



Improving outcome for mental disorders by enhancing memory for treatment



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ABSTRACT

Patients exhibit poor memory for treatment. A novel Memory Support Intervention, derived from basic science in cognitive psychology and education, is tested with the goal of improving patient memory for treatment and treatment outcome. Adults with major depressive disorder (MDD) were randomized to 14 sessions of cognitive therapy (CT)+Memory Support ($n = 25$) or CT-as-usual ($n = 23$). Outcomes were assessed at baseline, post-treatment and 6 months later. Memory support was greater in CT+Memory Support compared to the CT-as-usual. Compared to CT-as-usual, small to medium effect sizes were observed for recall of treatment points at post-treatment. There was no difference between the treatment arms on depression severity (primary outcome). However, the odds of meeting criteria for 'response' and 'remission' were higher in CT+Memory Support compared with CT-as-usual. CT+Memory Support also showed an advantage on functional impairment. While some decline was observed, the advantage of CT+Memory Support was evident through 6-month follow-up. Patients with less than 16 years of education experience greater benefits from memory support than those with 16 or more years of education.

Memory support can be manipulated, may improve patient memory for treatment and may be associated with an improved outcome.

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Patient memory for the contents of treatment is poor. Accurate recall for physician advice is approximately one third (Jansen et al., 2008). Following a cognitive behavior therapy (CBT) session (Lee & Harvey, 2015), patients successfully recalled only 19.6%–36.9% of the recommendations made. Recall is particularly poor for health behavior change advice (Flocke & Stange, 2004) and poor memory for treatment is associated with poorer adherence (Lee & Harvey, 2015).

These findings are perhaps not surprising. First, even when memory functioning is optimal, it is an imperfect system, with fallibility possible at encoding, storage or later recollection (Schacter, 2001). Second, a psychosocial treatment session is typically 50 min long, covers complex information, and can elicit

negative emotion. Negative emotion is associated with attentional biasing and narrowing, which impacts encoding (Easterbrook, 1959). Third, even in the absence of memory deficits, the odds are stacked *against* people learning, generalizing and transferring knowledge to new situations; this is known as the transfer of learning problem (Barnett & Ceci, 2002; Thorndike, 1932). Fourth, memory deficits and biases are common across mental disorders (Airaksinen, Larsson, & Forsell, 2005; Behnken et al., 2010; Jelinek et al., 2006; Robinson et al., 2006; Varga, Magnusson, Flekkoy, David, & Opjordsmoen, 2007). Memory impairment is associated with worse outcome including poorer social functioning and increased risk of relapse (Bearden et al., 2006; Cohen, Forbes, Mann, & Blanchard, 2006; Majer et al., 2004; Martinez-Aran et al., 2004; Polak, Witteveen, Reitsma, & Olf, 2012). Additionally, memory impairment predicts worse outcome following cognitive behavior therapy (CBT) (Aharonovich, Nunes, & Hasin, 2003; Lee & Harvey, 2015; Wild & Gur, 2008). Perhaps poor memory for treatment may, at least in part, account for these findings.

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There is a literature documenting that the impact of memory impairment on memory encoding and retrieval can be minimized. Specifically, memory encoding and retention can be markedly improved via the application of memory support techniques among older adults (Bamidis et al., 2014) and even among those with memory impairments as severe as Alzheimer's disease, vascular dementia (Almkvist, Fratiglioni, Agüero-Torres, Viitanen, & Bäckman, 2010) and frontal lobe dysfunction (Bunce, 2003). Beneficial changes of memory support have also been observed at the structural and functional levels in the brain (Engvig et al., 2010; Kirchhoff, Anderson, Barch, & Jacoby, 2012).

This evidence raises the possibility that an adjunctive intervention that improves memory for treatment might also improve treatment outcome. Hence, a Memory Support Intervention was developed comprised of eight powerful memory promoting strategies that can be proactively, strategically and intensively integrated into treatment-as-usual to support patient encoding and retrieval of the contents of treatment. These strategies were distilled from the education and cognitive science literature and selected based on carefully honed criteria (Harvey et al., 2014). Examples are provided in Table 1. The memory support is delivered alongside each 'treatment point'. A treatment point is defined as a main idea, principle, or experience that the treatment provider wants the patient to remember or implement as part of the treatment (Lee & Harvey, 2015).

The Memory Support Intervention is designed to be applicable across disorders (transdiagnostic) and across treatments (trans-treatment). However, as a platform for conducting a preliminary evaluation of the approach, we evaluated the Memory Support Intervention with patients who met diagnostic criteria for major depressive disorder (MDD) who were treated with one intervention—cognitive therapy (CT). MDD was selected as the focus because it is one of the most prevalent psychiatric disorders and a leading cause of disability worldwide (Mathers & Loncar, 2006). Hence, there is an urgent need for innovations focused on improving treatment for MDD. Also, there is evidence that MDD is characterized by memory impairment (Taconnat et al., 2010), memory impairment is associated with poorer outcome (Bearden et al., 2006) and memory impairment can be minimized in MDD (Taconnat et al., 2010). The rationale for focusing on CT for MDD is that it has been extensively studied. The encouraging pattern of results is clear and well replicated. There is evidence that CT for MDD can be as effective as antidepressant medication for the initial treatment of moderate to severe MDD (DeRubeis et al., 2005; Dimidjian et al., 2006). Moreover, following the withdrawal of treatment, patients treated with CT are significantly less likely to relapse relative to patients treated with antidepressant medication and no more likely to relapse than patients continued on medications (Dobson et al., 2008; Hollon et al., 2005). Recent meta-analyses confirm CT as an important and frontline treatment for

Table 1
The eight memory support strategies (Harvey et al., 2014).

Definition	Use in treatment
Attention recruitment	
Theories of memory include attention as a core process (Baddeley, 2012; Baddeley & Hitch, 1974). Experiments show that engaging attention improves memory (Gazzaley & Nobre, 2012; Harrison, Mullet, Whiffen, Ousterhout, & Einstein, 2014; Markant & Amso, 2014; Melara, Tong, & Rao, 2012).	The treatment provider uses expressive language that explicitly communicates to the patient that a treatment point is important to remember (e.g., "if there is one thing I would like you to remember in ten years time, it is this skill" or "this is a key point to remember"), or multimedia/diverse presentation modes (e.g., handouts, poems, songs, note taking, role-playing, imagery, using a white board) as a means to recruit the patient's attention.
Categorization	
There is ample empirical evidence that categorizing information improves recall (Hunt & McDaniel, 1993; Ley, Bradshaw, Eaves, & Walker, 1973). Given the limited capacity of the human information processing system, binding information into meaningful chunks increases memory capacity (Baddeley, 2012; Baddeley & Hitch, 1974).	Involves explicit effort by the treatment provider to work with the patient to group treatment points discussed into common themes/principles (e.g., "Let's create a list of ways we can work on waking up at the same time each morning").
Evaluation	
It is clear that generating and evaluating explanations promotes learning across a wide variety of settings (Graesser, Langston, & Baggett, 1997; Lombrozo, 2006; Siegler, 2002), and is more effective than spending twice as much time studying (Chi, de Leeuw, Chiu, & LaVancher, 1994). Evaluation promotes deeper processing (Craik & Lockhart, 1972) as well as conceptual understanding (Murphy & Medin, 1985).	The treatment provider works with the patient to (a) discuss the pros/cons of a treatment point (e.g., "What would be some advantages/disadvantages of waking up at the same time each morning?"); or (b) use comparisons to compare a new treatment point to an existing or hypothetical alternative (e.g., "How would this new strategy of exercising more compare to lying in bed all day when you are feeling depressed?").
Application	
Empirical demonstrations show that people fail to apply learned material to a similar situation that only differs in surface features (Gick & Holyoak, 1983; Lockhart, Lamon, & Gick, 1988). Practicing the application of new knowledge in a variety of contexts assists transfer of learning (Hmelo-Silver, 2004).	The treatment provider works with the patient to apply a treatment point to past, present, or future (real or hypothesized) scenarios (e.g., "Can you think of an example in which you might try this new method of coping to deal with your stress at work?").
Repetition	
There is robust evidence that repetition automatizes new knowledge (Guttentag, 1984; Rohrer & Taylor, 2007).	The treatment provider restates, rephrases, or revisits information discussed in treatment (e.g., "in other words," "as we talked about earlier," or "in sum").
Practice remembering	
Theories and empirical studies highlight that facilitating regenerating, restating and/or rephrasing information improves learning (Ballard, 1913; Karpicke & Roediger, 2007). Each conscious retrieval allows for another chance to encode (Bjork, 1975).	The treatment provider facilitates the patient to regenerate, restate, rephrase, and/or revisit a treatment point (e.g., "Can you tell me what some of the main ideas you've taken away from today's session?").
Cue-based reminders	
Transfer of learning is reduced when the learning and transfer contexts differ. Establishing cues that provide reminders increase the potential for transfer of learning (Kolodner, 1997).	The treatment provider helps the patient develop new or existing cues (e.g., colored wrist bands, reminder text messages/phone calls/e-mails, smart phone apps, acronyms, rhymes, and other mnemonics) to facilitate memory for treatment points.
Praising recall	
Classic experiments demonstrate that positive consequences for a behavior increases the probability of that behavior (Pavlov, 1927; Skinner, 1938; Thorndike, 1927).	The treatment provider rewards the patient for successfully recalling a treatment point (e.g., "It's really great that you remembered that point!") or remembering to implement a desired treatment point (e.g., "I'm so glad you remembered to step back and look at the evidence.").

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