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Comparing effects of detached mindfulness and cognitive restructuring in obsessive-compulsive disorder using ecological momentary assessment

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Abstract

Ecological momentary assessment (EMA) has been shown to be a valid and sensitive measure of treatment effects in obsessive-compulsive disorder (OCD). As part of a clinical trial, this EMA study deals with a comparison of two treatment conditions, that is, cognitive restructuring (CR) and detached mindfulness (DM). EMA data from $n = 39$ OCD patients were available from a randomized clinical trial on the effectiveness of CR and DM. Smartphone-based EMA sampling spread over 4 days each before and after treatment, with 10 random prompts per day and a 2-week intervention of either CR or DM. We tracked CR strategies (e.g., questioning an appraisal by re-evaluating risk), DM strategies (e.g., allowing one's thoughts to come and go), and application of newly learned strategies during Post-Treatment EMA. Although there was a trend towards DM strategies being applied more often during Pre-Treatment EMA than CR strategies, we did not find differences during Post-Treatment EMA between CR and DM regarding frequency or difficulty of application and experienced relief. As expected, we found a clear pre-post increase for all CR and DM behaviours except for one DM item. However, we did not find a treatment-specific increase of CR and DM behaviours; that is, both interventions equally well promoted a seemingly general treatment effect. Despite the ecological validity of EMA, however, social desirability effects cannot be ruled out, so that this conclusion must be handled cautiously. Further research is needed to replicate and generalize our results.

KEYWORDS

cognitive restructuring, detached mindfulness, ecological momentary assessment, EMA, metacognition, obsessive-compulsive disorder

1 | INTRODUCTION

Following the definition of *DSM-5*, obsessive-compulsive disorder (OCD) is characterized by obsessions, that is, intrusive and unwanted thoughts, images, or urges, which lead to compulsions, that is, overt behaviours or mental acts that serve the purpose of reducing patients' experience of tension, fear, or discomfort (American Psychiatric Association, 2013). The functional relationship between obsessions,

negative emotional states, and compulsions constitutes the core of influential theoretical models such as those by Rachman (1997, 1998) and Salkovskis (1985, 1999).

In addition to the functional relationships described above, both Rachman (1997, 1998) and Salkovskis (1985, 1999) assume that the negative emotional states experienced by patients are not a direct consequence of the intrusions themselves but rather of the meaning that patients attach to them. Drawing on classic models of cognitive therapy (e.g., Beck, 1979), Salkovskis refers to these evaluative cognitions as "automatic thoughts," whereas Rachman uses the term "misinterpretations." For instance, in an OCD patient, the intrusive thought "I did not lock the front door" could be followed by the automatic thought "Burglars will come and steal all my belongings, so that I will lose everything I own." Following the Obsessive Compulsive Cognitions Working Group (OCCWG, 1997), this automatic thought is an example of the overestimation of threat, which is one typical cognitive distortion inherent to OCD. Another prominent cognitive distortion emphasized by both Salkovskis and the OCCWG is the overestimation of responsibility, which is closely linked to the experience of guilt. The remaining four cognitive distortions listed by the OCCWG are overimportance of thoughts, excessive concern about the importance of controlling one's thoughts, intolerance of uncertainty, and perfectionism. Note, however, that from a conceptual point of view, the first two distortions actually reflect *meta* cognitions rather than content-related cognitions because they represent assumptions *about* thoughts (please see below for an elaboration on this). Regarding the latter two, in turn, it is important to emphasize that, like overestimation of threat, intolerance of uncertainty and perfectionism have been shown to be not specific to OCD, instead appearing as rather common features linking OCD to, for example, generalized anxiety disorder and other anxiety disorders as well as major depression (Frost & Steketee, 1997; Gentes & Ruscio, 2011; Salkovskis, 1998). Yet protocols of cognitive therapy for OCD typically target various of the above-named cognitive distortions employing classic strategies of cognitive restructuring (CR) such as Socratic questioning and behavioural experiments (e.g., Wilhelm & Steketee, 2006).

In contrast to the assumption of specific cognitive distortions, Wells (2011) has complemented the above-described perspective on OCD by introducing the concept of metacognition, which reflects attitudes and beliefs about cognitions such as intrusive thoughts. As such, the metacognitive model of OCD as proposed by Wells claims that what is driving OCD is a sort of metacognition that classifies mental events such as intrusive thoughts as important per se and assigns them a salient meaning or even power. Referring to the above-named example, Wells's model would put the emphasis not on a specific interpretation of the intrusive thought "I did not lock the front door" but rather on the metacognitive belief "Thoughts tell you what's about to happen"—a belief that is usually referred to as "Thought-Event-Fusion" and that exhibits a high overlap with the above-discussed OCCWG domain termed *overimportance of thoughts.*

In this article, we are referring to a clinical trial (registered at ClinicalTrials.gov under the ID NCT03002753) in which we compared

> ## Key Practitioner Message
> - In this study, we used ecological momentary assessment (EMA) to compare treatment effects of cognitive restructuring (CR) and detached mindfulness (DM) for obsessive-compulsive disorder (OCD).
> - The two EMA sampling periods were set prior to and after the completion of a 2-week intervention in either of the two conditions.
> - Overall, CR and DM did not differ regarding frequency of use, perceived difficulty, and experience of relief after treatment.
> - Pre-Post comparisons show a marked increase of both CR and DM behaviours across participants.
> - CR and DM behaviours increased similarly across both treatment conditions, pointing more towards general or shared rather than specific treatment effects.

an intervention derived from cognitive models (Rachman, 1997, 1998; Salkovskis, 1985, 1999), that is, cognitive restructuring (CR), with another intervention based on the metacognitive perspective (Wells, 2011), that is, detached mindfulness (DM).

Drawing on the theoretical models by Salkovskis and Rachman, CR educates patients to actively question their distorted misinterpretations of intrusive thoughts and to develop alternative appraisals of intrusions, for example, by re-evaluating risk and re-assessing personal responsibility. Because it requires a lot of involvement, motivation, and action from the patient, CR can be regarded as a rather effortful technique when compared with DM.

In contrast to this active and rational approach, DM is based on Wells's (2011) metacognitive perspective on OCD and teaches patients to position themselves at a distance in order to passively observe their obsessions—instead of categorizing them as important events that push them towards an immediate response (e.g., a compulsion). DM instructions, therefore, comprise letting thoughts come and go, positioning oneself at a distance from the obsession and telling oneself that it is "just a thought." When comparing DM with CR, one major advantage may be that DM is a less effortful technique, requiring less action and involvement from the patient.

The efficacy of CR for OCD has been well documented and summarized in meta-analyses (e.g., Öst, Havnen, Hansen, & Kvale, 2015). However, the majority of studies employing CR include behavioural experiments, which exhibit a high overlap with exposure tasks that are inherent in exposure and response prevention. Thus, little is known about the efficacy of purely "Beckian" CR.

A number of clinical trials have also demonstrated the efficacy of complex metacognitive treatment programmes for OCD, most of which, however, were conducted with comparably small samples (Fisher & Wells, 2008; Rees & van Koesveld, 2008; Shareh, Gharraee, Atef-Vahid, & Eftekhar, 2010; Simons, Schneider, & Herpertz-Dahlmann, 2006). By contrast, only very few studies aimed at investigating single metacognitive treatment components such as DM. For

instance, Firouzabadi and Shareh (2009) provided preliminary evidence in favour of the efficacy of DM in a single case study. Please confer Rupp, Jürgens, Doebler, Andor, and Buhlmann (2019) for a more detailed review of efficacy studies on metacognitive treatments in general and DM in particular.

Essentially, our clinical trial was inspired by the idea to study DM as a single intervention central to metacognitive therapy and to compare it with an equally narrowed cognitive intervention stripped of the conceptual overlap that behavioural experiments constitute in order to prove the efficacy of purely "Beckian" CR for OCD. On a conceptual level, we found it very interesting to thus compare an actively questioning approach to dealing with obsessive thoughts, that is, CR, with a passively observing one, that is, DM. We chose to deliver either treatment in a short and intense setting, so that both interventions were delivered in the form of four double sessions of 100 min each within 2 weeks.

We have previously reported (Rupp, Jürgens, et al., 2019) that both approaches turned out to be similarly effective concerning OCD symptoms reduction from pre to post assessment as measured with the German version of the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS; Hand & Büttner-Westphal, 1991), yielding effect sizes of d = 1.67 (CR) and d = 1.55 (DM).

As described in a preceding paper (Rupp, Falke, et al., 2019), we complemented our clinical trial with an ecological momentary assessment (EMA) study in order to measure OCD symptoms, emotions, and the application of functional as well dysfunctional coping behaviours in patients' everyday life—both before and after undergoing treatment. As a state-of-the-art diary method, EMA offers a wide range of ways to collect data in people's everyday lives, for example, by using a smartphone that asks patients to rate the intensity of their symptoms various times per day by sending random acoustic prompts. Compared with retrospective symptom scales (both clinician-administered and self-report) that are usually regarded as the gold standard in outcome research, the advantages of EMA comprise the reduction of retrospective bias and enhanced ecological validity (Ebner-Priemer & Trull, 2009; Schwarz, 2007; Shiffman, Stone, & Hufford, 2008). As described in detail by Rupp, Falke, et al. (2019), such diary-based outcome research is under-represented in the OCD literature, which gave rise to the idea of using EMA to examine two comparably short treatments (DM and CR) for reducing OCD symptoms and the application of functional and dysfunctional behaviours in patients' everyday lives.

Rupp, Falke, et al. (2019) demonstrated that the EMA method is sensitive to treatment effects in OCD, showing a decline of obsession frequency and avoidance behaviour as well as a trend towards a reduction of compulsions from Pre-Treatment EMA to Post-Treatment EMA. Importantly, we did not find any effect of the type of treatment (CR vs. DM) for any of these variables, indicating that both interventions were similarly effective. Whereas we did not find any pre-post effect concerning OCD-related emotions (such as discomfort, anxiety, and guilt) and other dysfunctional coping behaviours such as thought suppression, we did find that the degree to which the amount of subjective burden experienced due to obsessions depended on the actual frequency of obsessions was greater during Pre-Treatment EMA than during Post-Treatment EMA. As this result points to an effect of treatment in the form of using alternative strategies in dealing with (persisting) obsessions, it seemed reasonable to use the EMA approach in order to further study to what extent new functional coping behaviours (i.e., behaviours taught in the DM and CR interventions, respectively) are promoted through treatment, that is, from Pre-Treatment EMA to Post-Treatment EMA.

This paper investigates (a) whether newly learned coping behaviours are applied more often after than prior to treatment, (b) whether an increase of coping behaviours depends on the treatment condition (CR vs. DM), that is, whether treatment effects are specific or general, and (c) whether CR and DM differ concerning their applicability. For stress plays an important role in the variation of OCD symptoms (e.g., Horowitz, 1975), we controlled for reported stress at the preceding prompt. Please note that the following hypotheses were not formulated in the a priori trial registration on ClinicalTrials.gov because the details of the EMA study were developed after the design of the clinical trial itself had been established. Hence, the EMA study as such was not part of the pre-registration.

Concerning the pre-post effects, we hypothesized that

1. during Pre-Treatment EMA, DM strategies are more often employed by patients than CR strategies because engaging in a mode of passive observation (DM) requires less effort and cognitive load than actively questioning appraisals,
2. all behaviours related to the CR treatment condition, such as questioning to what extent a risk has been overestimated, increase from Pre-Treatment EMA to Post-Treatment EMA, but only in patients who have undergone the CR treatment,
3. all behaviours related to the DM treatment condition, such as allowing one's obsessions to come and go, increase from Pre-Treatment EMA to Post-Treatment EMA, but only in patients who have undergone the DM treatment, and
4. during Post-Treatment EMA, DM strategies are employed more often, are perceived as less burdensome, and yield a greater amount of relief than CR strategies because they are easier to grasp for participants and constitute a less effortful technique than CR.

2 | METHODS

We conducted our study between January 2017 and July 2018. The ethics committee of the Department of Psychology and Sport Science at the University of Münster, Germany, approved of the study protocol. Written informed consent was provided by all participants following a detailed explanation of the study procedure.

2.1 | Participants

This paper reports results from the exact same sample of n = 40 participants as our two preceding papers (Rupp, Falke, et al., 2019; Rupp, Jürgens, et al., 2019). Please see Rupp, Jürgens, et al. (2019) regarding data on the intention-to-treat sample and concerning details on

recruitment, inclusion and exclusion criteria, and diagnostic assessment. Please confer Table 1 in Rupp, Falke, et al. (2019) concerning a description of the completer sample (*n* = 40) that underlies the EMA data. All participants enrolled in the study fulfilled the *DSM-5* criteria for OCD and exhibited a Y-BOCS score of at least 17. They were randomly assigned to one of the treatment groups. Almost all participants exhibited more than one type of OCD symptoms, which made it impossible to assign them to categories such as "washers" or "checkers." However, we can report that a high share of participants were predominantly affected by checking compulsions in the broad sense, whereas washing compulsions were rather under-represented.

2.2 | Design and procedure

Both the Pre-Treatment EMA and Post-Treatment EMA sampling period comprised Friday through Monday, that is, 4 days, and involved the presentation of 10 random prompts per day. Further details concerning design and procedure have been described in our preceding paper (Rupp, Falke, et al., 2019). Also, that paper describes in detail the reasons underlying the choice of items and the skipping rules within the questionnaire.

2.3 | Items in the EMA questionnaire

All EMA items were developed via (a) recommendations derived from other research and study protocols and (b) conversations with experts in the field. All items were rated on a Likert scale that ranged from 0 (*not at all*) to 6 (*very much*). Whereas the original questionnaire was presented in German, we provide English translations of all items in Table 1. Please note that Screen 11 (Table 1), on which participants were asked three questions about their application of the newly learned coping behaviours (Hypothesis 4), was presented only during Post-Treatment EMA. Also note that the item *Relaxation* only served the purpose of detecting implausible response patterns. The six CR and DM behaviour items this article focuses on were deliberately chosen to best reflect the strategies that participants were educated to apply in the corresponding treatment condition.

2.4 | Feasibility and reactivity to EMA

We assessed feasibility of and reactivity to EMA by means of a post-monitoring questionnaire that participants filled in after each of the two sampling periods. Please see Rupp, Falke, et al. (2019) for details on the items in this questionnaire.

2.5 | Data cleansing and analysis

All analyses employed multilevel modelling performed with the statistical software R (R Core Team, 2018), especially the packages *lme4*

(Bates, Mächler, Bolker, & Walker, 2015), *nlme* (Pinheiro, Bates, DebRoy, & Sarkar, 2018), *lmerTest* (Kuznetsova, Brockhoff, & Christensen, 2017), and *MuMIn* (Barton, 2018). All item responses were coded from 0 to 6.

Final analyses were based on *n* = 39 participants because one participant from the CR group had to be excluded due to an extreme tendency towards the centre of the scale on all items across both sampling periods. All values (but not the entire trials) on the three variables concerning the application of the newly learned strategies (Screen 11) were deleted whenever the frequency of obsessions (Item *Obsessions*) had been rated as 0 (i.e., *not at all*). Also, all values on the variables *Difficulty* and *Relief* were deleted if *How often* had been rated as 0.

Preliminary data analysis also involved the computation of null models for all items that were used as dependent variables. This step included computing the corresponding intraclass correlations (ICC), that is, the percentage of the total variance in the dependent variable that is due to mean differences *between* (as opposed to *within*) participants.

2.6 | Hypothesis testing

Except for Hypothesis 1, hypothesis testing was based on the computation of multilevel models with trials on the first level and participants on the second level. Parameter estimation employed restricted maximum likelihood. We applied a significance level of 0.01 for all analyses. Further details on checks for multicollinearity and homoscedasticity as well as our procedure regarding the modelling of random slopes, and model comparisons have been described by Rupp, Falke, et al. (2019) and were the same for the analyses reported in this article.

The regression models underlying Hypotheses 2 and 3 included both random intercepts and random slopes regarding the *Pre-Post* variable, as we expected participants to differ in terms of their response to treatment. To keep notation compact, the random intercepts and slopes are omitted in the model equations below. The two regression models underlying Hypotheses 2 and 3 included the factor *Group* (i.e., CR vs. DM), the factor *Pre-Post* (i.e., Pre-Treatment EMA vs. Post-Treatment EMA), and the interaction of these two factors as fixed effects. As both models dealt with predicting the frequency of newly learned coping behaviours, *Obsessions*, that is, the frequency of obsessions, was added as a covariate in order to control for any reduction effects that can be solely traced back to a decrease of obsession frequency. Aiming at accounting for the considerable influence that stress exhibits on OCD symptoms and the choice of coping behaviour, we added as another covariate the *Stress* rating at the preceding prompt, which we labelled $Stress_{t-1}$.

Testing Hypothesis 1 employed a one-sided *t* test contrasting DM strategies versus CR strategies during Pre-Treatment EMA. The *t* test was based on mean DM and CR values for each person. The regression model for Hypotheses 2 and 3 was

Y_t = *Intercept* + *Pre-Post* + *Group* + *Pre-Post×Group* + $Stress_{t-1}$ + *Obsessions* + *error*, whereas Y_t denotes scores on one of the DM and CR behaviour items at time *t*.

TABLE 1 English translation of EMA items

Variable (short label)	English translation of item
Screen 1	
Stress	(1) Since the last prompt, to what extent have you been under stress?
Relaxation	(2) Since the last prompt, to what extent have you felt relaxed?
Screen 2	
Obsessions	(1) Since the last prompt, how frequently have you experienced obsessions?
Burden	(2) To what extent have you felt burdened by the obsessions you have experienced since the last prompt?
Screen 3	(1) To what extent were obsessions that you have experienced since the last prompt associated with the following feelings?
Anxiety	*anxiety*
Shame	*shame*
Sadness	*sadness*
Screen 4	(1) To what extent were obsessions that you have experienced since the last prompt associated with the following feelings?
Guilt	*guilt*
Helplessness	*helplessness*
Disgust	*disgust*
Screen 5	(1) To what extent were obsessions that you have experienced since the last prompt associated with the following feelings?
Tension/Discomfort	*tension/discomfort*
Frustration	*frustration*
Uncertainty	*uncertainty*
Screen 6	(1) Please rate to what extent you responded to obsessions that you have experienced since the last prompt in the following ways—regardless of how effective you experienced your response:
Suppression (Dys)	*I suppressed the obsession.*
Come and Go (DM)	*I allowed the obsession to come and go.*
Screen 7	(1) Please rate to what extent you responded to obsessions that you have experienced since the last prompt in the following ways—regardless of how effective you experienced your response:
Realistic (CR)	*I reviewed to what extent my apprehensions are realistic.*
Compulsion (Dys)	*I performed a compulsion (overt or covert).*
Screen 8	(1) Please rate to what extent you responded to obsessions that you have experienced since the last prompt in the following ways—regardless of how effective you experienced your response:
Monitoring (Dys)	*I monitored my actions with special attention.*
Distance (DM)	*I positioned myself at a distance from the obsession.*
Screen 9	(1) Please rate to what extent you responded to obsessions that you have experienced since the last prompt in the following ways—regardless of how effective you experienced your response:
Responsibility (CR)	*I wondered how far I overestimated my own responsibility.*
Just a Thought (DM)	*I told myself that it is just a thought.*
Screen 10	1) Please rate to what extent you responded to obsessions that you have experienced since the last prompt in the following ways—regardless of how effective you experienced your response:
Risk (CR)	*I questioned how far I overestimated the risk of something.*
Avoidance (Dys)	*I avoided objects or situations due to my obsessions.*
Screen 11	
How often	(1) How often have you applied the technique you learned in therapy to obsessions—regardless of how effective you experienced it?
Difficulty	(2) How difficult did you find it to apply the newly learned technique?
Relief	(3) To what extent did applying the newly learned technique create relief?

Note. Screen 11 was presented only in the Post-Treatment EMA. Because the German term "Anspannung," which generally fits very well with the emotional experience of OCD patients, does not translate easily into English, we listed both "tension" and "discomfort" as possible translations. The annotations "Dys," "DM," and "CR" are used to indicate which category the corresponding behaviour item belongs to.
Abbreviations: CR, cognitive restructuring; DM, detached mindfulness; Dys, Dysfunctional; EMA, ecological momentary assessment.

Regarding Hypothesis 4, that is, the items on the use of the newly learned strategies, we modelled random intercepts but not random slopes because the model did not include the *Pre-Post* factor. The model equation was as follows:

Y_t = *Intercept* + *Group* + *Stress*$_{t-1}$ + *error*, whereas Y_t denotes one of the variables *How often*, *Difficulty*, and *Relief*.

3 | RESULTS

3.1 | Preliminary data analysis

Please see Rupp, Falke, et al. (2019) concerning our results regarding the spaghetti plots, data cleansing, feasibility and reactivity, and multi-level factor analysis. Note that concerning factor analysis, we did not aggregate with regard to the CR and DM items because the factor structure was too arbitrary. Instead, we computed separate regression models for each of the six items.

Importantly, due to a step of data cleansing that only affected the three items on the use of the newly learned coping behaviours (Screen 11), the number of trials that underlies the regression models for Hypothesis 4 was smaller than for the regression models concerning Hypotheses 2 and 3. As all values on these three variables were deleted whenever the frequency of obsessions (Item *Obsessions*) had been rated as 0 (i.e., *not at all*), and for all values on the variables *Difficulty* and *Relief* were deleted if *How often* had been rated as 0 (i.e., *not at all*), the three regression models underlying Hypothesis 4 were based on a sample size varying between n = 316 and n = 367 trials.

Regarding null models, we found ICCs between 0.347 (*Realistic*) and 0.449 (*Come and Go*) for the six CR and DM items, which are the focus of this paper. Regarding the items *How often*, *Difficulty*, and *Relief*, the ICCs were 0.600, 0.554, and 0.631, respectively. Thus, it seemed reasonable to model the multilevel structure of the data in all analyses.

3.2 | Descriptive data analysis

Table 2 presents descriptive data on all Pre-Treatment EMA items and on the three items concerning the newly learned coping behaviours (only presented during Post-Treatment EMA). As Table 2 reveals, participants did already use DM and CR strategies during Pre-Treatment EMA, that is, prior to actually being taught these strategies during treatment. Please confer Rupp, Falke, et al. (2019) for a discussion of the remaining descriptive results.

3.3 | Hypothesis testing

With the maximum absolute correlations of fixed effects varying between 0.69 and 0.72 in each of the regression models computed, multicollinearity did not constitute a problem. Neither did the inspection of scatter plots raise any concerns in terms of heteroscedasticity.

For the two regression models involving the *Pre-Post* factor (Hypotheses 2 and 3), the model comparisons indicated a better fit (based on Akaike information criterion, Bayesian information criterion, and likelihood ratio tests) for the models including random slopes than for those excluding them, so that we only report the models including random slopes.

TABLE 2 Descriptive data concerning all EMA items

Variable	M	SD	Median
Stress	2.50	1.75	2.0
Relaxation	2.96	1.68	3.0
Obsessions	2.37	1.72	2.0
Burden	2.28	1.82	2.0
Emotions			
Anxiety	2.55	1.94	2.0
Shame	1.16	1.68	0.0
Sadness	1.69	1.97	1.0
Guilt	1.47	1.87	1.0
Helplessness	2.30	1.99	2.0
Disgust	1.25	1.68	0.0
Tension/discomfort	3.41	1.62	4.0
Frustration	2.45	2.03	2.0
Uncertainty	2.69	1.82	3.0
Behaviours			
Compulsion	3.21	1.84	3.0
Suppression	2.65	1.75	3.0
Avoidance	1.80	1.75	1.0
Monitoring	2.45	1.96	2.0
Come and Go	2.15	1.72	2.0
Distance	1.78	1.67	1.0
Just a Thought	1.58	1.62	1.0
Realistic	1.80	1.73	1.0
Responsibility	1.18	1.46	1.0
Risk	1.53	1.61	1.0
Use of new strategies			
How often			
DM	2.74	1.81	3.0
CR	3.30	1.59	4.0
Difficulty			
DM	2.68	1.64	2.5
CR	2.25	1.21	2.0
Relief			
DM	3.22	1.66	3.0
CR	3.01	1.42	3.0

Note. Except for the items concerning the use of new strategies, which were only presented at Post-Treatment EMA and for which data are given separately for DM and CR, all calculations are based on Pre-Treatment EMA data only. Calculations are based items coded 0 (*not at all*) to 6 (*very much*). Please see Table 1 for a description of the DM and CR items for which this table only lists the corresponding abbreviations.
Abbreviations: CR, cognitive restructuring; DM, detached mindfulness, EMA, ecological momentary assessment.

Regarding Hypothesis 1, there was a strong but non-significant trend towards DM strategies being used more frequently than CR strategies during Pre-Treatment EMA, $t(38) = 2.212$, $p = .017$, $d = 0.717$, so that Hypothesis 1 was not fully confirmed. The results concerning Hypotheses 2 to 4 can be retrieved from Tables 3–5 and may be summarized as follows: Concerning both CR and DM behaviours (Hypotheses 2 and 3), we found a significant effect of the *Pre-Post* factor, that is, an increase of those behaviours from Pre-Treatment EMA to Post-Treatment EMA, for all items except *Come and Go*. The contribution of the covariates *Obsessions* and *Stress$_{t-1}$* was significant in some of the models. However, the *Group* factor was not significant in any of the models. Although in most models a certain trend towards a *Pre-Post × Group* interaction emerged, this trend did not reach significance in any of them. Thus, neither of the two hypotheses was confirmed. Although there was a clear pre-post increase, there was no evidence confirming that the increase of a certain behaviour was specific to the corresponding intervention.

Regarding Hypothesis 4, we did not find a significant effect of the *Group* factor in any of the three models using *How often*, *Difficulty*, and *Relief* as dependent variables. Hence, it appears that in both treatment conditions, participants applied the newly learned coping behaviours equally often, experienced them as similarly difficult and experienced a comparable degree of relief. In sum, Hypothesis 4 was not confirmed.

4 | DISCUSSION

4.1 | Participants' application of CR and DM coping behaviours

Both Hypotheses 1 and 4 (frequency of CR and DM strategy use before and after treatment) dealt with the way coping behaviours related to CR and DM are applied by participants in their everyday lives. Interestingly, the Pre-Treatment EMA data (see Table 2) show that patients already tried to apply certain CR and DM strategies before actually being taught these strategies during treatment. And even though Hypothesis 1, which claimed that prior to treatment DM strategies are used more often than CR strategies, was not fully confirmed, there was a strong statistical trend towards this pattern. However, it is important to bear in mind that these results only reveal how often participants applied each strategy, whereas this does not reveal anything about their success in doing so. So, although we did not find evidence in favour of reactivity effects with regard to the post-monitoring questionnaire, we need to bear in mind that reactivity may have played a role because presenting the item itself may have encouraged participants to apply the corresponding coping behaviour.

The fact that DM strategies showed a tendency towards being applied more often than CR strategies before treatment may indicate that DM strategies indeed require less effort and cognitive load. However, this result may equally well be taken as a sign that especially approaches such as letting thoughts come and go are more part of

TABLE 3 Regression models concerning Hypothesis 2 (increase of CR strategies)

	b	SE	t	p
Realistic				
Intercept	1.40	0.26	5.39	**<.001**
Pre-Post.*Post*	1.30	0.33	3.89	**<.001**
Group.*DM*	−0.51	0.34	−1.50	.141
Stress$_{t-1}$	0.04	0.02	1.72	.086
Obsessions	0.15	0.03	5.34	**<.001**
Pre-Post.*Post* × Group.*DM*	−0.38	0.46	−0.83	.415
Observations: *n* = 1,598, Participants: *n* = 39				
Responsibility				
Intercept	0.81	0.26	3.055	**.004**
Pre-Post.*Post*	1.48	0.33	4.43	**<.001**
Group.*DM*	0.14	0.35	0.39	.700
Stress$_{t-1}$	0.05	0.02	2.70	**.007**
Obsessions	0.05	0.02	2.12	.034
Pre-Post.*Post* × Group.*DM*	−0.66	0.46	−1.44	.160
Observations: *n* = 1,597, Participants: *n* = 39				
Risk				
Intercept	1.06	0.28	3.81	**<.001**
Pre-Post.*Post*	1.38	0.31	4.38	**<.001**
Group.*DM*	−0.02	0.37	−0.05	.960
Stress$_{t-1}$	0.02	0.02	0.93	.354
Obsessions	0.13	0.03	4.99	**<.001**
Pre-Post.*Post* × Group.*DM*	−0.82	0.43	−1.87	.070
Observations: *n* = 1,597, Participants: *n* = 39				

Note. The first line of each table lists the dependent variable of the corresponding model. *p* values < .01 are printed in bold. Concerning the predictors "Pre-Post" and "Group," the corresponding reference category is given in italicized letters (*Post/DM*).
Abbreviations: CR, cognitive restructuring; DM, detached mindfulness.

common parlance than the questioning of appraisals, so that the latter are used less frequently in everyday life.

An important aspect that contradicts our assumptions concerning effort and cognitive load is that with regard to Hypothesis 4, we did not find any evidence suggesting that after treatment participants applied DM more often than CR. Neither did participants find DM less difficult to apply than CR nor did they experience DM as more relieving than CR. In sum, the results for Hypotheses 1 and 4 seem to reflect that whereas DM strategies may be easier to understand due to their presence in colloquial speech, there are no differences concerning applicability after treatment, that is, frequency of use, difficulty, and experienced relief. Though contradicting our hypotheses, this finding is in line with our main result from the clinical trial (Rupp, Jürgens, et al., 2019), where we found both CR and DM to be equally effective at reducing OCD symptoms as measured with the Y-BOCS. Thus, this finding adds to the overall impression that CR and DM seem rather equal not only in terms of efficacy but also with regard to applicability.

TABLE 4 Regression models concerning Hypothesis 3 (increase of DM strategies)

	b	SE	t	p
Come and Go				
Intercept	2.16	0.31	6.88	**<.001**
Pre-Post.*Post*	0.33	0.33	1.002	.323
Group.*DM*	0.47	0.43	1.10	.279
Stress$_{t-1}$	−0.03	0.02	−1.48	.141
Obsessions	−0.07	0.02	−2.74	**<.001**
Pre-Post.*Post* × Group.*DM*	0.69	0.46	1.48	.148
Observations: n = 1,598, Participants: n = 39				
Distance				
Intercept	2.28	0.30	7.49	**<.001**
Pre-Post.*Post*	1.10	0.33	3.38	**.002**
Group.*DM*	0.04	0.41	0.09	.928
Stress$_{t-1}$	−0.04	0.02	−1.815	.070
Obsessions	−0.13	0.03	−4.97	**<.001**
Pre-Post.*Post* × Group.*DM*	0.22	0.45	0.50	.617
Observations: n = 1,598, Participants: n = 39				
Just a Thought				
Intercept	1.88	0.30	6.20	**<.001**
Pre-Post.*Post*	0.98	0.31	3.19	**.003**
Group.*DM*	−0.41	0.41	−1.00	.325
Stress$_{t-1}$	0.02	0.02	0.92	.360
Obsessions	−0.04	0.03	−1.40	.162
Pre-Post.*Post* × Group.*DM*	0.79	0.43	1.85	.073
Observations: n = 1,597, Participants: n = 39				

Note. The first line of each table lists the dependent variable of the corresponding model. *p* values < .01 are printed in bold. Concerning the predictors "Pre-Post" and "Group," the corresponding reference category is given in italicized letters (*Post/DM*).
Abbreviations: DM, detached mindfulness.

4.2 | General versus specific effects of CR and DM treatment

As predicted by Hypotheses 2 and 3, there was a clear pre to post increase concerning the application of newly learned coping behaviours in both treatment conditions, which complements the finding that frequency of obsessions, experienced burden due to obsessions, and avoidance behaviour all decreased from Pre-Treatment EMA to Post-Treatment EMA (Rupp, Falke, et al., 2019). Hence, this result can be taken as further evidence for the treatment sensitivity of the EMA method in OCD. The DM item *Come and Go* failed to show this pre-post increase, maybe due to the presence of this strategy in common parlance, leading to a high mean at Pre-Treatment EMA compared with other functional strategies, which meant less room for a pre-post increase.

Even though there was a slight trend towards an interaction effect of *Group* and *Pre-Post* suggesting that CR behaviours increase more markedly in the CR condition and vice versa, the overall conclusion to draw from the regression results is rather that both treatments also

TABLE 5 Regression models concerning Hypothesis 4 (use of newly learned strategies)

	b	SE	t	p
How often				
Intercept	3.44	0.34	10.07	**<.001**
Group.*DM*	−0.57	0.46	−1.23	.228
Stress$_{t-1}$	−0.03	0.03	−1.03	.305
Observations: n = 730, Participants: n = 38				
Difficulty				
Intercept	1.97	0.28	6.91	**<.001**
Group.*DM*	0.36	0.38	0.94	.356
Stress$_{t-1}$	0.06	0.03	2.08	.038
Observations: n = 667, Participants: n = 36				
Relief				
Intercept	3.34	0.31	10.74	**<.001**
Group.*DM*	0.15	0.42	0.36	.725
Stress$_{t-1}$	−0.06	0.03	−2.05	.041
Observations: n = 667, Participants: n = 36				

Note. The first line of each table lists the dependent variable of the corresponding model. *p* values < .01 are printed in bold. Concerning the predictor "Group," the corresponding reference category is given in italicized letters (*DM*).
Abbreviations: DM, detached mindfulness.

promoted the use of strategies that actually belonged to a different treatment rationale. On the one hand, this may be interpreted in the light of general or shared as opposed to specific factors of treatment efficacy (e.g., Grawe, Donati, & Bernauer, 1994), because all newly learned behaviours reflect forms of problem actualization and problem solving and all imply the creation of new learning experiences. Drawing on this perspective, it also seems reasonable that at a certain point, CR and DM strategies become indistinct for patients, who may, for example, also use a CR strategy (questioning an appraisal) as a stepping stone for letting go of an obsession (i.e., a DM strategy), or vice versa. As summarized by Kazdin (2007), however, determining the working mechanism behind an effective psychological treatment is a challenging issue far beyond the scope of this article. On the other hand, this result may also be partly due to the fact that during Pre-Treatment EMA and Post-Treatment EMA, participants were presented all items concerning both CR and DM—which may have encouraged them to engage in either of them. Furthermore, this result may also partly be due to social desirability, which affects EMA as much as it affects all questionnaire-based research (Schwarz, 2007), because the structure of the EMA questionnaire made it easy for participants to guess that the researchers were aiming at finding CR and DM strategies to be used more often during Post-Treatment EMA.

4.3 | Strengths

Besides the fact that we conducted the first study on treatment sensitivity of the EMA method in the OCD field (Rupp, Falke, et al., 2019),

this is also the first study that used EMA as an outcome measure to reflect the effect of two different OCD-specific treatments. Therefore, the major strength of this study consists in providing ecologically valid data on OCD patients' use of specific coping behaviours prior to and after treatment.

4.4 | Limitations

As already noted in our previous paper (Rupp, Falke, et al., 2019), a major limitation of our study is that for the sake of practicability, each construct was measured by only a few items or even one single item in the EMA questionnaire. This is especially true of the item *Stress*, which is why future research should definitely differentiate more between the various facets of stress. However, this limitation also affects the choice of behaviour items employed to reflect CR and DM strategies given the wide range of strategies that can be labelled as pertaining to the CR or DM approach, respectively. For example, in the CR condition, questioning of appraisals also involved the issue of dealing with uncertainty, which the OCCWG (1997) listed as one cognitive distortion typical of OCD (see also, e.g., Gentes & Ruscio, 2011)—which, however, was not represented in the EMA items due to our a priori decisions. Thus, to arrive at a more representative result regarding the question to what extent effects of treatment are reflected in the EMA results and whether these results reveal a specific effect of the type of treatment, future research should employ a larger and possibly empirically grounded set of behaviour items to capture a wider range of facets pertaining to both DM and CR.

Furthermore, we did not have any control groups of mentally healthy participants or participants with an anxiety disorder. As this limits especially the generalizability of our Pre-Treatment EMA results to a certain extent, future research should address this aspect. Similarly, an interesting question for future research concerns the degree to which the effect of either treatment is moderated by the type of OCD symptoms. For in our sample, the co-existence of various OCD symptoms within one participant rather formed the rule than the exception, we were unable to form distinct categories in order to study this aspect.

Another limitation concerns the issue of reactivity. Even though the spaghetti plots and the post-monitoring questionnaire did not suggest any severe reactivity effects, it would be wrong to ignore that all CR and DM items were presented during Pre-Treatment EMA and Post-Treatment EMA equally across all participants, so that solely answering these items may have inspired participants to engage in those behaviours. Therefore, the conclusion that both treatments equally promote the use of CR and DM behaviours must be drawn with caution.

In future research, this issue might be addressed by adding a second baseline EMA before treatment, so that the actual treatment effects can be separated from the reactivity effects. Also note that, whereas EMA allows to rule out retrospective memory biases, other confounding variables such as social desirability and effects of response formatting still play a role and cannot be ruled out (Schwarz, 2007), which may have contributed to our results, too.

From a statistical point of view, it is important to note that as our regression models only dealt with means, measures of variability in the data have been neglected. So, although the spaghetti plots did not raise any concerns regarding autocorrelations, our analyses do not provide a definite answer to the question to what extent the variability of the newly learned behaviours changes from Pre-Treatment EMA to Post-Treatment EMA.

5 | CONCLUSIONS

This study adds to the existing psychotherapy outcome literature in OCD by providing ecologically valid data on how the use of functional coping behaviours changes following a specific intervention of either CR or DM. In contrast to our expectations, the two types of newly learned functional coping behaviours hardly differed in terms of applicability. Also, our results suggest that the use of functional coping behaviours was promoted equally through both treatment conditions, pointing more towards general than specific factors of treatment efficacy. However, as social desirability effects and other biases cannot be ruled out, this conclusion must be handled cautiously, and further research is needed to replicate and generalize our results.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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