



Depressive Symptoms and Emotional Eating: Mediated by Mindfulness?

Marthe M. Höppener¹ · Junilla K. Larsen¹ · Tatjana van Strien¹ · Machteld A. Ouwens² · Laura H. H. Winkens³ · Rob Eisinga⁴

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Abstract

The association between depressive symptoms and emotional eating has been well established. The aim of the current study was to examine whether the association between depressive symptoms and emotional eating was mediated by mindfulness, a construct that has successfully been implemented in the treatment of eating disorders and depression. Mindfulness, particularly, the component “acting with awareness” was theorized to decrease impulsive eating. Data from 417 Dutch adult participants were analyzed. Mediation analyses were conducted using structural equation modeling in Mplus. Of the five mindfulness subcomponents, only acting with awareness mediated the association between depressive symptoms and emotional eating. Results showed complete mediation in that the effect of depression on emotional eating was entirely carried indirectly through the mediator acting with awareness. None of the other mindfulness components mediated the depressive symptoms-emotional eating link. This indicates the potential importance of the “acting with awareness” construct, explaining why depressive symptoms would be associated with emotional eating. Future prospective research should examine whether, why and for whom acting with awareness may mediate the prospective link from depressive symptoms to emotional eating.

Keywords Emotional eating · Mindfulness · Acting with awareness · Depressive symptoms · Mediation

Introduction

Emotional eating is highly prevalent among adult populations and has been related to eating disorders (Heatherton and Baumeister 1991; Macht 2008; Stice et al. 2002) and weight gain over time (Hübner et al. 2016; Koenders and Van Strien

2011). There is robust cross-sectional evidence that depressive symptoms are positively linked to emotional eating (Kontinen et al. 2010a, b; Ouwens et al. 2009; Pidgeon et al. 2013; Stice 2002; Van Strien et al. 2016a, b), and recent longitudinal research suggests that depressive symptoms predict future emotional eating (Kidwell et al. 2017). Mindfulness may be a prominent mechanism explaining the link between depressive symptoms and emotional eating.

Mindfulness has often been described as the non-judgemental awareness of current experience and acceptance toward moments of experience (Bishop et al. 2004). Mindfulness as defined by Baer et al. consists of five subcomponents: “acting with awareness,” “non-reactivity,” “non-judgment,” “describing,” and “observing” (Baer et al. 2006), and is theorized to decrease impulsive eating, rumination, and increase healthy, internal coping mechanisms (Alberts et al. 2012; Kristeller and Wolever 2011; O'Reilly et al. 2014; Tak et al. 2015; Teasdale et al. 1995). It is therefore considered a promising innovative emotion regulation tool to decrease emotional eating (Daubenmier et al. 2011; Leahey et al. 2008; Kristeller and Wolever 2011; Mantzios and Wilson 2015; Ouwens et al. 2015). Surprisingly, less is known about the general association between mindfulness and emotional eating.

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✉ Junilla K. Larsen
j.larsen@bsi.ru.nl

¹ Behavioural Science Institute, Radboud University, PO Box 9140, 6500 HE Nijmegen, The Netherlands

² GGZ Breburg, Persona Cura, Department of Personality and Behavioral Disorders in the Elderly, PO Box 770, 5000 AT Tilburg, The Netherlands

³ Department of Health Sciences, Faculty Science, Amsterdam Public Health Research Institute, Vrije Universiteit Amsterdam, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands

⁴ Radboud Social Cultural Science, Radboud University, PO Box 9140, 6500 HE Nijmegen, The Netherlands

To date, one survey study in an obese population found that more mindfulness was associated with less emotional eating (Ouwens et al. 2015). Another survey study in a non-clinical sample found that mindfulness moderated the association between depressive symptoms and emotional eating, with more mindfulness linked to less emotional eating only among individuals with low depressive symptoms (Pidgeon et al. 2013). However, this study used a unidimensional operationalization of mindfulness (i.e., “attentional focus”). High attentional focus might be ineffective among individuals with high depressive symptoms. Two recent survey studies found evidence for the idea that “acting with awareness” was the most important mindfulness component being associated with emotional eating (Tak et al. 2015; Levin et al. 2014). Tak et al. (2015) found that acting with awareness was most strongly associated with emotional eating in people with diabetes. The same was found by Levin et al. (2014) among individuals who had undergone bariatric surgery for morbid obesity. Acting with awareness constitutes an awareness of emotions and present events, which may be a key factor in counteracting food-intake, particularly in response to depressive symptoms.

Notably, in most studies examining the association between depressive symptoms and mindfulness, a lack of mindfulness is considered as the antecedent of later depressive symptoms (Raphiphatthana et al. 2016). However, some recent findings on the temporal order of this association suggest that depressive symptoms also precede the development of mindfulness (Gotink et al. 2016; Raphiphatthana et al. 2016). According to well-supported cognitive models of depression, depressive symptoms may induce all sorts of negative cognitive biases (Beck 1976), which increase the chance of negative interpretations and less mindful thoughts or actions (i.e., acting without awareness). These decreasing mindful thoughts or actions may particularly be harmful in our current obesogenic environment, explaining the link from depressive symptoms to emotional eating through decreasing acts of mindfulness.

The main aim of the current study is to examine whether specific mindfulness components mediate the association between depressive symptoms and emotional eating. We hypothesize that depressive symptoms are positively related to emotional eating and that this association is mediated by the mindfulness subcomponents, particularly by acting with awareness.

Method

Participants

In total, 417 Dutch adults participated in the current study, of which approximately two thirds were female

(277 females, 134 males, and 6 unknown). The ages of the participants ranged from 18 to 85, with a mean age of 38.99 (SD = 17.59). The body mass index (BMI) of the participants ranged from 17.5 to 41.7 with a mean BMI of 24.0 (SD = 3.8). According to the WHO Expert Consultation (2004) cut-off points, 21.8% of the participants were pre-obese (BMI 25 to < 30) and 8.8% were obese (BMI > 30). Of the participants, 95% were Caucasian and more than half (61.9%) were not religious. The highest completed educational attainment of the participants ranged from primary education (1) to university (8). 2.4% of participants only completed primary education, 34.8% completed secondary education, and 62.8% completed tertiary education, including vocational training (7.5%), higher vocational training (13.5%), and higher professional training (25.6%) or the university (16.2%). Of the participants, 22.9% were students, 74.1% of participants noted a vocation, 2.4% were retired, and 0.6% reported unemployment.

Procedure

Students and research assistants (12 bachelor and 3 master students) recruited adult participants in their own social network. Participants were asked to fill out a survey on health and emotions. In some cases, these participants distributed the survey among their friends, creating a snowball sample. As participant recruitment deliberately focused on a diverse age-range, the snowball sample has helped in reaching a more diverse sample of participants. It was emphatically stated that participation was voluntary. Given the nature of the snowball sample, it is unknown how many participants were approached but declined to participate. The data was collected anonymously; after agreeing to participate in the study, the questionnaire was sent to the participants in an envelope and participants were instructed to seal the envelope after completing the questionnaire and to hand it to the research assistant. Filling out the questionnaire took approximately 30 min. Participant recruitment and data collection took place from February to April of 2014. Sealing the envelope ensured anonymity and a different research assistant than the recruiter entered the data in SPSS. The Ethics Committee of the Faculty of Social Sciences of the Radboud University Nijmegen approved the study (code-number: ECSW2015-1210-337).

Measures

To measure mindfulness, a Dutch translation of the Five Facet Mindfulness Questionnaire (FFMQ) was used (Baer et al. 2006). The FFMQ is a self-report questionnaire that results in a total mindfulness score and measures five

subcomponents of mindfulness: observing (the awareness and attention to internal and external stimuli, α in this sample is .78), non-judging (acceptance of thoughts and emotions, $\alpha = .87$), describing (the capacity to describe observations, $\alpha = .87$), non-reactivity (letting thoughts and feelings come and go without getting lost in them, $\alpha = .71$), and acting with awareness (awareness for the present moment and activity, $\alpha = .83$). The complete version of 39 items was used, with a 5-point scale ranging from 1 (never or almost never) to 5 (often or always). Cronbach's alpha for the FFMQ in this sample was .84.

Depressive symptoms were assessed by the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff 1977), translated to Dutch. The IOWA short form with 11 items was used (Carpenter et al. 1998). The CES-D has a 4-point scale. The CES-D has shown good internal consistency and test-retest reliability among (Dutch) adolescent and adult populations (Cuijpers et al. 2008; Morin et al. 2011; Roberts et al. 1990). Cronbach's alpha for the CES-D in this sample was .82.

Emotional eating was measured using the Dutch Eating Behavior Questionnaire (DEBQ; Van Strien et al. 1986). Answers were rated on a 5-point scale. The questionnaire measures different eating styles, among which emotional eating, which consists of 13 items. Cronbach's alpha of the subscale emotional eating in the current study was .92.

Scores on the above multi-item measures were tallied by taking the mean of the individual item scores. For depressive symptoms, the potential range of the scale scores is from 1 to 4, with a high score indicating depression, and for mindfulness (both overall scale and individual components) and emotional eating, the overall scores range from 1 to 5, with high scores indicating greater mindfulness and a greater tendency to engage in emotional eating, respectively.

Data Analyses

Data were analyzed using SPSS 23 (George and Mallery 2016) and Mplus 8 (Muthén and Muthén 2017). Prior to the mediation analysis, the data were screened with SPSS to verify the assumptions associated with the statistical analyses (normality, homoscedasticity, and linearity), and to calculate means, standard deviations, and bivariate correlations. Mplus was used to examine the extent to which the mindfulness components function as mediators in the relationship between depressive symptoms and emotional eating. The multiple mediators model was estimated using both maximum likelihood estimation (ML) and bootstrapping with 1000 samples to examine the accuracy of the ML standard errors of the estimates. The results are reported as unstandardized path coefficients followed by standard error in parentheses, and as

standardized path coefficients. Statistical significance was inferred by a p value less than .05. First, an unrestricted mediation model was applied to the data, estimating the direct and indirect effects of depressive symptoms and the control variables BMI, education, age, and gender on emotional eating via the mindfulness components mediators. Unstandardized coefficients are reported and results are significant when the 95% confidence interval does not reach zero. The subsequently applied restricted model fixed insignificant effects to zero.

Results

Descriptive Statistics and Correlations

The descriptive statistics and the correlations between emotional eating, depressive symptoms, mindfulness subcomponents, and covariates are displayed in Table 1. The self-reported emotional eating scores ranged from 1 to 5, with a mean value of 2.38. If, for descriptive purposes, a split value of 3 is used with scores exceeding 3 classified as high, then 22.8% of our sample scored high on emotional eating. The mean values of the overall mindfulness scale and the mindfulness subcomponents also ranged from 1 to 5 and all exceeded the value of 3 (i.e., mean value of 3.33 for the overall mindfulness scale). The most popular mindfulness component was taking a non-judgemental stance, the least popular one was observing. The depressive symptom scores had a potential range from 1 (no symptoms) to 4 (severe symptoms). The majority of the participants reported no or very little depressive symptoms. When using a cut-off value of > 2 , then 12.5% of the participants rated themselves as having at least mildly depressive symptoms. The descriptives for age, BMI, and gender replicate the sample characteristics, that is the mean age, mean BMI, and the proportion females in the sample.

As to the associations, a small positive correlation was observed between depressive symptoms and emotional eating (Cohen 1998). Cohen gives the following guidelines for the social sciences: small effect size, $r = 0.1$ – 0.23 ; medium, $r = 0.24$ – 0.36 ; large, $r = 0.37$ or larger (Cohen 1992). A negative, medium-sized correlation was found between acting with awareness and emotional eating and small negative associations were found between both the total mindfulness score and non-judgment and emotional eating. Observing was weakly positively correlated with emotional eating. Of the mindfulness components acting with awareness, non-reactivity and non-judgment were negatively correlated with depressive symptoms, and observing and describing positively. The latter correlations were all small to medium (Cohen 1998).

Table 1 Means, standard deviations, and bivariate correlations of emotional eating, depressive symptoms, mindfulness (total score), the five mindfulness components, gender, body mass index, education, and age in a non-clinical sample of 414 adult Dutch participants

	1	2	3	4	5	6	7	8	9	10	11	12
1. Emotional eating	–											
2. Depressive symptoms	.19***	–										
3. Mindfulness, total score	-.19***	-.35***	–									
4. Acting with awareness	-.30***	-.32***	.57***	–								
5. Non-reactivity	-.06	-.15**	.58***	.10*	–							
6. Non-judgment	-.19***	-.44***	.54***	.44***	.08	–						
7. Describing	-.05	-.17***	.66***	.17***	.28***	.13**	–					
8. Observing	.11*	.17***	.36***	-.17***	.25***	-.27***	.20***	–				
9. Gender (0 = male, 1 = female)	.32***	.00	.02	-.02	-.04	-.04	.05	.10*	–			
10. Body mass index	.13**	.09	-.04	.07	-.14**	.00	-.08	.02	-.08	–		
11. Education	.05	-.13*	.19***	.02	.22***	.01	.23***	.07	-.02	-.19***	–	
12. Age	-.22***	-.07	.06	.22***	-.08	.07	-.12*	.05	-.10	.40***	-.30***	–
M (SD)	2.38 (.83)	1.47 (.40)	3.33 (.37)	3.43 (.67)	3.15 (.58)	3.66 (.75)	3.36 (.72)	3.04 (.70)	.67 (.47)	24.02 (3.81)	4.97 (1.56)	38.99 (17.59)

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Mindfulness Components as Mediators

The results of the estimation of the unrestricted multiple mediators model are given in Table 2, in the form of unstandardized path coefficients and their standard errors (in parentheses). The top panel displays the direct effects of depressive symptoms and the independent control variables on the mindfulness subcomponents and on emotional eating. It also shows the direct effects of the five mindfulness components on emotional eating. The bottom panel presents the indirect effects of depression and the control variables on emotional eating via the mindfulness subcomponents.

As can be seen from the top panel of Table 2, depressive symptoms had a significant effect on all mindfulness subcomponents. The effects were positive for the observe mindfulness and negative for the other components. The direct effect of depressive symptoms on emotion eating, shown in the right-most column, was not significant however. Also note that acting with awareness was the only mindfulness subcomponent that had a direct, significant negative effect on emotional eating. The estimates of the other components failed to reach significance. These results together suggest complete mediation in that the effect of depression on emotional eating is entirely carried indirectly through the mindfulness mediator acting with awareness.

The indirect effects displayed in the bottom part of Table 2 support this conclusion. Depression had a significant, positive effect on emotional eating via acting with awareness ($b = .08$). This positive effect is the result of depression having a negative effect on acting with awareness ($b = -.32$), which in turn has a negative effect on emotional eating ($b = -.25$).

In addition to the unrestricted model, a restricted model that fixed insignificant effects to zero was applied to the data. Chi-square goodness-of-fit test statistics and additional fit indices suggest that a simple mediation model with acting with awareness as the sole mediator provided a good fit to the data ($\chi^2 = 21.584$, $p = .424$; CFI = .998, TLI = .998, RMSEA = .008). The unstandardized parameter estimates are reported in Table S1 in the Supplementary Material to this paper. The standardized path coefficients are displayed in Fig. 1. As can be seen, among the mindfulness subcomponents, acting with awareness was the only component affecting, in a negative way, emotional eating. Also, similar to the unrestricted model, the positive total effect of depression on emotional eating ($b = .06$) was simply the indirect effect through acting with awareness. Hence, the association between depressive symptoms and emotional eating is completely mediated by the sole mindfulness mediator of acting with awareness. The bootstrap confidence intervals support the claim, with 95% confidence, that

Table 2 Unrestricted mindfulness mediator model estimating the effect of depressive symptoms on emotional eating (unstandardized path coefficients, standard errors in parentheses, $n = 391$)

	Mindfulness mediators					Emotional eating
	Act aware	Non-judge	Describe	Observe	Non-react	
Direct effects						
Depressive symptoms	-.32 (.07)***	-.51 (.07)***	-.23 (.07)**	.23 (.07)***	-.13 (.06)*	.04 (.08)
BMI	.01 (.01)	.01 (.01)	.00 (.01)	.00 (.01)	-.02 (.01)*	.07 (.01)***
Education	.03 (.02)	-.01 (.03)	.09 (.03)***	.05 (.03)	.06 (.02)**	.05 (.03)
Age ÷ 10	.09 (.02)***	.02 (.03)	-.01 (.03)	.05 (.02)*	-.02 (.02)	-.13 (.03)***
Gender (0 = male)	.02 (.08)	-.06 (.08)	.10 (.08)	.18 (.08)*	-.01 (.07)	.61 (.09)***
Act aware						-.25 (.06)***
Non-judge						-.05 (.06)
Describe						-.03 (.06)
Observe						.05 (.06)
Non react						-.07 (.07)
Indirect effects on emotional eating via mindfulness mediators						
Depressive symptoms	.08 (.03)***	.02 (.03)	.01 (.01)	.01 (.01)	.01 (.01)	
BMI	-.01 (.01)	-.00 (.00)	.00 (.00)	.00 (.00)	.01 (.01)	
Education	-.01 (.01)	.00 (.00)	-.01 (.01)	.00 (.01)	-.01 (.01)	
Age ÷ 10	-.02 (.01)**	-.00 (.00)	.00 (.00)	.00 (.00)	.00 (.00)	
R^2	.103	.115	.073	.046	.070	.260

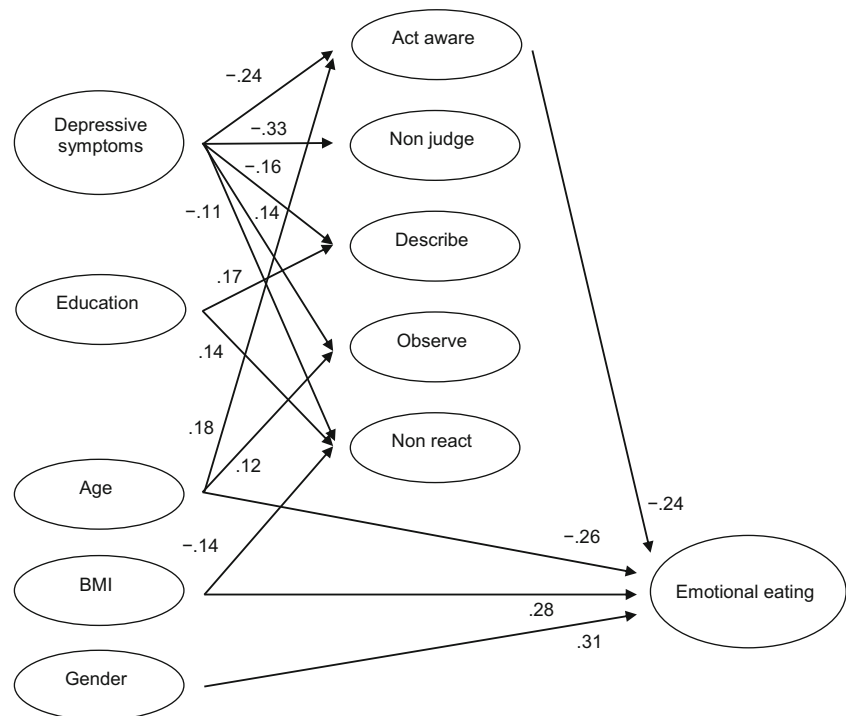
Bootstrap standard errors (1000 samples) are nearly identical to the standard errors displayed. Age was divided by 10 for presentation purpose

* $p < .05$, ** $p < .01$, *** $p < .001$

depression affects emotional eating indirectly through acting with awareness (95% CI: .03, .09). Finally, as can be seen in Fig. 1, emotional eating was also positively associated with BMI and with gender, the latter implying that

females scored higher on emotional eating than males. The positive effects of BMI and gender were found to be entirely direct. Age, however, was negatively associated with emotional eating. The negative effect of age on

Fig. 1 Restricted mindfulness mediator model: standardized path coefficients ($n = 391$). The coefficients represent the change in the dependent variable in standard deviation units for a one standard deviation change in the predictor variable



emotional eating was both direct and indirect via the acting with awareness facet of mindfulness.

Discussion

The main aim of the current study was to examine whether the association between depressive symptoms and emotional eating would be mediated by any of the mindfulness subcomponents. Previous studies have already shown negative associations between mindfulness and particularly the subcomponent “acting with awareness” and emotional eating in specific subpopulations, including obese people and people with diabetes (Tak et al. 2015; Ouwens et al. 2015; Levin et al. 2014). Our study adds to these studies in that the negative association between acting with awareness and emotional eating was replicated in a general adult population, suggesting that this association does not only exist among specific subpopulations but also among more general adult populations. Moreover, we found that of the five mindfulness subcomponents, only the subcomponent “acting with awareness” mediated the association between depressive symptoms and emotional eating. This indicates the potential importance of this construct, explaining why depressive symptoms would be associated with emotional eating. Consistent with previous studies, we found that females and participants with higher BMIs showed higher emotional eating (Geliebter and Aversa 2003; Larsen et al. 2006). Older participants were less likely to report emotional eating, a finding that has been reported before (Kessler et al. 2013). Older participants were also more likely to act with awareness, which in turn was related to less emotional eating. Further examining possible mediation of acting with awareness explaining the inverse relation between age and emotional eating was beyond the scope of this manuscript, but might be an interesting avenue for future research. Future prospective research should examine whether, why, and for whom acting with awareness may mediate the prospective link from depressive symptoms to emotional eating.

The mediating role of acting with awareness may be explained through the escape theory, which states that emotional eating occurs as a means to escape ones negative thoughts and feelings by narrowing ones focus to concrete acts and not to higher-abstract thought (Haedt-Matt and Keel 2011; Heatherton and Baumeister 1991). One previous study showed that avoidance of internal events mediated the relationship between negative emotions and emotional eating (Litwin et al. 2016). This same avoidance phenomenon may also explain our mediating findings for acting with awareness.

However, it is also possible that people act (i.e., eat) with less awareness because they are absorbed by depression induced cognitive biases and related ruminative thoughts (Beck

1976; Williams 2008). Notably, a meta-analysis of mindfulness intervention studies suggests that people may be trained in being more mindful (and act with more awareness) and that this might decrease depression induced ruminative thoughts (Gu et al. 2015). Moreover, particularly acting with awareness, through reduced automaticity, is related to less impulsivity (Brown and Ryan 2003; Levesque and Brown 2007), including impulsivity in maladaptive eating behaviors (Tak et al. 2015; Kristeller and Wolever 2011). Future work may examine whether and why a decrease in ruminative thoughts might facilitate more acting (i.e., eating) with awareness and, thus, decreased automaticity in eating and emotional eating.

Finally, the mediating role of acting with awareness in the depressive symptoms-emotional eating link may also be explained through difficulty identifying feelings, a subcomponent of alexithymia (Ciarrochi et al. 2011). Difficulty identifying feelings has been negatively linked to acting with awareness (Baer et al. 2006; Ciarrochi et al. 2011; Dekeyser et al. 2008) and positively linked to emotional eating (Carano et al. 2006; Hund and Espelage 2006; Larsen et al. 2006; Mazzeo and Espelage 2002; Moon and Berenbaum 2009; Pinaquy et al. 2003) and depressive symptoms (Ouwens et al. 2009). Similar to acting with awareness, difficulty identifying feelings has also been suggested to be a mediator of the association between depressive symptoms and emotional eating (Ouwens et al. 2009). Future longitudinal research should incorporate both mindfulness and alexithymia (e.g., difficulty identifying feelings) components to see which ones are most important in explaining the link between depressive symptoms and emotional eating.

Our findings for “acting without awareness” being the sole mindfulness component mediating the link between depressive symptoms and emotional eating is in line with previous intervention research. To date, a systematic review has shown that mindfulness-based interventions focusing on eating behaviors (i.e., eating with awareness) are more effective at achieving weight loss than general mindfulness interventions (Katterman et al. 2014). Another review underwrites this: programs that include or focus on eating-specific tasks are more effective in reducing emotional eating than interventions that do not include these practices (Kristeller and Wolever 2011). It is possible that these effective eating-specific tasks are similar to the subcomponent acting with awareness, in the sense that participants learn to “eat with awareness.” Future research should examine mechanisms explaining this association between acting with awareness and emotional eating, yielding further guidance for intervention research on whether and how acting with awareness can best be stimulated. We would also like to note the positive correlation between observing and both emotional eating and depression, which is in line with previous results in non-meditating participants (Baer et al. 2006; Levin et al. 2014).

Limitations and Future Research

A limitation of the current study includes the cross-sectional design, especially considering that mediation analyses in cross-sectional designs are less robust, as they lack the temporal order of events. However, the findings in the current study seem plausible, as longitudinal studies have already showed links between mindfulness and depression and emotional eating (Barnes and Lynn 2010; Mantzios and Wilson 2015; Raphiphatthana et al. 2016; Williams et al. 2010). Furthermore, as this is a survey study, all data are self-reported. The proportion of pre-obese and obese participants is lower than the Dutch average (De Groot and Bruggink 2012); this may be due in part to a bias in self-reports (Sherry et al. 2007), but may also be due to a selection bias in recruiting participants. The participants are relatively high educated, as 16.1% of the participants have a university degree and 25.4% have a higher professional training degree, while the national average of 2016 is 10.2% for a university degree and 17.8% for a higher professional training degree (Statistics Netherlands 2017). This may have influenced results, as there is some suggestion that highly educated participants score higher on the FFMQ (Baer et al. 2008).

Future research should include a longitudinal design to examine the causal order of effects. It would be interesting to follow at risk groups for eating disorders to see which relationships develop over time. In clinical studies, through longitudinal data, similar to Levoy et al. (2017), it can be studied which mindfulness components increase through the intervention and which of these components are related to outcome variables, such as weight loss and eating practices. Furthermore, experimental designs could be of help to gain insight in the mechanisms that drive the mediating relationship between depressive symptoms, acting with awareness and emotional eating. While manipulating mood and being offered food, experimental groups could be instructed to act with awareness in general or in regard to food consumption. Such experimental designs may help understand whether there is a direct effect of acting with awareness.

In conclusion, in the current study, the association between depression and emotional eating was mediated through the mindfulness subcomponent acting with awareness. Evidence for the importance of acting with awareness in normal-weight populations was, to the best of our knowledge, lacking. These results are important, as they indicate that acting with awareness is an important factor to consider in the association between depressive symptoms and emotional eating. Replication of these findings by future prospective studies can pave the way for applications in mindfulness interventions to prevent or decrease emotional eating.

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Contributors Marthe Höppener analyzed the data and drafted the paper. Junilla Larsen composed the questionnaire, oversaw data collection, and reviewed the paper. Rob Eisinga conducted the Mplus analyses and reviewed the paper. Tatjana van Strien, Machteld A. Ouwens, and Laura Winkens read and reviewed the paper.

Compliance with Ethical Standards

Conflict of Interest Tatjana van Strien has a copyright and royalty interest in the Dutch Eating Behavior Questionnaire (DEBQ) and manual.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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