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Do Improved Patient Recall and the Provision of Memory Support Enhance Treatment Adherence?

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Abstract

Background and Objectives—Patient adherence to psychosocial treatment is an important but understudied topic. The aim of this study was to examine whether better patient recall of treatment contents and therapist use of memory support (MS) were associated with better treatment adherence.

Methods—Data were drawn from a pilot randomized controlled trial. Participants were 48 individuals (mean age = 44.27 years, 29 females) with Major Depressive Disorder randomized to receive either Cognitive Therapy (CT) with an adjunctive Memory Support Intervention (CT +Memory Support) or CT-as-usual. Therapist and patient ratings of treatment adherence were collected during each treatment session. Patient recall was assessed at mid-treatment. Therapist use of MS was manually coded for a random selection of sessions.

Results—Patient recall was significantly associated with better therapist and patient ratings of adherence. Therapist use of Application, a specific MS strategy, predicted higher therapist ratings of adherence. Attention Recruitment, another specific MS strategy, appeared to attenuate the positive impact of session number on patient ratings of adherence. Treatment groups, MS summary scores and other specific MS strategies were not significantly associated with adherence.

Limitations—The measure for treatment adherence is in the process of being formally validated. Results were based on small sample.

Conclusions—These results support the importance of patient recall in treatment adherence. Although collectively the effects of MS on treatment adherence were not significant, the results support the use of certain specific MS strategy (i.e., application) as a potential pathway to improve treatment adherence. Larger-scale studies are needed to further examine these constructs.

Keywords

treatment adherence; memory support; cognitive therapy; transdiagnostic; depression; treatment development

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Treatment non-adherence is a major and complex problem in almost all patient populations, medical specialties, and settings in the health care system (Vermeire, Hearnshaw, Van Royen, & Denekens, 2001). Non-adherence is prevalent with estimates around 30–50% in various patient populations. Also, non-adherence leads to significant financial burden and poor clinical outcomes (Vermeire et al., 2001). Patient treatment adherence in the context of psychosocial treatments, however, is relatively understudied. The extant literature in this area has mainly focused on anxiety disorders (Taylor, Abramowitz, & McKay, 2012). For example, poor patient adherence to between-session exposure/relapse prevention assignment is associated with poor treatment outcomes in exposure and response prevention therapy for obsessive-compulsive disorder (Simpson et al., 2011). Perhaps not surprisingly, improving patient's adherence to treatment is considered a crucial step leading to positive treatment outcome (Lichstein, Riedel, & Grieve, 1994). In order to begin the process of improving patient treatment adherence, we focus on two likely contributing factors in the present study: patient recall of treatment contents and therapist use of memory support (MS).

While patient recall is considered to be a key component of treatment adherence in theoretical models of medical adherence (Kessels, 2003; Ley, 1988), mounting evidence shows that patient recall of treatment contents is quite poor. Poor patient memory for diagnostic and treatment information is well documented in the medical literature (e.g., Bober, Hoke, Duda, & Tung, 2007; Jansen et al., 2008; Pickney & Arnason, 2005), and has been associated with low treatment adherence (Bober et al., 2007; Jansen et al., 2008; Tosteson et al., 2003). Low adherence in turn leads to incorrect or incomplete implementation of medical recommendations, which contribute to financial burden and poor clinical outcome (for a review, see Vermeire et al., 2001). Consistent with the medical literature, a recent study of a psychosocial treatment found that better patient recall is associated with improved sleep outcomes in patients with co-occurring bipolar disorder and insomnia following cognitive therapy for insomnia (Lee & Harvey, 2015). At the same time, little is known regarding the extent to which patient recall affects psychosocial treatment adherence or whether strategies to improve patient recall may enhance psychosocial treatment adherence.

There is evidence suggesting that MS strategies (e.g., treatment providers repeating information, providing cues to facilitate retrieval, and writing down prescribed treatment recommendations) improve patient recall of medical information (Dillon, 2012; Morrow, Leirer, Carver, Decker Tanke, & McNally, 1999) and enhance treatment adherence (Cox, Tisdelle, & Culbert, 1988). Treatment provider use of MS strategies has also been shown to improve memory in patients with dementia and depression (e.g., Almkvist, Fratiglioni, Agüero-Torres, Viitanen, & Bäckman, 1999; Taconnat et al., 2010). A Memory Support Intervention is in the early stage of development as an adjunct to treatment-as-usual to improve patient recall of treatment contents. This intervention entails therapist use of eight MS strategies derived from the cognitive psychology and education literatures on learning and memory (Harvey et al., 2014). Note that this intervention is designed to improve patient memory for treatment and is not intended to have a direct effect on improving memory or cognitive functioning per se. In a recent pilot randomized controlled trial (RCT), the Memory Support Intervention was added to Cognitive Therapy (CT+Memory Support) for depression and has shown promising results, when compared to CT-as-usual, in terms of

improving patient recall of treatment contents as well as depression outcomes (Harvey et al., 2016). While this study demonstrated how adding MS to treatment can improve patient recall and clinical outcomes, many questions remain. In particular, and the focus of this paper, it is not yet known if patient recall and therapist use of MS are related to patient adherence to treatment. From a treatment development perspective, it is also important to identify the most effective MS strategies or ways of delivering MS strategies that are associated with better treatment adherence, to guide the future development and refinement of the Memory Support Intervention.

The current study examines whether and to what extent patient recall and therapist use of MS impact patient adherence to the contents of cognitive therapy (CT) for depression. Adherence is typically indicated by the degree or quality of homework completion, session attendance, or treatment dropout (Taylor et al., 2012). However, in the current study, we defined treatment adherence as patient's understanding and agreement/acceptance (i.e., treatment receipt) as well as the out-of-session practice of the treatment contents (i.e., treatment enactment). This broader definition of adherence is based on several sources: 1) according to the World Health Organization (2003), *adherence* is defined as "the extent to which a person's behavior – taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider"; 2) adherence is preferred over and differentiated from compliance, as adherence "requires patient's agreement to the recommendations" (WHO, 2003) and captures the notion of concordance, cooperation, and partnership between patients and providers (Vermeire et al., 2001); and 3) Lichstein, Ridel, and Grieve's (1994) treatment implementation model posits that it is important to ensure that patients comprehend the treatment as intended (i.e., treatment receipt) and practice the treatment outside of sessions as intended (i.e., treatment enactment) in order to infer treatment effectiveness (Lichstein et al., 1994).

There are three aims to this study. The first is to examine whether patient recall of treatment contents at mid-treatment is associated with treatment adherence. Based on prior evidence from the medical literature as reviewed above, we hypothesized that better recall of treatment contents would predict higher adherence ratings. The second is to examine whether therapist use of MS improves therapist ratings of patient adherence to treatment (for treatment receipt and enactment separately). The third is to examine whether therapist use of MS improves patient ratings of their treatment adherence (for treatment receipt and enactment separately). For aims 2 and 3, we examined the effects of randomized treatment conditions (CT+Memory Support vs. CT-as-usual) on treatment adherence as well as the effects of the degree/level of MS used in both conditions to achieve better statistical power. It is important to note that the only difference between the two treatment conditions is the level of MS therapists used to deliver the same CT treatment contents: CT+Memory Support received high levels of MS deliberately implemented by therapists, whereas CT-as-usual received low levels of MS already imbedded in standard CT. Based on our previous finding that therapist use of MS was associated with enhanced patient recall and better treatment outcome (Harvey et al., 2016), we hypothesized that therapist use of MS would be associated with better patient adherence to treatment.

Methods

Participants and Procedures

Data were provided by participants who were recruited to participate in a pilot randomized controlled trial reported elsewhere (Harvey et al., 2016). Participants were forty-eight adults with Major Depressive Disorder (MDD), who were randomized to receive 14 weekly, 50-min sessions of either Cognitive Therapy as usual (CT-as-usual) or Cognitive Therapy plus Memory Support (CT+Memory Support). The study was approved by the Committee for the Protection of Human Subjects (CPHS) at the University of California, Berkeley. Full details are available elsewhere (Harvey et al., 2016). Assessors were graduate students in clinical psychology or trained research assistants, who were independent of the therapy team and blind to treatment condition.

Table 1 presents the demographic information and sample characteristics. Full scale IQ was ascertained by administering the National Adult Reading Test (NART; Nelson & Willison, 1991). Baseline declarative memory was measured using Episodic Face-Naming Learning Task and as the percent of correctly recalled face-name pairs on the cued recall test (Mander, Santhanam, Saletin, & Walker, 2011; Miller et al., 2008; Sperling et al., 2003). Baseline declarative memory was not significantly correlated with patient recall of treatment contents measured at mid-treatment, any MS variables (e.g., total amount of MS, no. of MS types, MS bundles, and specific MS strategies), or treatment adherence variables (i.e., receipt and enactment). Depressive symptoms were assessed using the Inventory of Depressive Symptomatology, Self-Report (IDS-SR). Baseline IDS-SR score was not significantly correlated with patient recall at mid-treatment, any MS variables, or treatment adherence variables.

Both CT+Memory Support and CT-as-usual conditions received the same, standard CT according to published manuals (Beck, 1979). The adjunctive Memory Support Intervention is designed to be delivered along-side treatment-as-usual such as CT (hence, CT+Memory Support), aiming to enhance patient memory of treatment contents. Note that this intervention is intended to improve patient memory for treatment and is not intended to improve memory/cognitive functioning per se. Specifically, the Memory Support Intervention is comprised of eight MS strategies derived from cognitive psychology and education literature on learning and memory (Harvey et al., 2014). The eight MS strategies (for operational definitions, see Appendix A) include attention recruitment, application, evaluation, categorization, repetition, practice remembering, cue-based reminder, and praise recall, which have been operationalized previously (Lee, Worrell, & Harvey, 2015). The MS strategies are delivered with a “treatment point,” 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 treatments were delivered by licensed therapists and therapists working towards licensure. In both treatment conditions, each session was delivered by one therapist. In the CT+Memory Support condition, in addition to the standard training in CT-as-usual, therapists also received training of the Memory Support Intervention and were instructed to use as many MS strategies as possible without changing the CT or lengthening the session. The optimal dose of MS strategies for each session in CT+Memory

Support condition were derived using the pilot RCT data. Therefore, at the time of this study, the CT+Memory Support therapists were not instructed to deliver a specific number of MS strategies per session. The CT+Memory Support therapists were not blind to the study hypotheses. All therapists received weekly supervision from licensed clinical psychologists.

The inclusion criteria for the study were: 1) ≥ 18 years of age; 2) able and willing to give informed consent; 3) diagnosis of MDD according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) (American Psychiatric Association, 2000); 4) minimum score of 26 or above on the Inventory of Depressive Symptomatology, Self-Report (IDS-SR) (Rush, Gullion, Basco, Jarrett, & Trivedi, 1996); 5) minimum scores of 24 or above on the Inventory of Depressive Symptomatology, Clinician Report (IDS-C) (Rush et al., 1996); 6) 18 years of age or older; and 7) medications must have been stable for the past month if taking psychiatric medications.

The exclusion criteria for the study were: 1) history of bipolar affective disorder; 2) history of psychosis or psychotic features (including schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder, or psychotic organic brain syndrome); 3) current non-psychotic Axis I disorder that constitutes the principal diagnosis (defined below) requiring treatment other than that offered within the study; 4) history of substance dependence in the past six months; 5) IQ below 80; 6) acknowledging that depression has effects on memory (e.g., Behnken et al., 2010; Taconnat et al., 2010), evidence of any medical disorder or condition that could cause depression, or preclude participation in CT or that is associated with memory problems; or 7) current suicide risk sufficient to preclude treatment on an outpatient basis.

Measures

Treatment Adherence Rating Scale – Therapist- and Patient-Report—Patient adherence to treatment was measured using a rating scale developed for this study. All items were rated during weekly treatment sessions by both therapists and patients on a scale of 0% to 100% with 10% increments (for a sample scale, see Supplemental Material B). The items were derived based on Lichstein, Riedel, & Grieve's (1994) treatment implementation model. This model posits that ensuring treatment receipt (i.e., treatment was comprehended and accepted by the patient as intended) and out-of-session enactment (i.e., treatment recommendations/homework are practiced out of session as intended) are prerequisite steps to infer treatment effectiveness (Lichstein et al., 1994).

For the therapist version, at the end of each weekly treatment session, the therapist rated patient's treatment receipt on two items: 1) understanding of the content of the session (*no understanding* to *excellent understanding*), and 2) patient acceptance/agreement with the content of the session (*did not accept/agree* to *full acceptance/agreement*). They also rated patient's treatment enactment during the past week on three items: 1) homework assignment completion for the past week (*did not complete* to *fully completed*); 2) overall the extent to which patient adhered to the instructions/recommendations of the treatment during the past week (*no adherence* to *perfect adherence*); and 3) overall the extent to which the patient mastered the skills learned in therapy in the past week (*no mastery* to *perfect mastery*).

For the patient version, at the beginning of each weekly treatment session, the patient rated his/her adherence on four items that intend to measure treatment enactment: 1) completed the practice exercises outside of session this past week (*did not complete* to *fully completed*); 2) followed the instructions/recommendations of the treatment this past week (*not at all* to *completely*); 3) mastered the skills learned in therapy this past week (*no at all* to *completely*); and 4) used the skills learned in therapy this past week (*never* to *at every opportunity*). At the end of each weekly treatment session, the patient rated two adherence items that intend to measure treatment receipt: 1) understanding the content of this session (*no understanding* to *excellent understanding*); and 2) accept/agree with the content of this session (*did not accept/agree* to *full acceptance/agreement*).

Exploratory factor analyses (EFAs) were conducted on therapist (total $N = 498$) and patient (total $N = 478$) ratings of patient's treatment adherence, respectively, using iterative principal factors methods. Details were reported elsewhere (Dong, Lee, & Harvey, 2016b). Factor analyses found support for a two-factor solution for both therapist and patient ratings of adherence: factor 1 consists of the items intended to measure treatment enactment and factor 2 consists of items intended to measure treatment receipt. Correspondingly we used two summary scores for both therapist and patient ratings. The internal consistency for these adherence scales were excellent: Cronbach's α's = .87 and .89 for the therapist ratings of treatment receipt and enactment, and α's = .84 and .87 for the patient ratings of treatment receipt and enactment, respectively. There is adequate and accumulating evidence for the validity of this measure of treatment adherence (Dong et al., 2016b). Self-reported depressive symptoms at post-treatment were negatively correlated with both therapist and patient adherence ratings (r's = −.33– −.39, p's < .05), and working alliance ratings by both therapists and patients were positively correlated with therapist and patient adherence ratings (r's = .37–.82, p's < .01– .05), demonstrating adequate convergent validity.

Patient Recall Task—Patient recall for treatment contents was measured at mid-treatment (session 7) using the Patient Recall Task, a free recall task in which patients were asked to write down, in 10 min, as many treatment points as they can remember from the beginning of the treatment up to (and including) the most recent session (Lee & Harvey, 2015). Patient recall was then coded as the raw number of treatment points accurately recalled from the start of the treatment up to the most recent session. Evidence of reliability and validity for the Patient Recall Task was previously established with excellent inter-rater reliability between two independent coders ($r = .92$, $p < .001$) and adequate predictive validity of clinical outcome (r's = .34–.69, p's < .001–.15) (Lee & Harvey, 2015). In the present sample, the scores demonstrated adequate convergent validity with levels of MS received (r's = .29–.36, $p = .02$–.07) (Lee et al., 2015).

Memory Support Rating Scale (MSRS)—Therapists' use of MS strategies was coded using the MSRS for a random selection of therapy sessions (a minimum of three tapes per participant). Evidence for the reliability and validity of the MSRS was previously established Lee et al., 2015). The scale scores have adequate convergent validity (r's = 0.29–36, p's = .02–.07), discriminant validity (r's = .07–.13, p's = .42–.67), group differentiation

ability (*d's* = 1.50–1.64; *p's* <.001), internal consistency (Cronbach's α = .77), inter-rater reliability (ICC's = .73–.74), and test-retest reliability (ICC's = .70–.72) (Lee et al., 2015).

The following MS scores were generated and used in the current study: 1) *total amount of MS* (MS total) is the average total amount of MS used per session; 2) *number of MS types used* (MS types) is the average number of different types of MS used per session; 3) *MS bundles ≥ 2* is the average number of using two or more MS strategies at the same time per session; 4) *MS bundles ≥ 3* is the average number per session of using three or more MS strategies at the same time; and 5) *MS strategies* are the average use of each of the eight MS strategies per session. We defined MS bundles as the use of more than one MS strategies at the same time (for specific examples, see Supplemental Material A). It has been reported elsewhere that the levels of MS variables (i.e., total amount of MS, no. of MS types used, MS bundles ≥ 2, MS bundles ≥ 3) were significantly higher in CT+Memory Support than CT-as-usual (Dong, Lee, & Harvey, 2016; Harvey et al., 2016).

Data Analysis

All data analyses were conducted using Stata 14 (StataCorp, 2015). Multilevel modeling using maximum likelihood estimation was conducted to examine the impact of patient recall (Aim 1) and MS variables (Aims 2 and 3) on weekly adherence. All independent and dependent variables used in the data analysis were standardized (except for session and randomized treatment groups, which are unit-free). The intraclass correlations (ρ) were calculated from the Level 1 Model (see Tables 4 and 5) for therapist and patient ratings of adherence, respectively. Regarding the model specification, the fixed part of the model includes either patient recall (Aim 1) or one of the MS variables (Aims 2 and 3) as well as **session (14 sessions in total; coded from** 0 to 13). An interaction term between MS variable and session was also tested and was retained if the term was statistically significant. The random part of the model included a random intercept and a random slope of session, assumed to have bivariate normal distributions with zero means and unstructured covariance matrix[1].

Standardized coefficients for all variables were reported. The standardized coefficient indicates the mean change in standard deviation units of *y* for a one standard deviation change in *x*. We used α = .05 for Aim 1, and a more stringent α = .01 for Aims 2 and 3 due to the large number of models tested. Corresponding confidence intervals for significant predictors are reported.

[1]The multilevel model for patient recall is expressed as follows:

$$y_{ij}=\beta_0+\beta_1*session_{ij}+\beta_2*(patient\ recall\ at\ session\ 7)_j+\zeta_{1j}+\zeta_{2j}*session_{ij}+\varepsilon_{ij},$$
$$\zeta_{1j}\sim N(0,\psi_{11}),\ \zeta_{2j}\sim N(0,\psi_{22}),\ Cov(\zeta_{1j},\zeta_{2j})=\psi_{12},\varepsilon_{ij}|\zeta_{1j}\sim N\ (0,\theta)$$

The multilevel model with interaction term (between a MS variable and session) is expressed as follows:

$$y_{ij}=\beta_0+\beta_1*session_{ij}+\beta_2*MS_j+\beta_3*session_{ij}*MS_j+\zeta_{1j}+\zeta_{2j}*session_{ij}+\varepsilon_{ij},$$
$$\zeta_{1j}\sim N(0,\psi_{11}),\ \zeta_{2j}\sim N(0,\psi_{22}),\ Cov(\zeta_{1j},\zeta_{2j})=\psi_{12},\varepsilon_{ij}|\zeta_{1j}\sim N\ (0,\theta)$$

Results

Table 2 presents the descriptive statistics for all study variables in the total sample as well as in each randomized group (CT+Memory Support vs. CT-as-usual), including the therapist and patient ratings of treatment enactment and receipt, all the continuous MS variables (i.e., Total MS, No. of MS types, MS bundles ≥ 2, MS bundles ≥ 3, and specific MS strategies), and patient recall of treatment contents at mid-treatment. The *ICC*s were .43 (99% CI: [.26, .63]) and .44 (99% CI: [.25, .65]) for therapist ratings of treatment receipt and enactment, and .43 (99% CI: [.25, .62]) and .52 (99% CI: [.33, .70]) for patient ratings of treatment receipt and enactment, respectively.

Aim 1

We examined whether better patient recall of treatment contents at mid-treatment predicted better treatment adherence in Aim 1. As shown in Table 3, patient recall of treatment contents at mid-treatment (i.e., session 7) were significantly associated with higher therapist ratings of treatment receipt ($\beta = .20$, $SE = .10$, $p = .04$, 95% CI: [.01, .40], higher therapist ratings of treatment enactment ($\beta = .22$, $SE = .09$, $p = .02$, 95% CI: [.04, .40]), higher patient ratings of treatment receipt ($\beta = .22$, $SE = .10$, $p = .03$, 95% CI: [.03, .42]), and higher patient ratings of treatment enactment ($\beta = .25$, $SE = .10$, $p = .01$, 95% CI: [.05, .44]), after accounting for the effects of the number of sessions. These results suggest that a one standard deviation increase in patient recall (*SD* for patient recall = 3.9 treatment points; see Table 2) was associated with an average of .22 to .25 standard deviation increase in therapist and patient ratings of adherence.

Aim 2

We examined whether being in the CT+Memory Support group (vs. CT-as-usual) as well as therapists using higher levels of MS strategies (regardless of treatment condition) predicted better therapist ratings of treatment adherence in Aim 2. As shown in Table 4, in the Level 1 Model with session number as the only predictor, therapist ratings of treatment enactment improved significantly as session number increased ($\beta = .04$, $SE = .01$, $p = .002$, 99% CI: [.01, .07]), while there was no significant effect of session on treatment receipt ($\beta = .02$, $SE = .01$, $p = .06$, 99% CI: [−.01, .04]). Randomized treatment group (CT+Memory Support vs. CT-as- usual) did not significantly predict changes in therapist ratings of treatment receipt ($\beta = -.17$, $SE = .21$, $p = .43$, 99% CI: [.01, .07]) or treatment enactment ($\beta = -.003$, $SE = .19$, $p = .002$, 99% CI: [.01, .07]) during treatment, after accounting for the effects of the number of sessions. Similarly, total MS, No. of MS types, MS bundles (≥2 or 3), as well as specific MS strategies (except for Application) were not significantly associated with therapist ratings of either treatment enactment or receipt, after accounting for the effects of the number of sessions. However, therapist use of Application significantly predicted higher therapist ratings of treatment receipt ($\beta = .29$, $SE = .09$, $p = .002$, 99% CI: [.05, .53]) and treatment enactment ($\beta = .24$, $SE = .09$, $p = .004$, 99% CI: [.02, .46]), such that using one standard deviation more instances of application (*SD* for application = 1.30 instances; see Table 2) during a treatment session was significantly associated with a .24–.29 standard deviation increase in therapist ratings of patient adherence to treatment, after accounting for the effects of the number of sessions.

Aim 3

We examined whether being in the CT+Memory Support group (vs. CT-as-usual) as well as therapists using higher levels of MS strategies (regardless of treatment condition) predicted better patient ratings of treatment adherence in Aim 3. As evident in Table 5, in the Level 1 Model with session number as the only predictor, patient ratings of their treatment adherence both before and at the end of the session improved significantly as session number increased. Randomized treatment group did not differ significantly in terms of the changes in therapist ratings of treatment receipt ($\beta = -.20$, $SE = .20$, $p = .31$, 99% CI: [−.72, .32]) or enactment ($\beta = -.09$, $SE = .21$, $p = .68$, 99% CI: [.63, .45]) during treatment, after accounting for the effects of the number of sessions. Similar to the findings on therapist ratings, the effect size of randomized treatment group on patient ratings of treatment receipt was also in the small range and in the expected direction such that CT+Memory Support had higher therapist ratings of treatment receipt than CT-as-usual. None of the specific MS strategies, MS summary or bundles were associated with patient ratings of treatment receipt or enactment, after accounting for the effects of the number of sessions. However, there was a significant negative interaction between session and attention recruitment ($\beta = -.03$, $SE = .01$, $p = .004$, 99% CI: [−.06, −.003]), such that higher levels of attention recruitment attenuated the positive impact of session on patient ratings of their treatment enactment (see Figure 1), after accounting for the effects of the number of sessions.

Discussion

The current study examined the extent to which patient recall and therapist use of MS were associated with patient adherence to cognitive therapy for depression. Because the two randomized treatment groups (CT+Memory Support vs. CT-as-usual) differ only in terms of the levels of MS therapist provided, we elected to focus on examining patient recall and the degree of MS used in relation to treatment adherence for the whole sample to improve statistical power, in addition to examining the effects of treatment groups. The first aim was to determine whether patient recall of treatment contents was associated with patient adherence. We found that better patient recall of treatment contents at mid-treatment was indeed significantly associated with better therapist and patient ratings of adherence for both treatment receipt and enactment. The results suggest that a one standard deviation increase in patient recall was associated with an average of .22 to .25 standard deviation increase in therapist and patient ratings of adherence. These results are consistent with the numerous reports from the medical literature supporting patient recall as a key factor in treatment adherence (Vermeire et al., 2001).

The second aim was to examine whether therapist use of MS was associated with therapist ratings of adherence. We found that using application, one of the eight MS strategies, was associated with better therapist ratings of treatment adherence (for both treatment receipt and enactment). However, the impact of randomized treatment condition, other specific MS strategies, summary scores, or MS bundles were not significant. Treatment condition (CT +Memory Support vs. CT-as-usual) did not significantly predict treatment enactment and receipt. The current study used data from a pilot RCT and is thus underpowered to detect significant differences. Future investigation in a larger sample is warranted. Additionally, the

optimal dose of MS per session was derived using this pilot data. It is possible that there would be greater between group differences on treatment adherence and other outcomes when the optimal dose of MS is delivered during every session.

It is important to note again that, although the current version of the Memory Support Intervention contains eight MS strategies intended to be used collectively, identifying the most effective MS strategies or bundles for treatment adherence is important for guiding further development and refinement of this intervention. Application involves the therapist helping the patient to apply a treatment point to past, present, or future scenarios that are either real or hypothetical (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?") (Harvey et al., 2014; Lee & Harvey, 2015). Our results suggest that discussing how the patient can apply a new skill learned in treatment in various scenarios/examples is associated with increased therapist ratings of patient adherence to treatment, including increased understanding and agreement with the treatment contents, completion of homework and follow recommendations, and overall mastery of skills learned in therapy[2]. These findings are consistent with prior work suggesting that explicitly linking abstract principles to multiple specific examples facilitate the transfer of learning (Gentner, Loewenstein, & Thompson, 2003). This finding also supports the standard practice in CBT of setting homework to complete between sessions to promote application (Kazantzis, Deane, & Ronan, 2004).

The third aim was to examine whether therapist use of MS was associated with patient ratings of adherence. We found that treatment unfolding over a longer period of time predicted higher patient ratings of treatment adherence. However, randomized treatment condition, MS summary scores and bundles, and specific MS strategies (except for Attention Recruitment) did not significantly predict patient ratings of treatment adherence. Interestingly, using higher levels of attention recruitment attenuated the positive association between session and patient ratings of their out-of-session treatment enactment. The enactment aspect of treatment adherence assesses out-of-session homework completion, mastery/using skills, and following recommendations (i.e., treatment enactment). As such, this result suggests that high levels of attention recruitment may be helpful at the very beginning of the treatment but may be unhelpful as treatment progresses for out-of-session treatment enactment[3]. Attention recruitment involves the therapist "using expressive language that explicitly communicates to the patient that a treatment point is important to remember, or multimedia/diverse presentation modes as a means to recruit the patient's attention" (Harvey et al., 2014; Lee & Harvey, 2015). One possible explanation is that therapists recruiting patients' attention to the most important treatment point each session may enhance patients' memory for the highlighted point while impairing the related but unmentioned treatment points—an effect that has been shown in the non-clinical cognitive psychology literature (Coman & Berry, 2015). It would be important for future studies to

[2]Note that a follow-up multivariate regression analysis confirmed that the level of application was significantly associated with all of the five items of therapist ratings of adherence in addition to the summary scores presented in this study.
[3]Note that a follow-up analysis showed that the level of attention recruitment was stable throughout treatment (i.e., no significant difference comparing early-, mid-, and later-phase of the treatment).

determine the timing and extent to which using attention recruitment is helpful in promoting better adherence outcomes.

To the best of our knowledge, this study is the first to examine the extent to which patient recall and therapist use of MS may impact patient adherence to a psychosocial treatment. This is the first study to demonstrate that better patient recall of psychosocial treatment contents is associated with better patient adherence to treatment. Although the majority of MS variables (including treatment conditions) were not significantly associated with treatment adherence, one specific MS strategy, namely application, was significantly associated with better treatment adherence both in terms of treatment receipt and enactment as rated by therapists. Interestingly, our findings evidenced discrepancies between therapist and patient ratings of adherence. It seems likely that therapist and patient ratings of adherence offer different perspectives on treatment adherence that are equally valuable to consider. Additionally, further research is needed to understand key factors that impact adherence to psychosocial treatments. Factors such as between-session social support, understanding and acceptance of treatment contents, patient satisfaction and perceived importance—all of which were previously indicated in medical adherence (DiMatteo, 2004; Kessels, 2003; Ley, 1988; Velligan et al., 2009)—may need to be considered within the context of psychosocial treatments. With a better understanding of treatment adherence, therapists will be able to target barriers to treatment adherence and improve adherence and clinical outcome.

These results need to be interpreted in the context of several limitations. First, the current study draws data from a pilot RCT and thus has insufficient power to detect statistical significance. It was purposefully underpowered because pilot RCTs are ‘more about learning than confirming’ (Lee, Whitehead, Jacques, & Julious, 2014). Future large-scale confirmatory trials are needed. Additionally, as this study was based on CT for depression, we do not know the generalizability of the present findings to other types of psychosocial treatments or other psychiatric disorder. We also acknowledged that the current sample is highly educated. Again, replications in larger and more representative samples are needed. Furthermore, the Treatment Adherence Rating Scale used in this study is still in the process of being formally validated. However, we report preliminary evidence for its validity and suggest that results from the current study may serve as convergent validity evidence for the adherence ratings. Additionally, a factor analysis was conducted to support the use of summary scores in the analyses. Nonetheless, future studies are needed to further develop, improve, and validate the adherence measure. Also, we relied upon subjective measures of adherence. The addition of objective measures of adherence (e.g., the use of a standardized scoring rubric to measure level of homework completion), could provide additional valuable information about patient adherence to psychosocial treatment.

In sum, the current study examined whether improved patient recall and therapist use of MS were associated with better patient adherence to psychosocial treatments. Patient recall of treatment contents significantly predicted better treatment adherence. The collective effect of MS was not significantly associated with treatment adherence. However, therapist use of application (a specific MS strategy) was associated with better treatment adherence based on therapist ratings, and therapist use of attention recruitment (a specific MS strategy) appears

to depend on the phase of the therapy based on patient ratings in terms of its impact on adherence. These results provide insight into factors and strategies that impact psychosocial treatment adherence and have implications for the further development of the memory support intervention. These results may also be relevant to the medical adherence literature, given that the memory support intervention has potential to be integrated into a broad range of interventions including physician visits. Overall, this study highlights the importance of patient recall of treatment contents in patient adherence to treatment. This study also provides an initial preliminary evidence for the use of certain specific MS strategies as a potential pathway to improve treatment adherence. Larger-scale studies are needed to further examine these constructs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix

Memory Support Strategies (from Lee, Worrel, & Harvey, 2015)

Attention Recruitment

Involves the treatment provider using 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

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

Involves the treatment provider working 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 your current habit of lying in bed all day when you are feeling depressed?”).

Application

Involves the treatment provider working 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

Involves the treatment provider restating, rephrasing, or revisiting information discussed in treatment (e.g., “in other words,” “as we talked about earlier,” or “in sum”).

Practice Remembering

Involves the treatment provider facilitating the patient to regenerate, restate, rephrase, and/or revisit a treatment point (e.g., “Can you tell me some of the main ideas you’ve taken away from today’s session?).

Cue-Based Reminder

Involves the treatment provider helping 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.

Praise Recall

Involves the treatment provider rewarding 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.”).

Highlights

- Patient's treatment adherence is relatively understudied in psychosocial treatments
- Patient recall and Memory Support (MS) are important factors for treatment adherence
- Patient recall of treatment contents was associated with improved adherence
- Therapist use of Application (a specific MS) was associated with improved adherence

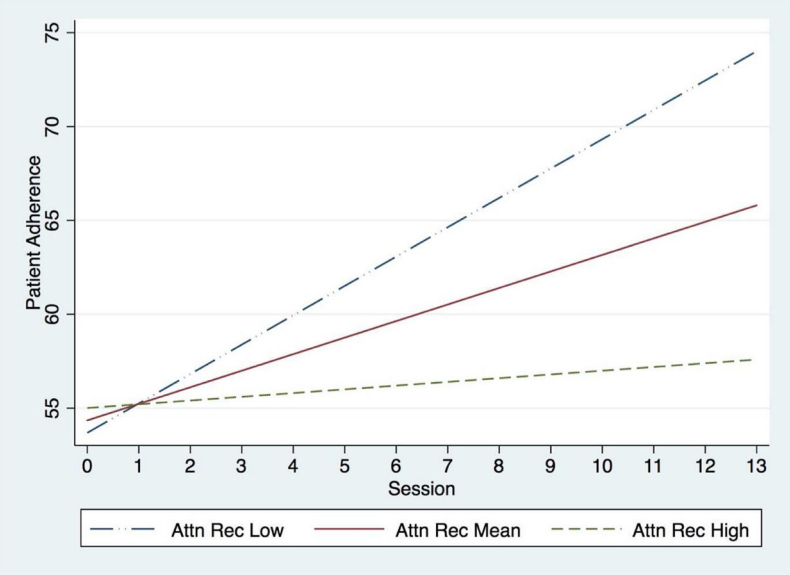

Figure 1.

Note. The y-axis represents summary score of the patient before-session ratings. The x-axis represents sessions 1–14 (coded as 0–13). Attn Rec = Attention Recruitment. Attn Rec Low = Attention Recruitment was fixed at 1*SD* below the mean. Attn Rec Mean = Attention Recruitment was fixed at its mean. Attn Rec High = Attention Recruitment was fixed at 1*SD* above the mean.

Table 1

Demographic Information of the Study Sample (N = 48)

Characteristic	Total (*N* = 48)		CT-as-usual (*N* =23)		CT+Memory Support (*N*= 25)	
	M* or *N	**% or *SD***	***M* or *N***	**% or *SD***	***M* or *N***	**% or *SD***
Female	29	60.42	17	73.90	12	48.00
Ethnicity						
Hispanic or Latino	8	16.67	3	13.04	5	20.00
Not Hispanic or Latino	37	77.08	17	73.91	20	80.00
Declined to answer	3	6.25	3	13.04	0	0.00
Race						
American Indian/Alaska Native	1	2.08	0	0.00	1	4.00
Asian	4	8.33	3	13.04	1	4.00
African American	2	4.17	1	4.35	1	4.00
Caucasian	36	75.00	16	69.57	20	80.00
Bi-racial/Multi-racial	1	2.08	1	4.35	0	0.00
Declined to answer	4	8.33	2	8.70	2	8.00
Marital Status						
Single	23	47.92	11	47.83	12	48.00
Married/Partnered	18	37.50	8	34.78	10	40.00
Divorced/Separated/Widow	6	12.50	3	13.05	3	12.00
Declined to answer	1	2.08	1	4.35	0	0.00
Employed						
Full-time	13	27.08	6	26.09	7	28.00
Part-time	13	27.08	4	17.39	9	36.00
Unemployed	15	31.25	8	34.78	7	28.00
Retired	3	6.25	2	8.70	1	4.00
Declined to answer	4	8.33	3	13.05	1	4.00
Income						
<$20,000	17	35.42	7	30.40	10	40.00
$20,000–$35,000	6	12.50	2	8.70	4	16.00
$35,000–$50,000	11	22.92	7	30.40	4	16.00

Characteristic	Total (*N* = 48)		CT-as-usual (*N* =23)		CT+Memory Support (*N*= 25)	
	M* or *N	**% or *SD***	***M* or *N***	**% or *SD***	***M* or *N***	**% or *SD***
$50,000–$60,000	6	12.50	1	4.30	5	20.00
>$60,000	3	6.25	2	8.70	1	4.00
Refused/Did not know	8	10.42	4	16.70	1	4.00
Comorbidity, Medical	23	47.92	11	45.80	12	50.00
Comorbidity, Psychiatric	26	54.17	10	43.50	16	64.00
Mood Medication	20	41.67	11	44.00	9	39.10
Age (years)	44.27	10.97	44.65	12.17	43.92	9.98
Education (years)	15.81	1.89	16.26	2.03	15.40	1.68
IDS-SR	41.19	9.23	43.00	9.77	39.52	8.55
Full scale IQ (NART)	120.21	5.84	120.68	5.62	119.78	6.33
Correct recall of face-name pairs	0.68	0.17	0.67	0.17	0.68	0.17

Note. M = Mean. *N* = no. of observations. *SD* = Standard Deviation. Two randomized treatment conditions did not differ on these variables. IDS-SR = Inventory of Depressive Symptomatology, Self-Report.

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Table 2

Descriptive Statistics of the Study Variables

	Total Sample			CT+Memory Support			CT-as-usual		
Variable	***n***	***M***	***SD***	***n***	***M***	***SD***	***n***	***M***	***SD***
Treatment Adherence – Therapist Rating									
Treatment enactment	45	68.91	12.38	24	68.96	13.19	21	68.86	11.70
Treatment receipt	46	80.48	10.47	25	79.50	11.15	21	81.64	9.75
Treatment Adherence – Patient Rating									
Treatment enactment	45	59.34	16.09	24	58.09	18.37	21	60.76	13.32
Treatment receipt	46	88.02	9.05	25	86.85	11.02	21	89.43	5.87
Patient recall at mid-treatment	40	8.2	3.90	21	8.52	4.87	19	7.84	2.52
MS summary variables									
Total amount of MS	44	13.5	8.54	23	18.32	8.83	21	8.23	3.87
No. of MS types	44	4.13	1.24	23	4.85	1.16	21	3.34	0.74
MS bundles ≥ 2	42	2.99	2.13	22	4.14	2.20	20	1.73	1.10
MS bundles ≥ 3	27*	0.83	0.69	19	1.05	0.72	8	0.32	0.09
Specific MS strategies									
Attention recruitment	44	3.35	1.97	23	4.33	1.85	21	2.28	1.51
Application	44	1.63	1.30	23	2.03	1.47	21	1.19	0.94
Evaluation	44	0.71	0.65	23	1.01	0.66	21	0.39	0.48
Categorization	44	0.28	0.35	23	0.25	0.36	21	0.32	0.33
Repetition	44	4.78	2.90	23	6.34	2.93	21	3.08	1.69
Practice remembering	44	2.07	2.22	23	3.35	2.37	21	0.67	0.71
Cue-based reminder	44	0.36	0.36	23	0.45	0.34	21	0.26	0.37
Praise recall	44	0.31	0.55	23	0.56	0.66	21	0.04	0.12

Note. M = Mean. *SD* = Standard Deviation. For treatment adherence, the grand means across sessions are presented.

*MS bundles ≥ 3 = average instances per session for therapist use of 3 or more MS strategies at the same time. Since MS bundles ≥ 3 is less common than MS bundles ≥ 2, particularly for the CT-as-usual condition (therapist in this condition was not trained to provide MS), the *N* is much smaller for this variable.

Table 3

Multilevel Model Results for Weekly Therapist and Patient Ratings of Treatment Adherence (Receipt and Enactment) Predicted by Patient Recall

	Therapist Ratings		Patient Ratings	
	Treatment Receipt	***Treatment Enactment***	***Treatment Receipt***	***Treatment Enactment***
	Estimate (*SE*)	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**
Fixed-effects				
intercept	−.06 (.12)	−.25 (.13)	−.19 (.12)	−.25 (.12)*
session	.02 (.01)	.04 (.01)**	.03 (.01)**	.04 (.01)**
patient recall	.20 (.10)*	.22 (.09)*	.22 (.10)*	.25 (.10)*
Random-effects				
intercept	.61 (.10)	.69 (.12)	.65 (.10)	.65 (.11)
session	.03 (.02)	.05 (.01)	.02 (.02)	.05 (.01)
correlation	−.22 (.41)	−.63 (.16)	−.43 (.32)	−.44 (.21)
residual	.76 (.03)	.80 (.03)	.72 (.02)	.71 (.02)

Note. MS = Memory Support. *SE* = Standard Error. Patient recall was measured at mid-treatment (session 7). Estimates for fixed-effects parameters are standardized coefficients. Estimates for random-effects parameters are standard deviations. Correlation is between random intercept and random slope for session.

* $p \leq .05$,

** $p \leq .01$.

Table 4

Multilevel Model Results for Weekly Therapist Ratings of Treatment Adherence (Receipt and Enactment) Predicted by MS Variables and Session

	Level 1 Model	**Level 2 Models**					
		Tx Group	***MS total***	***MS types***	***MS bundles≥2***	***MS bundles≥3***	***Application***
Therapist ratings	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**
Treatment Receipt							
Fixed-effects							
intercept	−.14 (.11)	−.05 (.16)	−.11 (.11)	−.11 (.11)	−.08 (.11)	−.07 (.12)	−.11 (.11)
session	.02 (.01)	.02 (.01)	.02 (.01)	.02 (.01)	.02 (.01)	.02 (.01)*	.02 (.01)
MS variable		−.17 (.21)	.08 (.10)	.13 (.10)	−.02 (.10)	−.004 (.12)	.29 (.09)**
Random-effects							
intercept	.66 (.10)	.65 (.10)	.64 (.10)	.63 (.10)	.60 (.09)	.56 (.10)	.66 (.11)
session	.02 (.02)	.02 (.02)	.03 (.02)	.03 (.02)	.03 (.01)	.04 (.01)	.05 (.01)
correlation	−.07 (.46)	.00 (.50)	−.09 (.45)	−.09 (.44)	.01 (.45)	−.06 (.40)	−.63 (.16)
residual	.75 (.02)	.75 (.02)	.75 (.02)	.75 (.02)	.74 (.02)	.61 (.03)	.79 (.03)
		Group	*MS total*	*MS types*	*MS bundles≥2*	*MS bundles≥3*	*Application*
Treatment Enactment	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)
Fixed-effects							
intercept	−.28 (.13)	−.27 (.16)	−.27 (.13)*	−.27 (.13)*	−.25 (.13)	−.20 (.14)	−.27 (.12)*
session	.04 (.01)**	.04 (.01)**	.04 (.01)**	.04 (.01)**	.04 (.01)**	.04 (.01)**	.04 (.01)**
MS variable		−.003 (.19)	.12 (.09)	.14 (.09)	.09 (.09)	.16 (.12)	.24 (.09)**
Random-effects							
intercept	.70 (.11)	.70 (.11)	.69 (.11)	.68 (.11)	.72 (.11)	.59 (.12)	.59 (.09)
session	.05 (.01)	.05 (.01)	.05 (.01)	.05 (.01)	.05 (.01)	.02 (.03)	.03 (.02)
correlation	−.59 (.17)	−.59 (.17)	−.59 (.17)	−.59 (.18)	−.62 (.16)	−.21 (.73)	−.19 (.42)
residual	.79 (.03)	.79 (.03)	.79 (.03)	.79 (.03)	.78 (.03)	.72 (.03)	.75 (.02)

Note. MS = Memory Support. Tx Group = CT+Memory Support vs. CT-as-usual. *SE* = Standard Error. Each column represents one multilevel model with dependent variable being either treatment enactment or receipt. Each column name under Level 2 Models is the MS variable used in that model. The MS-by-session interaction terms for the models presented in this table were all non-significant at α = .01 or .05; therefore, the final model contains only main effects of session and MS variables. For specific MS strategies, only models with significant effects are presented (i.e., application). Continuous MS variables are averaged scores across coded sessions. Estimates for fixed-effects parameters are standardized coefficients. Estimates for random-effects parameters are standard deviations. Correlation is between random intercept and random slope for session. *p*-values for random-effects not shown.

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* $p \leq .05$,

** $p \leq .01$.

Table 5

Multilevel Model Results for Weekly Patient Ratings of Treatment Adherence (Receipt and Enactment) Predicted by MS Variables and Session

	Level 1 Model	**Level 2 Model**					
		Tx Group	***MS total***	***MS types***	***MS bundles≥2***	***MS bundles≥3***	***Attn Rec***
Patient ratings	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**	**Estimate (*SE*)**
Treatment Receipt							
Fixed-effects							
intercept	−.19 (.11)	−.09 (.16)	−.18 (.11)	−.18 (.11)	−.13 (.11)	−.20 (.14)	
session	.03 (.01)**	.03 (.01)**	.03 (.01)**	.03 (.01)**	.02 (.01)**	.03 (.01)**	
MS variable	-	−.20 (.20)	−.02 (.10)	.0004 (.10)	−.05 (.10)	.01 (.14)	
Random-effects							
intercept	.65 (.10)	.65 (.10)	.64 (.10)	.64 (.10)	.60 (.09)	.62 (.12)	
session	.03 (.02)	.03 (.02)	.03 (.01)	.03 (.01)	.02 (.02)	.01 (.01)	
correlation	−.14 (.38)	−.17 (.37)	−.31 (.32)	−.30 (.32)	.05 (.68)	1.00 (.00)	
residual	.75 (.02)	.75 (.02)	.74 (.02)	.74 (.02)	.73 (.02)	.73 (.03)	
		Group	*MS total*	*MS types*	*MS bundles≥2*	*MS bundles≥3*	*Attn Rec*
Treatment Enactment	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)	Estimate (*SE*)
Fixed-effects							
intercept	−.32 (.13)	−.27 (.17)	−.29 (.13)*	−.01 (.37)	−.29 (.13)*	−.29 (.16)	−.29 (.13)*
session	.04 (.01)**	.04 (.01)**	.04 (.01)**	.04 (.01)**	.04 (.01)**	.03 (.01)*	.04 (.01)**
MS variable	-	−.09 (.21)	−.15 (.10)	−.07 (.08)	−.16 (.10)	.04 (.14)	.03 (.13)
MS X session	-	-	-	-	-	-	−.03 (.01)**
Random-effects							
intercept	.74 (.11)	.74 (.11)	.73 (.11)	.74 (.11)	.71 (.11)	.74 (.14)	.72 (.11)
session	.05 (.01)	.05 (.01)	.05 (.01)	.05 (.01)	.05 (.01)	.04 (.02)	.04 (.01)
correlation	−.43 (.21)	−.44 (.21)	−.50 (.19)	−.48 (.20)	−.52 (.19)	−.40 (.30)	−.48 (.22)
residual	.71 (.02)	.71 (.02)	.71 (.02)	.71 (.02)	.71 (.02)	.70 (.03)	.71 (.02)

Note. MS = Memory Support. Tx Group = CT+Memory Support vs. CT-as-usual. *SE* = Standard Error. Each column name under Level 2 Models represents the MS variable used in that model. The interaction between MS and session was retained only if it was significant. For specific MS strategies, only models with significant effects are presented (i.e., attention recruitment for treatment enactment). Estimates for fixed-effects parameters are standardized coefficients. Estimates for random-effects parameters are standard deviations. Correlation is between random intercept and random slope for session. *p*-values for random-effects not shown.

* $p \leq .05$,
** $p \leq .01$.