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# Use and Effects of Therapist Memory Support Strategies in Cognitive Behavioral Therapy and Interpersonal Psychotherapy for Depression

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## Abstract

**Purpose** The use of memory support strategies could help patients with major depressive disorder (MDD) to improve their memory for the content of therapy, leading to better treatment outcomes. Constructive memory support strategies prompt patients to construct new ideas. Non-constructive memory support strategies encourage the passive processing of therapy content. Building on previous work in a university setting, our goal was to investigate the effects of therapists' natural use of memory support strategies in cognitive behavioral therapy (CBT) and interpersonal psychotherapy (IPT) for MDD in routine clinical practice.

**Methods** In the context of a multicenter randomized trial, comparing once- versus twice weekly sessions of CBT and IPT for MDD in routine clinical practice, videos of therapy sessions from 75 patients during different phases of treatment ( $n=67$  between session 1–4,  $n=59$  between session 5–8,  $n=56$  between session 9–12) were rated on therapist use of memory support strategies and how the patient responded to the information given by the therapist (patient learning behavior). Hypotheses were investigated with mixed models.

**Results** Memory support strategies were related to more patient learning behavior. Constructive memory support strategies were related to reduced depression in the next session, but not to recall or change in therapy skills or depression at the end of treatment.

**Conclusions** Memory support strategies might be beneficial in routine clinical practice in increasing patient learning behavior and reducing next session depression. Future studies should find out which strategy works for whom and whether a higher dose leads to change in depression over treatment.

**Keywords** Psychotherapy · Learning · Memory support strategies · Depression

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## Introduction

Improving memory for treatment may be a way to improve outcomes for psychotherapy for major depressive disorder (MDD) (Bruijnicks et al., 2019a, b, c, d; Harvey et al., 2014). During cognitive behavioral therapy, one of the most frequently researched and widely used treatments for depression, the therapist and patient work towards changing behavior, thoughts, and emotions to reduce depressive symptoms (Beck et al., 2024). However, patients with depression suffer from multiple cognitive problems that could interfere with their ability to learn from what is discussed in the session (Bruijnicks et al., 2019a, b, c, d; Snyder, 2013). Indeed, patient memory for treatment is poor (Gumport et al., 2015, 2018) and biases of increased attention towards negative information (Elgersma et al., 2018; Everaert et al., 2022; Klawohn et al., 2020) may function as a blockade to efficient learning within the therapy session. In one study of three-sessions of online cognitive behavioral therapy (CBT) for MDD, patients recalled and applied only 50–60% of the therapy points (i.e., distinct ideas, principles, skills and strategies that are learned during psychotherapy) discussed in the previous session accurately (Gumport et al., 2015). In a different study, therapists estimated that half of their patients have problems remembering what was discussed during the sessions (Zieve et al., 2019a, b, c).

The use of memory support strategies that support the encoding and retrieval of episodic memory could help patients with depressive symptoms improve their declarative memory for the content of treatment sessions which, in turn, would lead to improved treatment outcomes (Harvey et al., 2014). One reason these strategies might help is because they target deficits in executive skills and prospective memory (i.e., the ability to remember and carry out previously formed intentions in the future) that are seen in patients with MDD (Behnken et al., 2010; McFarland & Vasterling, 2018). This could help them to organize, maintain and retrieve relevant information from the sessions. Based on knowledge from cognitive and educational science, Harvey and colleagues (2014) proposed eight memory support strategies (i.e., attention recruitment, categorization, evaluation, application, repetition, practice remembering, the use of cue-based reminders and praising recall) that can be used to enhance memory for therapy points. For example, asking the patient about their memory for the last session to increase and practice remembering a CBT principle (i.e., behavior, thoughts and feelings are linked) or practicing new learned skills by discussing and imagining the application of these skills in daily life (for example completing a thought form when mood gets low (er))<sup>1</sup>. In a randomized

study that compared cognitive therapy including 17 memory support strategies per session (CT+MS) to CT as usual (which included 8 memory support strategies per session), results showed that CT+MS led to better past-session recall at post-treatment (Cohen's  $d=0.35$ ) and lower depression severity (Cohen's  $d=-0.27$ ) at 6-month follow-up (Dong et al., 2022). However, Dong and colleagues (2022) reported that the effects of memory support strategies on recall and depression were not present when patients needed to recall information from all therapy sessions ("cumulative recall") and CT+MS did not lead to larger changes in depressive symptoms from baseline to posttreatment or 6-month follow-up compared to CT as usual. One potential explanation for this delayed finding effect is that memory support strategies operate mostly indirectly through other mechanisms such as the development of skills and the effects of memory support strategies will be most evident after the end of treatment (Dong et al., 2022).

Two types of memory support have been defined. Constructive memory support strategies (i.e., application, evaluation, categorization, cue-based reminder) are defined as strategies that involve therapists promoting the patients to construct new ideas, inference or connections, while non-constructive memory support strategies (i.e., attention recruitment, repetition, practice remembering, praise recall) do not involve these prompts (Chi & Wylie, 2014; Zieve et al., 2019b). Evidence suggests that the use of constructive memory support strategies, and not the use of non-constructive memory support strategies, is related to better recall of treatment contents (Zieve et al., 2019). Interestingly, researchers have measured the extent to which the patient expressed ideas beyond the information that was given by the therapist, a concept referred to as 'patient learning behavior'. The researchers also mapped out how therapists delivered the memory support strategies including inviting patients to respond and prompting them to elicit a constructive response (scaffolding). Therapist use of scaffolding and inviting a response from the patient after the use of constructive memory support strategies was related to more patient learning behavior, which was related to better recall at posttreatment (Zieve et al., 2019a, b, c). Another study showed that for constructive memory support strategies specifically, eight uses per session were optimal to improve recall, therapy mechanisms and depressive outcomes (Sarfani et al., 2023). In summary, these findings point to the importance of the use of constructive memory strategies and the way therapists deliver the strategy to promote patient learning behaviors as potential pathways to improve treatment outcomes.

One reason why memory support strategies may not always lead to improved outcomes might be that to improve treatment outcomes, memory support strategies should

<sup>1</sup> Please see (Zieve et al., 2019a and Zieve et al., 2019b) for more concrete examples.

focus on enhancing the development of skills that patients learn during therapy as opposed to focusing on theoretical elements of the treatment (e.g., the CBT model). Skill development is a central process in different psychotherapies and has been related to less attrition and a reduction of depressive symptoms in multiple studies (Bruijniks, Meeter, Lemmens, Peeters, Cuijpers, & Huibers, 2022; Bruijniks, Meeter, Lemmens, Peeters, Cuijpers, Renner et al., 2022; Forand et al., 2018; Strunk et al., 2007; Warmerdam et al., 2010). In CBT, skills have been defined as patients' ability to identify and evaluate patterns of dysfunctional thinking and find ways to increase rewarding activities (Hundt et al., 2013; Strunk et al., 2014). Interestingly, experimental research on the effects of retrieval as a memory support strategy during problem-solving therapy showed that retrieval—as a single memory support strategy—led to better recall in a subgroup of patients, but not to better problem-solving skills or therapy outcome (Bruijniks et al., 2019a, b, c, d). Likewise, in a study that measured patient's knowledge level during therapist-supported internet CBT (i.e., no memory support strategies were provided in this study), increased knowledge of CBT during treatment was not related to change in depressive symptoms (Berg et al., 2019). The hypothesis that memory support should focus on the development of skills to have a positive effect on treatment outcome has preliminary support from two studies. First, in an early study of memory support, patients in a CT+MS condition, compared to CT as usual, reported more accurate thoughts and application as well as generalization of the content of treatment. Behavioral generalization was related to a reduction in depression scores while thoughts about and application of treatment content were related to a 50% reduction in depressive symptoms (Gumpert et al., 2018a). Second, mediation analyses have suggested that greater use of memory support strategies by therapists led to reduced depressive symptoms and lower impairment through better patient adherence to treatment and subsequent better use of, and competence in, CBT skills (Sarfan et al., 2022)(Sarfan et al., 2022).

Another reason why memory support strategies may not always lead to improved outcomes is that patients may differ in the extent to which they benefit from memory support strategies. For example, Berg et al. (2019) showed that patients who were already knowledgeable about depression and CBT at baseline benefitted less from therapist-supported internet CBT. Perhaps patients with less knowledge are more curious and open to change or less to get stuck in intellectualization compared to patients who already know about depression and CBT (Berg et al., 2019). In addition, cognitive functioning or educational level may play a role in making memory support strategies beneficial. Dong and colleagues (2022) found that the effects of CT+MS were moderated by educational level: the effects of CT+MS were

larger for patients who completed college compared to those who did not (Dong et al., 2022). However, an earlier pilot study that included a larger number of less educated patients found the opposite results: the effects of CT+MS were larger for patients who did not complete college, compared to patients who did complete college (Harvey et al., 2016). Similarly, in the experiment that isolated retrieval as a memory support strategy during four sessions of problem-solving therapy in distressed individuals, retrieval led to better recall compared to the active control condition, but only in the individuals with low working memory (Bruijniks et al., 2019a, b, c, d). Taken together, more studies are needed to better understand the role of cognitive functioning or educational level as moderators of the effects of memory support. Also, different memory support strategies (for example, constructive versus non-constructive) might be helpful for individuals who have different educational backgrounds.

The present study investigated the use of memory support strategies, patient learning behavior, recall, therapy skills and depression in data from a Dutch randomized multicenter effectiveness trial conducted in routine practice settings. The main finding was that twice-weekly sessions were more effective than weekly sessions of CBT or interpersonal psychotherapy (IPT) for depression (Bruijniks et al., 2020). For the present report, videos of the sessions were rated for therapist natural use of memory support strategies, invitation to respond, use of scaffolding and patient learning behavior using rating manuals developed by Lee and colleagues(2016) and Zieve colleagues (Zieve et al., 2019). The use of memory support strategies can be considered to be “pantreatment”, i.e. relevant for a broad range of types of treatment (Dong et al., 2022). Therefore, for this particular study, we translated the principles from the CBT memory support manual to the IPT condition to enable the coding of memory support strategies and patient constructive learning behavior in IPT. The aims of the present study were sixfold. The first was to describe the frequency of constructive and nonconstructive memory support strategies, invitation to respond, use of scaffolding and patient constructive learning behavior in CBT and IPT for depression in routine clinical practice. Second, we tested the relationship between the use of constructive and nonconstructive memory support strategies, scaffolding and invitation to respond and patient learning behavior within the session. Third, we tested whether the overall use of constructive and nonconstructive memory support strategies during treatment was related to change in therapy skills and depressive symptoms over treatment. Fourth, we investigated the effects of memory support strategies in a session on depression and recall in the next session and tested whether the use of constructive and nonconstructive memory support strategies in a particular session was related to recall and depression in the next, controlling for

prior depression. Fifth, we tested whether educational level and working memory moderated the relation between the use of constructive and nonconstructive memory support strategies and change in patient learning behavior, next-session recall, next-session depression and change in therapy skills and depressive symptoms during treatment. Sixth, explored whether use of memory support strategies differed between those who received weekly versus twice-weekly sessions (Bruijniks, Meeter, Lemmens, Peeters, Cuijpers, Renner et al., 2022).

We expected that the use of more non-constructive and constructive memory support strategies would be related to more patient learning behavior, better recall and less depression in the next session, better development of therapy-specific skills and reduced depressive symptoms over treatment, and that these effects would be larger for patients with less education and lower working memory capacity. In addition, we expected that patients who received more scaffolding and invitations to respond would exhibit more patient learning behavior. Finally, we expected that patients who received weekly sessions would receive more memory support compared to those who received twice weekly sessions, due to longer time between the sessions in the lower session frequency and therefore higher presence of impaired patient memory.

## Method

### Design

The present study was a secondary analysis of a randomized controlled trial showing that twice-weekly sessions lead to better posttreatment outcomes than weekly sessions of cognitive behavioral therapy (CBT) or interpersonal psychotherapy (IPT) for depression in routine clinical practice. The present study was observational and focused on the relation between the observed use of memory support strategies and presence of patient constructive learning behavior, self-reported therapy process and depressive outcome. The original study took place between 2014 and 2018. Details on the study protocol and outcomes can be found elsewhere (Bruijniks et al., 2015, 2020). All study procedures were approved by the Medical Ethical Committee of VU Medical Centre Amsterdam (registration number 2014.337). Informed consent was obtained from all participants prior to participation in the study.

### Participants

Participants were included if they had a primary diagnosis of a DSM-IV or DSM-5 major depressive disorder (including

chronic depression as defined according to DSM-5 criteria or dysthymic disorder as defined by DSM-IV), aged 18 to 65 years, Dutch speaking, a pre-treatment score  $\geq 20$  on the Beck Depression Inventory-II (BDI-II (Beck et al., 1996) and access to internet facilities. Participants were excluded if they had started antidepressants or had a dosage change in the past 3 months, showed acute suicide risk, had a DSM-IV or DSM-5 diagnosis of drug- or alcohol dependence or a cluster A or B personality disorder or received more than five sessions of CBT or IPT in the previous year.

### Interventions

CBT was based on the manual by Beck and colleagues (1979) and IPT was based on the manual by Klerman and colleagues (1984). Both treatments consisted of 12 to 45-minute face-to-face sessions, depending on patient progress. The treatments were provided in the context of a RCT on the role of session frequency at 9 different treatment sites (Bruijniks et al., 2020), and therapists were not aware of any research questions related to memory support strategies as stated in this manuscript. Participants received an average of 17.80 (SD=3.25,  $N=75$ ) sessions.

### Procedure

Separate informed consent was signed for videotaping of the sessions (participants could participate in the trial without consenting to videotaping). Participants were recruited and treated in one of nine different mental health centers. For the present study, participants completed measurements at baseline, before each session, and 0.5, 3 and 6 months after the start of treatment. 126 patients gave consent for videotaping the sessions ( $n=126$ , 63%,  $n=60$  for CBT and  $n=66$  for IPT). There were no significant differences between patients whose sessions were videotaped versus not in gender, age, having a partner, active employment, BDI-II baseline scores or number of depressive episodes. Patients who did not give consent for the videotaping their sessions were more likely to have at least one parent born outside of the Netherlands and had higher scores on the BDI-II at month 6 (Bruijniks et al., 2021).

The schedule for selecting tapes to be rated included two steps. First, patients were randomly drawn (using the random function in Excel). Second, for each of these patients, three videos were selected to be rated, if available, one for each of three different phases of treatment (phase 1: between session 1 and 4, phase 2: between session 5 and 8, phase 3: between sessions 9 and 12). When a patient was selected with only 1 or 2 video's available, another patient with more videos available was drawn. A total of 75 patients were rated resulting in  $n=67$  (CBT:  $n=30$ , IPT:  $n=37$ ),  $n=59$  (CBT:

$n=30$ , IPT:  $n=29$ ), and  $n=56$  (CBT:  $n=29$ , IPT:  $n=27$ ) videos rated for phase 1, 2 and 3 respectively. Videos included sessions delivered by 49 different therapists, CBT therapists had an average of 7.40 ( $SD=7.07$ ) years' experience and IPT therapists had an average of 5.60 ( $SD=7.64$ ) (years of prior experience data was only available for  $n=32$  and  $n=18$  CBT and IPT therapists, respectively<sup>2</sup>). Due to capacity problems (the project run out of time) we were forced to finish data collection after rating videos of 75 patients. Videos were scored by 5 raters (four MSc level psychologists in training and the first author who also supervised the other raters). All raters received a one-day training from the first author, in which videos were scored together for training purposes. The first two raters were trained using two videos and were followed up by the third and fourth rater, who were trained using the same two videos, plus an additional 6 videos to establish consistency with the first two raters. Ratings of the training videos (i.e., the two training videos for the first two raters, the two plus six training videos for the subsequent two raters) were not used in the data analyses. 29 videos were double-rated ( $n=10$  by rater 1, 2 and 5,  $n=3$  by rater 1 and 2,  $n=13$  by rater 3, 4 and 5,  $n=2$  by rater 3 and 4,  $n=1$  by rater 4 and 5) to compute the interrater reliability. The mean scores of these 29 videos were used in the other analyses. The number of uniquely-rated videos per rater was  $n=34$  (rater 1),  $n=44$  (rater 2),  $n=37$  (rater 3),  $n=36$  (rater 4) and  $n=2$  (rater 5).

To compute inter-rater reliability the total number of memory supports used per session and the number of different memory support strategies used per session, intraclass correlation coefficients (ICCs) were computed. A two-way mixed-effects model, consistency, was used (Koo & Li, 2016). The average ICC<sup>3</sup> could be considered moderate (Koo & Li, 2016), between 0.57 and 0.69 for the total number of memory support per session and between 0.57 and 0.71 for the number of different memory support strategies used per session for a single and average measures ICC, respectively. The number of separate memory support strategies per session was low (see Supplementary materials 2, Table 2), which might affect the usefulness of Cohen's kappa. Therefore, raters categorical scores were recoded on the separate memory support strategies as absent (0) versus present (1) and we report proportions for positive and

negative agreement between raters<sup>4</sup>, where a value of zero would indicate zero agreement and a value of one absolute agreement (Byrt et al., 1993; Cicchetti & Feinstein, 1990). Positive agreement (i.e. agreement in indicating the presence of a memory support strategy) (i.e., varied from high (0.87 for practice remembering, 0.79 for attention recruitment, 0.77 for evaluation, 0.67 for application) to moderate (0.67 for application, 0.53 for repetition), too low for some categories with extreme low prevalence (0.40 for praise recall, 0 for cue use and categorization; for frequency of ratings, see also Table 2). Negative agreement (i.e. agreement in indicating the absence of a memory support strategy) was high ( $>0.7$ ) in all categories.

## Measures

### Therapist use of Learning Strategies

#### Therapist use of Memory Support Strategies

Memory Support Rating Scale (MSRS; Lee et al., 2016) is an observer-rated instrument that measures therapists use of eight different memory support strategies during the therapy session (counting the number of times each strategy is used per session). The different memory support strategies are attention recruitment, categorization, evaluation, application, repetition, practice remembering, cue-based reminder and praise recall. These strategies have been defined in Harvey et al. (2014) and Lee et al. (2016). Strategies can be distinguished as constructive memory support strategies (application, evaluation, categorization, cue-based reminder) or non-constructive memory support strategies (i.e., attention recruitment, repetition, practice remembering, praise recall). The MSRS has shown high internal consistency (Cronbach's  $\alpha=0.77$ ), interrater reliability (ICC=0.73-0.74) and convergent and discriminant validity (Lee et al., 2016) and was used successfully to rate memory support in a previous study, showing an average percent agreement between each coder and the expert coder of 89% (Dong et al., 2022). Memory support strategies were scored when they were applied to treatment points. Treatment points were defined as insights, skills, or strategies that the treatment provider would want the patient to remember as part of the treatment and could consist of five different categories. The MSRS manual describes treatment points specific to CBT. In the context of the present study, we adjusted these definitions for use in IPT. Treatment point categories per treatment modality can be found in the supplementary materials 3. After rating the presence of a

<sup>2</sup> Note that of these 49 therapists, in this dataset  $n=30$  provided CBT,  $n=16$  provided IPT and  $n=2$  provided both. Data on the years of experience for 1 therapist was missing.

<sup>3</sup> To calculate the ICC, a weighted mean was calculated of all double ratings between all different combinations of ratings ( $n=13$  double ratings between rater 1 and 2,  $n=15$  double ratings between rater 3 and 4,  $n=10$  double ratings between rater 1 and 5,  $n=10$  double ratings between rater 2 and 5,  $n=13$  double ratings between rater 3 and 5,  $n=13$  double ratings between rater 4 and 5).

<sup>4</sup> For Cohen's kappa a weighted mean was calculated in the same way as for the ICC.

memory support strategy on the MSRS, raters were asked to analyze the 3-minute period after use of the memory support strategy for further statements of the therapist and responses of the patient. These variables (invitation to response, use of scaffolding, patient constructive responses) are described below.

### Therapist Invitation to Patient to Respond

Following the procedures of Zieve and colleagues (2019), when a memory support strategy was detected, the rater additionally rated whether the therapist invited the patient to respond (yes/no). Invitation to respond was defined as any verbal or nonverbal cues from the therapist for a response to the memory support strategy.

### Therapist use of Scaffolding

Following the procedures of Zieve and colleagues (2019), when a memory support strategy was detected, the rater additionally rated whether the therapist applied scaffolding (yes/no). Scaffolding was defined as using prompts to motivate the patient further on the current line of thinking, for example by paraphrasing, reflecting on what the patient said or highlighting critical features of a problem.

### Patient Learning Behavior

#### Patient Constructive Responses to Memory Support

When a memory support strategy was detected, the rater additionally rated whether the patient replied with a constructive response (yes/no). Based on cognitive science literature (Chi & Wylie, 2014), constructive responses were defined as patient responses that contain ideas about the concepts and techniques in the therapy that go beyond the information that the therapist already presented (Zieve et al., 2019; instructions received from Lee and Harvey, personal communication, 2019). Raters could also report spontaneous patient constructive responses, indicating a constructive response that occurred in the absence of a memory support strategy. The presence of all constructive responses (spontaneous and not spontaneous) were merged into one variable representing patient learning behavior.

### Therapy Processes

#### Session Recall

After each session, therapists rated the degree to which the patient remembered the previous session's content on

11-point visual analogue scale (0=patient remembers nothing – 10=patient remembers everything). Therapists were instructed to start the session by asking what the patient remembered from the previous session and base their ratings on this answer and the recall of the patient during the current session. The original study included recall ratings for each therapy session, but the current study will only include the recall ratings that are needed to relate them to the use of memory support strategies in the session before (recall rated at session 2 till 13).

### Therapy-specific Skills

Therapy-specific skills were measured using the Cognitive Therapy Scale-Self Report (CCTS-SR) and Interpersonal Psychotherapy Skills Scale-Self-Report (IPSS-SR) to measure CBT skills and IPT skills respectively. The instruments were administered at baseline and 0.5, 3, and 6 months after start of treatment. The CCTS-SR is a 29-item questionnaire designed to assess patients' use of CBT skills during the past 2 weeks. Items were rated on a scale of 1 (not at all) to 7 (completely), minimum score=29, maximum score=203. The IPSS-SR consists of 25 items measured on a 7-point Likert Scale 1 (not at all) to 7 (completely) and assesses patients' use of IPT skills during the past two weeks, minimum score=25, maximum score=175. The IPSS-SR consists of four scales measuring communication skills and social support, understanding of own feelings, coping with grief and major life change, and understanding the feelings of others. The CCTS-SR has shown sufficient validity and reliability (Strunk et al., 2014) and initial psychometric properties of the IPSS-SR have been supported (Bruijniks et al., 2019), but single factor structures of both scales were not supported and need further examination (Bruijniks et al., 2019c; Buss et al., 2021).

### Symptom Outcome

#### Depression

Depressive symptoms were measured with the Beck Depression Inventory II (BDI-II; Beck et al., 1996; van der Does, 2002). The BDI-II was measured at baseline and before each session, two weeks after start of treatment and monthly during treatment. BDI-II is a 21-item self-report instrument assessing depressive symptoms over the past two weeks. A score of 0–13 indicated minimal depression, 14–19 mild depression, 20–28 moderate depression and 29–63 severe depression. The BDI-II has high validity and reliability (Hiroe et al., 2005; Wang & Gorenstein, 2013).

## Potential Moderators

Education level and working memory were assessed at baseline as potential moderators.

### Educational Level

Highest completed educational level was measured in the following categories, ranging from low to high educational level: lower educational level stated as none (1), lower special education (2), primary school (3), practical training school (4); middle educational level stated as: lower general secondary education (5), higher general secondary education (6), intermediate vocational education (7); higher education level has been as higher vocational education (8), pre-university education (9), university (10).

### Working Memory

Working memory was measured with the n-back task (Braver et al., 1997). The n-back task is an updating task and psychometric studies pointed to the n-back task as an efficient method for measuring working memory capacity (Schmiedek et al., 2014; Wilhelm et al., 2013). Participants were asked if a letter on the screen matched a letter previously (1-back, 2-back, 3-back) presented for 500 ms with an interval of 2000 ms. Participants were asked to run a test trial, during which they got elaborate feedback about the incorrect responses. Participants then completed a 1-back trial (2 min) and a 2-back trial (two parts of 2.5 min). Only when they performed well on the 2-back (i.e. 2/3 correct responses; a correct response means a correct press or a correct no-press), they were forwarded to the 3-back part of the task that also took 5 min (two parts of 2.5 min). The amount of n-backs (i.e. potential hits) in each condition was 33%. Feedback was given after a correct response (marked by a green V) or a miss (marked by a black X). Working memory load increased as the task progressed from 1-back to 3-back. Accuracy of responses (% correctly identified n-backs and % correctly identified no presence of a n-back) was measured and used as an outcome measure. Maximum scores for each trial was 200, making the maximum score on all trials 1000 (results of the test trial were not included). The relative score was computed by individual score/1000 \* 100.

### Other Measures

#### Diagnosis of MDD

The presence of a depressive disorder was indicated by a diagnosis following the Structural.

Clinical Interview for DSM-IV Axis I disorders (SCID-I) (First et al., 2002) or Mini International Neuropsychiatric Interview Plus (MINI-Plus) (Van Vliet & De Beurs, 2007).

### Statistical Analyses

First, demographics (age, gender, educational level, baseline working memory scores, treatment frequency and modality) and descriptives (means and standard deviations) of the use of constructive and non-constructive memory support strategies, scaffolding, invitations to respond and patient learning behaviors and therapy processes were reported.

Second, we ran four separate multilevel regression models using maximum likelihood estimation to test whether the use of constructive and nonconstructive memory support strategies, scaffolding or invitation to respond in a current session were related to patient learning behavior in the same session, while controlling for depression scores in the current session. Models had two levels, repeated observations (level 1) in patients (level 2) and allowed for a random intercept to account for differences between persons in patient learning behavior. Each model used the default independent covariance structure. Likelihood-ratio tests were used to test whether adding a random intercept on therapist or site level improved the two-level model, and whether adding a random slope to account for the relation between the predictor and patient learning behavior improved the model. Third, the relation between constructive and nonconstructive memory support strategies and change in therapy skills and depressive symptoms measured over treatment was tested in three separate linear regression models. The average use of constructive or nonconstructive memory support strategies were independent variables and residualized change scores of CBT skills (CCTS-SR), IPT skills (IPSS-SR), depressive symptoms (BDI-II) were used as dependent variables in separate models. Residualized change scores were computed by predicting the observed change score with the score at baseline and adding the residual resulting from this model to the observed change score. Baseline depression was added as a covariate in the models on IPT and CBT skills.

Fourth, we ran two separate multilevel regression models using maximum likelihood estimation to test whether the use of constructive and nonconstructive memory support strategies in a current session was related to recall and depression in the following session, controlling for depression in the current session. Models had two levels, repeated observations (level 1) in patients (level 2) and allowed for a random intercept to account for differences

**Table 1** General descriptives of the full sample ( $n=75$ )

General descriptives	
Female, $n$ (%)	43 (57.3)
Age, $M$ ( $SD$ )	37.56 (11.52)
BDI-II baseline, $M$ ( $SD$ )	34.49 (9.34)
BDI-II month 6, $M$ ( $SD$ )	20.84 (13.48)
Number of comorbid Axis 1 disorders, $M$ ( $SD$ )	1.15 (1.25)
Presence of chronic depression, $n$ (%)	45 (60)
Level of education	
low, $n$ (%)	8 (10.7)
medium, $n$ (%)	38 (50.7)
high, $n$ (%)	29 (38.7)
Baseline working memory	64.46 (19.66)
Twice-weekly session frequency, $n$ (%)	31 (41.3)
Treatment modality: CBT, $n$ (%)	39 (52)

Note. BDI-II=Beck Depression Inventory-II,  $M$ =mean,  $SD$ =standard deviation. Low educational level has been defined as no former education or special lower education or primary school or practical training school; middle educational level has been defined as completing lower general secondary education or higher general secondary education or intermediate vocational education; and higher education level has been defined as completing higher vocational education or pre-university education or university. Total  $N$  was 57 and 59 for BDI-II scores at month 6 and baseline working memory respectively

between persons in patient learning behavior. Each model used the default independent covariance structure. Again, likelihood-ratio tests were used to test whether adding a random intercept on therapist or site level improved the two-level model, and to test whether adding a random slope to account for the relation between the predictor and constructive patient learning behavior improved the model.

Fifth, to test educational level and working memory as moderators of the relation between the use of constructive and non-constructive memory support strategies and patient learning behavior, recall, therapy skills and depressive symptoms, educational level and working memory were added as independent variables and as interactions with constructive and non-constructive memory support strategies to the above described models. In the models testing moderation, variables were centered around the mean (i.e., use of constructive and nonconstructive memory support strategies, working memory) or median (educational level) before computing the interaction term to reduce multicollinearity (Kraemer & Blasey, 2003).

Sixth, using an independent samples t-test, we tested whether the use of memory support strategies differed between those who received one session weekly versus two session weekly.

All hypotheses were tested at  $p<.05$ . Analyses were run in SPSS (Version 29) and Stata (Version 16).

**Table 2** Descriptives of recall and therapy skills per treatment modality ( $M$  ( $SD$ ))

	CBT weekly	CBT twice-weekly	IPT weekly	IPT twice-weekly
Recall session 2	6.57 (1.27)	5.17 (1.72)	6.60 (2.11)	6.88 (2.35)
Recall session 3	6.00 (1.63)	6.17 (2.22)	6.30 (2.90)	6.88 (2.16)
Recall session 4	6.00 (1.73)	4.33 (3.67)	6.27 (2.76)	7.29 (2.21)
Recall session 5	6.29 (1.97)	5.83 (3.18)	6.30 (2.16)	7.13 (1.64)
Recall session 6	7.00 (1.41)	7.17 (.98)	6.27 (1.90)	7.13 (1.88)
Recall session 7	6.67 (1.50)	7.40 (1.34)	6.90 (1.79)	7.17 (1.60)
Recall session 8	6.33 (1.36)	7.40 (1.94)	6.82 (1.94)	7.00 (1.30)
Recall session 9	6.83 (.98)	8.00 (.81)	6.27 (1.73)	6.62 (1.84)
Recall session 10	7.50 (.54)	6.80 (2.77)	7.00 (1.88)	7.00 (1.51)
Recall session 11	6.67 (1.21)	6.80 (2.38)	7.00 (1.70)	6.63 (1.68)
Recall session 12	7.40 (.54)	7.20 (1.30)	6.80 (1.81)	6.88 (2.16)
Recall session 13	7.20 (.83)	6.40 (2.30)	7.00 (2.13)	6.75 (1.66)
CTSS-SR: CBT skills baseline	81.00 (30.57)	84.83 (27.76)	79.64 (15.13)	69.13 (13.62)
CTSS-SR: CBT skills month 6	109.00 (33.19)	121.00 (9.13)	84.50 (26.64)	121.17 (17.40)
IPSS-SR: IPT skills baseline	85.86 (15.09)	95.33 (32.36)	87.09 (17.02)	93.25 (24.85)
IPSS-SR: IPT skills month 6	102.80 (13.18)	113.40 (18.28)	99.50 (19.87)	119.20 (16.93)

Note. CBT=cognitive behavioral therapy, IPT=interpersonal psychotherapy,  $M$ =mean,  $SD$ =standard deviation. Note that information on constructive learning responses were available for  $n=159$  videos

## Results

### Descriptives

The sample consisted of patients who were mostly severely depressed (BDI-II:  $M=34.49$ ,  $SD=9.34$ ) at baseline. Mean age was 37.56 ( $SD=11.52$ ) and 57.3% of the patients were female. 41.3% of the patients received sessions twice a week and 52% of the sample received CBT. Sample characteristics are given in Table 1. Descriptives on recall and therapy skills are given in Table 2. Correlations between baseline working memory, educational level, memory support strategies, patient learning behaviors and therapy process change are given in Table 3, Supplemental Table 1.

**Table 3** Correlations between baseline working memory, educational level, memory support strategies, patient constructive learning behaviors and therapy process change

	Baseline working memory	Educational level
Constructive memory support strategies	.05	-.22*
Non-constructive memory support strategies	-.00	-.09
Scaffolding	.004	-.19
Invitation to respond	.05	-.22
Constructive patient behavior	.03	-.17
Recall	.26*	-.04
Change in CBT skills (CCTS-SR)	.16	-.03
Change in IPT skills (IPSS-SR)	.03	.30*

Note. CTSS-SR=Cognitive Therapy Scale-Self Report, IPSS-SR=Interpersonal Psychotherapy Skills Scale-Self-Report. \* =  $p < .05$ , \*\* =  $p < .01$

### Aim 1: The frequency of constructive and nonconstructive memory support strategies, invitation to respond, use of scaffolding and patient learning behavior

Non-constructive memory support strategies were used more often compared to constructive memory support strategies ( $M = 1.92$ ,  $SD = 1.65$ ;  $M = .80$ ,  $SD = 1.04$  for non-constructive and constructive memory support strategies, respectively; Cohen'  $d = 0.81^5$ ). Patient learning behavior was present in 46.5% of the sessions. Descriptives regarding the therapist use of constructive and non-constructive memory support strategies and patient learning behaviors per treatment condition and treatment phase are presented in data supplement 1.

### Aim 2: The relationship between the use of constructive and nonconstructive memory support strategies, scaffolding invitation to respond and patient learning behavior within the session<sup>6</sup>

More use of constructive and non-constructive memory support strategies was related to more patient constructive learning behavior ( $B = 0.32$ ,  $SE = 0.06$ , 95%  $CI = 0.19 - 0.45$ ,  $p < .001$ ;  $B = 0.21$ ,  $SE = 0.04$ , 95%  $CI = 0.12 - 0.30$ ,  $p < .001$ ). Use of scaffolding and invitations to respond were significantly related to more patient constructive learning behavior ( $B = 0.27$ ,  $SE = 0.05$ , 95%  $CI = 0.16 - 0.38$ ,  $p < .001$ ;  $B = 0.26$ ,  $SE = 0.04$ , 95%  $CI = 0.18 - 0.34$ ,  $p < .001$ ).

<sup>5</sup> Cohen's  $d$  was calculated as:  $(M_2 - M_1) / SD_{pooled}$

<sup>6</sup> Two-level models (measurements in patients) with random intercept and slope showed the best fit and are reported. Except for the model on the relation between invitation to respond and patient learning behavior: a random slope could not be fitted and results of the two-level model with a random intercept are reported.

### Aim 3: The relation between constructive and nonconstructive memory support strategies and change in therapy skills and depressive symptoms over treatment

Use of constructive and non-constructive memory support strategies were not related to change in depression from baseline to 6 months after start of treatment ( $B = -2.48$ ,  $SE = 3.16$ ,  $p = .43$ ;  $B = -1.77$ ,  $SE = 2.50$ ,  $p = .48$ ). Constructive and non-constructive memory support strategies were not related to change in CBT skills ( $B = -0.78$ ,  $SE = 7.59$ ,  $p = .91$ ;  $B = 3.51$ ,  $SE = 5.98$ ,  $p = .56$ ) or to change in IPT skills ( $B = -5.30$ ,  $SE = 4.75$ ,  $p = .27$ ;  $B = -6.09$ ,  $SE = 3.71$ ,  $p = .10$ ).

### Aim 4: The relation between the use of constructive and nonconstructive memory support strategies and recall and depression in the next session<sup>7</sup>

Constructive and non-constructive memory support strategies were not related to recall in the subsequent session ( $B = 0.01$ ,  $SE = 0.12$ , 95%  $CI = -0.22 - 0.25$ ,  $p = .91$ ;  $B = -0.032$ ,  $SE = 0.08$ , 95%  $CI = -0.15 - 0.14$ ,  $p = .96$ ). More use of constructive memory support strategies was related to lower depression in the next session ( $B = -1.12$ ,  $SE = 0.49$ , 95%  $CI = -2.09 - 0.15$ ,  $p = .02$ ). Use of non-constructive memory support strategies was not related to depressive symptoms in the subsequent session ( $B = 0.24$ ,  $SE = 0.31$ , 95%  $CI = -0.36 - 0.85$ ,  $p = .43$ ).

### Aim 5: Educational level and working memory as moderators of the relation between the use of constructive and non-constructive memory support strategies and patient learning behavior, recall, therapy skills and depressive symptoms

Educational level moderated the relation between scaffolding and patient learning behavior ( $B = -0.02$ ,  $SE = 0.01$ , 95%  $CI = -0.05 - 0.001$ ,  $p = .04$ ). Correlations between scaffolding and patient learning behavior for the different educational levels were larger for patients with lower educational levels (Educational level 1,  $r(6) = 0.63$ ,  $p = .09$ , Educational level 2,  $r(36) = 0.57$ ,  $p < .001$ , Educational level 3,  $r(27) = 0.44$ ,  $p = .01$ ). Working memory did not moderate the relation between scaffolding and patient learning behavior. Educational level and working memory did not moderate the relation between constructive or non-constructive memory

<sup>7</sup> For the relation between memory support strategies and recall three-level models (measurements in patients in therapists) with random intercept on patient level showed the best fit and are reported. For the models on the relation between memory support strategies and depression two-level models (measurements in patients) with a random intercept showed the best fit and are reported.

support strategies and change in CBT skills, IPT skills, next session recall, depressive symptoms in the next session or change in depressive symptoms over treatment. Educational level and working memory did not moderate the relation between constructive or non-constructive memory support strategies, invitation to respond and patient learning behavior.

### **Aim 6: Constructive and Nonconstructive Memory Support between Session Frequencies**

Although slightly more constructive ( $M=0.95$ ,  $SD=1.08$  versus  $M=0.72$ ,  $SD=0.70$ ) and non-constructive ( $M=2.27$ ,  $SD=1.39$  versus  $M=1.72$ ,  $SD=1.00$ ) memory support strategies were used in weekly sessions compared to twice weekly sessions, the differences between session frequencies were not significant,  $t(73)=1.01$ ,  $p=.31$ ;  $t(72.92)=1.98$ ,  $p=.05$ , respectively.

## **Discussion**

The use of constructive and non-constructive memory support strategies, as well as the use of scaffolding and invitations to respond, were related to more patient learning behavior. However, only the use of constructive, and not non-constructive, memory support strategies were related to reduced depressive symptoms in the subsequent session while controlling for depressive symptoms in the current session. The use of memory support strategies was not related to recall, therapy skills, posttreatment depression, session frequency and relations were not moderated by working memory and educational level.

Our findings are partly in the line with the findings reported by Dong and colleagues (2022). Specifically, the total use of memory support strategies was much lower in the present sample. This is perhaps not surprising given Dong et al. (2022) was conducted in a university environment under tightly controlled circumstances, whereas the current study was conducted in routine clinical practice (patients seen at nine different treatment sites). Also, therapists in the present study used similar types of memory support strategies most frequently compared to Lee et al. (2020). Specifically, in the present study, the use of cue-based reminders, evaluation, categorization and praising recall were rare, while application, attention recruitment, repetition or practice remembering were used more often (note that practice remembering was used less often in Lee and colleagues, 2020). Also, non-constructive memory support strategies were used more often compared to the constructive memory support strategies in the present study as well as Dong et al. (2022). However, compared to the CT-as-usual arm in Dong et al. (2022),

where about eight memory support strategies were used per session, in the present dataset, therapists used on average only one to three different memory support strategies per session. This low number of memory support strategies is also surprising considered some degree of memory support is part of the CBT protocol (Beck, 2020). One explanation for why effects were only found on the short term (i.e., the next session) might also be the low use of memory support strategies: a certain amount of memory support strategies per session may affect depression in the next session, but if a certain dose and frequency is not consistently used each session, the effects may disappear over time. Taken together, this study extends prior research by documenting a low use of memory support strategies in routine practice settings. This is an important finding and raises the possibility that teaching clinicians in routine practice to deliver (constructive) memory support strategies may be impactful.

Consistent with the findings of Zieve et al. (2019a, b, c), scaffolding and inviting a response were related to more constructive patient learning behavior, albeit at a lower rate in the present study (i.e., between zero and once a session compared to about once per session in the study of Zieve et al., 2019a, b, c), possibly because of the difference in use of memory support strategies between the studies). Further, finding that use of constructive memory support strategies was related to lower depression in the next session is in line with findings reporting CT+memory support (MS) resulting in lower depression at 6 month follow-up (Dong et al., 2022) and higher odds of remission and recovery (Harvey et al., 2016). Because the dose of memory support strategies was much lower in the present study, our findings point to the possibility that the use of memory support strategies can also be related to subsequent reduced depressive symptoms even when provided in a smaller dose. However, the effects did not hold at posttreatment. Finally, findings support the notion that the memory support intervention that was developed may be relevant to a broad range of types of treatment (Harvey et al., 2017). Specifically, our findings indicate that the use of memory support strategies and patient constructive learning behavior may play a role in IPT for depression too.

In contrast to earlier findings, the use of memory support strategies in the present study did not relate to recall or therapy skills and the effects were not moderated by educational level or working memory. One potential explanation for not finding a relationship with next session recall might be limitations in the instrument used to measure recall. Past session recall in this study was estimated by the therapist on a 11 point visual analogue scale, while in the study of Dong et al. (2022), a free recall test was given to the patients and coders counted the number of treatment points recalled (i.e., main ideas and experiences that are learnt during

psychotherapy). It is possible that the measure used in the present study did not measure actual memory performance (but merely gave an impression of the recall) or was less reliable because it was rated by therapists and not patients themselves. No psychometric information about the recall task was available. Although the current study and Dong et al. (2022) used the same instrument to measure therapy skills, it is possible that the number of memory support strategies was too low to improve the development of therapy skills in the present study. Nevertheless, it should be noted that the number of support strategies was not too low to be associated with reduced depression scores during the next session. A future study should measure therapy skills each session to find out whether the effect of memory support strategies is mediated by the development of therapy skills. This same limitation may explain the absence of moderating effects of educational level and working memory. This finding contrasts our hypothesis and findings of previous studies that show that memory support strategies might be more helpful for patient with lower cognitive capacities at baseline (Bruijniks et al., 2019a, b, c, d; Harvey et al., 2016), if the overall number of memory support strategies is very low on average, it might be not possible to find that patients with lower educational levels and working memory benefit more from a higher dose of memory support strategies.

Several study limitations need to be mentioned. First, we had limited power to detect moderation effects of treatment modality and educational level and working memory. The small number of patients with low levels of education might have led to an underestimation of the effects (Memon et al., 2019). Also, multiple tests without Bonferroni correction were conducted, leading to a potential risk for type I error. Our results need to be interpreted cautiously and further investigated in future studies. Because of limited power, we were not able to adequately test the effects of memory support strategies per treatment type (CBT versus IPT) or treatment phase. Second, the use of memory support strategies was so low overall that we were not able to investigate the role of separate strategies on outcomes. In particular, the prevalence of certain memory support strategies (cue-based reminders, categorization, praising recall, evaluation) was very low. However, though constructive memory support strategies were less present compared to non-constructive memory support strategies, the constructive memory support strategies were related to depressive symptoms in the next session. Third, although an informal research plan was set-up before the start of the study, this plan was not pre-registered. The results presented in this manuscript should be considered tentative without replication. Also, the multilevel model does not account for the relation between between-patient differences in the predictor and in the outcome variable. Future studies should consider estimating

models that separately estimate between-patient and within-patient effects (Falkenström et al., 2017).

Future studies should use an experimental design to find out which memory support strategy is effective and further test moderators, such as educational level and cognitive abilities, to find out which strategy is most effective for whom. Especially in a setting where standard use of memory support strategies is low (i.e., one to three strategies per session) it would be interesting to experimentally test whether enhancing the frequency and dose of memory support strategies can improve the effects of treatment for depression. Also, determining out whether different patients benefit from different forms of memory support strategies (i.e., constructive versus non-constructive) or whether constructive memory support strategies are more effective in general for all may lead to more specific recommendations on the use of memory support strategies.

The current study extends previous work on the use of memory support strategies in a university setting to investigating how memory support strategies are used and linked to treatment outcomes in routine clinical practice. Another strength of the present study was the number of video ratings per patient and the session measurements of depression and recall, which enabled us to investigate the direct effect of memory support on therapy processes and outcomes in the subsequent session. Another strength was that the therapy sessions took place outside an academic context and focused on therapist natural use of memory support. This study is the first to further our knowledge on memory support in the context of routine clinical practice.

In summary, the present study showed that in a low dose, constructive memory support strategies are related to patient learning behavior and reduced next session depression in routine clinical practice and support for the pan-treatment use of memory support strategies. Future studies should test which strategy works for whom and whether a higher dose leads to changes in depression over treatment.

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**Data Availability** Data requests can be send to the corresponding author.

## Declarations

**Competing Interests** The authors declare no competing interests.

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