**Extended Report**

**Abstract**

Background: Depression has a profound effect on quality of life (QoL) and is associated with rumination, hopelessness and social difficulties. It is important to explore novel intervention techniques that may reduce depression, and also improve rumination, hope and QoL. Aims: In this extended report, we report the findings of two pilot randomized controlled trials examining the feasibility of a potentially important novel clinical technique (MEmory Specificity Training; MEST) on depression, social problem-solving (Study 1), rumination, hope and QoL (Study 2). Method: In Study 1, Iranian women with depression (*N*=24) completed the Beck Depression Inventory-II and Means-Ends Problem-Solving test at baseline, post-training and 2-month follow-up. In Study 2, female students with moderate depression (*N*=24) completed the Ruminative Response Scale, Adult Hope Scale and Short-Form Health Survey at baseline and post-training. Assessors were blind to group allocation. In both studies participants were randomly assigned to MEST or a non-active control group. Results: In both studies MEST was found to be feasible and associated with low drop-out rates and high rates of self-reported patient and group facilitator satisfaction. In Study 1 two participants in the MEST group dropped out following the second session. In Study 2 all participants completed MEST. There was preliminary evidence that MEST may bring about clinical benefit in terms of depression, social problem-solving (Study 1), QoL, rumination and hope (Study 2). Conclusions: MEST is a promising technique in the treatment of depression.

**Keywords:** MEmory Specificity Training, rumination, quality of life, hope, social problem-solving

Overgeneral memory (OGM) is a cognitive marker of depression and strongly influences the progression of this disorder (Sumner, Griffith, & Mineka, 2010). Those with depression have considerable problems recalling personal memories of discrete events that happened at a certain place and time (i.e., specific memories). Rather those with depression have a tendency to retrieve general, categoric memories (i.e., OGM) (Williams et al., 2007). Considerable evidence indicates that OGM is associated with impaired social problem-solving (Sutherland &Bryant, 2008), problems imagining future specific events (Williams et al., 1996) and rumination (Williams, 1996). Thus, OGM impacts everyday cognitive functioning. Furthermore, given autobiographical memory is fundamental in establishing and maintaining interpersonal relationships (Bluck, Alea, Habermas, & Rubin, 2005), difficulties in retrieving specific memories can result in on-going negative interpersonal encounters and low mood (Raes, Williams, & Hermans, 2009). As a result of these relationships, it is not unexpected then, that OGM predicts the course of depression (Kleim & Ehlers, 2008).

Depression has a profound impact on an individual’s quality of life (QoL) and hope (Goodman, Disabato, Kashdan, & Machell, 2016; Hofmann, Curtiss, Carpenter, & Kind, 2017). Specifically, hope has a negative association with depression (Goodman et al., 2016) and while depression is associated with impairments in QoL, changes in QoL are not fully accounted for by changes in depression (Hirschfield et al., 2002). Thus, it is important to also investigate the influences of psychological interventions for depression on the enhancement of QoL (Hofmann et al., 2017).

Recent research indicates OGM is modifiable and that a brief training program, MEmory Specificity Training (MEST), targeting OGM can have positive outcomes in depression (Raes et al., 2009). Raes and colleagues (2009) demonstrated that MEST can reduce OGM and memory specificity improvements were associated with improved problem-solving skills and reduced rumination. This initial preliminary study substantiated the theoretical notion that altering OGM is achievable. Neshat-Doost and colleagues (2013) then examined the efficacy of MEST in Afghan adolescent refugees with high levels of symptoms of depression. Following training the MEST group retrieved a higher proportion of specific autobiographical memories and at 2-month follow-up had lower levels of depression than did the non-active control group. Change in memory specificity mediated the relationship between receiving MEST and reductions in depression. Eigenhuis and colleagues (2017), in a single-group pilot study, found that MEST was associated with increased specificity and decreased depression following training. Furthermore, they demonstrated feasibility in an out-patient setting, participants and trainers reported satisfaction with MEST, and patients undertaking MEST showed high levels of motivation and compliance. Werner-Seidler and colleagues (2018) conducted a cluster-randomized controlled pilot trial investigating the efficacy of MEST relative to psychoeducation and supportive counselling for depression. Whilst both groups had a reduction in depression, there was no support for the MEST group having greater reductions in depression symptoms relative to psychoeducation and supportive counselling group. They also found evidence that MEST was associated with improved social problem-solving.

While accumulating research indicates that MEST is a promising therapeutic intervention for depression (Erten et al., 2018), this area of clinical research is still in its infancy. Thus, further research is needed at all stages of treatment development (i.e., proof of concept studies right through to scaled-up later phase evaluations) (MRC, 2000). This includes further exploration of the feasibility and efficacy of MEST in different populations. Accumulating evidence suggests that OGM is a pan-cultural cognitive bias (e.g., Dritschel, Kao, Astell, Neufeind, & Lai, 2011; Jobson, Moradi, Rahimi-Movaghar, Conway, & Dalgleish, 2014). However, MEST, as an intervention for depression, has thus far primarily been investigated in patients from Belgium, the Netherlands and the UK, with the exception of Neshat-Doost and colleagues (2013) who used a sample of Afghan adolescents. MEST has potential appeal for the treatment of depression in low- and middle-income countries, countries that often have poor health infrastructure, limited access to resources, and health staff that have limited access to training, which in turn influences the delivery of evidence-based interventions (Chandran, Hyder, & Peek-Asa, 2010; Hoysted et al., 2018; Schnyder et al., 2016). Evidence-based psychological treatments for depression (e.g., cognitive behavior therapy) are often complex, costly to deliver and require highly trained therapists (Werner-Seidler et al., 2018). MEST, therefore, offers an attractive, accessible therapeutic option for the treatment of depression in these regions. Additionally, the effect of MEST on improving cognitive domains associated with OGM, such as social problem-solving, and depression-associated factors (i.e., QoL, hope), still requires attention. Thus, we conducted two pilot randomized controlled trials (RCT) investigating the feasibility and preliminary effectiveness of MEST in two samples of depressed Iranian women. Our aims and methods were based on a pilot study conducted by Eigenhauis and colleagues (2017) investigating the feasibility and effectiveness of MEST in an out-patient setting in the Netherlands. Thus, we investigated the feasibility of MEST by focusing on two aspects; the perspective of the patients/participants and that of the group facilitators. Parallel to Eigenhauis and colleagues, we also explored whether there was preliminary support for MEST being able to reduce depression and improve social problem-solving (Study 1), QoL, hope and rumination (Study 2) in these samples.

In order to address these aims, we designed our two pilot studies to examine feasibility of this novel approach (MEST), and to obtain preliminary data that could be used to inform later-stage trials (Moore, Carter, Nietert, & Stewart, 2011). Following the recommendations of Moore and colleagues (2011) and Johanson and Brooks (2010), we decided that at least 10 participants in each group would be appropriate for these initial pilot studies. This aligns with our previous MEST trials, whereby MEST has been compared to a non-active control group (Moradi et al., 2012; Neshat-Doost et al., 2013), whereby 10-12 participants in each group offered sufficient numbers to generate preliminary data to examine our aims (Dalgleish et al., 2014; Werner-Seidler, 2018). For both RCTs we obtained ethical approval from the University of Isfahan. Following procedures outlined in Iran, the trial protocol for both Study 1 and 2 was pre-registered (174862/96) with the Research Committee of Department of Psychology and the Research Committee of the Faculty of Educational Sciences and Psychology of University of Isfahan. The protocol is available by contacting the authors.

**Study 1 – Depression Symptoms and Social-Problem-Solving**

**Participants**

Participants (aged 24-62 years old) were female Iranian community members with major depressive disorder. All women were not employed in paid work but rather engaged in home duties. Inclusion criteria included being female, between the ages of 18 and 65 years of age and currently meeting diagnostic criteria for major depressive disorder. Exclusion criteria included comorbid personality disorder, diagnosed bipolar disorder, a current anxiety disorder, substance use, or a neurological condition (i.e., traumatic brain injury). We recruited participants from the general community using advertisements in local newspapers and social media. Twenty-seven women were screened for the trial and met major depressive disorder diagnostic criteria according to the Iranian version of the Structured Clinical Interview for DSM-5 (SCID; First, Spitzer, Gibbon, &Williams, 1996). One participant was excluded due to current substance use. Two participants declined to participate in the trial as they felt that MEST was not the appropriate psychological intervention for them. The Institute of Psychiatry Medical Tehran University has found the reliability and validity of the Iranian version to be good (Moradi et al., 2012). Independent clinical psychologists, who had been trained in using the Iranian SCID, conducted the structured clinical interviews in Farsi. HN assessed the SCID interviews for reliability. There was complete agreement. Twenty-four participants agreed to participate in the study. These women were randomly allocated to the control (*n*= 11) or MEST (*n*= 13) groups. Two participants in the MEST group dropped out following the second session due to gaining employment and thus, not being able to attend the group sessions that were held during working hours. Participant characteristics are presented in Table 1. The two groups did not differ significantly in terms of age, education or baseline depression. The CONSORT (consolidated standards for reporting trials) diagram is presented in Figure 1 and CONSORT extension for Pilot and Feasibility Trials Checklist is presented in Supplement 1.

**Measures**

**Beck Depression Inventory – II (Beck, Steer, & Brown, 1996)**

The BDI-II is a 21-item self-report measure that assesses symptoms of depression. Each item is rated on a 4-point response scale and total scores range from 0 to 63. The BDI-II has good psychometric properties (Beck et al., 1996) and been validated in Iranian samples (Moradi, Herlihy, Yasseri, Turner, & Dalgleish, 2008).

**Means-Ends Problem-solving test (MEPS; Platt & Spivack, 1975)**

The MEPS was used to measure social problem-solving (MEPS; Platt & Spivack, 1975). As commonly used in depression studies (e.g., Watkins & Moulds, 2005), we administered a shortened version of the MEPS (Scenarios 2, 4, 8, 10). In the current study we used the overall effectiveness score (Platt & Spivack, 1975; Zacks et al., 2001), with higher scores reflecting greater levels of social problem-solving ability. Two researchers, blind to the research aims, coded the MEPS. There was 80% agreement between coders and discrepancies were resolved by discussion.

**MEST**

Trained senior clinical psychologists delivered MEST at a local health service in Isfahan. MEST consists of a fully manualized, structured treatment delivered over five 60-minute sessions to groups of 5-8 individuals. The objective of the treatment is to enhance memory specificity through systematic practice, which occurs in sessions and at home, of memory retrieval in response to emotional and neutral cue words. Session 1 provides basic psycho-education about depression and memory. As a group, participants then practice recalling memories in response to positive and neutral cues, with demonstrations and support from the group facilitator. For homework, participants have to identify specific memories in response to 10 cue words (5 positive, 5 neutral). Session 2 follows the same format with further practice focusing on recalling memories in response to positive and neutral cue words. For homework, participants must identify specific memories in response to 10 cue words, and identify two daily specific memories. In Session 3, practice in response to negative cues is introduced, and homework is identical to that following Session 2, but now negative cues are also provided. Session 4 involves further exercises using negative and positive cues. Session 5 includes further practice and a brief summary of the program is offered (see Neshat-Doost et al., 2013; Dalgleish et al., 2014; Werner-Seidler et al., 2018).

**Procedure**

Following Eigenhauis and collegaues (2017), we examined the feasibility of MEST by focusing on the perspectives of the patients and group facilitators. This information was collected using feedback from the patients and was gathered in an unstructured way in the last session of MEST. All patients were asked to provide their opinion about MEST. Group facilitator feedback was collected in an unstructured way by asking them about their experiences after finishing MEST. Following informed consent, researchers blind to group status tested participants individually at the university on three occasions: at baseline, post-training, and 2-month post-training follow-up. Assessment was conducted in Farsi and consisted of the BDI-II and MEPS. The assessors were not involved in the delivery of MEST. Following the baseline assessment, participants were randomly allocated, using simple randomization (computer-generated random numbers), by an independent research assistant to either the MEST group or control group. The control group had no additional contact.

**Data Analysis Plan**

Following the approach of Eigenhauis and colleagues (2017), we planned to assess feasibility for patients by examining compliance (i.e., drop-out) and patient feedback. Group facilitator feedback was examined by exploring the themes that arose from the unstructured discussions with group facilitators. Following Eigenhauis and colleagues, we also examined change in our main outcome variables. This was assessed using two 2 (group; MEST vs. control) x 2 (time; post, follow-up) mixed analysis of covariance (ANCOVA), with depression and social problem-solving as the dependent variables and baseline variables as the covariates. Despite the preliminary nature of the study, these analyses were included as they allow our findings to be situated within an accumulating number of pilot studies investigating the effectiveness of MEST with similar sample sizes but different populations (e.g., Eigenhauis et al., 2017; Moradi et al., 2014; Neshat-Doost et al., 2013). We also examined change in outcome variables from baseline to post-training and from baseline to follow-up for the MEST intervention group using repeated ANOVAs.

**Results**

We found that MEST was feasible in this group. In terms of compliance, 11 patients (85%) in the MEST group completed MEST. Two patients in the MEST group dropped out following the second session due to finding employment and thus, were not able to attend the group sessions (Figure 1). Two patients declined to participate in MEST as they felt that MEST was not the appropriate psychological intervention for them. Patients reported that MEST helped change their thinking about their memories, increased a sense of empowerment, and that they benefited from the group format, as it allowed participants an opportunity to share their experiences with others who had common experiences. Patients noted that because the group was comprised of individuals with similar experiences, participants were motivated to actively participate in MEST and support other group members.

Group facilitators reported that that their positivity for MEST increased as MEST progressed (i.e., it took a while to get used to the format and focus of MEST). Facilitators reported that patients became more involved and motivated over the course of the sessions and enjoyed listening to others’ memories. Facilitators noted that at times they felt that the process of improvement seemed slow. Facilitators reported that some patients had initial difficulties with the homework tasks and that facilitators needed to spend some time at the beginning of Session 2 assisting a few participants. However, by Session 3 all participants could effectively complete the homework practice tasks. The facilitators noted that a few participants did not attend Session 2 so the facilitators contacted these participants and described the importance of attending all sessions of MEST. Following this, all participants attended all sessions. Both facilitators and participants noted that a negative aspect of MEST was the limited selection of specified cue words. Sometimes participants wanted to speak about a certain memory that was not associated with the list of words outlined in the protocol. Rather, the protocol meant the facilitator was required to devote more time to practice and following the training. Additionally, there were times when patients reported feeling tired mid-session due to finding MEST a little monotonous. This was resolved, however, by including a short break in the sessions. The facilitators noted the importance of continually including the rationale for MEST throughout. There was no important harms or unintended effects.

Table 1 shows the mean depression and MEPS scores for the two groups at the three assessment time points. The group main effect was significant for depression symptoms, *F*(1, 19)=6.61*, p=* .02, *ηp2*=.26, *M*difference= -6.05, *SE*= 2.35, 95%CI [-10.97- -1.13]; the MEST group reported significantly fewer symptoms of depression than the control group. The time main effect, *F*(1,19)=.31, *p*= .58, *ηp2*=.02, and interaction, *F*(1,19)=.98, *p*= .34, *ηp2=* .05, were both non-significant. The MEST group had significantly fewer depression symptoms at post-training, *F*(1, 10)= 12.04, *p*<.01, *ηp2*= .50, *M*difference = -8.39, *SE*= 2.42, 95%CI [-13.65- -3.12], and at follow-up, *F*(1, 10)= 17.89, *p*<.01, *ηp2*= .64, *M*difference = -8.64, *SE*= 2.04, 95%CI [-13.19- -4.09], when compared to baseline[[1]](#footnote-1).

For problem-solving, there was a trend towards significance for social problem-solving, *F*(1,19)=4.07, *p*= .06, *ηp2*=.18, *M*difference= 3.31, *SE*= 1.14, 95%CI [-.09-4.70]; the MEST group tended to score higher than the control group. The time main effect and interaction were both non-significant, *F*s<1, ηp2s< .01. The MEST group had significantly improved problem-solving at post-training, *F*(1, 10)= 14.85, *p*< .01, *ηp2*= .55, *M*difference= 2.35, *SE*= .61, 95%CI [1.02-3.67], and follow-up, *F*(1, 10)= 9.72, *p*=.01, *ηp2*= .49, *M*difference= 3.09, *SE*= .99, 95%CI[.88-5.30], when compared to baseline[[2]](#footnote-2). To examine whether a decrease in depressive symptoms accounted for changes in problem-solving, we also conducted these analyses using standardized residual change scores in BDI-II scores as a covariate. A similar pattern of results emerged suggesting that changes in depressive symptoms (e.g., symptom improvement) did not account for the improvements in problem-solving. Given attrition, we also conducted the above analyses using the imputation method of carrying forward the last observed response (Hollis & Campbell, 1999). Similar findings emerged.

**STUDY 2 – QOL, HOPE AND RUMINATION**

**Method**

**Participants**

All 300 undergraduate female students residing in a dorm of University of Isfahan were screened for the trial. Inclusion criteria included undergraduate female students living in a dorm of University of Isfahan with moderate depression; defined as scoring over 18 on the Beck Depression Inventory-II (BDI-II; Beck et al., 1996). Exclusion criteria included those females that had mild depression or below (i.e., scored 18 or below on the BDI-II). Thirty participants meet inclusion criteria. We randomly selected 24 participants using computer-generated random numbers. These participants were randomly allocated, using simple randomization, by the research assistant to the control (*n*= 12) or MEST (*n*= 12) groups. Participant characteristics are presented in Table 2. The groups did not differ in terms of age and baseline rumination, hope or QoL (with the exception of role limitations due to physical health). The CONSORT diagram is presented in Figure 2 (see Supplement 1 for CONSORT checklist).

**Measures**

**Short-Form Health Survey** (SF-36; Ware & Sherbourne, 1992). Quality of life was assessed using the SF-36. The SF-36 was constructed for clinical research and has been used in cross-cultural research (Montazeri, Goshtasebi, Vahdaninia, & Gandek, 2005; Ware & Sherbourne, 1992). The SF-36 examines 1) physical functioning; 2) role limitations due to physical problems; 3) bodily pain; 4) social functioning; 5) general mental health; 6) role limitations due to emotional problems; 7) vitality; and 8) general health perceptions. The scores for these eight areas are the weighted sums of the questions in each section. Each scale is directly transformed into a 0-100 scale, with lower scores indicating greater disability. In the current study internal consistency was good (Cronbach’s α=.89).

**Ruminative Response Scale** (RRS; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). The RRS was used measure to assess depression-related rumination. It contains 22 items that are rated on 4-point scales (1= *almost never* to 4= *almost always*). The sum of the scores provide an overall rumination score, with higher scores indicating greater rumination. The RRS has been used in previous cross-cultural research (Lee & Kim, 2014). In the current study internal consistency was Cronbach’s α=.85.

**Adult Hope Scale** (AHS; Snyder et al., 1991). The AHS is a 12-item measure assessing level of hope, including agency (4 items) and pathways (planning to accomplish goals) (4 items). The remaining four items are fillers. Items are answered using 8-point scales. Agency and pathway items are summed to provide an overall hope score, with higher scores indicating greater hope. In the current study internal consistency was Cronbach’s α=.77.

**MEST**

Trained psychologists delivered MEST at University of Isfahan. The MEST manualized training package was used as described in Study 1.

**Procedure**

Informed consent was obtained from all individual participants included in the study. Researchers blind to group status tested participants individually at the university on two occasions: at baseline and post-training. Assessment consisted of the SF-36, RRS and AHS (Farsi versions). The assessors were not involved in the delivery of MEST. Following the baseline assessment, participants were randomly allocated, using simple randomisation, by an independent research assistant to either the control or MEST group. The control group had no additional contact.

**Data Analysis Plan**

As in Study 1, following the approach of Eigenhauis and colleagues (2017), we planned to assess feasibility for patients by examining compliance (i.e., drop-out) and patient feedback, and feasibility for group facilitators by examining their feedback from the unstructured discussions. Following Eigenhauis and colleagues, we also examined change in our main outcome variables. This was assessed using a one-way (MEST vs. control) multivariate analysis of covariance (MANCOVA), with QoL scores as the dependent variables, and baseline scores as the covariates. We also conducted two one-way (intervention vs control) ANCOVAs with post-training rumination and hope as the outcome variables and baseline variables as the covariates. We also examined change in outcome variables for the MEST intervention group from baseline to post-training using repeated ANOVAs.

**Results**

We found that MEST was feasible in this group. In terms of compliance all participants in the MEST group completed MEST. Participants reported that MEST assisted in the recovery of personal specific memories, they enjoyed the group meetings, and felt that MEST had improved their depression and quality of life and this on-going improvement was a significant motivation for continuing participation in MEST sessions. Group facilitators reported that prior to commencing MEST, participants expressed some ambiguity about participation related to the required time commitment. Facilitators also noted that at times there were concerns about session progress, too much storytelling by participants and difficulties staying on task (facilitators had to keep reminding the group of the aims of MEST). This problem was quickly resolved (Session 2), however, as rapport developed between the facilitator and participants. The facilitators noted that some flexibility in sessions assisted with participant compliance and motivation. The facilitators reported that participants had difficulties with the first homework task and required assistance via phone. However, by Session 3 all participants had completed homework tasks and reported no difficulties. Some participants requested telephone reminders during the week to remind them to complete the homework. Facilitators reported that reminding participants at the beginning of each session about the rationale for MEST assisted with participant motivation and participation. Facilitators reported that participants appeared to enjoy learning from others in the group. There was no important harms or unintended effects.

The MANCOVA revealed a group main effect, Wilks’ Lambda= .03, *F*(6, 8) = 22.86, *p*=.001, *ηp2*= .97. As shown in Table 2, follow-up univariate ANOVAs revealed that the MEST group reported significantly greater QoL in all domains. We also found that at post-training the MEST group had significantly less rumination, *F*(1, 21)= 18.56, *p*<.001, *ηp2*= .47, *M*difference= 20.80, *SE*= 4.83, 95%CI [-30.83- -10.76], and greater hope, *F*(1, 21)= 183.42, *p*<.001, *ηp2*= .90, *M*difference= 12.48, *SE*= .92, 95%CI [10.56-14.40], than the control group. Furthermore, compared to baseline, the MEST group at post-training had significantly less rumination, *F*(1, 11)= 47.18, *p*<.001, *ηp2*= .81, *M*difference= -13.58, *SE*= 1.98, 95%CI [-17.93--9.23], greater hope, *F*(1, 11)= 91.37, *p*<.001, *ηp2*= .89, *M*difference= 8.07, *SE*= 1.32, 95%CI [5.17-10.96] and greater QoL in the domains of physical functioning, *F*(1, 11)= 9.042, *p*=.01, *ηp2*= .45, *M*difference= 21.20, *SE*= 7.05, 95%CI [5.68-36.72]; role limitations - physical health, *F*(1, 11)= 53.90, *p*<.001, *ηp2*= .83, *M*difference= 45.14, *SE*= 10.43, 95%CI [22.18-68.10]; role limitations - emotional problems, *F*(1, 11)= 185.49, *p*<.001, *ηp2*= .94, *M*difference= 73.89, *SE*= 5.43, 95%CI [61.95-85.83]; vitality, *F*(1, 11)= 182.06, *p*=.001, *ηp2*= .66, *M*difference= 19.98, *SE*= 4.35, 95%CI [10.42-29.54]; social functioning, *F*(1, 11)= 33.11, *p*<.001, *ηp2*= .75, *M*difference= 30.63, *SE*= 5.32, 95%CI [18.91-42.34]; and general health, *F*(1, 11)= 12.58, *p*<.01, *ηp2*= .53, *M*difference= 20.42, *SE*= 5.76, 95%CI [7.75-33.09]. There was no significant change in general mental health, *F*(1, 11)= 29.10, *p*<.001, *ηp2*= .73, *M*difference= 5.25, *SE*= 4.79, 95%CI [-5.28-15.78]; or pain, *F*(1, 11)= 29.10, *p*<.001, *ηp2*= .73, *M*difference= 10.46, *SE*= 6.27, 95%CI [-3.51-24.42][[3]](#footnote-3).

**Discussion**

Overall we found that MEST was feasible as an intervention for depression in samples of Iranian women with depression. In both studies, MEST was associated with high compliance (i.e., low drop-out rates). In Study 1, 85% of participants (11/13 participants) in the MEST group completed MEST. Two participants in the MEST group dropped out following the second session because they found employment and were no longer able to attend the group sessions that were held during working hours (Figure 1). Two participants also did not commence MEST as they felt MEST was not an appropriate psychological intervention for them. In Study 2, all participants allocated to the intervention arm completed MEST. In terms of patient feedback, participants reported that MEST assisted in changing ways of thinking and recalling memories, increased their sense of empowerment, improved symptoms and that they enjoyed the group format, which allowed participants an opportunity to share their experiences with others with common experiences.

Group facilitators reported that they felt increasingly positive about MEST, participants appeared to enjoy learning from others in the group and that participants became more involved and motivated over the course of the sessions. They noted that at times there were difficulties, especially in Session 1, keeping participants on task and at times improvement seemed slow. They specified that reminding participants at the beginning of each session about the rationale for MEST helped with participant motivation and participation. Facilitators noted that a break was needed mid-session and that some flexibility within sessions assisted with compliance and motivation. In Study 1, both facilitators and participants noted that a negative aspect of MEST was the limited selection of specified cue words as participants at times wanted to speak about a certain memory that was not associated with a cue words outlined in the protocol. In both studies, facilitators reported that some participants had initial problems with the homework practice words following Session 1. In Study 1, facilitators had to assist participants complete the homework tasks at beginning of Session 2. In Study 2, the facilitators reported that some participants required assistance via phone on how to complete the homework. However, by Session 3 participants became effective at independently completing the homework practice tasks.

Following Eigenhauis and collegaues (2017), we also explored whether there was preliminary evidence for the effectiveness of MEST in being able to alleviate depression and improve social problem-solving, QoL, hope and rumination in samples of Iranian women experiencing symptoms of depression. This aim was developed to enable us to investigate whether there was support for later-phase trials (i.e., definitive evaluations examining the efficacy of MEST), especially taking into account similar emerging pilot trials assessing MEST (MRC, 2000). There was preliminary evidence that MEST may bring about clinical benefit in terms of depression symptomatology, social problem-solving (Study 1), QoL, rumination and hope (Study 2).

These studies provide further evidence that MEST, as a novel technique, may be feasible therapeutic option that has potential appeal for the treatment of depression in low- and middle-income countries. We also found further preliminary evidence that MEST may bring about clinical benefit in terms of depression, in this instance in a sample of Iranian women with depression. There is growing evidence that MEST may also improve some of the cognitive deficits associated with OGM, such as social problem-solving and rumination (e.g., Raes et al., 2009; Werner-Seidler et al., 2018). This research also provides initial evidence that MEST may be associated with improvements in QoL and hope. Autobiographical memory is fundamental in supporting identity (understanding the self and who one would like to be), directing (guiding current behavior, planning for future) and social-bonding (initiating and maintaining relationships) (Bluck et al. 2005). Thus, training patients to be able to provide more specific memories may in turn improve functioning in areas pivotal to human functioning, such as QoL and hope. Further research is needed to investigate these claims.

Furthermore, participants and group facilitators reported satisfaction with MEST, indicating that this low-intensity training may be feasible in treating depression in middle-income countries. This is important as the low resource, low-intensity, minimal training aspects of MEST means this training is potentially an attractive intervention for those with depression in these regions. It is important that researchers investigate the influences of novel psychological interventions on the enhancement of QoL (Hofman et al., 2017). Current psychological interventions associated with moderate improvements in QoL (Hofman et al., 2017) are often complex, costly and require highly skilled therapists. Thus, MEST may be a novel low-resource approach for improving QoL.

There are several limitations. First, in both studies the sample size was small and thus the findings remain preliminary. However, they align with our study aims and the findings align with previous pilot data emerging from other populations. Second, the absence of an autobiographical memory measure is a significant limitation. This is worth noting as in early stage studies exploring treatment development and evaluation it is important to investigate underpinning mechanisms. However, we still have confidence in our suggestion that these studies support the need for further larger trials in the area, as significant previous work (Eigenhuis et al., 2017; Neshat-Doost et al., 2013; Raes et al., 2009) has provided proof of concept that it is possible to modify memory specificity and MEST is effective in achieving this. However, in the current studies we cannot be certain of the mechanisms of change and a measure of memory specificity needs to be included in future MEST trials. Finally, given the gender and size of the sample, the generalizability of the findings is limited. Despite these limitations, the findings highlight the need for further evaluations of MEST in depression.

**References**

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). Beck depression inventory. Harcourrt Brace

and Company, San Antonio, TX.

Bluck, S., Alea, N., Habermas, T., & Rubin, D. (2005). A tale of three functions: The self-

reported uses of autobiographical memory. *Social Cognition, 23*, 91-117. doi:10.1521/soco.23.1.91.59198

Chandran, A., Hyder, A. A., & Peek-Asa, C. (2010). The global burden of unintentional injuries

and an agenda for progress. *Epidemiologic Reviews*. doi:10.1093/epirev/mxq009

Dalgleish, T., Bevan, A., McKinnon, A., Breakwell, L., Muller, V., Chadwick, I., …& Werner-

Seidler, A. (2014). A comparison of MEmory specificity training (MEST) to education and support (ES) in the treatment of recurrent depression: Study protocol for a cluster randomised controlled trial. *Trials, 15*, 293. doi.org/10.1186/1745-6215-15-293

Dritschel, B., Kao, C. M., Astell, A., Neufeind, J., & Lai, T. J. (2011). How are depression and

autobiographical memory retrieval related to culture? *Journal of Abnormal Psychology*, *120*(4), 969. Doi:10.1037/a0025293

Eigenhuis, E., Seldenrijk, A., van Schaik, A., Raes, F., & van Oppen, P. (2017). Feasibility and

effectiveness of memory specificity training in depressed outpatients: A pilot study. *Clinical Psychology & Psychotherapy, 24*, 269-277. Doi: 10.1002/cpp.1995

Erten, M . N., & Brown, A. D. (2018). Memory specificity training for depression and

posttraumatic stress disorder: A promising therapeutic intervention. *Frontiers in Psychology.* Doi: doi.org/10.3389/fpsyg.2018.00419

First, M. B., Spitzer, R.L., Williams, J. B. W., & Gibbon, M. (1997). *The Structured Clinical Interview for DSM-IV Disorders (SCID).* Washington DC: American Psychiatric Press.

Goodman, F., Disabato, D., Kashdan, T., & Machell, K. (2016). Personality strengths as

resilience: A one-year multiwave study. *Journal of Personality. 85,* 423-434. Doi: 10.1111/jopy.12250.

Hirschfeld, R. M., Dunner, D. L., Keitner, G., Klein, D. N., Koran, L. M., Kornstein, S. G., &

Keller, M. B. (2002). Does psychosocial functioning improve independent of depressive symptoms? A comparison of nefazodone, psychotherapy, and their combination. *Biological Psychiatry, 51*, 123–133. Doi: 10.1016/S0006-3223(01)01291-4

Hofmann, S. G., Curtiss, J., Carpenter, J. K., & Kind, S. (2017). Effect of treatments for

depression on quality of life: a meta-analysis. *Cognitive behaviour therapy*, *46*(4), 265–286. doi:10.1080/16506073.2017.1304445

Hollis, S., & Campbell, F. (1999). What is meant by intention to treat analysis? Survey of published randomised control trials. *British Medical Journal, 319*, 670–674. Doi: 10.1136/bmj.319.7211.670

Hoysted, C., Babl, F. E., Kassam-Adams, N., Landolt, M. A., Jobson, L., Van Der Westhuizen, C., …& Alisic, E. (2018). Knowledge and training in paediatric medical traumatic stress and trauma-informed care among emergency medical professionals in low-and middle-income countries. *European Journal of Psychotraumatology, 9*:1, 1468703, DOI:10.1080/20008198.2018.1468703

Jobson, L., Moradi, A. R., Rahimi-Movaghar, V., Conway, M. A., & Dalgleish, T. (2014). Culture and the Remembering of Trauma. Clinical Psychological Science, 2(6), 696-713. doi:10.1177/2167702614529763

Johanson, G. A., & Brooks, G. P. (2010). Initial Scale Development: Sample size for pilot

studies. *Educational and Psychological Measurement, 70(3),* 394–400. Doi:10.1177/0013164409355692

Kleim, B., & Ehlers, A. (2008). Reduced autobiographical memory specificity predicts

depression and posttraumatic stress disorder after recent trauma. *Journal of Consulting and Clinical Psychology,76*, 231–242.Doi: 10.1037/0022-006X.76.2.231

Lee, S., & Kim, W. (2014). Cross-Cultural Adaptation, Reliability, and Validity of the Re- vised

Korean Version of Ruminative Response Scale. *Psychiatry Investigation, 11*, 59-64. Doi: 10.4306/pi.2014.11.1.59

Montazeri, A., Goshtasebi, A., Vahdaninia, M., & Gandek, B. (2005). The short form health

survey (SF-36): Translation and validation study of the Iranian version. *Quality of Life Research,* *14*, 875-882. Doi:10.1007/s11136-004-1014-5

Moore, C. G., Carter, R. E., Nietert, P. J., & Stewart, P. W. (2011). Recommendations for

planning pilot studies in clinical and translational research. *Clinical and Translational Science, 4(5),* 332–337. doi:10.1111/j.1752-8062.2011.00347.x

Moradi, A. R., Abdi, A., Fathi-Ashtiani, A., Dalgleish, T., & Jobson, L. (2012). Overgeneral

autobiographical memory recollection in Iranian combat veterans with posttraumatic stress disorder. *Behaviour Research and Therapy, 50*, 435-441.

Moradi, A., Herlihy, J., Yasseri, G., Turner, S., &Dalgleish, T. (2008).Specificity of episodic

and semantic aspects of autobiographical memory in relation to symptoms of posttraumatic stress disorder(PTSD). *Acta Psychologica, 127*, 645–653.

Moradi, A. R., Moshirpanahi, S., Parhon, H., Mirzaei, J., Dalgleish, T., & Jobson, L. (2014). A

pilot randomized controlled trial investigating the efficacy of memory specificity training in improving symptoms of posttraumatic stress disorder. *Behaviour Research and Therapy, 56*, 68–74. doi: 10.1016/j.brat.2014.03.002

MRC (2000). *A framework for the development and evaluation of RCTs for complex*

*interventions to improve health*. Medical Research Council, London.

Neshat-Doost, H. T., Dalgleish, T., Yule, W., Kalantari, M., Ahmadi, S. J., Dyregrov, A., &

Jobson, L. (2013). Enhancing autobiographical memory specificity through cognitive training: An intervention for depression translated from basic science. *Clinical Psychological Science, 1,* 84-92. Doi: 10.1177/2167702612454613

Platt, J. J., & Spivack, G. (1975). *Manual for the mean-end problem-solving procedure (MEPS):*

*A measure of interpersonal cognitive problem-solving skill.* Hahnemann Medical College and Hospital, Philadelphia.

Raes, F., Williams, J. M. G., & Hermans, D. (2009). Reducing cognitive vulnerability to

depression: A preliminary investigation of memory specificity training (MEST) in inpatients with depressive symptomatology. *Journal of Behavior Therapy and Experimental Psychiatry, 40*, 24–38.Doi: 10.1016/j.jbtep.2008.03.001

Schnyder, U., Bryant, R. A., Ehlers, A., Foa, E. B., Hasan, A., Mwiti, G., . . . Yule, W. (2016).

Culture-sensitive psychotraumatology. *European Journal of Psychotraumatology, 7*(1), 31179.Doi: 10.3402/ejpt.v7.31179

Snyder, C. R., Harris, C., Anderson, J. R., Holleran, S. A., Irving, L. M., Sigmon, S. T., et

al. (1991). The will and the ways: Development and validation of an individual-differences measure of hope. *Journal of Personality and Social Psychology, 60*, 570-585.

Sumner, J. A., Griffith, J. W., & Mineka, S. (2010). Overgeneral autobiographical memory as a

predictor of the course of depression: A meta-analysis. *Behaviour Research and Therapy, 48*,614–625.Doi: 10.1016/j.brat.2010.03.013

Sutherland, K., & Bryant, R. A. (2008). Social problem solving and autobiographical memory in

posttraumatic stress disorder. *Behaviour Research and Therapy, 46*, 154–161.DOI: 10.1016/j.brat.2007.10.005

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A

psychometric analysis. *Cognitive Therapy and Research, 27(3),* 247-259. Doi: 10.1023/A:1023910315561

Watkins, E., & Moulds, M. (2005). Distinct modes of ruminative self-focus: Impact of abstract

versus concrete rumination on problem solving in depression*, Emotion, 5,* 319-328. Doi: 10.1037/1528-3542.5.3.319

Werner-Seidler, A., Hitchcock, C., Bevan, A., McKinnon, A., Gillard, J., Dahm, T., …&

Dalgleish, T., (2018). A cluster randomized controlled platform trial comparing group MEmory specificity training (MEST) to group psychoeducation and supportive counselling (PSC) in the treatment of recurrent depression. *Behaviour Research and Therapy, 105,* 1-9. Doi: 10.1016/j.brat.2018.03.004.

Williams, J. M. G., Barnhofer, T., Crane, C., Hermans, D., Raes, F., Watkins, E., & Dalgleish, T.

(2007). Autobiographical memory specificity and emotional disorder. *Psychological Bulletin, 133,*122–148.doi: 10.1037/0033-2909.133.1.122

Williams, J. M. G., Ellis, N. C., Tyers, C., Healy, H., Rose, G., &MacLeod, A. K. (1996).

Specificity of autobiographical memory and imageability of the future. *Memory and Cognition, 24*, 116–125.Doi: 10.3758/BF03197278

Williams, J. M. G. (1996). Depression and the specificity of autobiographical memory. In D. C.

Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 244–267). Cambridge, England: Cambridge University Press.

Zacks, J.M., Tversky, B., & Iyer, G. (2001). Perceiving, remembering, and communicating

structure in events. *Journal of Experimental Psychology: General*, *130*, 29–58

Ware, J.E., Jr., & Sherbourne, C.D. (1992). The MOS 36-Item Short-Form Health Survey (SF-

36): I. Conceptual Framework and Item Selection. *Medical Care, 30*, 473-483.

Table 1

*Means (and standard deviations) for Group Characteristics and Study Variables*

|  |  |  |
| --- | --- | --- |
| Variables | MEST Group | Control Group |
| Age | 39.23 (8.14) | 43.36 (12.12) |
| Education – years | 5.31 (1.55) | 5.91 (2.02) |
| Baseline Depression | 21.82 (10.88) | 21.82 (11.81) |
| Post-Training Depression | 11.91 (9.13) | 19.64 (9.51) |
| Follow-Up Depression | 13.18 (7.80) | 17.55 (8.21) |
| Baseline Problem-Solving | 6.70 (2.18) | 8.48 (3.37) |
| Post-Training Problem-Solving | 9.48 (2.72) | 8.30 (3.58) |
| Follow-Up Problem-Solving | 9.80 (3.63) | 7.70 (2.97) |

Table 2

*Means (and standard deviations) for Group Characteristics and Study Variables*

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | MEST Group | Control Group | Statistics |
| Age | 22.40 (4.09) | 21.50 (3.06) | *F*(1,22) = .31, *ηp2=* .01 |
| Quality of Life Baseline  Physical functioning  Role limitations due to physical health  Role limitations due to emotional problems  Vitality  Social Functioning  Mental Health  Pain  General Health | 52.26 (22.04)  17.36 (24.99)  5.56 (12.97)  22.10 (12.85)  43.75 (17.27)  29.75 (12.49)  63.64 (16.97)  34.17 (21.93) | 63.33 (22.09)  42.36 (26.46)  5.83 (13.64)  27.08 (14.69)  52.08 (19.82)  27.33 (11.42)  67.08 (13.39)  41.28 (20.76) | *F*(1,22)  *F*= 1.51, *ηp2=* .06  *F*= 5.66\*, *ηp2=* .21  *F*= .003, *ηp2*=.001  *F*= .78, *ηp2=* .03  *F*= 1.21, *ηp2=* .05  *F*= .25, *ηp2=* .01  *F*= .30, *ηp2=* .01  *F*= .67, *ηp2=* .03 |
| Quality of Life Post-Traininga  Physical functioning  Role limitations due to physical health  Role limitations due to emotional problems  Vitality  Social Functioning  Mental Health  Pain  General Health | 73.46 (13.04)  62.50 (27.18)  79.44 (20.83)  42.08 (9.16)  74.38 (10.88)  36.00 (10.58)  74.09 (10.97)  54.58 (5.82) | 33.21 (19.14)  14.58 (19.82)  .00 (.00)  14.58 (11.57)  37.50 (19.22)  24.08 (7.44)  49.79 (20.46)  18.33 (12.67) | *F*(1,21)  *F*= 38.48\*\*, *ηp2=* .65, 95%CI[28.17-56.59]  *F*= 18.46\*\*, *ηp2=* .47, 95%CI[24.71-71.06]  *F*= 185.70\*\*, *ηp2=* .90, 95%CI[67.40-91.68]  *F*= 37.72\*\*, *ηp2=* .64, 95%CI[17.78-35.99]  *F*= 29.41\*\*, *ηp2=* .58, 95%CI[22.28-50.00]  *F*= 8.03\*, *ηp2=* .28, 95%CI[2.91-18.98]  *F*= 11.32\*\*, *ηp2=* .36, 95%CI[9.14-38.97]  *F*= 86.05\*\*, *ηp2=* .80, 95%CI[28.85-45.53] |
| Baseline Rumination | 59.18 (5.49) | 56.58 (10.51) | *F*(1,22) = .10, *ηp2=* .01 |
| Post-Training Ruminationa | 44.17 (4.79) | 64.33 (17.04 | *F*(1,21)=18.21\*\*,*ηp2=* .45,95%CI [-30.83- -10.76] |
| Baseline Hope  Post-Training Hopea | 10.83 (3.71)  21.81 (1.88) | 12.31 (4.50)  9.67 (2.80) | *F*(1,22) = .76, *ηp2=* .03  *F*(1,21) = 183.42\*\*, *ηp2=.*90, 95%CI [10.56-14.40] |
| \* *p* < .05; \*\**p* < .01. a Post-training analyses included baseline data as a covariate | | | |

*Figure 1.* CONSORT (consolidated standards of reporting trials) diagram of the progress through the phases of the randomized trial.

Assessed for eligibility (*n*= 27)

## Enrollment

Excluded (*n*= 3 )

-Not meeting inclusion criteria (*n*= 1)

- Declined to participate in MEST (*n*= 2)

Randomized (*n* = 24)

## Allocation

Allocated to Control (*n* = 11)

## Analysis

## Analysis

## Analysis

## Follow-Up

Completed MEST Intervention (*n* = 11)

Discontinued intervention (dropped out after Session 2) (*n*= 2 )

## Post-Training

Completed Follow-Up (*n* = 11)

Lost to Follow-Up (*n* = 0)

Completed Follow-Up (*n* = 11)

Lost to Follow-Up (*n* = 2)

Lost to Follow-Up (*n* = 0)

Allocated to MEST Intervention (*n* = 13)

Received Allocated Intervention (*n* = 13)

Analysis Including Pre- and Post-Intervention Data (*n* = 11)

Analysis Including Follow-Up Data (*n* = 11)

Data not included in Analyses (*n*= 0)

Analysis Including Pre- and Post-Intervention Data (*n* = 11)

Analysis Including Follow-Up Data (*n* = 11)

Data not included in Analyses (*n*= 2)

*Figure 2.* CONSORT (consolidated standards of reporting trials) diagram of the progress through the phases of the randomized trial.

Assessed for eligibility (*n*=300)

## Enrollment

Met eligibility for moderate depression (*n* = 30).

24 participants randomly selected

Randomized (*n* = 24)

## Allocation

Allocated to Control (*n* = 12)

Allocated to MEST Intervention (*n* = 12)

Received Allocated Intervention (*n* = 12)

## Post-Training

Lost to Follow-Up (*n* = 0)

Completed MEST Intervention (*n* = 12)

Did not complete MEST Intervention (*n*=0)

## Analysis

Analysis Including Pre- and Post-Intervention Data (*n* = 12)

Analysis Including Follow-Up Data (*n* = 12)

Analysis Including Pre- and Post-Intervention Data (*n* = 12)

Analysis Including Follow-Up Data (*n* = 12)

## Analysis

## Analysis

1. There was no significant change in the control group at post-training, *F*(1, 10)= 1.26, *p*= .29, *ηp2*= .11, *M*difference = -2.18, *SE*= 1.94, 95%CI [-6.51- 2.15], or follow-up, *F*(1, 10)= 2.82, *p*= .12, *ηp2*= .22, *M*difference = -4.27, *SE*= 2.54, 95%CI [-9.94-1.40], when compared to baseline. [↑](#footnote-ref-1)
2. There was no change in the control group, *F*s<1, ηp2s< .04 [↑](#footnote-ref-2)
3. Compared to baseline, the control group at post-training had significantly lower levels of hope, *F*(1, 11)= 6.26, *p*=.03, *ηp2*= .36, *M*difference= -2.63, *SE*= 1.05, 95%CI [-4.94--.32], and worse physical health, *F*(1, 11)= 20.21, *p*=.001, *ηp2*= .65, *M*difference= -30.13, *SE*= 6.70, 95%CI [7-44.87- -15.38]; role limitations - physical health, *F*(1, 11)= 8.03, *p*=.02, *ηp2*= .42, *M*difference= -27.78, *SE*= 9.80, 95%CI [-49.35- -6.20]; pain, *F*(1, 11)= 5.61, *p*=.04, *ηp2*= .34, *M*difference= -17.29, *SE*= 7.30, 95%CI [-33.36- -1.23], and general health, *F*(1, 11)= 13.49, *p*<.01, *ηp2*= .55, *M*difference= -22.95, *SE*= 6.25, 95%CI [-36.70- -9.20]. There was no significant change in rumination, *F*(1, 11)= 2.85, *p*=.12, *ηp2*= .21, *M*difference= 7.75, *SE*= 4.59, 95%CI [-2.36- 17.86], role limitations - emotional problems, *F*(1, 11)= 2.19, *p*=.17, *ηp2*= .16, *M*difference= -5.83, *SE*= 3.94, 95%CI [-14.50-2.84]; vitality, *F*(1, 11)= 4.02, *p*=.07, *ηp2*= .27, *M*difference= -12.50, *SE*= 6.23, 95%CI [-26.21-1.21]; social functioning, *F*(1, 11)= 2.66, *p*=.13, *ηp2*= .19, *M*difference= -14.58, *SE*= 8.95, 95%CI [-34.28-5.12]; or mental health, *F*(1, 11)= .68, *p*=.43, *ηp2*= .06, *M*difference= -3.25, *SE*= 3.96, 95%CI [-11.96-5.46]. [↑](#footnote-ref-3)