) = 13.11$, $p = .001$, $\eta_p^2 = .34$, qualified by a significant Time × Group interaction, $F(1, 26) = 11.02$, $p = .003$, $\eta_p^2 = .30$. Breaking this down, participants in the rehearsal group recalled significantly fewer memories at Time 2 than at Time 1, $t(13) = 3.47$, $p = .004$, $d = 1.23$, whereas those in the MoL condition showed no significant change across time, $t(13) = 0.00$, *ns*. Participants in the MoL condition also recalled a greater number of memories relative to the rehearsal condition at Time 2, $t(26) = 3.95$, $p < .001$, $d = 1.50$.

At the surprise 3-month follow-up (Time 4), 3 participants were not contactable (1 MoL, 2 rehearsal), leaving 25 participants. We examined 3-month retention relative to the previous time point that memory was assessed (after the mood induction at Time 3; see Figure 1). Using the same mixed-model approach as for the previous analysis, the Time × Group ANOVA revealed a main effect of Time, $F(1, 23) = 67.69$, $p < .001$, $\eta_p^2 = .75$, a main effect of Group, $F(1, 23) = 15.58$, $p < .01$, $\eta_p^2 = .40$, and a Time × Group interaction, $F(1, 23) = 22.98$, $p < .001$, $\eta_p^2 = .50$, reflecting the fact that there was no difference in the numbers of memories recalled by the MoL and rehearsal groups at Time 3, $t(26) = 0.62$, *ns*, whereas MoL participants remembered significantly more memories than those in the rehearsal group at the 3-month follow-up (Time 4), $t(23) = 4.33$, $p < .001$, $d = 1.72$. This indicates that the MoL significantly outperforms rehearsal in supporting longer-term targeted retrieval of the preselected memory set.[1]

Mood repair in the laboratory

Our initial analyses compared the two memory training conditions. Follow-up analyses compared training against the no-training condition.

Participants in the two training groups did not differ in terms of depressive symptoms or mood at the start of the mood induction session (Time 3; ps > .05; see Table 1). For the primary analyses of mood repair, the composite affectivity score for positive mood across time points was examined because this was the target of the memory retrieval process. However, analyses examining composite negative affectivity are also reported.

We first confirmed that participants in the two training groups could access their practiced memories after a

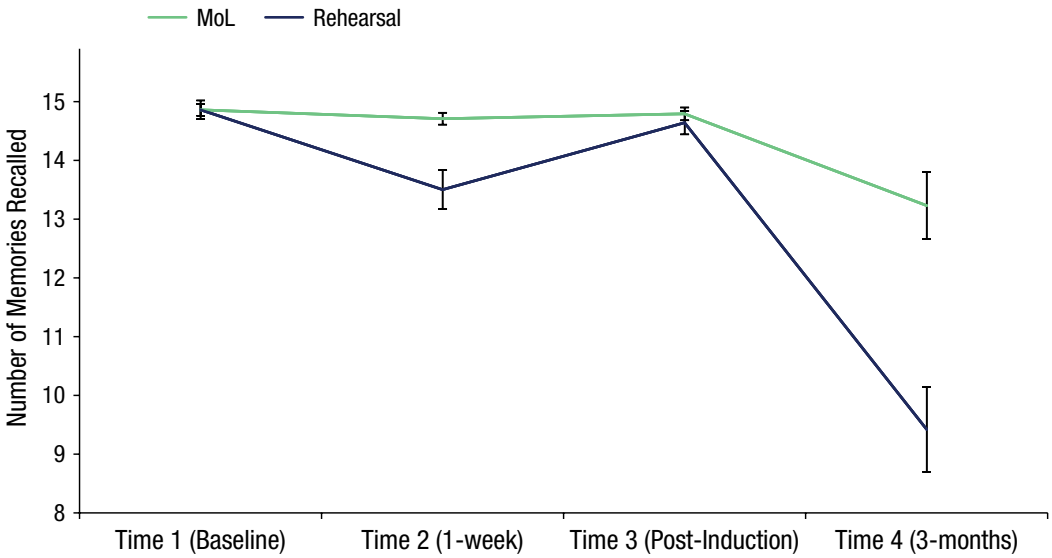

Fig. 1. Mean (±1 *SEM*) memory retention at Times 1, 2, 3, and 4 referring to baseline, 1 week recall test, post–memory induction recall, and 3-month follow-up (respectively) for the MoL and rehearsal groups.

downturn in mood, with recall at or near ceiling for both groups, and with no difference between groups, $t < 1$ (Time 3; Figure 1).

To investigate our key hypothesis that positive memory recall would successfully repair mood by enhancing positive affect in the two training groups and to explore any differences as a function of training regimen, we computed an omnibus 2 (Group: MoL, Rehearsal) × 3 (Time: Preinduction, Postinduction, Post–Memory Recall) mixed-model ANOVA with positive affectivity as the dependent variable. We anticipated that affectivity scores would obey a quadratic function across the three time points with mood going down following the induction and rising again following memory recall, so therefore examined the quadratic contrast term for the effects in involving Time. There was a main effect of Time, quadratic $F(1, 26) = 40.36$, $p < .001$, $\eta_p^2 = .61$, but no main effect of Group and no Time × Group interaction, Fs < 1. Breaking down the effect of Time, we found that positive affectivity decreased significantly from baseline to postinduction, $F(1, 26) = 18.90$, $p < .001$, $\eta_p^2 = .42$, confirming that the negative mood induction significantly reduced positive affect. It is critical that recalling the prelearned positive memories significantly enhanced positive affectivity compared with postinduction, $F(1, 26) = 44.68$, $p < .001$, $\eta_p^2 = .63$, consistent with successful mood repair. Furthermore, positive affect following memory recall was significantly better than it had been at baseline, $F(1, 26) = 8.12$, $p < .01$, $\eta_p^2 = .24$, suggesting that memory recall not only repaired mood but *enhanced* positive mood relative to preinduction levels. The lack of significant main or interactive effects involving group provides no support for a differential effects of training condition (MoL or rehearsal) on mood repair under laboratory conditions.

Effects of training versus no training on mood repair

To evaluate the impact of memory training per se on mood repair, we compared our two training groups (pooled together, given the absence of group differences in the analyses) to the no-training control group. The pooled training and control groups did not differ in terms of symptoms, mood, or memory characteristics at the start of the mood induction session (Time 3; ps > .05; see Table 1).

An ANOVA with Training (training, no training) and Time (preinduction, postinduction, post–memory recall) as factors and positive affectivity as the dependent variable again revealed a main effect of Time, quadratic $F(1, 39) = 30.54$, $p < .001$, $\eta_p^2 = .11$, no main effect of training, $F(1, 39) = 0.10$, $p > .05$, but there was the expected significant Time × Training interaction, quadratic $F(1, 39) = 6.32$, $p = .016$, $\eta_p^2 = .14$. To break down this interaction we again looked at changes in mood across the different time points. As we would expect, from baseline to postinduction, the mood induction caused an overall worsening in positive mood, $F(1, 39) = 13.07$, $p = .001$, $\eta_p^2 = .25$, but there was no main, $F < 1$, or interactive effect of training, $F(1, 39) = 2.45$, $p > .05$. It is critical, however, that the combined training group reported greater positive mood improvement following recall (relative to postinduction) compared with the no-training controls, $F(1, 39) = 7.42$, $p = .01$, $\eta_p^2 = .16$. Deconstructing this interaction revealed that although mood improvement from postinduction to post–memory recall was significant in the nontrained group, $t(12) = 2.88$, $p = .014$, $d = 0.48$, this improvement was more marked in the trained group, $t(27) = 6.77$, $p < .001$, $d = 1.28$. Finally, although as previously noted, the training group reported significantly better mood following recall compared with baseline, $t(27) = 2.87$, $p = .008$, $d = 0.54$, there was no support for this in the no training group, $t < 1$.[2]

Use of positive and self-affirming memories in everyday life

To test whether memory training increases the frequency with which individuals retrieved their set of memories to assist emotion regulation in everyday life (outside of homework sessions), we performed an ANOVA with the number of times participants in the training groups reported retrieving memories for mood repair in their diaries (over the month prior to the mood induction, see SU1) as the dependent variable. Results indicated that individuals in the MoL group ($M = 21.86$, $SD = 12.01$) reported retrieving memories more than twice as often as those using rehearsal ($M = 11.35$, $SD = 8.01$), $F(1, 26) = 7.38$, $p = .012$, $\eta_p^2 = .22$ (see SU2). This difference was driven primarily by a difference in the deliberate recall of the preselected memories to repair mood by the MoL group ($M = 9.64$, $SD = 7.38$; rehearsal: $M = 3.64$, $SD = 2.71$), $F(1, 26) = 8.17$, $p = .008$, $\eta_p^2 = .24$, as compared with the automatic recall of memories which did not reach statistical significance (MoL: $M = 12.21$, $SD = 8.55$; rehearsal: $M = 7.71$, $SD = 7.30$), $F(1, 26) = 2.24$, $p > .05$.

To confirm that the retrieval of these memories in day-to-day life actually led to mood repair, we conducted a mixed-model ANOVA with Group (MoL, rehearsal) as the between-subjects factor, Time (pre–memory recall, post–memory recall) as the within-subjects factor, and mood rating in the diary as the dependent variable. There was a main effect of Time, $F(1, 26) = 43.98$, $p < .001$, $\eta_p^2 = .63$, but no main effect of group, and no interaction (Fs < 1). This mirrors the laboratory mood induction findings and suggests that participants recalling their memories in day-to-day life outside the lab can successfully use those memories to repair mood, regardless of the method they used to bring the memories to mind.

Together, these data suggest that preselected memories can be used effectively by formerly depressed individuals to repair mood in day-to-day life, and this ability is enhanced by the MoL via its capacity to facilitate the more frequent use of this technique.

Discussion

The present study replicated earlier findings (Dalgleish et al., 2013) showing that the MoL is superior to rehearsal training as a mnemonic device to aid the recollection of a preidentified set of positive, self-affirming memories over a 1-week interval after training has ceased. The data also showed, for the first time, that the advantage of the MoL in enhancing retention extends to the longer term—in this case 3 months in the absence of formal training. We are not suggesting that participants did not encounter triggers in their environment along their familiar route that may have led to involuntary, informal retrieval (which they probably did), but rather that structured ongoing training was *not necessary* for the memory advantage. This confirms that the training parameters selected were successful in firmly establishing the MoL-supported memory store, which led to a stable memory repository that remained intact over time.

In terms of mood repair, as predicted, recalling a set of self-affirming memories counteracted the downturn in positive mood triggered by a sad mood induction, regardless of whether participants had been trained to use the MoL or rehearsal. The equivalent level of recall at Time 3 between these groups reflects the success of the memory training regime, which was designed to bring both groups up to ceiling. It is interesting that positive memory recall actually elevated mood beyond baseline levels, something that was not observed for the control participants who had not received memory training. This is a critical finding because previous research has suggested that individuals in remission from depression find it hard to experience improved mood as a consequence of recalling positive memories (Joormann et al., 2007) and doubtless reflects the benefits of preidentifying and elaborating positive memories (cf. Werner-Seidler & Moulds, 2012).

Although it is encouraging that positive and self-affirming memories were used to repair mood in the lab, a more pertinent clinical question is whether the memory repository could be used in day-to-day life to counter naturally occurring downturns in mood. We found that training in the MoL led to more frequent use of memory recall to repair mood, relative to rehearsal across 4 weeks. One possibility is that this difference reflects the well-travelled and familiar route chosen to embed the loci. Presumably, the loci would have served as memory triggers when encountered in day-to-day life, continually activating and reinforcing the autobiographical memory material contained in the store (over and above the formal training regime). Although speculative, repeated activation over time may have reduced the threshold level at which this material could be accessed. This novel finding that MoL-supported memory retrieval facilitates adaptive emotion regulation in everyday contexts is clinically promising.

The MoL is a particularly attractive mnemonic device for clinical use for a number of reasons. First, it is easily acquired by individuals in remission from depression. Anecdotal reports during debriefing suggested that, in general, participants enjoyed the idiographic and creative nature of the task. Second, as we have shown, the MoL is a skill that, once acquired, is maintained over the long term. Third, MoL training can be delivered relatively easily by nonspecialists, making it an attractive low-intensity treatment option to improve the emotion regulation repertoires of previously depressed individuals. We suggest that the most useful application of the MoL to clinical domains is as a simple strategy to counter everyday mild downturns in mood.

Some potential limitations associated with this study deserve consideration. First, we included a relative small sample which limits the confidence with which conclusions can be drawn. That said, the results are clear, are consistent across analyses, and accord with the theory and research we used to derive our hypotheses. It was our intention to investigate whether the MoL might have utility in the regulation of emotion in depression, and we believe a sample of this size allowed us to address this question. Testing larger samples is always desirable. However, we wanted to ensure the study, as a multisession longitudinal study, would be acceptable to participants with a history of depression, and a prestudy power calculation was in accord with the numbers recruited here.

Another consideration is that the numerous training sessions and multiple follow-ups meant that the researcher developed an ongoing relationship with participants. It is conceivable that this may have opened up the study to a greater influence of demand characteristics. To address this, care was taken to deliver all experimental procedures in a standardized, scripted fashion. Even if there were some influences of demand, there is no reason to expect this would have differed systematically across the two training groups as the degree of contact and nature of the relationship would have been the same. This was not problematic for the no-training group only, although the fact that this group did not follow the same procedures as the other two groups opens up the possibility that the observed effects could have been attributed to tasks other than just previous training, such as completing the diary or memory repetition. Therefore, this group has its own complications and limits the conclusions that can be drawn.

The findings reported in the present study confirm that compared with rehearsal, the MoL provides a memory retention advantage for positive or self-affirming memories over short- and long-term intervals. In addition, the MoL is an acceptable and feasible mnemonic device that can be used by formerly depressed individuals to facilitate adaptive mood repair by promoting the use of positive autobiographical memory material to counteract downturns in mood both inside the lab and in day-to-day life.

Author Contributions

A. Werner-Seidler and T. Dalgleish developed the study concept and design. Testing and data collection were performed by A. Werner-Seidler. Data analysis was conducted by A. Werner-Seidler, with guidance from T. Dalgleish. A. Werner-Seidler drafted the manuscript, and T. Dalgleish provided revisions and critical feedback. Both authors approved the final version.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Supplemental Materials

Additional supporting information may be found at http://cpx.sagepub.com/content/by/supplemental-data.

Notes

1. We repeated this analysis comparing T1 to T4 and found an identical pattern of results, which included the critical Time × Group interaction, $F(1, 23) = 19.43$, $p < .001$, $\eta_p^2 = .47$.
2. We repeated the analyses with negative affect as the dependent variable. The pattern of results was the same as those for positive affectivity, although when comparing the pooled training group to the nontrained group, the interactive effect involving group was only at a trend level, $F(1, 39) = 3.93$, $p = .055$ $\eta_p^2 = .09$.

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