AMERICAN PSYCHOLOGICAL ASSOCIATION

Emotion

ISSN: 1528-3542

2023, Vol. 23, No. 1, 41–51
https://doi.org/10.1037/emo0000783

How Context, Mood, and Emotional Memory Interact in Depression: A Study in Everyday Life

Janna N. Vrijsen[1, 2], Nessa Ikani[1, 2], Pierre Souren[3], Mike Rinck[3], Indira Tendolkar[1], and Aart H. Schene[1]

[1] Department of Psychiatry, Donders Institute for Brain, Cognition and Behaviour, Radboud University Medical Center

[2] Pro Persona Mental Health Care, Depression Expertise Center, Nijmegen, the Netherlands

[3] Behavioural Science Institute, Radboud University Nijmegen

Cognitive theories of depression hold that negative contextual triggers (e.g., stressful events) induce more negative and less positive mood, in turn instigating negatively biased memories. However, context-related variability in mood and emotional memory has received insufficient attention, while the dynamic interaction between these factors plays a crucial role in the kindling of new depressive episodes. Experience Sampling Method (ESM) for repeated, daily life measures of context, mood, and autobiographic emotional memory was used in 46 currently depressed, 90 remitted-depressed, and 55 never-depressed individuals. Currently depressed individuals showed strongest negative processing style and never-depressed most positive, with remitted-depressed patients scoring intermediate. The moderated mediation model indicated that context appraisal had a direct effect on the appraisal of the recalled event (i.e., our operationalization of emotional memory), which was mediated by positive (but hardly by negative) mood and was independent of depression status. This mediation strength was relatively similar to the strength of the direct effect of context on memory. Results are in line with cognitive theories of depression. Especially context seems important for emotional memory. The association between context, mood, and memory, however, may be independent of depression status. Yet, the "level" of mood, context, and event appraisal does depend on depression status.

Keywords: depression, memory, ecological momentary assessment, affect, environment

Supplemental materials: https://doi.org/10.1037/emo0000783.supp

Depression is characterized by negatively biased information processing (Gotlib & Joormann, 2010; LeMoult & Gotlib, 2019); with consistent evidence found for negatively biased memory and a lack of the positive memory bias that nondepressed individuals typically display (Gotlib & Joormann, 2010; Matt et al., 1992). Evidence for negatively biased memory in depression is most consistent for explicit (LeMoult & Gotlib, 2019) and self-relevant information such as adjectives that are endorsed as self-descriptive (Gaddy & Ingram, 2014; Gotlib & Joormann, 2010) and autobiographical information (Gadassi Polack et al., 2020; Kim et al., 2018). Negative memory bias contributes to depressive symptom levels and recurrence of depression (Johnson et al., 2007; LeMoult et al., 2017); and may hence be used as clinical outcome predictor. Evidence indicates that individuals remitted from depression continue displaying a slight negative bias and lack the positive bias of never-depressed individuals (e.g., Gethin et al., 2017; for reviews see Gotlib & Joormann, 2010; Joormann & Arditte, 2015). Taken together, negatively biased memory is associated with depression vulnerability.

This article was published Online First May 27, 2021.

Janna N. Vrijsen https://orcid.org/0000-0002-7081-9893

Indira Tendolkar https://orcid.org/0000-0003-3171-3671

This work was funded by MIND Netherlands (Grant 2014 6909).

We thank Livia van de Kraats, Chantal Neijnens, and Renske van der Wal for their help with data collection.

All dependent variables or measures that were analyzed for this article's target research question have been reported in the Method and Materials section. All levels of all independent variables, whether successful or failed, have been reported in the Method and Materials section. The total number of excluded observations and the reasons for making those exclusions have been reported in the Method and Materials section.

The authors have no conflicts of interest.

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy restrictions. This because the data include descriptions of locations and events unique to the participant.

There are no previously published or currently in-press works stemming from this same dataset.

Janna N. Vrijsen developed the study concept, supervised data collection and drafted the manuscript. Aart H. Schene contributed to the study design. Nessa Ikani, Pierre Souren, and Janna N. Vrijsen performed the data analyses. All authors provided critical revisions and input on the interpretation of the results. All authors approved the final version of the manuscript for submission.

Correspondence concerning this article should be addressed to Janna N. Vrijsen, Department of Psychiatry, Donders Institute for Brain, Cognition and Behaviour, Radboud University Medical Center, P.O. Box 9101, 6500 HB Nijmegen, the Netherlands. Email: Janna.Vrijsen@radboudumc.nl

Collectively, the various influential cognitive theories of depression include a description of activation of some sort of underlying information structure (e.g., schema, network) by negative context (e.g., stressful event, negative cue), resulting in automatic negatively biased information processing in memory (and other cognitive domains; Beck, 1967; Beck & Bredemeier, 2016; Bower, 1981; Ingram, 1984). This in turn, results in (increased risk for) depressive symptoms. The cognitive theory of Beck (1967, 2008) poses that negative experiences activate negative schemas which are developed based on adverse childhood experiences. These schemas guide (and bias) information processing. This biased processing of information in turn elicits symptoms of depression including negative mood. Relatedly, Ingram (1984) states that when negative networks are activated by appraisals of context (e.g., negative events), individuals elaborate on negative information, which can activate connected memory networks by associative linkages, contributing to depressive symptom development including increased negative and decreased positive mood. This inability to disengage from negative stimuli in memory manifests clinically as a ruminative response style (Beck, 2008; Gotlib & Joormann, 2010). Bower (1981) discusses mood-congruent processing: Negative mood (elicited by negative context) activates nodes within a negative cognitive network. The spreading activation within the network creates a strongly activated network, resulting in negatively biased processing in memory. This in turn contributes to depressive symptom development or aggravation. The models show slight differences in as to when negative mood is elicited. Moreover, the direct automatic activation of negative mood after negative appraisal of stimuli by the basic evolutionary function of the amygdala is not included in these models (see Disner et al., 2011). Importantly, however, a synthesis of these models shows that negatively appraised context and negative mood (or: decreased positive mood) may activate maladaptive schemas or networks, resulting in negatively biased (mood-congruent) memory processing.

Hypotheses based on these cognitive theories are mostly tested in the lab. Lab-based mood and emotional memory research yields high control. They, for example, allow for control over which stimuli is encoded while purposefully keeping the context (and hence likely its influence on mood) constant for all participants. Because mood and emotional cognitive processing are not static, and they (as well as their interrelations) are influenced by the context, lab-based studies may lack relevance for everyday life. Since emotional memory may function differently in everyday life than in a lab-setting, the usefulness of lab-based bias assessments in the evaluation of depression treatment (e.g., Harmer & Cowen, 2013) and therapeutic bias modification interventions (Jones & Sharpe, 2017) might be suboptimal. This is especially true for computer tasks such as the widely used Self-Referent Encoding task (SRET; Derry & Kuiper, 1981); where participant's recall of positive and negative self-descriptive adjectives is tested. In fact, there are claims that the SRET has low sensitivity (Dobson & Shaw, 1987) and doubtful external validity (Dainer-Best et al., 2018). The SRET has, however, produced consistent results over the years and can be considered the 'golden standard' for measuring selective memory bias. Hence, current emotional memory research largely ignores the effects of (changing) contextual information and individual differences in the personal relevance of the stimuli used.

New technical developments such as the Experience Sampling Method (ESM) offer avenues for emotional memory measurement innovations and for testing the interplay between context, mood, and memory. ESM is a systematic, nonintrusive, reliable and valid method (Csikszentmihalyi & Larson, 2014). ESM has great advances: It provides a naturalistic measure of context information, valuable information on daily fluctuations in mood, and the rich and nuanced data collected allows for refined statistical analyses (Shiffman et al., 2008). Applying ESM is hence a partial solution to the emotional memory research dilemma. Whereas lab research controls what actually happens (including which information is encoded) but lacks ecological validity, research in daily life is realistic and hence has more relevance for clinical practice but lacks control (e.g., over the emotionality of the to be encoded stimuli).

Indeed, recent ESM studies found that mood changes result from situational cues, for example a person's location and company (e.g., Sandstrom et al., 2017). The within-person context and mood changes in turn, affect cognitive functioning, including memory (von Stumm, 2016, 2018). These studies indicate that context may affect memory more than mood changes, yet covered nonemotional memory only. An ESM study by Connolly and Alloy (2018) in students found evidence for negative event recall as a vulnerability factor for depression. Participants received smartphone notifications to which they reported on their experience of negative life events, whether these events resulted in stress-reactive rumination, as well as their depressed mood after an event occurred. A negative recall bias was found for events that causes stress-reactive rumination: Negative events resulting in more stress-reactive rumination were more likely to be recalled two weeks later. Furthermore, individuals who endorsed and recalled more negative life events that caused stress-reactive rumination (or: stressors) displayed increased depressive symptoms, likely because endorsement indicates integration into an existing negative network/schema. Collectively, the few studies available indicate that applying ESM in mood- and emotional memory research may push research and possible clinical applications to depression forward.

Considering these developments, we investigated the effect of context on emotional memory in daily life, and its mediation by positive and negative mood. Emotional memory was operationalized as the appraisal (relatively more positive vs. negative) of personal episodic declarative memories, or put differently, the valence attached to recalled recently experienced events. Because positive and negative mood represent different dimensions (Watson & Tellegen, 1985), both were assessed. We examined moderation of the mediation effect by depression status to explore the depression-status dependence of the findings. Hence, currently-, remitted-, and never-depressed individuals were included in the study. We extend previous emotional memory work (Connolly & Alloy, 2018) by approaching the role of context and event recall with ESM—as a new emotional memory measure—and by testing our model in patients (in remission). Based on cognitive theories, we expected that more negatively appraised context would be associated with less positive and higher levels of negative mood, which subsequently would be associated with recall of a negatively appraised recent event. This mediation pattern was expected to exist in all three participant groups, with no specific

hypotheses regarding differences between groups. However, we did expect currently depressed individuals to recall more negatively appraised events, show more self-referent memory bias and present with more depressive symptoms (including rumination) compared to never-depressed control participants, with the remitted depressed as in intermediate group. Furthermore, we examined the association between this ESM emotional memory measure and the SRET negative memory bias index, to explore whether it may represent a memory *bias* measure. We expected less positively appraised ESM-based emotional memory to correlate with more negative memory on the SRET bias and more depressive symptoms. Investigating the mediating role of mood in the association between context and autobiographical emotional memory can increase our understanding of the kindling effects of acute contextual triggers (Segal et al., 1996).

Method and Materials

Participants

A sample consisting of 46 currently depressed, 90 remitted-depressed, and 55 never-depressed individuals participated in the study. Our sample size is based on the study by Peeters et al. (2003) with a comparable design (best proxy at the time) in depressed and healthy individuals. We therefore aimed to collect data in $n = 50$ currently depressed patients and $n = 50$ never-depressed individuals; a larger sample of remitted depressed patients was included to accommodate secondary analyses on the number of previous episodes (different research question). Currently and remitted-depressed individuals were recruited via a crowd funding program initiated by the Dutch Foundation for Mental Health called 'MIND Netherlands'and via the Radboud University Medical Center, Center for Mindfulness. Never-depressed controls were recruited via the Radboud University's research participant system and via previous study samples (see Vrijsen et al., 2014). Two participants (both remitted-depressed) dropped out, resulting in $N = 189$ for the analyses. No participants had to be excluded due to incompliance with the protocol (maximum number of missing prompts was 9%). Sample characteristics are presented in Table 1.

During a telephonic interview, a trained researcher or clinician used the Structured Clinical Interview for *DSM–IV* Axis I Disorders [SCID-IV-RV; First et al., 1996) to assess the presence of current and past Major Depressive Disorder (MDD) and (hypo) manic episodes, current anxiety disorder (including posttraumatic stress disorder (PTSS) and obsessive–compulsive disorder (OCD)), addiction in the last 6 months, and current psychosis. We included individuals (ages 18–70) with either an MDD episode, who had experienced one or several MDD episodes in the past (last episode >1 month ago), or who never experienced an MDD episode. Excluded were individuals who were blind, deaf, currently psychotic or acutely suicidal, with current diagnosis of an anxiety disorder (including PTSS and OCD; specific phobia was allowed), lifetime (hypo)manic episodes, addiction in the last six months, a sensorimotor- or neurological handicap hindering participation, or insufficient command of the Dutch language. This study was approved by the Radboud University's Social Sciences ethical committee (code: MEDAL study) and carried out in accordance with the provisions of the Helsinki Declaration of 1975; as revised in 2008.

Apparatus

Questionnaires

Participants' gender identification, age in years, highest level of education, and medication use were assessed. Next, the Beck Depression Inventory-second edition (BDI-II; Beck et al., 1996; for Dutch validated version: Van der Does, 2002) was used to assess depression symptom severity. The BDI-II contains 21 items, which can be scored between 0 to 3. The total score can be categorized as minimal- (0–13), mild- (14–19), moderate- (20–28) or severe depressive symptoms (≥29). The BDI-II assesses symptoms regarding the previous two weeks. Internal consistency was excellent ($\alpha = .94$) for the current sample. The 21-item Beck Anxiety Inventory (BAI; Beck et al., 1988; Dutch version evaluated by Muntingh et al., 2011) was used to assess anxiety symptoms. The

Table 1
Group Differences on Demographic Variables and Baseline Questionnaires (N = 189) Including Statistical Group Comparisons

Variable	Currently depressed	Remitted-depressed	Never depressed	Group comparison
Age (*M*, *SD*)	48.7, 11.2	52.5, 11.1	51.7, 10.9	$F(2, 186) = 1.82$, $p = .165$
Gender (% female)	72	78	78	$\chi^2(2) = 0.85$, $p = .655$
Education (%)				$\chi^2(4) = 5.82$, $p = .213$
Low	4	4	0	
Medium	30	18	23	
High	65	80	77	
BDI-II (*M*, *SD*)	28.5, 11.0	12.4, 9.2	3.0, 3.4	$F(2, 186) = 114.83$, $p < .001$
BAI (*M*, *SD*)	18.0, 9.4	9.4, 7.7	2.2, 2.7	$F(2, 186) = 61.51$, $p < .001$
Living arrangement (%)				$\chi^2(6) = 9.95$, $p = .127$
Alone	37	25	29	
With partner	44	55	45	
In community	4	0	0	
With family members	15	21	26	
RRS (*M*, *SD*)	56.4, 11.0	48.3, 11.5	31.8, 8.5	$F(2, 186) = 73.96$, $p < .001$
Medication use (% yes)	85	78	0	$\chi^2(2) = 103.93$, $p < .001$

Note. BDI-II refers to the Beck Depression Inventory total score, BAI refers to the Beck Anxiety Inventory total score, RRS refers to the Ruminative Response Scale total score, Medication use refers to psychoactive medication use only.

21-item BAI was especially developed to minimize its relationship with depression. Participants rate the severity of each symptom on a four-point scale ranging from 0 to 3. The total score is used to indicate anxiety symptom severity. The internal consistency was excellent (α = .92). The 26-item Ruminative Response Scale (RRS; Treynor et al., 2003; Dutch validated version by Raes et al., 2003) was used to assess ruminative thinking style. The RRS consists of 22 items that can be scored between 1 and 4, and describes trait ruminative responses to a depressed mood. The total score is used in the analyses. The internal consistency was excellent in the current sample (α = .95).[1]

Self-Referent Encoding Task

The computerized Self-Referent Encoding task (SRET; Derry & Kuiper, 1981) was used to measure explicit verbal memory bias for positive and negative stimuli. Twenty-four Dutch adjectives (12 positive, 12 negative; presented in fixed random order) were selected from the Dutch translation of the Affective Norms for English Words (ANEW; Bradley & Lang, 1999). For each word, participants were instructed to indicate whether it was self-descriptive or not by pressing either of two keys on the keyboard upon presentation. After a two min distraction (Raven's Progressive Matrices; Raven, 1958); participants were given three minutes to type in all the words they remembered. Spelling errors were permitted. Response to the first two and last two words were removed to reduce primacy and recency effects on the memory bias index. A negative memory bias index was calculated by dividing the number of correctly recalled negative words endorsed as self-descriptive by the total number of endorsed and recalled words (cf. Gotlib et al., 2004).

Smartphone Application

The participants were given a Samsung Galaxy Y (2011) smartphone on which the MovisensXS application was installed. All ESM cycles occurred over a six-day period and began on a Tuesday, Wednesday, or Thursday, and hence always included a weekend and multiple weekdays.

Participants were prompted to perform ESM mood and context measures seven times per day during active hours (8 a.m.–10 p.m.). See Table 2 for an overview of the ESM design. The first prompt was initiated by the participant after awaking; the other prompts were push messages. These prompts were given at random times within two-hour intervals.

Mood and Context. Mood and context were assessed at every prompt. Positive and negative mood were assessed with the following statements: "I feel happy" and "I feel sad." These items reflect the core depressed/sad mood symptom of depression (cf. the *DSM*). Participants also indicated how relaxed and anxious they were (fillers). Participants provided their answers using sliders anchored with "not at all" (score 0) and "very much" (score 100). Upon presentation of the question, the slider was positioned in the middle (at score 50) and had to be moved before the response could be confirmed and the next question would appear. Next, participants indicated their context: Both their current location and the company they were with (filler). The question for location read "Where am I?," which could be answered by tapping on one of the buttons presented below each other on the screen with the labels "At home," "At someone else's home," "Work/School," "Public place," "In transit," and "Somewhere else." They also indicated how pleasant the location was, using a slider with the anchored with "not at all" (score 0) and "very much" (score 100). Importantly, we were primarily interested in the *positive* and *negative mood ratings*, and the *appraisal of the location as measure of context* (see the description of the ESM-based assessments below) to test the conceptual model (see Figure 1). Other questions were fillers to keep participants from focusing primarily on their mood state and/or from anticipating the memory questions.

ESM Autobiographical Memory. Episodic autobiographical memory of recent events was assessed at three prompts per day, to avoid participants anticipating having to recall an event. Participants were asked to think of (thus: recall) the most important event since the previous prompt and to appraise the event using a slider, anchored with "extremely unpleasant" and "extremely pleasant" (possible range 0–100). A relatively positive appraisal would represent positively valenced autobiographical memory and a relatively negative appraisal was hypothesized to represent negatively valenced memory. Participants were also asked to provide a brief three-word description of this event and indicate when the event took place ("the past 30 minutes," "30 minutes to one hour ago," "more than an hour ago"), to ensure actual episodic memory of a concrete event.[2]

Procedure

After in- and exclusion criteria were checked and eligibility was confirmed, the baseline appointment was scheduled where written informed consent was obtained. Here, participants filled out the questionnaires (BDI-II, RRS, BAI), completed the SRET, and received instructions and a demo for the ESM phase. The research team was available for questions via phone/e-mail during the full test period. After six at-home ESM days, participants returned to the lab for the postmeasure where they filled out questionnaires (not included in the current study), received the debriefing, and returned the smartphone.

Results

Demographics and Symptom Levels

See Table 1 for the means and group comparisons. Currently-, remitted-, and never-depressed individuals did not differ on mean age, gender identification, educational level, or living arrangement. As expected, fewer of the never-depressed controls used psychoactive medication, $\chi^2(1) = 83.34$, $p < .001$ for never-depressed versus remitted and $\chi^2(1) = 75.96$, $p < .001$ for never-depressed versus currently depressed. There was no difference in medication use frequency between currently and remitted-depressed individuals, $\chi^2(1) = .79$, $p = .376$. Groups also differed on BDI-II, RRS, and BAI total scores, with currently depressed individuals having the highest

[1] Additional questionnaires were included for answering different research questions not presented here: Positive and Negative Affect Scale, Momentary Ruminative Self-Focus Inventory, Rosenberg Self-Esteem Scale, Positive Mental Health Scale, Parental Acceptance-Rejection Questionnaire, Childhood Trauma Questionnaire, and the International Physical Activity Questionnaire.

[2] Additional ESM questions were included for answering different research questions not presented here: Recent (same day) and remote (previous day) recall of events, contexts, and mood states, as well as sleep quality and mastery.

Table 2
Overview Design ESM Smartphone Application Across the Six Testing Days

Time 24-h	Prompt	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
8–10	1[†]	Mood/context	Mood/context	Mood/context	Mood/context	Mood/context	Mood/context
10–12	2	Mood/context	Mood/context + Memory	Mood/context + Memory	Mood/context	Mood/context + Memory	Mood/context
12–14	3	Mood/context + Memory	Mood/context	Mood/context	Mood/context + Memory	Mood/context	Mood/context + Memory
14–16	4	Mood/context	Mood/context	Mood/context + Memory	Mood/context	Mood/context + Memory	Mood/context + Memory
16–18	5	Mood/context + Memory	Mood/context + Memory	Mood/context	Mood/context + Memory	Mood/context	Mood/context
18–20	6	Mood/context + Memory	Mood/context + Memory	Mood/context + Memory	Mood/context	Mood/context	Mood/context
20–22	7	Mood/context	Mood/context	Mood/context	Mood/context + Memory	Mood/context + Memory	Mood/context + Memory

Note. ESM = Experience Sampling Method; Memory = including the autobiographical memory question.
[†] First prompt activated by participant: button-press (within time-frame); all other prompts: random within two-hour time-frame.

symptom levels and controls the lowest. Never-depressed versus remitted-depressed on BDI-II: $F(1, 141) = 53.34$, $p < .001$, on RRS: $F(1, 141) = 85.29$, $p < .001$, and on BAI: $F(1, 141) = 44.44$, $p < .001$. Never-depressed versus currently depressed on BDI-II: $F(1, 99) = 266.66$, $p < .001$, on RRS: $F(1, 99) = 161.64$, $p < .001$, and on BAI: $F(1, 99) = 142.77$, $p < .001$. Remitted-depressed versus currently depressed on BDI-II: $F(1, 132) = 80.79$, $p < .001$, on RRS: $F(1, 132) = 15.34$, $p < .001$, and on BAI: $F(1, 132) = 32.84$, $p < .001$.

Statistical Approaches

Daily Life Association Context, Mood, and Autobiographical Memory in Clinical Depression

In line with the association between context, mood, and autobiographical memory proposed by cognitive theories, and the exploration of the role of depression status, the primary hypothesis of the study was tested using a moderated mediation model (see Figure 1). Models were fitted separately for positive and negative mood. We had to take into account that the data were hierarchical within participants; typically, 18 measurements (6 days; 3 measurements/day) for each participant. All available datapoints were used in the multilevel analyses. Missing data was not imputed. The frequently used Sobel approach for mediation analysis does not consider this multilevel data structure (Preacher et al., 2007); neither does a bootstrapping approach such as Process (Hayes, 2013). The model for moderated mediation was therefore estimated with a multilevel analysis—a type of regression analysis appropriate for hierarchical data—using the program MLwiN Version 3.03 (Charlton et al., 2019). Level 1 in this model was measurement (typically 18) of context, memory, and positive and negative mood. Level 2 was participant (depression status is a level-2 predictor). The hierarchical dataset included 189 participants ($M_{measurements} = 16.6$, $SD = 1.9$).

Moderated mediation is demonstrated when the strength of the indirect effect of context (X; appraisal of the location) on autobiographical memory (Y; appraisal of the recalled event), via the two mediators positive (M1) and negative mood (M2) depends on depression status (W; never-depressed, remitted-depressed and currently depressed). In order to test this for a hierarchical dataset, the procedure recommended by Bauer et al. (2006) was used. All interval variables were standardized across participants. Specification of the models for the analytical approach can be found in the online supplementary materials.

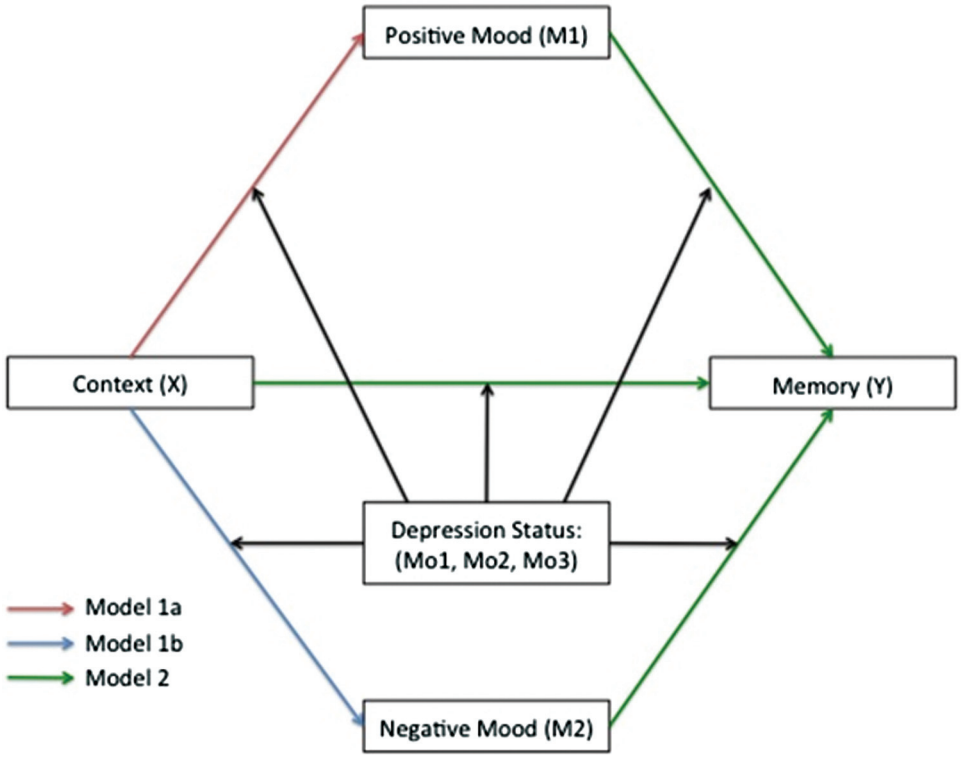
As expected, the two mediators (positive and negative mood) were strongly correlated ($r = .74$, $p < .001$), therefore, multicollinearity was expected. Furthermore, the moderator was categorical—two extra variables had to be random at participant level, implying extra (co)variances, thus convergence problems were also expected. Therefore, Markov Chain Monte Carlo (MCMC) estimation was used (Browne, 2019). The following steps (Jones, 2013) were taken: (a) constraining all covariance at participant level to zero, for the full model, (b) apply IGLS estimation, (c) free all covariance, (d) apply a MCMC estimation.

Association Context, Mood and Autobiographical Memory—Without Depression Status as Moderator

First, the mediation model without depression status as a moderator was considered. The model demonstrated that the effect of context on memory mediated by positive mood (Figure 1 model 1a, model 2) was substantial (.118; $SE = .033$) and the effect of context mediated by negative mood (Figure 1 model 1b, model 2) was small (.020; $SE = .019$). Direct effect of context on autobiographical memory was substantial (.137; $SE = .027$). The total effect of context on memory, and context as mediated by positive and negative mood was large (.275; $SE = .026$).

On an exploratory level, significant/relevant effects of context on explaining variance in positive and negative mood were inspected. In the model without a moderator, context had a large effect (.223; $SE = .023$) on positive mood (Figure 1 model 1a) and a substantial effect (−.143; $SE = .021$) on negative mood (Figure 1 model 1b). Moreover, the effect of positive mood on memory when controlling for context was found to be large (.542; $SE = .130$). However, the effect of negative mood on memory was unexpectedly small (−.089; $SE = .126$). The estimated regression coefficients for the effects of context on the mediators of positive and negative mood, as well as direct and indirect effects of context on autobiographical memory (for the two different mediators) can be found in the online supplementary materials.

Figure 1
Conceptual Moderated Mediation Model of the Association Between Appraisal of the Context (Specifically the Person's Location) via Mood (M1 = Positive/M2 = Negative) on Memory Including Depression Status



Note. 1. Currently depressed, 2. Remitted-depressed, 3. Never depressed as a moderator (indicated by black arrows).

Association Context, Mood and Autobiographical Memory—Including Depression Status as Moderator

In order to establish whether the strength of the effects of positive and negative mood differed between the three participant groups, a mediation model including the moderator depression status (see Figure 1) was tested. Formal moderation was tested by adding depression status (dummy coded) to the mediation model. For reasons of clarity, we present the mediation results separately for the three participant groups in Table 3. Approximately similar for all three groups, and in line with the estimated model without a moderator, the effect of context on autobiographical memory mediated by positive mood, moderated by depression status (Figure 1 model 1a, model 2, including the black arrows) was substantial (.101–.110; *SE* = .031–.045). Moreover, the effect of context mediated by negative mood, moderated by depression status (Figure 1 model 1b, model 2, including the black arrows) was small (.016–.024; *SE* = .018–.021). Direct effects of context on autobiographical memory were substantial (.128–.158; *SE* = .039–.048). The total effect of context mediated by positive and negative mood was large (.253–.284; *SE* = .039–.057).

Subsequent exploratory analyses showed the same similarity between models (i.e., with/without moderator included) and groups, revealing large effects (.206–.218; *SE* = .034–.057) of context on positive mood and substantial effects on negative mood (−.103–−.1185; *SE* = .033–.048). Moreover, the effect of positive mood on memory was large (.462–.556; *SE* = .107–.117), whereas the effect of negative mood on memory was small (−.079–−.113; *SE* = .108–.117).

Interestingly, the three groups did not significantly differ from each other regarding the effects of context on autobiographical memory as mediated by mood, context on mood, and mood on autobiographical memory. However, it is important to interpret this finding within the range of the observed values, see Table 4 for the standardized means. That is, when looking at the means of positive and negative mood of all groups, generally lower positive mood and higher negative mood was observed for remitted and currently depressed individuals compared to never-depressed controls. The same was observed for context, which was rated as less pleasant (hence, more unpleasant) by currently depressed compared to the other groups.

Group Comparisons on and Correlations Between Emotional Memory Measures

Univariate ANOVAs were used to compare the three groups on the emotional memory measures. As expected, groups differed significantly on the mean appraisal of the recalled events across the six training days (the aggregated autobiographical memory

Table 3

Estimated Regression Coefficients for the Effects of Context on Memory via the Mediators Positive and Negative Mood (Figure 1: Model 1, Model 2, Including the Black Arrows)—Mediation Model With Moderation

Model characteristic	Effect	*SE*	95% CI	*p*-value	*SD* (fixed effect)	70% of participants	% of participants with positive mediation
Never depressed							
Mediator 1: Positive mood	0.109	0.032	[0.046, 0.171]	<.001	0.147	−0.044–0.261	77
a-path	0.218	0.047		<.001	0.266		
b-path	0.556	0.108		<.001	0.148		
covariance ab	−0.013	0.010					
Mediator 2: Negative mood	0.019	0.018	[−0.015, 0.054]	.134	0.053	−0.035–0.074	64
a-path	−0.103	0.040		.005	0.211		
b-path	−0.092	0.117		.216	0.195		
covariance ab	0.010	0.010					
Direct effect	0.147	0.046	[0.057, 0.236]	<.001	0.152	−0.011–0.304	83
Total effect	0.275	0.052	[0.173, 0.376]	<.001	0.240	0.021–0.528	87
Remitted-depressed							
Mediator 1: Positive mood	0.101	0.031	[0.041, 0.161]	<.001	0.130	−0.034–0.236	78
a-path	0.217	0.034		<.001	0.221		
b-path	0.462	0.107		<.001	0.258		
covariance ab	0.00,099	0.011					
Mediator 2: Negative mood	0.024	0.021	[−0.016, 0.064]	.121	0.088	−0.067–0.115	61
a-path	−0.146	0.033		<.001	0.221		
b-path	−0.079	0.108		.233	0.317		
covariance ab	0.012	0.012					
Direct effect	0.128	0.039	[0.052, 0.204]	.197	0.150	−0.028–0.283	80
Total effect	0.253	0.040	[0.174, 0.331]	<.001	0.217	0.028–0.477	88
Currently depressed							
Mediator 1: Positive mood	0.110	0.045	[0.022, 0.197]	.007	0.191	−0.089–0.308	72
a-path	0.206	0.057		<.001	0.309		
b-path	0.479	0.117		<.001	0.299		
covariance ab	0.011	0.018					
Mediator 2: Negative mood	0.016	0.021	[−0.025, 0.057]	.223	0.035	−0.021–0.053	67
a-path	−0.185	0.048		<.001	0.250		
b-path	−0.113	0.109		.149	0.081		
covariance ab	−0.0,049	0.0,061					
Direct effect	0.158	0.048	[0.063, 0.253]	<.001	0.143	0.010–0.306	87
Total effect	0.284	0.057	[0.173, 0.395]	<.001	0.241	0.036–0.534	88

Note. Memory = including the autobiographical memory question.

variable), $F(2, 186) = 24.71$, $p < .001$, $\eta_p^2 = .21$. The events are recalled and evaluated from unpleasant to pleasant on a scale ranging from 0–100, hence a score >50 can be considered as a relative positive autobiographical memory. The currently depressed showed the least ($M = 58$, $SD = 12$) and never-depressed individual the most ($M = 75$, $SD = 10$) relative positive autobiographical memory, with the remitted-depressed individuals as intermediate group ($M = 68$, $SD = 13$), with all pairwise comparisons $p < .001$. The groups also differed significantly on the SRET negative memory bias score, $F(2, 174) = 22.55$, $p < .001$, $\eta_p^2 = .21$. The currently depressed showed most negative memory bias ($M = .40$, $SD = .34$) and never-depressed individual least negative bias ($M = .04$, $SD = .15$), with the remitted-depressed individuals as intermediate group ($M = .21$, $SD = .27$), with all pairwise comparisons $p < .002$.

Bivariate Pearson correlations were used to examine the associations between the emotional memory variables and clinical variables. The mean appraisal of the recalled autobiographical events

Table 4

Means and Standard Deviations (SD) of Each Group for the Standardized Scores of Appraisals of Context, Positive Mood, Negative Mood, and Appraisal of the Autobiographical Memory

	Currently depressed		Remitted-depressed		Currently depressed	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*
Context	−.35	.61	.00	.59	.30	.52
Positive mood	−.74	.59	.03	.65	.56	.54
Negative mood	.84	.68	−.04	.65	−.63	.53
Memory	−.37	.51	.001	.51	.31	.42

Note. These are the standardized means.

correlated significantly negatively with BDI-II and RRS total scores, and with the SRET negative memory bias score: $r = -.52$, $p < .001$ with BDI-II, $r = -.44$, $p < .001$ with RRS, and $r = -.38$, $p < .001$ with SRET (i.e., moderate to strong). As expected, the SRET negative bias score correlated positively with the BDI-II score, $r = .52$, $p < .001$ and with the RRS score, $r = .36$, $p < .001$.

To address the question if the variables in the main model (context appraisal, positive and negative mood, emotional memory) are not redundant to each other because they assess the same construct, we examined the correlations between the aggregated context answers, the positive and negative mood answers, and the memory answers (or: the mean appraisal of the context and recalled events and the mean mood ratings across the six days). We further explored redundancy in the key variables using linear regression models with a forward stepwise variable selection algorithm. These results are presented in the online supplementary materials and showed that the key variables have independent prediction value toward each other.

Discussion

Cognitive theories of depression all indicate an important role for contextual cues in triggering biased processing and subsequently a rise of depressive symptoms (Beck, 1967; Beck & Bredemeier, 2016; Bower, 1981; Ingram, 1984). With this study, we aimed to assess the interplay of context, mood, and emotional autobiographical episodic memory in depression using daily life measures, to ultimately provide a more valid test of emotional memory. To this end, we developed a new measure of emotional memory assessing the valence of recalled recent event, and allowing for the assessment of context appraisal in daily life and hence addressing several limitations of existing bias measures. The moderated mediation model showed that (a) context appraisal was substantially and significantly related to emotional autobiographical memory, and (b) this association was mediated by positive mood. These associations were found to be independent of depression status and hence may represent a human trait rather than a depression-specific marker.

The results support our hypothesis and are in line with cognitive theories of depression: Negative context appraisal seems to be related to less positive mood, in turn leading to better recall of negatively evaluated events. Based on Beck (1967), the context activated a potent self-schema, which depending on if this schema is relatively more positive or negative, resulted in the recall of a positively or negatively appraised event. With the aim to provide a valid measure of daily life emotional memory and possibly memory bias, we prompted the recall and appraisal of autobiographical recent 'important' events. This way of measuring exerts no control over the actual events that occurred. Based on the vast amount of evidence for negatively biased recall in depression (Matt et al., 1992; Gotlib & Joormann, 2010) taken together with the moderate-to-strong association of the ESM-based emotional memory measure with the SRET negative bias index, we feel confident to assume that this new measure (in part) taps into negative memory bias, a predictor of depression recurrence (e.g., LeMoult et al., 2017) and hence treatment target of interest.

Mediation of the association between context and emotional memory by mood was found to be similar for currently depressed, remitted-depressed and never-depressed individuals, and was mainly found for positive mood. This indicates that the association between context, positive mood and memory may be independent of depression status, underscoring the value of proof-of-principle studies in never-depressed samples. However, the level of negative and positive mood, as well as the strength of negative memory bias did differ between depression groups. Thus, the mechanisms may be similar, but at which 'level' of mood, context appraisal and emotional memory one 'enters the model' does depend on depression status. Here, ruminative thinking may play a role, as individuals who ruminate more following (recall of) a negative event compared to a neutral or positively appraised event may possess stronger negative memory bias (cf. Joormann, 2010; Joormann et al., 2007; see also ESM-based study by Connolly & Alloy, 2018).

Somewhat in contrast to previous research on the association between context and mood (Rottenberg et al., 2005) – but in line with studies on context, mood and cognitive functioning (von Stumm, 2016, 2018) – our results indicate that context appraisal contributed substantially to autobiographical emotional memory. In fact, the strength of the mood mediation effect was relatively similar to the strength of the direct effect of context on memory. What does this imply for theory? The role of context (and specifically context appraisal, so whether an event or environment is considered as stressful, pleasant etc.) in cognitive processing of emotional information should be emphasized more in the theoretical models. The different cognitive theories of depression include the role of contextual triggers (external as studied here, but the trigger can also be internal). Bower's theory is missing a clear notion of the role of context, although context is implied to influence the mood state. In the different theories, the subjective experience of the valence (or: the appraisal) of the context is proposed to affect emotional memory. To further the collective knowledge described in the cognitive theories of depression, research should (1) examine which aspects of the context affect the processing of emotional information in the different cognitive domains, and (2) what the internal effect of a contextual trigger is (e.g., does a direct negative mood effect have to trigger a ruminative response style [see Response Styles Theory; Nolen-Hoeksema, 1991] to increase negative cognitive bias and in turn depressive symptoms?).

What do the results imply for clinical research and practice? Perhaps psychological treatments should include techniques for explicit reappraisal of the context to decrease cognitive vulnerability to depression that is, negatively biased memory. Moreover, improving positive mood, perhaps through context reappraisal, may yield more clinically relevant results than aiming to decrease negative (depressotypic) mood. This subscribes to the increased focus in research and clinical practice on positive psychology and positive mental health (see WHO, 2004). Moreover, this new and valid way of measuring emotional memory paves the way for innovations in memory bias modification (Hertel et al., 2017; Vrijsen et al., 2016, 2018) as an inexpensive and easily accessible depression treatment and relapse prevention tool. In fact, the first ESM-based treatment interventions for depression are emerging, highlighting its

potential for clinical research and practice (Bastiaansen et al., 2018; Simons et al., 2017).

The theory-driven hypotheses regarding the associations between context, mood and emotional memory, as investigated by means of the moderated mediation model (see Figure 1), were all derived from leading cognitive theories of depression (e.g., Beck, 1967; Beck & Bredemeier, 2016; Bower, 1981; Ingram, 1984). In doing so, we did not examine alternative ordering of context, mood (positive and negative) and emotional memory, and directionalities within these models. The number of daily measurements including all three variables (context, mood and emotional memory) was, however, too low to perform adequately powered time-series analyses or Structural Equation Modeling with the aim to investigate bidirectional or reciprocal relations between two or more variables within individuals over time and between individuals (de Haan-Rietdijk et al., 2016). Future studies should aim to prompt participants more frequently on assessments of context, mood and emotional memory in order to confirm that the current ordering of variables based on theory are indeed more or equally plausible as other orderings. Such findings would hold important implications for theory (re-)conceptualizations.

A strength of the current study is the inclusion of patient samples. Additional strong aspects of the study are the repeated measuring in daily life, the association to lab-based measures, and the use of a data-appropriate statistical approach. On the other hand, a limitation of the study is that positive and negative mood were assessed using single items a choice that was made to keep the duration and complexity of prompts to a minimum. Therefore, it is unknown to what extent the findings generalize to broader concepts of positive and negative mood. Another limitation of our main emotional memory variable is its reliance on subjective assessments, without allowing for an objective assessment (if there is such a thing) of the events that occurred. Unlike controlled lab studies, it is impossible to experimentally control what people experience in their everyday life. We do not know whether depressed individuals had more exposure to negative events, thereby resulting in more negative memories. The lack of control over encoding is a weakness of the study. However, and although there is a clear association between what is encoded and recalled (see Combined Cognitive Bias Hypothesis; Everaert et al., 2012), bias in memory is not uniquely linked to bias in encoding in depression. For example, encoding and subsequent memory was biased for positive information, but only memory was biased for neutral and negative information in depressed individuals (Gotlib et al., 2011). Biased memory is strongly related to, but not fully dependent on, bias in encoding. The current study will hopefully foster further research on the interplay between context, mood, and emotional memory, and the use of ESM for both measuring and modifying (biased) emotional memory in daily life.

References

Bastiaansen, J. A., Meurs, M., Stelwagen, R., Wunderink, L., Schoevers, R. A., Wichers, M., & Oldehinkel, A. J. (2018). Self-monitoring and personalized feedback based on the experiencing sampling method as a tool to boost depression treatment: A protocol of a pragmatic randomized controlled trial (ZELF-i). *BMC Psychiatry*, *18*(1), 276. https://doi.org/10.1186/s12888-018-1847-z

Bauer, D. J., Preacher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychological Methods*, *11*(2), 142–163. https://doi.org/10.1037/1082-989X.11.2.142

Beck, A. T. (1967). *Depression: Clinical, experimental and theoretical aspects*. Harper and Row.

Beck, A. T. (2008). The evolution of the cognitive theory of depression and its neurobiological correlates. *The American Journal of Psychiatry*, *165*(8), 969–977. https://doi.org/10.1176/appi.ajp.2008.08050721

Beck, A. T., & Bredemeier, K. (2016). A unified model of depression: Integrating clinical, cognitive, biological, and evolutionary perspectives. *Clinical Psychological Science*, *4*(4), 596–619. https://doi.org/10.1177/2167702616628523

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, *56*(6), 893–897. https://doi.org/10.1037/0022-006X.56.6.893

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Beck Depression Inventory* (2nd ed.). The Psychological Corporation.

Bower, G. H. (1981). Mood and memory. *American Psychologist*, *36*(2), 129–148. https://doi.org/10.1037//0003-066X.36.2.129

Bradley, M. M., & Lang, P. J. (1999). *Affective norms for English words (ANEW): Instruction manual and affective ratings*. University of Florida, The National Institute of Mental Health Center for the Study of Emotions and Attention.

Browne, W. J. (2019). *MCMC Estimation in MLwiN v3.03*. Centre for Multilevel Modelling, University of Bristol.

Charlton, C., Rasbash, J., Browne, W. J., Healy, M., & Cameron, B. (2019). *MLwiN Version 3.03*. Centre for Multilevel Modelling, University of Bristol.

Connolly, S. L., & Alloy, L. B. (2018). Negative event recall as a vulnerability for depression: Relationship between momentary stress-reactive rumination and memory for daily life stress. *Clinical Psychological Science*, *6*(1), 32–47. https://doi.org/10.1177/2167702617729487

Csikszentmihalyi, M., & Larson, R. (2014). Validity and reliability of the experience-sampling method. In M. Csikszentmihalyi (Ed.), *Flow and the foundations of positive psychology* (pp. 35–54). Springer.

Dainer-Best, J., Lee, H. Y., Shumake, J., Yeager, D. S., & Beevers, C. G. (2018). Determining optimal parameters of the Self Referent Encoding Task: A large-scale examination of self-referent cognition and depression. *Psychological Assessment*, *30*(11), 1527–1540. https://doi.org/10.1037/pas0000602

de Haan-Rietdijk, S., Kuppens, P., & Hamaker, E. L. (2016). What's in a day? A guide to decomposing the variance in intensive longitudinal data. *Frontiers in Psychology*, *7*, 891. https://doi.org/10.3389/fpsyg.2016.00891

Derry, P. A., & Kuiper, N. A. (1981). Schematic processing and self-reference in clinical depression. *Journal of Abnormal Psychology*, *90*(4), 286–297. https://doi.org/10.1037/0021-843X.90.4.286

Disner, S. G., Beevers, C. G., Haigh, E. A., & Beck, A. T. (2011). Neural mechanisms of the cognitive theory of depression. *Nature Reviews Neuroscience*, *12*(8), 467–477. https://doi.org/10.1038/nrn3027

Dobson, K. S., & Shaw, B. F. (1987). Specificity and stability of self-referent encoding in clinical depression. *Journal of Abnormal Psychology*, *96*(1), 34–40. https://doi.org/10.1037/0021-843x.96.1.34

Everaert, J., Koster, E. H., & Derakshan, N. (2012). The combined cognitive bias hypothesis in depression. *Clinical Psychology Review*, *32*(5), 413–424. https://doi.org/10.1016/j.cpr.2012.04.003

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1996). *Structured Clinical Interview for DSM–IV Axis I Disorders-Clinician Version (SCID-CV)*. American Psychiatric Press.

Gadassi Polack, R., Tran, T. B., & Joormann, J. (2020). "What has been is what will be"? Autobiographical memory and prediction of future events in depression. *Cognition and Emotion*, *34*(5), 1044–1051.

Gaddy, M. A., & Ingram, R. E. (2014). A meta-analytic review of mood-congruent implicit memory in depressed mood. *Clinical Psychology Review*, *34*(5), 402–416. https://doi.org/10.1016/j.cpr.2014.06.001

Gethin, J. A., Lythe, K. E., Workman, C. I., Mayes, A., Moll, J., & Zahn, R. (2017). Early life stress explains reduced positive memory biases in remitted depression. *European Psychiatry*, *45*, 59–64. https://doi.org/10.1016/j.eurpsy.2017.06.011

Gotlib, I. H., & Joormann, J. (2010). Cognition and depression: Current status and future directions. *Annual Review of Clinical Psychology*, *6*(1), 285–312. https://doi.org/10.1146/annurev.clinpsy.121208.131305

Gotlib, I. H., Jonides, J., Buschkuehl, M., & Joormann, J. (2011). Memory for affectively valenced and neutral stimuli in depression: Evidence from a novel matching task. *Cognition and Emotion*, *25*(7), 1246–1254. https://doi.org/10.1080/02699931.2010.538374

Gotlib, I. H., Kasch, K. L., Traill, S., Joormann, J., Arnow, B. A., & Johnson, S. L. (2004). Coherence and specificity of information-processing biases in depression and social phobia. *Journal of Abnormal Psychology*, *113*(3), 386–398. https://doi.org/10.1037/0021-843X.113.3.386

Harmer, C. J., & Cowen, P. J. (2013). 'It's the way that you look at it'—A cognitive neuropsychological account of SSRI action in depression. *Philosophical Transactions of the Royal Society of London. Series B; Biological Sciences*, *368*(1615), 20120407. https://doi.org/10.1098/rstb.2012.0407

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Hertel, P. T., Maydon, A., Cottle, J., & Vrijsen, J. N. (2017). Cognitive bias modification: Retrieval practice to simulate and oppose ruminative memory biases. *Clinical Psychological Science*, *5*(1), 122–130. https://doi.org/10.1177/2167702616649366

Ingram, R. (1984). Toward an information-processing analysis of depression. *Cognitive Therapy and Research*, *8*(5), 443–477. https://doi.org/10.1007/BF01173284

Johnson, S. L., Joormann, J., & Gotlib, I. H. (2007). Does processing of emotional stimuli predict symptomatic improvement and diagnostic recovery from major depression? *Emotion*, *7*(1), 201–206. https://doi.org/10.1037/1528-3542.7.1.201

Jones, E. B., & Sharpe, L. (2017). Cognitive bias modification: A review of meta-analyses. *Journal of Affective Disorders*, *223*, 175–183. https://doi.org/10.1016/j.jad.2017.07.034

Jones, K. (2013). Developing multilevel models for analysing contextuality, heterogeneity and change. https://www.researchgate.net/publication/268331676_Vol2Traingmanual2014withminorcorrections

Joormann, J. (2010). Cognitive inhibition and emotion regulation in depression. *Current Directions in Psychological Science*, *19*(3), 161–166. https://doi.org/10.1177/0963721410370293

Joormann, J., & Arditte, K. A. (2015). Cognitive aspects of depression. In I. H. Gotlib & C. L. Hammen (Eds.), *Handbook of depression* (pp. 298–321). Guilford Press.

Joormann, J., Yoon, K. L., & Zetsche, U. (2007). Cognitive inhibition in depression. *Applied & Preventive Psychology*, *12*(3), 128–139.

Kim, D., Yoon, K. L., & Joormann, J. (2018). Remoteness and valence of autobiogrpahical memory in depression. *Cognitive Therapy and Research*, *42*(3), 230–235. https://doi.org/10.1007/s10608-017-9881-6

LeMoult, J., & Gotlib, I. H. (2019). Depression: A cognitive perspective. *Clinical Psychology Review*, *69*, 51–66. https://doi.org/10.1016/j.cpr.2018.06.008

LeMoult, J., Kircanski, K., Prasad, G., & Gotlib, I. H. (2017). Negative self-referential processing predicts the recurrence of major depressive episodes. *Clinical Psychological Science*, *5*(1), 174–181. https://doi.org/10.1177/2167702616654898

Matt, G. E., Vazquez, C., & Campbell, W. K. (1992). Mood congruent recall of affectively toned stimuli: A meta-analytic review. *Clinical Psychology Review*, *12*(2), 227–255. https://doi.org/10.1016/0272-7358(92)90116-P

Muntingh, A. D., van der Feltz-Cornelis, C. M., van Marwijk, H. W., Spinhoven, P., Penninx, B. W., & van Balkom, A. J. (2011). Is the beck anxiety inventory a good tool to assess the severity of anxiety? A primary care study in The Netherlands study of depression and anxiety (NESDA). *BMC Family Practice*, *12*(1), 66. https://doi.org/10.1186/1471-2296-12-66

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, *100*(4), 569–582. https://doi.org/10.1037/0021-843X.100.4.569

Peeters, F., Nicolson, N. A., Berkhof, J., Delespaul, P., & deVries, M. (2003). Effects of daily events on mood states in major depressive disorder. *Journal of Abnormal Psychology*, *112*(2), 203–211.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research*, *42*(1), 185–227. https://doi.org/10.1080/00273170701341316

Raes, F., Hermans, D., & Eelen, P. (2003). De Nederlandstalige versie van de Ruminative Response Scale (RRS-NL) en de Rumination on Sadness Scale (RSS-NL) [The Dutch version of the Ruminative Response Scale (RRS-NL) and the Rumination on Sadness Scale (RSS-NL)]. *Gedragstherapie*, *36*(2), 97–104.

Raven, J. C. (1958). *Standard progressive matrices*. H. K. Lewis.

Rottenberg, J., Gross, J. J., & Gotlib, I. H. (2005). Emotion context insensitivity in major depressive disorder. *Journal of Abnormal Psychology*, *114*(4), 627–639. https://doi.org/10.1037/0021-843X.114.4.627

Sandstrom, G. M., Lathia, N., Mascolo, C., & Rentfrow, P. J. (2017). Putting mood in context: Using smartphones to examine how people feel in different locations. *Journal of Research in Personality*, *69*, 96–101. https://doi.org/10.1016/j.jrp.2016.06.004

Segal, Z. V., Williams, J. M., Teasdale, J. D., & Gemar, M. (1996). A cognitive science perspective on kindling and episode sensitization in recurrent affective disorder. *Psychological Medicine*, *26*(2), 371–380. https://doi.org/10.1017/s0033291700034760

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology*, *4*(1), 1–32. https://doi.org/10.1146/annurev.clinpsy.3.022806.091415

Simons, C. J. P., Drukker, M., Evers, S., van Mastrigt, G. A. P. G., Höhn, P., Kramer, I., Peeters, F., Delespaul, P., Menne-Lothmann, C., Hartmann, J. A., van Os, J., & Wichers, M. (2017). Economic evaluation of an experience sampling method intervention in depression compared with treatment as usual using data from a randomized controlled trial. *BMC Psychiatry*, *17*(1), 415. https://doi.org/10.1186/s12888-017-1577-7

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, *27*(3), 247–259. https://doi.org/10.1023/A:1023910315561

Van der Does, A. J. W. (2002). *De Nederlandse versie van de Beck Depression Inventory Tweede Editie* [The dutch version of the Beck depression inventory] (2nd ed.). Swets & Zeitlinger.

von Stumm, S. (2016). Is day-to-day variability in cognitive function coupled with day-to-day variability in affect? *Intelligence*, *55*, 1–6. https://doi.org/10.1016/j.intell.2015.12.006

von Stumm, S. (2018). Feeling low, thinking slow? Associations between situational cues, mood and cognitive function. *Cognition and Emotion*, *32*(8), 1545–1558. https://doi.org/10.1080/02699931.2017.1420632

Vrijsen, J. N., Becker, E. S., Arias-Vasquez, A., van Dijk, M. K., Speckens, A., & van Oostrom, I. (2014). What is the contribution of different cognitive biases and stressful childhood events to the presence and number of previous depressive episodes? *Psychiatry Research*, *217*(3), 134–142. https://doi.org/10.1016/j.psychres.2014.02.033

Vrijsen, J. N., Dainer-Best, J., Witcraft, S. M., Papini, S., Hertel, P., Beevers, C. G., Becker, E. S., & Smits, J. A. J. (2018). Effect of cognitive bias modification-memory on depressive symptoms and autobiographical memory bias: Two independent studies in high-ruminating and dysphoric samples. *Cognition and Emotion*, *33*(2), 288–304. https://doi.org/10.1080/02699931.2018.1450225

Vrijsen, J. N., Hertel, P. T., & Becker, E. S. (2016). Practicing emotionally biased retrieval affects mood and establishes biased recall a week later. *Cognitive Therapy and Research*, *40*(6), 764–773. https://doi.org/10.1007/s10608-013-9563-y

Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin*, *98*(2), 219.

Williams, J. M., & Broadbent, K. (1986). Autobiographical memory in suicide attempters. *Journal of Abnormal Psychology*, *95*(2), 144–149. https://doi.org/10.1037/0021-843X.95.2.144

World Health Organization. (2004). WHO; Promoting mental health: concepts, emerging evidence, practice (Summary report). Retrieved November 20, 2019, from https://www.who.int/mental_health/evidence/en/promoting_mhh.pdf

Received April 7, 2020
Revision received December 2, 2020
Accepted December 23, 2020 ■