



# Reducing emotional eating through mindfulness-based cognitive-behavioural training

Michael Macht, Heiner Vogel

## Abstract

The efficacy of a mindfulness-based cognitive-behavioral training program to reduce emotional eating behavior was investigated in a randomized controlled trial. Patients of a rehabilitation clinic (mean age 51 years, 57 % women) showing high scores of emotional eating and a mean body mass index of 36 were randomly assigned to regular treatment (n = 262) or to an additional training program with six group sessions (n = 260). Characteristics of eating and emotion regulation were assessed with standardized questionnaires at the beginning of training, at the end of training, and one, three, and five months thereafter. The training reduced the expression of emotional eating up to three months after the end of the training, improved emotion regulation and promoted the ability to enjoy food. We conclude that emotional eating can be successfully treated with relatively little time through mindfulness-based behavioral therapy training.

**Keywords:** emotional eating, stress, mindfulness-based intervention, emotion regulation, psychology

## Introduction

The habit of eating to cope with emotional stress is often referred to as «emotional eating»: an eating pattern triggered by anxiety, anger, or depressive moods. Here, these and other negative emotions increase the motivation to eat, which is experienced as an appetite or craving, rather than a physically anchored hunger sensation. Mostly energy-dense food is eaten, often associated with a loss of control over eating behavior. As a consequence, the intensity of the stressful emotion decreases, reinforcing and sustaining the emotionally triggered eating.

This eating pattern was validated in laboratory experiments, where individuals with high emotional eating scores ate more in response to induced emotions than individuals with low scores. Emotional eating behavior develops in an interplay of learning processes, biological and sociocultural factors, which is not yet well understood. It contributes to the development of obesity and eating disorders and complicates changes in dietary behavior, such as those required for bariatric surgery or diabetes treatment [1–6].

Since problematic forms of emotional eating can be regarded as maladaptive emotion regulation strategies, their treatment should aim at improving emotion regulation. For this purpose, mindfulness-based techniques have proven effective in combination with cognitive-behaviour therapy, which also promote the perception of hunger and satiety and the self-control of eating behavior. They are therefore particularly suitable for the treatment of emotional eating patterns [7–10].

However, in previous studies on the effect of mindfulness-based approaches to problematic eating patterns, emotional eating was rarely the main target, at best in small, non-clinical samples [11, 12]. We therefore investigated the efficacy of a specially developed training program to overcome emotional eating pat-

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Session topic	Informations	Exercises in the group	Exercises in everyday life
1 mindful eating	information on the training mindfulness and self-observation	mindfulness exercise mindful eating	mindful eating mindfulness exercise / eating feeling diary <sup>a</sup>
2 identifying eating triggers	what makes us eat	mindfulness exercise to recognize eating triggers the faces of hunger	where my hunger is (located) my food triggers
3 understanding food and feelings <sup>b</sup>	what feelings are what feelings have to do with food	self-observation of eating triggers, bodily sensations and feelings	emotional observation
4 decoding emotional eating experiences <sup>b</sup>	why eating helps to cope with emotional stress the inner life of eating	decoding emotional eating experiences	decoding emotional eating experiences a look into the history of eating
5 managing emotions through means other than food	coping with emotions other than through food	collecting alternative forms of coping	collecting and testing alternative ways of coping
6 coping with urges to eat	the nature of desire	techniques for coping with cravings, closing round	on the wave of desire

Table 1: Sessions of the training program – overview

<sup>a</sup> These exercises are continued throughout the training.

<sup>b</sup> To adapt to the standard treatment of the clinic, sessions 3 and 4 were performed in a block.

terms in patients of a rehabilitation clinic in a controlled randomized trial. The training program combines mindfulness-based interventions with methods of cognitive behavior therapy. It aims, first to improve self-observation of eating triggers, feelings, and episodes of emotional eating, second, to improve impulse control, emotion regulation, and enjoyment of food [13]. ♦ Table 1 provides an overview of the training. It is designed to be delivered to groups (8–12 people) and is composed of weekly sessions of approximately 90 minutes.

In each session, information is provided, homework is discussed, and new exercises are performed. Among other things, the group is instructed in mindful self-observation and keeping an eating-feelings diary. Other exercises focus on noticing physical hunger sensations and recognizing external influences on eating behavior. Alternative forms of emotion management are encouraged through psychoeducation on emotion regulation, group discussions and imagination exercises. A pilot study indicated effectiveness of the training in a non-clinical sample [14].

## Methods

### Design

Participants of the control group (CG) received the standard treatment of the clinic («treatment as usual» including nutritional counseling and exercise therapy). Participants in the intervention group (IG) additionally participated in exercise training. The participants were randomly assigned to the groups. Dependent variables were obtained at the beginning and end of training, and one, three, and five months afterward. The study was conducted between November 2015 and December 2017. The project was

reviewed and approved by the Ethics Committee of the Medical Faculty of the University of Würzburg and complied with the data protection guidelines of the German Pension Insurance including the Informed Consent of the participants.

### Dependent variables

Characteristics of eating and emotion regulation were assessed with standardized questionnaires: emotional, external, and restrained eating behavior with the Dutch Eating Behaviour Questionnaire (DEBQ) [15, 16], pleasure-oriented eating behavior with the Gourmet Questionnaire [17], and emotion regulation skills with the Self-Assessment of Emotional Competencies Questionnaire (SEK-27

### Sample

Individuals were classified as «emotional eaters» if they scored at or above 2.8 for women and 2.1 for men on the relevant subscale of the DEBQ. These cut-off values corresponded to the lower limit of the upper third of the distributions for women and men in a sample of 1.385 subjects from previous projects of our group and are above the mean values of healthy subjects, approximately in the range of obese subjects and slightly lower than in subjects with bulimia nervosa or binge-eating disorder [19–23]. A total of 522 individuals were studied (IG: n = 260; KG: n = 262).



	Premeasurement		End of training				1 month after training			
	CG	IG	CG	IG	p	$\eta^2$	CG	IG	p	$\eta^2$
	M (SEM)	M (SEM)	M (SEM)	M (SEM)			M (SEM)	M (SEM)		
emotional eating behavior (DEBQ)	3.6 (0.7)	3.6 (0.7)	2.9 (0.9)	2.7 (0.8)	0.015	0.018	2.8 (0.9)	2.5 (0.8)	< 0.001	0.055
pleasure-oriented eating behavior (GFB)	122.9 (22.1)	122.5 (19.9)	124.4 (24.1)	134.7 (22.8)	< 0.001	0.087	127.6 (23.7)	133.2 (23.6)	0.010	0.030
external eating behavior (DEBQ)	3.7 (0.6)	3.6 (0.6)	3.2 (0.7)	3.1 (0.7)	0.026	0.015	2.9 (0.7)	2.7 (0.6)	0.057	0.016
restrained eating behavior (DEBQ)	2.7 (0.7)	2.7 (0.7)	3.1 (0.7)	3.1 (0.7)	0.182	0.005	3.3 (0.7)	3.4 (0.7)	0.143	0.009

Table 2: Self-rating of eating behavior and results of covariance analyses to examine group differences.

Means (M) and standard errors (SEM) are adjusted as covariates after pre-measurement.

DEBQ = Dutch Eating Behavior Questionnaire [15, 16]; GFB = Gourmet Questionnaire [17]; CG = control group; IG = intervention group; Effect sizes  $\eta^2$ : small = 0.01, medium = 0.06, large = 0.14

Participants in the two groups were comparable in sociodemographic characteristics. The scores of the Symptom Check List-90 [24] and the Emotion Regulation Questionnaire (SEK-27) were similar to those of patients in outpatient psychotherapeutic treatment at baseline. Depressive symptoms were evident in a majority of participants. The most common physical conditions

were diabetes, high blood pressure, and obesity.

### Statistical analysis

Possible training effects were tested by comparing the intervention and control group at each

CG	Premeasurement		End of training				1 month after training			
	IG	CG	IG		p	$\eta^2$	CG	IG	p	$\eta^2$
	M (SEM)	M (SEM)	M (SEM)	M (SEM)			M (SEM)	M (SEM)		
SEK-27 total score	2.2 (0.7)	2.2 (0.6)	2.6 (0.6)	2.7 (0.6)	0.002	0.028	2.5 (0.8)	2.7 (0.6)	0.005	0.036
attention	2.2 (0.9)	2.0 (0.8)	2.7 (0.8)	2.9 (0.6)	0.001	0.029	2.5 (0.9)	2.7 (0.7)	0.001	0.050
clarity	2.4 (1.0)	2.4 (0.8)	2.7 (0.8)	2.8 (0.7)	0.096	0.008	2.7 (0.9)	2.8 (0.7)	0.092	0.013
body awareness	2.4 (0.9)	2.3 (0.7)	2.7 (0.7)	2.7 (0.7)	0.388	0.002	2.6 (0.9)	2.8 (0.7)	0.066	0.015
understanding	2.2 (0.9)	2.1 (0.8)	2.6 (0.8)	2.8 (0.7)	< 0.001	0.037	2.7 (0.9)	2.7 (0.7)	0.246	0.006
resilience	2.0 (1.0)	1.9 (0.9)	2.4 (0.9)	2.6 (0.8)	0.006	0.021	2.4 (1.1)	2.6 (0.9)	0.003	0.039
self-support	2.3 (0.9)	2.3 (0.9)	2.6 (0.9)	2.7 (0.8)	0.008	0.020	2.6 (0.9)	2.6 (0.7)	0.124	0.011
regulation	1.9 (0.8)	1.8 (0.7)	2.3 (0.8)	2.5 (0.7)	0.012	0.018	2.2 (0.9)	2.4 (0.7)	0.023	0.023
acceptance	2.2 (0.9)	2.2 (0.8)	2.7 (0.8)	2.7 (0.7)	0.152	0.006	2.6 (1.0)	2.7 (0.8)	0.010	0.030
readiness for confrontation	2.3 (1.0)	2.4 (0.9)	2.6 (0.8)	2.7 (0.8)	0.110	0.007	2.5 (1.0)	2.6 (0.8)	0.329	0.004

Table 3: Self-rating of emotion regulation and results of covariance analyses to test group differences.

Means (M) and standard errors (SEM) are adjusted as covariates after premeasurement. IG = Interventionsgruppe; KG = Kontrollgruppe; SEK-27 = Questionnaire for self-assessment of emotional competencies [18].

Effect sizes  $\eta^2$ : small = 0.01, medium = 0.06, large = 0.14



3 months after training				3 months after training			
CG	IG			CG	IG		
M (SEM)	M (SEM)	p	$\eta^2$	M (SEM)	M (SEM)	p	$\eta^2$
2.7 (0.9)	2.5 (0.9)	0.020	0.029	2.7 (0.9)	2.6 (0.9)	0.177	0.009
123.7 (21.7)	132.7 (25.4)	0.001	0.057	122.9 (25.0)	131.9 (26.4)	0.001	0.051
2.9 (0.6)	2.7 (0.6)	0.276	0.006	3.0 (0.8)	2.8 (0.7)	0.273	0.006
3.3 (0.7)	3.3 (0.7)	0.957	0.000	3.0 (0.8)	3.2 (0.7)	0.311	0.005

time point using analyses of covariance (ANCOVA) controlling for baseline values at a significance level of  $\alpha = 5\%$  using SPSS. The partial eta squared ( $= \eta^2$ ) was determined to estimate effect sizes. A value of 0.01 ( $\eta^2 = 0.0099$ ) was assumed to be a small effect, 0.06 ( $\eta^2 = 0.0588$ ) a medium effect, and 0.14 ( $\eta^2 = 0.1379$ ) a large effect [25]. In addition, drop-out analyses were performed.

3 months after training				5 months after training			
CG	IG			CG	IG		
M (SEM)	M (SEM)	p	$\eta^2$	M (SEM)	M (SEM)	p	$\eta^2$
2.5 (0.7)	2.5 (0.8)	0.361	0.005	2.5 (0.8)	2.5 (0.8)	0.420	0.003
2.4 (0.9)	2.5 (0.8)	0.104	0.014	2.4 (0.9)	2.4 (0.9)	0.331	0.005
2.8 (0.8)	2.8 (0.8)	0.787	0.000	2.8 (0.9)	2.7 (0.9)	0.627	0.001
2.6 (0.9)	2.6 (0.9)	0.887	0.000	2.6 (0.9)	2.5 (0.9)	0.844	0.000
2.6 (0.9)	2.6 (0.9)	0.361	0.005	2.7 (0.9)	2.6 (0.9)	0.829	0.000
2.5 (1.0)	2.4 (1.0)	0.487	0.003	2.5 (1.0)	2.5 (1.0)	0.220	0.008
2.5 (0.9)	2.5 (0.9)	0.643	0.001	2.6 (1.0)	2.5 (0.9)	0.973	0.000
2.2 (0.9)	2.2 (1.0)	0.562	0.002	2.2 (0.9)	2.2 (0.9)	0.290	0.006
2.6 (0.9)	2.6 (1.0)	0.466	0.003	2.5 (0.9)	2.5 (0.9)	0.292	0.006
2.6 (0.9)	2.5 (0.9)	0.828	0.000	2.5 (0.9)	2.5 (0.9)	0.793	0.000

## Results

Participants of the intervention group reported a decrease in emotional eating immediately after training and one and three months after. Immediately after training, external eating behavior scores were also reduced. The ability to enjoy food was increased at all survey time points after training (♦ Table 2). Emotion regulation was also improved. Training participants improved skills to perceive, accept, tolerate, and influence their own emotions. These effects were evident immediately after the training, but not three and five months later (♦ Table 3).

♦ Figure 1 shows that slight improvements in eating and emotion regulation already occurred during treatment as usual. However, the training resulted in a further, statistically significant increase in efficacy.

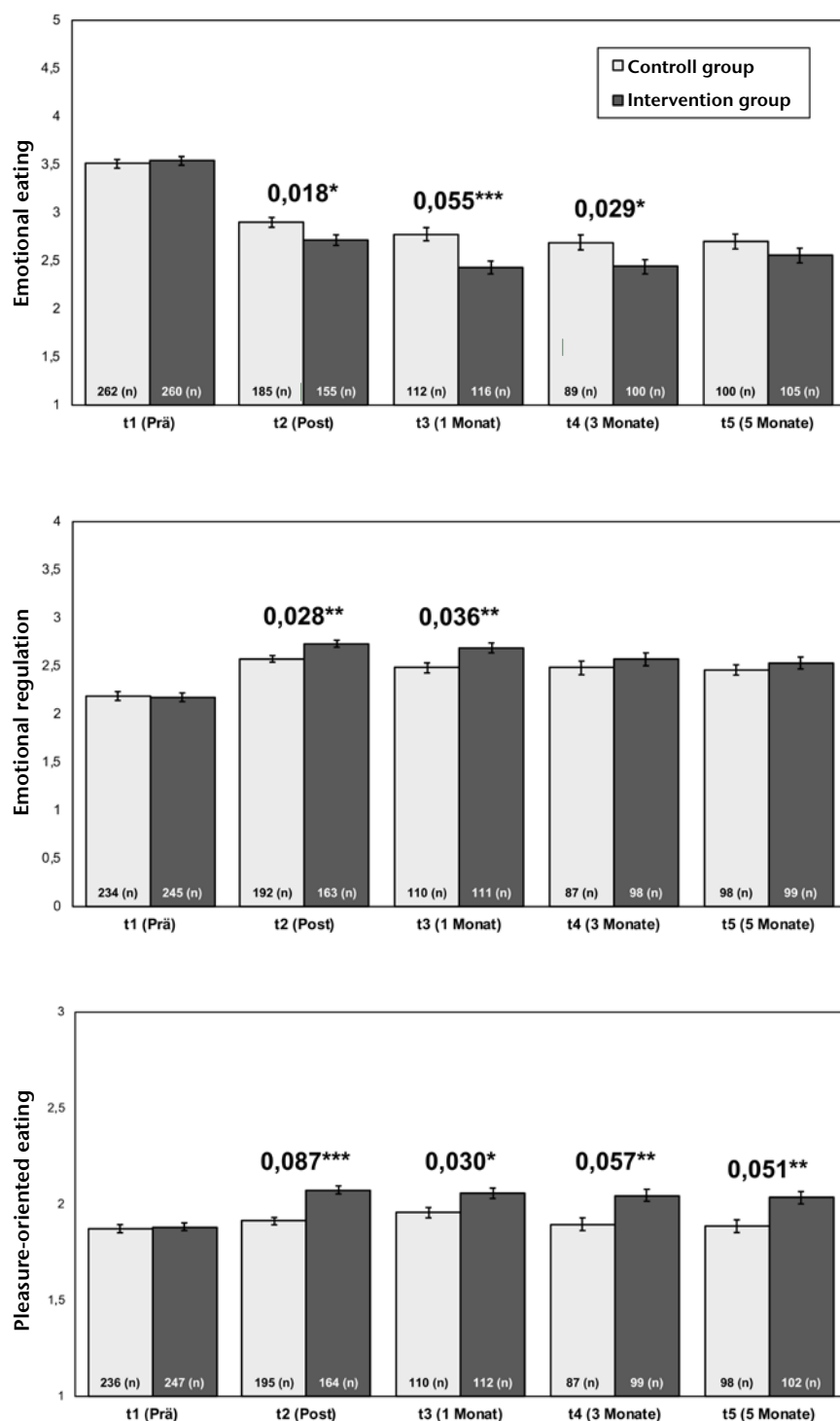
## Discussion

Up to now, intervention studies on the change of emotional eating are sparse, with a lack of randomized, controlled studies with follow-up measurements and clinical samples [see among others 11, 14, 26, 27]. Comparable results were only found in a study by Roosen et al [12], after a larger number of training sessions.

Accordingly, the training studied here appears not only to be effective, but also comparatively time-efficient. It therefore offers itself as a building block in the prevention and treatment of eating disorders and, moreover, can be applied when dietary change is hampered by emotional eating patterns.

A methodological problem of our study lies in the relatively high drop-out rate. While the response rate of the questionnaires immediately after the end of the training was satisfactory (72%), it was reduced in follow-up measurements (40%) at the later measurement points. It can therefore not be ruled out that the effects of the training were overestimated, although the comparisons between participants who took part in the entire training and drop-outs did not reveal any significant differences with regard to group membership, sociodemographic characteristics, body weight, characteristics of eating behavior and emotion regulation. Also, the pattern of results was essentially preserved after conservative analyses.

Only individuals whose data were available at



**Fig. 1: Emotional eating, emotion regulation and pleasure-oriented eating before and after training**  
Means and standard errors of the intervention and control group (the values of the postmeasurements were adjusted with the premeasurement values by covariance analysis). Indicated are effect sizes ( $\eta^2$ ) and significance values: \*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ .

most measurement time points were included in these analyses. Future studies will need to show whether the effects of training reported here are further confirmed. The follow-up surveys over a period of several months argue for an additional introduction of refresher sessions after the actual training has ended in order to maintain its effects and improve everyday transfer. This is especially true for changes in emotion regulation, which did not last as long as changes in eating behavior.

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#### Conflict of Interest

The authors declare no conflicts of interest.

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