The current state of Memory Specificity Training (MeST) for emotional disorders

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Highlights

- MeST has promise in improving autobiographical memory and treating psychopathology

- It can be implemented in mental health services, and provided in computerised form

- MeST has been adapted to address cognitive flexibility and future thinking deficits

Abstract

Memory Specificity Training (MeST) is an intervention developed from basic science that has found clinical utility. MeST uses cued recall exercises to target the difficulty that some people with emotional disorders have in recalling personally experienced events. MeST is simple enough to be delivered alongside traditional interventions or online by artificial intelligence. Currently, research indicates MeST's effects are immediate, but short lived, and there is limited research indicating its superiority over established interventions. Future investigations must establish the dosage and specific components of MeST that are necessary for clinically significant effects. Further, it must establish the secondary processes (e.g., problem-solving) that mediate between MeST-driven improvements in memory and symptoms. Similar interventions that build upon the idea of training autobiographical memory specificity are also emerging, and warrant further investigation.

1. Introduction

Memory Specificity Training (MeST) is a prototypical example of a psychotherapeutic intervention that is derived from basic science and which has shown potential in the prevention and treatment of mental health problems. Research has shown that difficulty retrieving memories of specific, personally-experienced events (e.g., *The last time I went on a date with my partner*) is common amongst people with a range of psychiatric diagnoses, including Major Depressive Disorder (MDD), Post-traumatic Stress Disorder (PTSD) and Schizophrenia [1–3]. This difficulty can persist following treatment [4,5]and can predict a worsening in symptomatology thereafter [6]. These and other findings led Raes, Williams and Hermans [7] to develop MeST.

Although MeST has been adapted over the years, its main component involves training people through cued recall exercises to retrieve specific autobiographical memories. During these exercises, when a person retrieves a memory that is not specific (i.e., not of a single event; *dating my partner*), they are instructed to focus on the sensory-perceptual and contextual details of a particular time within the memory that could make this memory specific and unique (e.g., *a particular date, the restaurant, the smell and taste of the food, the tablecloths, the conversation*). Although there is some variability between implementations with regards to the exact content of MeST, in general MeST is conducted in a group format and its other sessions include basic psychoeducation about the nature of autobiographical memory specificity and mental health, exercises related to preventing generalisation (i.e., inhibiting people's ability to retrieve negative memories when they are attempting to retrieve a positive memory, for example, retrieving a memory of clumsiness when trying to think about a time when we were skilled), and exercises to understand and overcome the situational factors that may make it particularly difficult to retrieve specific memories (e.g., stress). Despite its simplicity, a recent meta-analysis found that MeST outperforms both passive (e.g.,

waitlist) and active (e.g., psychoeducation) control groups in terms of its effects on improving autobiographical memory specificity and to a lesser extent its effects on reducing depressive symptoms [8].

MeST has now been delivered to adults with diagnoses of MDD [7,9,10], Post-Traumatic Stress Disorder [11,12], Schizophrenia [13], and Bipolar Disorder [14]. It has also been delivered to adolescents [15] and older adults [16,17] and has been delivered in countries and cultural settings as diverse as Belgium (e.g., [7], the Netherlands [9], the United Kingdom [10], Spain [13], the United States [11], Japan [18] and Iran [12]. MeST is simple enough to be adapted to the needs of individual settings. As such, MeST's efficacy and effectiveness have been examined in research settings in randomised controlled trials [10] and in translations to routine clinical practices in inpatient and outpatient settings [19]. This latter transportability study has raised several challenges that future implementations of MeST should consider.

1.1. Lessons learnt from clinical transportability

First, when delivered in a research context, MeST is offered in a strict or *closed* group format where the composition of groups remains the same throughout the intervention and where new content is introduced in each session. However, many routine care settings often involve participants being admitted and discharged at irregular intervals. Second, the five to eight one-hour sessions that are typical in research-based MeST, and the number of cue word exercises conducted within, may not be feasible for routine care settings. Yet, it is unclear what dose of MeST is necessary in order to improve memory or symptoms. Third, participants in research settings typically enrol voluntarily but this is not usually feasible in routine care settings where participants may instead be prescribed MeST. Finally, research-based MeST is often delivered by a single professional, whereas many routine care settings

are multidisciplinary and involve multiple staff working with each client. These challenges can have important implications on session continuity and participant motivation.

Although it could be fruitful for future investigations to explore these challenges in more detail (e.g., exploring MeST in fixed versus dynamic group formats, with the same or different therapists, etc.), research and practice could instead harness recent computerised adaptations of MeST so that participants can work on the exercises at their own pace outside of care settings. Issues of dosing are also of utmost importance within future MeST investigations and these recent computerised adaptations of MeST have begun to shed light on these issues.

1.2. Computerised MeST

In order to meet the growing need for accessible, low-cost interventions that can be delivered to large cohorts of people, MeST is now being delivered by machine learning algorithms that are able to receive participant memories and determine the specificity of these memories [20–22]. In Computerised MeST (C-MeST), feedback is then offered to participants, much as it would be by an in-person therapist, regarding how to improve the specificity of their memories [14,17,18,23].

Studies of C-MeST with at-risk participants such as healthy young adults with low levels of memory specificity [18], older adults [17] or people with a history of depression [24] indicate that C-MeST can lead to an improvement in memory specificity and may mitigate against subsequent increases in depressive symptoms in the short-term. Trials of C-MeST with clinical participants are ongoing but preliminary evidence suggests that it can also improve depressive symptoms amongst people with MDD [23]. However, C-MeST has yet to be compared to an active control group (e.g., psychoeducation). Nevertheless, these investigations have provided valuable insights into how much and which components of MeST are necessary.

1.3. Necessity and sufficiency

C-MeST investigations are the first MeST investigations to quantify session-to-session change in autobiographical memory specificity. These investigations have, with one exception involving participants with MDD [23], found that the effects of MeST on autobiographical memory specificity are fully realised by the end of the first session and, in the absence of other MeST components such as psychoeducation and group interaction, there is no additional improvement thereafter [17,24]. It is tempting to assume that MeST requires only minimal dosing. However, there is meta-analytical evidence that MeST's superiority over control groups is often lost at follow-up in clinical and healthy samples [8]. MeST may exert immediate effects on memory specificity but it may be insufficient at producing enduring change.

In the absence of a comparison between C-MeST with only cued recall exercises and MeST with its additional components (e.g., the group dynamic/social support, psychoeducation, its components regarding generalisation), it is also unclear which components of MeST are necessary in order to elicit change in specificity and symptoms. In contrast to C-MeST investigations that found no further improvement in specificity after the first session, a recent investigation of MeST in routine care settings found a positive correlation between the number of sessions that participants completed and improvements in memory specificity. Interestingly though, the correlation between the number of discrete memory exercises that participants completed across all sessions and memory specificity was not significant [25]. Although more MeST leads to greater change in memory specificity, this association may be attributable to the non-specific components of MeST, or potentially symptom improvement, and not necessarily the cued recall exercises themselves. It could also be that this association is attributable to the cumulative effects and timing of training sessions and the opportunity between sessions to consolidate one's learning, but not necessarily the

individual number of exercises one completes per se. Direct investigations of the amount of MeST that is necessary to elicit long-term change in memory specificity and symptoms are now warranted. Another way to examine how and in what circumstances MeST elicits its effects would be to explore the secondary processes that mediate the association between MeST-driven improvements in memory specificity and improvements in emotional disorders. It also remains possible that improving autobiographical memory specificity through MeST may be necessary to preventing a recurrence of psychopathological symptoms, but that on its own it may not be sufficient to produce enduring therapeutic change. In order to examine this possibility, we can consider the mechanisms by which MeST is expected to operate and the other secondary processes that are thought to be involved in symptom reduction.

1.4. Mechanism of action

We use our autobiographical memories to regulate negative affect [26] and solve problems [27,28]. Our memories help us to understand others' intentions [29] and to develop intimacy [30–32] and attract support [33] from them. We use our memories to simulate possible future events [34–37] which in turn produces anticipatory pleasure [38–40] and hope [41,42]. Any effect of MeST on symptoms may be driven by change in these secondary processes.

There is evidence that MeST improves problem solving abilities [7,10,16] and reduces feelings of hopelessness [7,43,44]. Werner-Seidler et al. [10] provided the only analysis of whether changes in secondary processes (i.e., problem solving) mediated improvements in depression symptoms. However, their analysis yielded non-significant effects. Further exploration of potential mediating mechanisms is needed to understand how MeST influences symptoms, and thus guide efforts to refine MeST.

1.5. Adaptations of MeST

Since the emergence of MeST, other newer interventions have since been created that are based on the principles of MeST, i.e. training people to think about autobiographical

experiences in a specific way. One such intervention targets episodic future thinking [45]. Similarly to MeST, Future Specificity Training (FeST) involves cue word exercises where participants are prompted to imagine specific future events that could happen to them. Relative to a waitlist control, FeST has been associated with significant improvements in the specificity, detail and imageability of thoughts about the future as well as improvements in anticipated and anticipatory pleasure, and perceived control [45]. MeST has also recently been combined with mental imagery exercises in order to help young adolescents with MDD to improve their ability to retrieve and re-experience past events and pre-experience future events [46].

One might also ask whether problems with specificity are just one facet of autobiographical memory problems. There is evidence that people with sub-clinical and clinical levels of depression or PTSD have difficulty not only in retrieving specific memories but also in flexibly switching between specific memories and non-specific or general memories [47–49]. Although exclusively retrieving generalised or non-specific autobiographical information at the expense of specific memories may lead to difficulties in secondary processes, the ability to retrieve generalised information can also be beneficial, such as in guiding efficient decision making [50]. The ability to abstract information into life periods or categories of events may also be adaptive in the event that these are perceived as positive, or, for adverse experiences, where something can be learned from them. Memory Flexibility Training (MemFlex) builds on MeST's cued recall exercises and combines them with training to flexibly shift between retrieval of specific and non-specific memories. MemFlex has shown moderate effects on the ability to retrieve specific memories and to flexibly shift between these and general memories. In addition, it has shown beneficial effects on problem solving in people with past and current MDD diagnoses [51,52]. MemFlex has performed comparably to psychoeducation on depressive symptoms but has also led to

relatively lower treatment drop-out and two additional depression-free weeks within a three-month follow-up period [52]. In PTSD sufferers, MemFlex also improves, relative to waitlist control, memory specificity, memory flexibility, PTSD symptoms and the overgeneralised, maladaptive cognitive appraisals which drive PTSD [49]. Future investigations could examine whether these adaptations to MeST, or the additional components that they offer, are superior to MeST in terms of their effects on symptoms.

1.6. MeST and treatment augmentation

Existing Cognitive-Behavioural Therapies (CBT) encourage people to use specific autobiographical memories to challenge their biased cognitions about themselves and the world [53]. Ongoing research is thereby exploring whether individual differences in autobiographical memory specificity moderates the effects of CBT [53]. Further, psychotherapy is itself an autobiographical experience. Clinicians often use memory support strategies to support their client's memory for this experience [54], and the amount of time spent using exercises to support clients' therapeutic memories has been associated with CBT outcomes [54]. Building upon current memory support strategies, MeST's cued recall exercises could also be used to help people remember the therapeutic experience itself. MeST could also be combined with CBT to improve problems with autobiographical memory specificity where CBT does not [4,5]. Indeed, if poor specificity does reduce treatment effects, completion of MeST prior to CBT could enhance treatment efficacy [53]. Although the combination of MeST and routine treatment in prior studies was associated with significant improvements in depressive symptoms [19,55], these studies have not included non-MeST control groups making it impossible to determine whether these improvements were attributable to MeST. In summary, MeST might be used to augment the effects of CBT by improving people's ability to retrieve autobiographical experiences that might then be

reappraised within CBT whilst also improving their ability to remember the CBT experience itself. It will be interesting for future studies to explore these possible augmentative effects.

2. Conclusions

MeST is now a decade old and is at a junction. The investigations discussed here provide an example of the pathway that interventions developed from basic science can take in order to find clinical utility. MeST is simple enough to be delivered in routine clinical practice alongside established interventions or to be stripped back such that it can be cost-effectively delivered by artificial intelligence. However, the effects of MeST on both memory specificity and symptoms are immediate and short lived, and further research in clinical samples is needed to establish whether long-term treatment effects are superior to, or at least equivalent to, other established low-intensity interventions. In order for MeST to take the next step, we must improve our understanding regarding how much, and which components of MeST are necessary in order to produce long lasting therapeutic change.

Author Contributions

All authors contributed to the conceptualization, and writing and reviewing of drafts and revisions.

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* This trial exemplifies the kinds of adaptations that can be made to MeST with a view to enhancing its effects. In particular, the authors combine MeST with elements of imagery rescripting, such that participants not only retrieve specific memories but in some cases they

also reappraise these memories and make them more positive. It is also one of the few trials of MeST amongst young people. This trial showed promising effects on both memory specificity, depressive and anxious symptoms, and self esteem.

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such as people with incurable cancer, of how MeST could be augmented, such as if it is combined with aspects of Life Review Therapy. In this trial, people learn to retrieve specific memories and to integrate them into a broader life narrative. The intervention led to improvement on the primary outcome of ego-integrity, a construct that refers to a person's sense of contentment and meaning with regards to the events in their life.