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Original article

Metacognitive Training for Depression (D-MCT) reduces false memories in depression. A randomized controlled trial

Steffen Moritz[1,*], Brooke C. Schneider[1], Judith Peth, Sönke Arlt, Lena Jelinek

Department of Psychiatry and Psychotherapy, University Medical Center Hamburg-Eppendorf, Martinistraße 52, 20246 Hamburg, Germany

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ABSTRACT

Metacognitive Training for Depression (D-MCT) is a highly standardized group program targeted at depression-related ("Beckian") emotional as well as cognitive biases, including mood-congruent and false memory. While prior results are promising with respect to psychopathological outcomes (depression), it is unclear whether D-MCT also meets its goal of improving cognitive biases, such as false memories.

In the framework of a randomized controlled trial (registered trial, DRKS00007907), we investigated whether D-MCT is superior to an active control condition (health training, HT) in reducing the susceptibility of depressed patients for false memories. False memories were examined using parallel versions of a visual variant of the Deese-Roediger McDermott paradigm.

Both groups committed less false memories at post assessment after 4 weeks compared to baseline. Relative to HT, D-MCT led to a significant decrease in high-confident false memories over time.

The study presents first evidence that D-MCT decreases the susceptibility of depressed patients for false memories, particularly for errors made with high confidence that are presumably the most "toxic" in terms of mood-congruent memory distortions.

1. Introduction

Major depression is one of the most prevalent and debilitating psychiatric disorders [1] and ranks 5th worldwide among the leading causes of years lived with disability [2]. It affects one in seven persons at some point during their life, with a lifetime morbidity risk of approximately 30% [3]. The disorder is multidimensional and involves cognitive (e.g., concentration difficulties), somatic (e.g., disrupted sleep), and emotional symptoms (e.g., feelings of guilt and/or worthlessness) and most individuals with a depressive disorder experience some difficulties in social, occupational and home functioning [4,5].

Whereas memory dysfunctions are not among the core diagnostic features of depression, they are prevalent [6] and represent a multi-faceted and important *battleground* for the disorder. In addition to "cold" memory deficits for retrospective [7,6] and prospective material [8] that manifest already at the first episode [9], a number of memory distortions have been elucidated in depression that likely play a role in both the formation and maintenance of the disorder. For quite some time now, over-generalized autobiographical memory (OGM) has been implicated as an important cognitive contributor to depression. OGM is associated with depression severity [10] as well as an increased risk for disease chronicity [11–15]. Another well-researched cognitive bias that has attracted attention since the 1980s [16,17] is the mood-congruent memory (MCM) effect [18], which refers to the phenomenon that depressed patients often show better recall and recognition for negative-valenced memory material [19,20]. It has been argued that this bias is most prominent for negative information that is personally relevant [18,19,21].

In addition, the phenomenon of false memories has been investigated in depression. False memories are defined as the recall of objects that were never presented, or events that never occurred [22]. Several studies have demonstrated that depression is not only characterized by enhanced loss of memory information, but also an increased susceptibility for false memories [20,21,24–26]. Importantly, false memories, as retrospective memories, are often mood-congruent: Patients or individuals with a negatively-induced mood are more prone to falsely remember negative information [21,23,25–28]. More recently, it was found that MCM is modulated by context, as it makes a difference whether a positive word like "love" is presented with a positive or negative adjective (e.g., "no" or "much") [25,26,29].

* Corresponding author.
E-mail address: moritz@uke.de (S. Moritz).
[1] Split first author.

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The aforementioned memory distortions may lower mood in multiple ways. "Cold" (or content-neutral) cognitive dysfunction is related to psychosocial and functional outcome [30,31]) and cognitive dysfunction may be a primary mediator of functional deficits observed in depression [5,32]. For example, low work performance is likely to lower mood via enhanced stress and other negative consequences (e.g., working over-time). However, some cognitive dysfunctions are secondary (see below) and subjective perception of decreased memory performance is more pronounced than objective problems [33]. The former may foster unfounded worry about developing dementia or neurodegeneration, especially in middle-aged or older patients, which can foster depressive symptoms by catastrophizing [34]. Memory preference for negative material may thus lead to a preponderance of negative information in an individuals' consciousness and heavily distorts one's view of him- or herself and others, as well as the future [i.e., cognitive triad of depression; 35]. Accordingly, improving memory performance and "correcting" memory biases may also represent an important mechanism for mood repair. We thus concur with recent calls [35,36] to make cognitive problems a core target of depression treatment.

Psychotherapy, and particularly cognitive behavioral therapy (CBT), has shown to be effective in the treatment of depression, including relapse prevention [37,38]. CBT targets cognitive-affective biases, such as selective abstraction and over-generalization. In contrast, teaching patients about the aforementioned memory problems and biases is not part of standard CBT programs. Metacognitive Training for Depression (D-MCT) aims to fill this gap [39]. D-MCT amalgamates CBT exercises with a metacognitive approach that aims to modify depression-related "Beckian" emotional, as well as more general cognitive biases. D-MCT is a highly standardized open group intervention that contains eight modules. It is rooted in MCT for psychosis; for the similarities and differences between D-MCT and metacognitive therapy by Wells' please see a recent commentary [40]. One of D-MCT's eight modules is devoted to memory. Patients are educated about memory problems in depression (and their origin), are introduced to the phenomenon of mood-congruent (false) memories and are taught how to improve their memories. It also addresses the frequent worry of patients that they may develop dementia. As discussed above, while memory impairment and other neuropsychological dysfunctions frequently occur in depression, the module uses a psychoeducational approach to inform patients that such memory difficulties may also be secondary to reduced motivation, or anxiety, as well as rumination or concentration difficulties during formal assessments [41,42]. Disclosure of these secondary influences is intended to attenuate patients' exaggerated worries about a neurodegenerative process (normalization).

Results from a pilot study revealed positive effects of D-MCT on depressive symptoms [43]. Similar results were reported in a randomized controlled trial (RCT), in which D-MCT was found to be superior compared to an active control group with medium to strong effect sizes [44]. Additionally, patients rate the training positively at both immediate and long-term assessments [45].

This is the first study to investigate the influence of D-MCT on the proneness for false memories in depressed patients. We hypothesize that in comparison to a control intervention (i.e., Health Training), D-MCT would yield a greater effect in reducing patients' susceptibility for false memories from baseline to post-assessment after 4 weeks.

2. Methods

2.1. Participants

This study is part of a larger trial [44], which reports results on the primary outcomes [i.e., measures of depression, dysfunctional attitudes, self-esteem and overall functioning] but not on false memories. A total of 84 patients who fulfilled DSM-IV diagnostic criteria for a depressive disorder and had no history of psychotic symptoms (i.e., hallucinations, delusions, or mania), current suicidality (Suicidal Behaviors Questionnaire Revised score ≥ 7), or intellectual disability (estimated IQ < 70). Patients were recruited from a psychosomatic outpatient day clinic (RehaCentrum Hamburg) at the University Medical Center Hamburg-Eppendorf (Germany). Patients were randomly allocated to either Metacognitive Training for Depression (D-MCT; $n = 41$) or Health Training (HT; $n = 43$). Written informed consent was obtained from all participants before participation in the baseline assessment. The study was approved by the Ethics Committee of the German Association for Psychology (DGPs) and was conducted in accordance with the Declaration of Helsinki. For the current study, participants with substance or alcohol dependence, as well as patients with a neurological disorder (including brain injury) were excluded. A total of 77 participants underwent the false memory paradigm at pre-assessment (92% from entire sample) and 68 at post-assessment [88% retention rate from subsample; D-MCT, $n = 39$ (pre), $n = 33$ (post); health training, $n = 38$ (pre), $n = 35$ (post)]. Table 1 shows group comparisons at baseline. Individuals in the two condition did not differ on any psychopathological or background characteristics, including type of medication, number of episodes and comorbid diagnoses. All participants provided written informed consent prior to participation. The study was registered at the German Clinical Trials Register (No. DRKS00007907).

Table 1
Sociodemographic and Psychopathological Characteristics of the Sample. Frequencies, Means and Standard Deviations (in Brackets).

Variable	D-MCT (n = 39)	HT (n = 38)	Statistics
Background characteristics			
Age	44.28 (10.11)	47.68 (9.12)	$t(75) = 1.55$; $p = .126$
Gender (female/male)	28/11	29/9	$\chi^2(1) = 0.20$, $p = .651$
Education (years)	10.51 (1.64)	10.43 (1.54)	$t(75) = 0.22$; $p = .829$
IQ (MWT-B)	107.24 (12.12)	109.97 (12.13)	$t(72) = 0.97$; $p = .335$
Treatment and Diagnoses			
Medication (antidepressant, antipsychotic, combination, none)	26/0/1/12	24/2/1/11	$\chi^2(3) = 2.11$, $p = .550$
Presence of dysthymia	28/10	28/10	$\chi^2(1) = 0.00$, $p > .99$
Presence of comorbid anxiety disorder	20/19	21/17	$\chi^2(1) = 0.12$, $p = .726$
Numbers of depressive episodes	4.21 (8.01)	2.00 (2.18)	$t(64) = 1.53$; $p = .134$
Psychopathology			
BDI-I	25.28 (8.57)	27.22 (11.85)	$t(74) = 0.81$; $p = .420$
HDRS	16.59 (5.01)	17.84 (6.78)	$t(75) = 0.92$; $p = .361$

Notes: BDI-I = Beck Depression Inventory-I, HDRS = Hamilton Depression Rating Scale, MWT-B = vocabulary test to estimate verbal intelligence.