Brief Empirical Report

aps ASSOCIATION FOR PSYCHOLOGICAL SCIENCE

Clinical Psychological Science
1(1) 84–92

DOI: 10.1177/2167702612454613
http://cpx.sagepub.com
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Enhancing Autobiographical Memory Specificity Through Cognitive Training: An Intervention for Depression Translated From Basic Science

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Abstract

The objective of this study was to investigate the efficacy of memory specificity training (MEST) on autobiographical memory recall and depression. Afghan adolescents with depression were randomly assigned to a MEST group or to a control group. At baseline, both groups completed Persian versions of the Autobiographical Memory Test (AMT) and the Mood and Feelings Questionnaire (MFQ). The MEST group then had five weekly group sessions of MEST. The control group had no additional contact. The AMT and MFQ were then readministered to all participants, and the MFQ was readministered at 2-month follow-up. The MEST group retrieved a higher proportion of specific memories following training and had lower levels of depression at 2-month follow-up than did the control group. Change in memory specificity predicted follow-up depression over and above baseline depression and mediated the relationship between receipt of MEST and reduction in later depression. The results suggest that MEST can improve autobiographical memory performance and drive subsequent reduction in depression symptoms.

Keywords

memory specificity training, autobiographical memory, depression, adolescence

Received 4/5/12; Revision accepted 6/8/12

Reduced autobiographical memory specificity (AMS) is considered a cognitive marker and predictor of the course of depression (Sumner, Griffith, & Mineka, 2010). That is, individuals with depression, those in remission, and formerly depressed individuals all have significant difficulties providing specific memories (Williams et al., 2007). There is now substantive evidence that reduced AMS has important implications for the functionality of everyday cognition. Reduced AMS has been found to be associated with impaired everyday and interpersonal problem solving (Raes et al., 2005; Sutherland & Bryant, 2008), difficulties in imagining specific events in the future (Williams et al., 1996), rumination (Williams, 1996), and a lack of exposure to negative memories and associated negative emotions—which, although unpleasant in the short term, is associated with well-being in the longer term (Raes, Williams, & Hermans, 2009). Consequently, these difficulties potentially result in ongoing negative social encounters, diminished positive social reinforcement and self-efficacy, feelings of hopelessness, and depressed mood (Raes et al., 2009). In light of these relationships, it is not surprising that reduced AMS has been found to predict subsequent major depression at 6 months, over and above what could be predicted from initial symptom severity (Kleim & Ehlers, 2008). Importantly, research suggests that reduced AMS is not a fixed feature of an individual's mnemonic style (Yeung, Dalgleish, Golden, & Schartau, 2006); it can be modified (Williams, Teasdale, Segal, & Soulsby, 2000). Therefore, it is proposed that clinical efforts to improve AMS should have positive clinical outcomes for patients who are depressed (Raes et al., 2009).

Preliminary research has investigated whether a brief training program targeting AMS can mitigate this known vulnerability factor for depression and whether these improvements

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are accompanied by improvements in the variables assumed to mediate the influence of AMS on the course of depression (Raes et al., 2009). Raes et al. evaluated the effect of a group-based standalone training program (memory specificity training; MEST) comprising four weekly 1-hour sessions with 10 depressed female inpatients. They found that participants' retrieval styles became significantly more specific and that observed improvements in AMS were significantly associated with improvements in rumination, cognitive avoidance, and problem-solving skills. As the researchers acknowledge, this was a preliminary study hampered by the absence of a control group, by a relatively high dropout rate, and because there was no follow-up period. This latter issue is particularly important because, theoretically, one would expect that any advantages in terms of depression symptoms accrued by the reduced specificity of memories would emerge some weeks following the memory intervention—a point that the researchers emphasize and that led to their excluding any analysis of depressive symptoms in their report (Raes et al., 2009; Williams et al., 2007). These limitations notwithstanding, this initial study supports the theoretical hypothesis that it is possible to modify AMS and validates a training program to achieve this goal. The data suggest that MEST may be a promising program that improves a core cognitive component of depression (Raes et al., 2009).

The present study takes this research to the next stage. Three key questions are addressed. First, in a blinded, randomized design, can participants in the MEST group increase AMS compared with those in the control group? Second, does MEST lead to any improvement in depressive symptomatology either immediately following training or, more likely, at follow-up? Third, do increases in AMS over the course of training mediate any improvements in depression at follow-up? This latter question is particularly important, as it speaks to the theoretically predicted causal relationship between AMS enhancement and depression reduction (Williams et al., 2007).

To explore these questions, we recruited bereaved adolescents who were currently experiencing significant symptoms of depression and who were recent refugee immigrants from a war zone. We know that adolescents with depression also present with reduced AMS (Kuyken & Dalgleish, 2011), which is of clinical importance given that adolescence is a central developmental period in terms of the etiology and long-term prognosis of depression (Kuyken & Dalgleish, 2011). We also know that reduced AMS is associated with the experience of trauma (Dalgleish, Rolfe, Golden, Dunn, & Barnard, 2008) and with difficulties following bereavement (Golden, Dalgleish, & Mackintosh, 2007). This sample is therefore an ideal group to address the current research questions.

Method

Participants

We used data from Raes et al. (2009) as the basis for a power calculation. In their study, MEST produced a change in the proportional measure of AMS of 1.1 standard deviation units. Based on this effect size, and assuming no change in AMS in our control group, we calculated that a sample size of 22 (11 per group) would provide 80% power, with a directional alpha of .05, to detect a similar improvement in AMS in the present study. We approached a charity school for adolescents in Qhom, Iran, to collaborate in providing participants for the study. Seventy adolescents consented to be assessed, all of whom had lost their fathers due to the war in Afghanistan and had subsequently immigrated to Iran as refugees. Following Raes et al.'s procedure, participants were selected if they were experiencing significant levels of depressive symptomatology. Specifically, to be included in the training study, participants had to score higher than 27 on the Persian version of the Mood and Feeling Questionnaire (pMFQ). The Mood and Feeling Questionnaire (MFQ) is a well-established questionnaire intended for use with adolescents; it covers a broad range of depression symptoms. The cutoff of 27 was selected because research indicates that adolescents who score above 27 on the MFQ meet the screening criteria for major depression disorder; these results hold for the pMFQ (Neshat-Doost, Nouri, Molavi, Kalantari, & Mehrabi, 2006; Park, Goodyer, & Teasdale, 2002; Wood, Kroll, Moore, & Harrington, 1995). We decided not to exclusively select participants who met the diagnosis for depression, because reduced AMS has been found to be a transdiagnostic impairment and to be present in those who are in remission or have recovered from depression; also, the MFQ has been found to be sensitive to detecting high-level depression symptoms.

Twenty-three adolescents met this inclusion criterion on the pMFQ and were randomized[1] to either MEST (n = 12) or the control condition (n = 11). The mean number of years participants had been in Iran was 9.51 (SD = 3.28). There were 11 girls and 12 boys. The mean age of the participants was 14.88 years (SD = 1.89). The mean number of years of education was 6.84 (SD = 2.08).

Materials

Autobiographical Memory Task (AMT). The AMT (Williams & Broadbent, 1986) is the gold-standard test of memory specificity, and the version presented here was identical to that prototypically employed in the existing research. The AMT has adequate psychometric properties (Griffith et al., in press). In the present study, participants were presented with 18 Persian cue words consisting of positive (e.g., *party*, مهماني), negative (e.g., *accident*, تصادف), and neutral (e.g., *class*, کلاس) words. These words were selected based on a pilot study in which the positive and negative emotionality of several hundred Persian words were rated by 60 raters. Three psychologists then selected six positive, six negative, and six neutral words with the highest emotionality ratings that were also balanced for frequency of use and length (Griffith et al., 2009). Before use in the current study, these words were tested for feasibility as memory cues with 30 Afghan adolescents living in Isfahan.

The cue words were presented in written form, each on an A4 card, in a separate random order for each participant. Participants were instructed to read each word aloud, and they were then given 30 s in each case to retrieve a specific memory. Participants were told that the memory they recalled could be an important or trivial event that happened recently or a long time ago, but that it should be something that happened at a particular time on a particular day. Examples of acceptable and unacceptable responses were given. Three practice cues were given (*gigantic, bag*, and *homework*). Generated memories were tape recorded for coding. Specific memories were defined as events that lasted for a day or less. Nonspecific memories were coded as extended (events that lasted for longer periods of time) or categoric (events that occurred repeatedly over a period of time) memories, in line with the previous literature (Williams et al., 2007); these data are presented in the Results section. If a participant failed to recall a memory or talked about things that were not memories, the response was classified as "no memory." The raters were blind to the study's aims and to the group allocation of participants. A second assessor rated 20% of the memories. Interrater reliability for specificity and nonspecificity was good ($\kappa = .92$). Research has found that, in the absence of any manipulation or intervention, there is consistency and stability in scores on the AMT across time; this is consistent with the notion of AMS as a stable trait variable (Griffith et al., in press). Therefore, as in previous research examining change in AMS (Sutherland & Bryant, 2008), parallel forms of the AMT were not employed. The inclusion of a control group also ensured that in the unlikely event of any practice effects in the experimental group, such changes would be taken account of in the analyses.

Adult Reading Test (ART). The Persian version (Haghshenas, Farashbandi, Mani, & Tahmasbi, 2001) of the ART (Brooks, Everatt, & Fidler, 2004) assesses the literacy skills of adolescents and adults in Persian. This was included to assess the comparability of the groups in terms of verbal ability, which can influence performance on the AMT (Williams et al., 2007). It has been standardized for Persian speakers, and the psychometric properties have been found to be good (Haghshenas et al., 2001).

Mood and Feeling Questionnaire (MFQ). We used the Persian version (Neshat-Doost et al., 2006) of the MFQ (Angold, Costello, Pickles, & Winder, 1987), which is a 32-item questionnaire based on criteria for depression. It consists of a series of descriptive phrases regarding how the participant has been feeling or acting, and the adolescent rates whether the phrase was descriptive of *most of the time, sometimes*, or *not at all* in the past 2 weeks. The reliability and validity of the Persian measure has been found to be good (Neshat-Doost et al., 2006). In the current study, internal consistency was high ($\alpha = .92$).

Revised Children's Manifest Anxiety Scale (RCMAS). To assess anxiety and ensure comparability across groups, the Persian version of the RCMAS (Reynolds & Richmond, 1978) was used because it measures the level and nature of anxiety as experienced by adolescents and has good psychometric properties (Taghavi & Alishahi, 2004). In the current study, internal consistency was good ($\alpha = .79$).

Impact of Event Scale (IES). The IES (Horowitz, Wilner, & Alvarez, 1979) is a 15-item self-report questionnaire measuring the severity of symptoms of intrusion and avoidance around a specified event—in this case, paternal bereavement. The Persian version of the IES was used (Moradi, Herlihy, Yasseri, Turner, & Dalgleish, 2008). In the current study, internal consistency was good ($\alpha = .83$). We included the IES to provide a measure of postevent symptomatology at baseline so that we could ensure comparability across the two groups.

MEST

MEST was conducted by trained senior clinical psychologists, Hamid Taher Neshat-Doost and Sayed Jafar Ahmadi. The training package consisted of five weekly 80-min group sessions in one of the classrooms. All words used in the training were different from the words used in the AMT.

Session 1 included the aims and outline of MEST. At the beginning of this session, the definition and importance of key terms, such as *autobiographical memory* and *recall*, and the three types of autobiographical memory (specific, extended, and categoric) were explained. Examples of each of the recall types were written on a whiteboard. At the end of the session, participants were given 10 cue words and were instructed to write down specific, extended, and categoric memories for each of the words during the next week as homework. Each participant was provided with a pen and notebook to use for summarizing sessions and for homework tasks.

Session 2 commenced with a review of Session 1 and homework. The group then was prompted to give positive cue words. These words were written on the whiteboard, and participants were asked to provide a specific memory for each of the cue words. If one of the participants recalled a nonspecific memory, the type of the memory (i.e., categoric or extended) was clarified, and the participants were prompted to recall specific memories. At the end of the session, 10 positive cue words were given and participants were asked to provide one specific memory for each of the words as homework.

Sessions 3 and 4 were very similar to Session 2, as were the associated homework tasks. The only difference was the content of the cue words. The cue words were negative for Session 3 and neutral for Session 4.

Session 5 was again similar to previous sessions. The distinction between different types of autobiographical memory recall was practiced with positive, negative, and neutral cue words, and the difference between a memory and a nonmemory was clarified.

Procedure

Ethical approval was obtained from the University of Isfahan. An information sheet and a consent form were given to participants and their parents or guardians. Participants were tested individually in a classroom by researchers blind to group status on three occasions: at pretraining, posttraining, and 2-month posttraining follow-up. The pretraining assessment consisted of the AMT, ART, MFQ, IES, and RCMAS. Following this, we randomly allocated participants to either MEST or the control group (which had no additional contact). The AMT, RCMAS, and MFQ were readministered at posttraining, and the RCMAS and MFQ were again readministered 2 months later. Figure 1 summarizes the trial CONSORT (consolidated standards of reporting trials) diagram.

Results

Participant characteristics

Participant characteristics and group comparisons are presented in Table 1. The groups did not differ significantly on demographic or baseline measures.

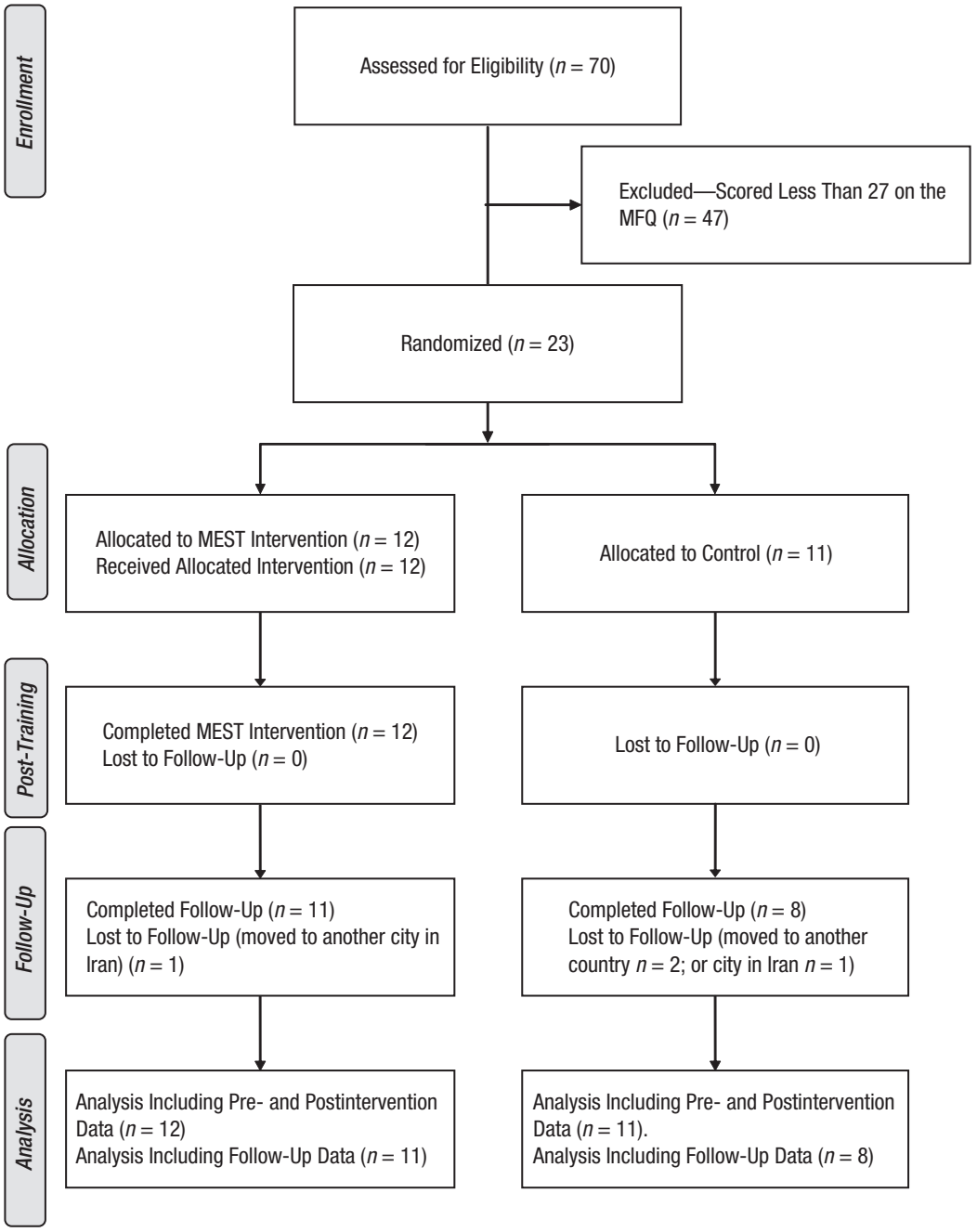

Fig. 1. CONSORT (consolidated standards of reporting trials) diagram of the progress through the phases of the randomized trial.
Note: MFQ = Mood and Feeling Questionnaire; MEST = memory specificity training.

Table 1. Means (Standard Deviations) for Participant Characteristics and Proportion of Specific, Extended, and Categoric Memories at Pre- and Posttraining for the MEST and Control Groups

	MEST (n = 12; male = 6, female = 6)	Control (n = 11; male = 6, female = 5)	t value	p value
Age	15.25 (1.66)	15.45 (2.07)	–0.26	.80
Education, years	6.92 (1.16)	6.45 (2.02)	0.68	.50
Education, term grade	17.07 (2.13)	17.08 (1.32)	0.02	.99
Education, year grade	17.20 (1.32)	16.87 (1.80)	0.30	.77
Time in Iran, years	9.00 (3.10)	11.18 (4.12)	1.44	.16
ART	22.58 (6.58)	25.63 (9.71)	0.84	.41
MFQ pretraining	27.42 (13.63)	30.64 (15.47)	0.53	.60
IES	24.00 (13.44)	27.27 (12.97)	0.59	.56
RCMAS pretraining	17.75 (4.20)	18.64 (4.37)	0.50	.63
AMT pretraining				
Specific	.63 (.15)	.61 (.51)	0.45	.66
Categoric	.23 (.61)	.29 (.20)	–1.29	.21
Extended	.14 (.10)	.10 (.09)	0.67	.51
AMT posttraining				
Specific	.95 (.07)	.65 (.15)	6.13	< .0001
Categoric	.03 (.05)	.23 (.17)	–3.56	< .01
Extended	.02 (.03)	.12 (.19)	–3.35	< .01

Note: MEST = memory specificity training; ART = Adult Reading Test; MFQ = Mood and Feeling Questionnaire; IES = Impact of Event Scale; RCMAS = Revised Children's Manifest Anxiety Scale; AMT = Autobiographical Memory Test.

Research Question 1: Specificity

Table 1 shows the mean proportion of specific memories retrieved across the two groups at pre- and posttraining.[2] A 2 (group: MEST, control) × 2 (time: pretraining, posttraining) mixed analysis of variance (ANOVA) was used with the proportion of specific memories as the dependent variable. There was a significant Group × Time interaction, $F(1, 21) = 9.84$, $p < .01$, $\eta_p^2 = .32$. Table 1 shows that although there was no significant difference between the groups at pretraining ($d < 0.01$), at posttraining the MEST group retrieved a significantly greater proportion of specific memories than did the control group ($d = 2.56$).[3] In addition, whereas the control group did not differ in terms of memory responses at pre- and posttraining, $t(10) = 0.80$, $p = .45$, $d = 0.33$, the MEST group provided a significantly greater proportion of specific memories at posttraining than at pretraining, $t(11) = 4.82$, $p = .0001$, $d = 2.14$. This effect size was smaller but comparable to that found in the initial study of Raes et al. (2009; current study $\eta_p^2 = .59$; Raes et al.'s study $\eta_p^2 = .73$). To check whether changes in depressive symptomatology accounted for these findings, the mixed ANOVA was recalculated using pretraining, posttraining, or change in MFQ scores as covariates. The results remained significant, indicating that changes in depressive symptomatology do not explain the changes in AMS.

Research Question 2: Depression symptoms

Figure 2 shows the mean MFQ scores for the two groups at pretraining, posttraining, and follow-up. Four participants (MEST = 1, control = 3) could not be contacted at the follow-up stage because they had moved to other cities. Therefore, the imputation method of carry forward of last observed response was used to reduce the effect of deviations from random allocation (Hollis & Campbell, 1999).[4] A 2 (group: MEST, control) × 3 (time: pretraining, posttraining, follow-up) mixed ANOVA was used with MFQ as the dependent variable. There was a significant Group × Time interaction, $F(1, 21) = 4.89$, $p = .04$, $\eta_p^2 = .19$. Planned comparisons showed no significant differences between the groups at pretraining, $t(21) = 0.53$, $p = .60$, $d = 0.22$, or posttraining, $t(21) = 1.25$, $p = .23$, $d = –0.52$. However, participants in the MEST group were significantly less depressed than those in the control group at follow-up, $t(21) = 2.35$, $p = .03$, $d = 0.97$. In addition, participants in the

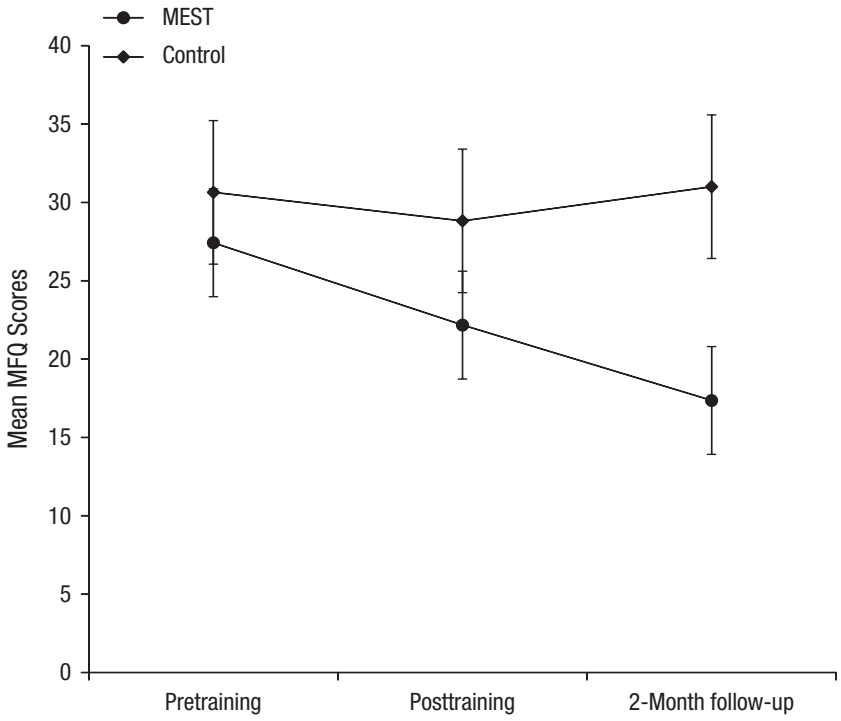

Fig. 2. Mean depression (MFQ) scores at pretraining, posttraining, and follow-up.
Note: MFQ = Mood and Feeling Questionnaire; MEST = memory specificity training.

MEST group did not differ in terms of depression at pre- and posttraining, $t(11) = 1.43$, $p = .18$, $d = 0.42$, but were significantly less depressed at follow-up compared to at posttraining, $t(10) = 2.42$, $p = .03$, $d = 0.47$. Participants in the control group did not differ in depression scores between pretraining, posttraining, and follow-up.

Research Question 3: Relationship between changes in AMS and depression symptoms

Change scores were computed for the MFQ and AMS (posttraining minus pretraining; Dimitrov & Rumrill, 2003). To determine the relative contribution of improved AMS on follow-up depression over and above the contribution of baseline depression, we conducted a hierarchical regression that entered MFQ baseline scores at the first step and AMS change scores at the second step. It was found that although baseline depression did significantly predict follow-up depression when entered as the first variable in the hierarchical regression (adjusted $R^2 = .45$, $\beta = .69$, $SE = .16$, $t = 4.31$, $p < .001$), AMS change did significantly and independently predict follow-up depression (adjusted $R^2 = .62$, $\Delta R^2 = .18$, $\beta = -.44$, $SE = 6.11$, $t = -3.25$, $p < .01$). It was also found that although MFQ change did not significantly predict follow-up depression (adjusted $R^2 = .04$, $\beta = .10$, $SE = .30$, $t = .45$, $p = .66$), AMS change did significantly and independently predict follow-up depression (adjusted $R^2 = .29$, $\Delta R^2 = .34$, $\beta = -.61$, $SE = 8.31$, $t = 3.20$, $p < .01$).

Next, we carried out a mediation analysis using bootstrapping procedures (Preacher & Hayes, 2008) with 5,000 resamples with replacement to examine whether the relationship between group allocation and follow-up depression was mediated by standardized residual change scores (as in the study by Raes et al., 2009) in AMS. Because baseline depression scores predicted follow-up depression scores, they were included as a covariate in the mediation analysis. Statistical significance ($\alpha = .05$) is indicated by the 95% confidence intervals not crossing zero. It was found that change in AMS mediated the relationship between group allocation and follow-up depression, with a 95% bootstrap confidence interval of –23.07 to –3.62.[5]

Discussion

This study investigated the impact of MEST on AMS and symptoms of depression in a distressed sample of bereaved adolescent Afghan refugees. The results indicated that MEST was successful in significantly enhancing AMS in trained participants relative to no significant change in the control group. Moreover, consistent with earlier studies (Raes et al., 2009; Williams et al., 2000), this improvement remained significant when depression scores were included as a covariate, suggesting that AMS changes were not simply an epiphenomenon of changes in mood. Second, although the groups did not differ in terms of depressive symptomatology following MEST, adolescents in the MEST group had significantly lower levels of

depressive symptoms at the 2-month follow-up than did those in the control group. Third, the study found that improved AMS predicted follow-up depression scores over and above depression change scores from pre- to posttraining and baseline depression. Furthermore, change in AMS was found to mediate the relationship between group allocation and follow-up depression. This suggests that MEST improves AMS, which in turn has a causal effect on improving depression symptomatology in the longer term.

To our knowledge, this is the first study of MEST employing a controlled design, the first to examine the impact of MEST on depressive symptoms, and the first to examine the relationship between changes in AMS and depression. Clinically, the findings are promising because they suggest that MEST, a standalone training program that focuses on memory recall, can improve depression symptoms. Thus, including a brief training component that targets memory recall as an adjunct to cognitive behavior therapy or prior to therapy may have beneficial effects on memory recall and mood. The findings are also clinically important because they demonstrate improvements in AMS and mood in adolescence, which is a central developmental period in terms of depression. This population is also of interest because it is a non-Western refugee group. Initial findings suggest that reduced AMS is a cognitive bias that occurs across cultures (Humphries & Jobson, in press). The current study demonstrates that AMS is modifiable across cultures.

Recent years have witnessed significant advances in understanding the cognitive science of depression, but the majority of these insights have yet to be translated into clinical application. To further advance knowledge in this field, the following developments are suggested. Basic research over several decades has established that reduced AMS is a cognitive marker and predictor of the course of depression and, without intervention, is a stable trait marker of the disorder when patients are in episode and in remission. Such research has resulted in a strong theoretical foundation for the role of AMS in depression (e.g., Williams et al., 2007); this research has identified in preliminary form a possible intervention (MEST) to improve symptoms of depression (preclinical phase; Medical Research Council, 2000). The current study, combined with data from Raes et al. (2009), tested whether the intervention is feasible and whether the theoretically expected treatment effect is supported (exploratory trial phase; Medical Research Council, 2000). The results are promising and demonstrate the clinical efficacy in reducing depressive symptoms of this simple, standalone training program that has been translated from basic science. These findings suggest that a later-phase trial (Medical Research Council, 2000) comparing MEST with another active intervention is warranted. Additional research questions concern whether these findings replicate in other populations and whether the theoretically proposed mechanisms (e.g., problem solving, ability to imagine the future, rumination, exposure to negative memories) mediate the relationship between enhanced AMS and improvements in depression.

Some aspects of the study merit comment. The study would have been improved had the control group been involved in a similar group setting and given similar cognitive tasks that did not focus on AMS. Although it seems unlikely that simple inclusion in a regular group convention would have resulted in changes in a stable trait variable such as memory specificity, which then mediated reduction in depressed symptoms, the use of a minimal contact control is a limitation. In addition, the sample size was small. However, it was in line with our power calculation, which was shown to be appropriate given the effect sizes generated, and our a priori hypotheses were supported, suggesting that lack of power was not an issue here. We deliberately focused on participants with high levels of depressive symptoms rather than a particular *Diagnostic and Statistical Manual of Mental Disorders* diagnosis. This is consistent with the initial study by Raes et al. (2009) and reflects the fact that reduced AMS is a transdiagnostic marker for a range of diagnoses, including Major Depressive Disorder, Complicated Grief, and Posttraumatic Stress Disorder (Williams et al., 2007). It would be interesting in future, larger studies to examine the effects of MEST as they pertain to different nosological categories. We acknowledge that we did not use parallel forms of the AMT at pre- and posttraining, based on our empirically derived assumption that the practice and familiarity effects would be minimal. As expected, the control group exhibited almost no change in AMS over time, suggesting that it is unlikely that practice effects accounted for findings. In sum, the present findings support MEST as an active training intervention that can successfully reduce AMS in adolescents with depressive symptomatology, thereby mediating improvements in depressed mood at 2-month follow-up.

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.

Funding

This research was funded by the Children and War Foundation. Laura Jobson received funding from a postdoctoral research fellowship award from the National Institute for Health Research. Tim Dalgleish was supported by the UK Medical Research Council (MC-US-A060-0019).

Notes

1. Allocation was made using a random-number list generated by computer and concealing the result of each randomization in a sealed, numbered envelope that was opened only after the participant had consented to participate.
2. Although the current study focuses on specific memories, findings were similar if extended, categoric, or no memories were substituted into the analyses.
3. To estimate the statistical significance of the intervention effect accounting for the group component of variance, we used the correction formulas outlined by Baldwin, Murray, and Shadish (2005). At posttraining, the MEST group still retrieved a significantly greater proportion of specific memories than did the control group ($p < .001$).

4. Similar findings emerged when the imputation method was not used; participants in the MEST group were significantly less depressed than those in the control group at follow-up, $t(17) = 2.34$, $p = .03$, and those in the MEST group were significantly less depressed at follow-up compared to posttraining, $t(10) = 2.47$, $p = .03$. Participants in the control group did not differ in depression scores between posttraining and follow-up.

5. When controlling for baseline depression, categoric standardized residual change scores did not significantly mediate the relationship between group allocation and follow-up depression, with a 95% bootstrap confidence interval of –9.54 to 4.24.

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