



Dispositional mindfulness promotes public health of the obesity population by reducing perceived discrimination and weight stigma concerns

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Abstract

Aim Perceived discrimination and weight stigma concerns are believed to induce negative emotional symptoms. In this article, we tested the mediation effect of perceived discrimination and weight stigma concerns on the association between dispositional mindfulness and negative emotional symptoms.

Subjects and methods A total of 254 recruited obesity participants who provided their height and weight and completed the Five-Facet Mindfulness Questionnaire and Depression Anxiety Stress Scale were investigated along with their stigma-related variables (perceived discrimination and weight stigma concerns).

Results The results indicated a negative association between dispositional mindfulness and perceived discrimination and between weight stigma concerns and negative emotional symptoms. Perceived discrimination, weight stigma concerns, and negative emotional symptoms were also positively correlated. The mediation analysis showed that perceived discrimination mediated the relationship between dispositional mindfulness and negative emotional symptoms rather than weight stigma concerns, which mediated the relationship between perceived discrimination and negative emotional symptoms.

Conclusion Mindfulness may benefit negative emotional symptoms of obese individuals by reducing the effect of perceived discrimination, which further reduces weight stigma concerns. The results shed light on mindfulness-based weight stigma reduction interventions.

Keywords Mindfulness · Obesity · Negative emotional symptoms · Multiple mediation model

Obese individuals are more likely to have a worse psychological status than non-obese populations (Puhl and Brownell 2001). The obese are exposed to discrimination and suffer from weight-based stigma that poses a threat to them and undermines their psychological well-being and physical welfare (Major and O'Brien 2005; Puhl and Heuer 2009) by contributing to depression symptoms (Pascoe and Richman 2009) and poor health (Hunger and Major 2015; Hunger et al. 2015). The discrimination and weight stigma may also cause an obesity cycle, whereby weight stigma reduces the executive

resources, which in turn makes the obese take in more calories (Major et al. 2014). The salutary effect of mindfulness on negative emotional symptoms by enhancing well-being and reducing symptoms has been demonstrated (Brown et al. 2007; Major et al. 2014; Teasdale et al. 1995), and mindfulness-based interventions (MBIs) have been largely documented as benefiting obese populations in achieving weight loss (Olson and Emery 2015) and reducing clinical symptoms (Katterman et al. 2014) as well as improving psychological status (Baer 2003; Brown et al. 2007).

At the clinical level, MBIs are efficient in diet therapies for obese people as both a primary treatment (Katterman et al. 2014) and an assistant approach (Lillis et al. 2009) in which the obesity-related behaviors of subjects (e.g., binge eating, emotional eating, and external eating) are modified significantly (Chacko et al. 2016; Katterman et al. 2014; O'Reilly et al. 2014). Chacko et al. (2016) tested an MBI designed to facilitate postoperative weight loss for which they recruited 18

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postoperative patients and randomized them to either an MBI or a standard intervention. Despite achieving no significant difference in the weight changes between groups, the result did show a decrease in emotional eating in the MBI group (Chacko et al. 2016). At the psychological level, mindfulness training can increase self-regulation, which further promotes the success of the individual in controlling negative emotions and decreasing maladaptive eating behaviors (O'Reilly et al. 2014). In addition, results from 8 of 15 studies analyzed by Rogers and colleagues indicated an improvement in psychological health outcomes such as depression, anxiety, and stress due to MBIs (Rogers et al. 2017). One of these studies showed that the symptoms of depression and anxiety in 18 obese women were diminished after they were trained in mindfulness meditation (Kristeller and Hallett 1999). Lillis et al. (2009) randomly assigned 43 of 87 participants who had completed a weight loss program to receive an Acceptance and Commitment Therapy (ACT) aimed at helping them cope with weight-relevant stigma and distress. Compared with the other 44 subjects, the results of the 40 subjects (3 participants did not receive the assigned intervention) showed that the ACT had a positive effect on their stigma, distress, and distress tolerance as well as their psychological flexibility (Lillis et al. 2009). This also indicated the beneficial effect of mindfulness on the psychological well-being of obese individuals because ACT applies several core strategies of mindfulness, including acceptance and non-judgmentalism (Baer 2003). However, the ways in which mindfulness has a positive effect on the negative emotional symptoms of obese individuals are not yet well understood (Coffey and Hartman 2008; Shapiro et al. 2006). We need a better understanding of the underlying mechanisms to offer more efficient and long-lasting approaches to help obese people (Hagger et al. 2016).

Previous studies have suggested that mindfulness-based trainings and interventions can produce positive effects by changing thought patterns, especially cognitive processing (Baer 2003; Teasdale et al. 1995). The nature of mindfulness includes acceptance and non-judgmentalism (Bishop 2002; Brown et al. 2007; Kabat-Zinn and Hanh 2009) and accepts the awareness and events of the present without filtering or evaluating (Brown et al. 2007; Brown and Ryan 2003; Teasdale 1999). Both components influence obesity-relevant stigmatization (i.e., perceived discrimination and weight stigma concerns) by non-judgmentally accepting them (i.e., do not discriminate and do not concern). As one of the most comprehensive trainings advancing non-judgmental acceptance (Baer et al. 2005), Mindfulness-Based Cognitive Therapy (MBCT) applies the principle of “facilitate a detached or decentered view of one’s thoughts” in which it treats negative emotions or thoughts as “just thoughts, rather than the reflection of reality” (Baer 2003, p. 127). As a result, the negative thoughts or feelings will be treated as mental events instead of negatives themselves (Teasdale et al. 2002). Baer et

al. (2005) conducted a case study that applied MBCT to intervene in a severe binge-eating problem of a client named Sally. A sequence of mindfulness exercises including mindful eating, body scans, sitting meditation, and discussions about thoughts was performed to teach Sally to be more aware of the internal present-moment experiences and allow them to come and go without judgment instead of being subjected to them. The pre-, post-, and follow-up scores of the Kentucky Inventory of Mindfulness Skills showed evidence of increased mindfulness such as observation and non-judgmental acceptance. Sally’s attitude toward mindfulness practicing changed, and her ability to handle the urge to binge was enhanced. More importantly, she found a better way to accept aversive feelings rather than automatically judging or avoiding them (Baer et al. 2005).

Perceived discrimination is the subjective cognition of challenging life events in which individuals are the targets of prejudices, discriminatory treatments, and unfair judgments (Pascoe and Richman 2009). Weight stigma concerns refer to worries about being rejected, devalued, discriminated against, or disregarded because of one’s weight (Hunger and Major 2015). They arise from internal cognitive processes as a response to external events (Hunger and Major 2015; Pascoe and Richman 2009). Perceived discrimination and weight stigma concerns lead to disadvantageous cognitive patterns that bring about undesired outcomes of negative emotional symptoms, such as depression, psychological distress, and anxiety (Hunger and Major 2015; Pascoe and Richman 2009; Schmitt et al. 2014). For instance, in the obese population, perceived weight discrimination is the main threatening factor that undermines their psychological well-being (Carr and Friedman 2005; Puhl and Heuer 2009; Sutin and Terracciano 2013), and the likelihood of having anxiety disorders is two times higher in people who report past weight discrimination than in those who do not (Hatzenbuehler et al. 2009). More specifically, the perception of discrimination can erode self-concept and self-worth by internalizing other’s views of the self (Schmitt et al. 2014), resulting in lower self-acceptance (Carr and Friedman 2005).

In contrast, dispositional mindfulness enables individuals to focus their attention on the present (Coffey et al. 2010) and to non-judgmentally accept negative perceptions of the self (Baer 2003). Mindfulness also enhances one’s ability to clarify self-concept (Hanley and Garland 2017) by efficiently distinguishing internal cognition (e.g., self-concept and self-worth) from external stimuli (e.g., discrimination and unfair experiences) (Brown et al. 2007). As a result, it can be hypothesized that dispositional mindfulness may help participants to attenuate perceived discrimination, which in turn leads to fewer negative emotional symptoms. In other words, perceived

discrimination mediates the relationship between dispositional mindfulness and negative emotional symptoms.

Similarly, weight stigma concerns are negative thoughts and emotions triggered after exposure to information with stigmatization (Major et al. 2014) and will threaten the social identity of an individual (Hunger et al. 2015). By non-judgmentally observing and accepting what the actual situation is (Baer 2003; Hunger et al. 2015), mindfulness will reduce automatic reactions toward mental events (e.g., negative feelings and thoughts) (Bishop et al. 2004), increasing objective observations and more conscious responses to mental stimuli (Barnes et al. 2007), thereby strengthening adaptive emotional regulation (Coffey et al. 2010). In addition, mindfulness may eliminate the threat to self-identity by reinforcing self-concept clarity (Hanley and Garland 2017). Accordingly, as an effective cognition-changing means (Teasdale et al. 1995), mindfulness will alter internal negative thoughts by decreasing perceived discrimination and weight stigma concerns, consequently diminishing negative emotional symptoms.

Extant research has noted the strong correlation between perceived discrimination and weight stigma concerns (Hunger and Major 2015; Hunger et al. 2015; Major et al. 2014) because perceived discrimination is the subjective cognition arising from actual discriminatory experiences (Pascoe and Richman 2009), and weight stigma concerns can be activated by experienced past discrimination (Hunger et al. 2015) or weight stigmatizing messages (Major et al. 2014). Hunger and Major (2015) found that weight stigma mediated the relationship between perceived discrimination and psychological and physical health, validating the serial mediation of perceived discrimination and weight stigma concerns through which BMI is adversely associated with self-reported health. The fact that mindfulness can decrease perceived discrimination and weight stigma concerns, and their combined effect on negative emotional symptoms, implies that both may be the underlying mechanisms through which mindfulness affects negative emotional symptoms.

Taken together, the purpose of this research was to test the multiple mediation model that explains how dispositional mindfulness is related to negative emotional symptoms. We hypothesized that perceived discrimination and weight stigma concerns sequentially mediated the relationship between dispositional mindfulness and negative emotional symptoms. Specifically, dispositional mindfulness affects negative emotional symptoms through the paths of perceived discrimination and weight stigma concerns. The weight stigma concerns further mediate the relationship between perceived discrimination and negative emotional symptoms. The results of this study will shed light on the mechanisms of MBIs for obesity populations.

Method

Participants and procedures

Participants in the current study were recruited from 34 colleges and universities between September 2014 and June 2016. Self-identified obesity individuals interested in taking part in this study were invited to the Physical Examination Center of their colleges to measure their weight and height. They were then required to complete a questionnaire package to assess their attitude toward obesity, dispositional mindfulness, and negative emotional symptoms. We also calculated their body mass index (BMI, weight in kilograms/height in meters²). According to the World Health Organization, the appropriate BMI cutoff point for obesity is 23.0 for Asian populations (WHO Expert Consultation 2004). A total of 254 qualified obesity participants (115 females and 139 males) were selected for the final sample. The mean age was 22.50 years (SD = 0.71, ranging from 21 to 26), and the mean BMI was 30.17 (SD = 2.53, ranging from 24.15 to 40.52). Human ethics approval was obtained from Wuhan University. Participants signed a written informed consent before the study.

Measures

Dispositional mindfulness The Five-Facet Mindfulness Questionnaire was adopted to measure dispositional mindfulness using 39 items, relating to observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience factors (Baer et al. 2006). However, previous studies have suggested that the ‘observing’ component is sensitive to meditation practice and may only have relevance for participants with regular practice of meditation (Baer et al. 2008). Therefore, Williams et al. (2014) and (Duan and Li 2016) recommended calculating the overall score of dispositional mindfulness with the exclusion of the ‘observing’ facet in both Western and Eastern college student populations. A five-point Likert scale ranging from 1, never or rarely true, to 5, very often or always true, was applied for each item. A high mean score of the entire scale indicated a high level of dispositional mindfulness. In the current sample, McDonald’s ω of the scale was 0.927.

Perceived discrimination Hunger and Major (2015) recently modeled a system to ascertain perceived discrimination toward obesity, which was adapted from another widely used racial discrimination assessment (Williams et al. 1997). Participants were asked to rate the frequency of treatment in the past 12 months on a five-point Likert scale (0 = never to 4 = all the time). Sample items included “In the past 12 months, how often have you been treated with less respect than other people because of your weight?” and “In the past

12 months, how often have you been teased or harassed because of your weight?” Reliability and convergent/discriminant validity were calculated (Hunger and Major 2015). These English items were translated into Chinese by a PhD student and then translated back to English by another (Sperber 2004). Finally, the corresponding author compared the back-translated and original versions of the scale to modify and finalize the Chinese version. Previous studies have demonstrated the effectiveness of the triangle translation process (Duan et al. 2012; Tang et al. 2016). In the current sample, McDonald’s ω of the scale was 0.943.

Weight stigma concerns Concerns related to weight stigma were assessed by four items constructed by Hunger and Major (2015). A seven-point Likert scale was used to answer each item ranging from 1, strongly disagree, to 7, strongly agree. Sample items included: “I am afraid that other people will reject me because of my weight” and “I am concerned that I will not be treated fairly by others because of my weight.” Hunger and Major (2015) considered this scale as capable of assessing weight-specific issues rather than general apprehension. The translation procedures of the weight stigma concern scale were the same as for the discrimination assessment. In the current sample, McDonald’s ω of the scale was 0.965.

Negative emotional symptoms The Depression Anxiety Stress Scale is a 21-item instrument that can be used to assess negative emotional symptoms, including depression, anxiety, and stress in the past week (Wang et al. 2016). Participants read each item and indicated the answers on a four-point Likert scale (0 = “did not apply to me at all” to 3 = “applied to me very much or most of the time”). The mean score of the entire scale was calculated to reflect the general level of negative emotional symptoms. In the current sample, McDonald’s ω of the scale was 0.961.

Data analysis plan

Means and standard deviations of BMI, dispositional mindfulness, perceived discrimination, weight stigma concerns, and negative emotional symptoms were first described and the gender differences between these variables examined. Next, the Pearson correlations between the variables were calculated. The positive relationships between BMI and perceived discrimination, weight stigma concerns, and negative emotional symptoms were expected, whereas the negative relations between dispositional mindfulness and others were proposed. The serial mediation model, which posits that perceived discrimination and weight stigma concerns serially mediate the association between dispositional mindfulness and negative emotional symptoms, was tested by employing Model 6 in the PROCESS macro (Hayes 2013). Bootstrap samples of 10,000 were set to create 95% bias-corrected and

accelerated (BCa) confidence intervals (CI) to examine the indirect effects. The 95% confidence interval did not include zero, which indicated significance at the 0.05 level.

Results

Descriptive analysis and gender difference

Descriptive statistics, namely the mean and standard deviation of each variable, are displayed in Tables 1. Both male and female subsamples were described. The *t*-test indicated that the BMI level of male participants (mean = 31.03, SD = 2.66) was significantly higher than that of female participants (mean = 29.4, SD = 2.14). Although females perceived more discrimination and weight stigma concerns than males, the statistics were insignificant. The gender difference of negative emotional symptoms was also insignificant.

Correlation analysis

The correlation between variables are displayed in Table 2. As expected, a high BMI value was associated with high perceived discrimination ($r = 0.295, p < 0.001$), weight stigma concerns ($r = 0.348, p < 0.001$), and negative emotional symptoms ($r = 0.137, p < 0.001$) as well as low dispositional mindfulness ($r = -0.170, p < 0.01$). Dispositional mindfulness was negatively related to perceived discrimination ($r = -0.336, p < 0.001$), weight stigma concerns ($r = -0.267, p < 0.001$), and negative emotional symptoms ($r = -0.321, p < 0.001$). Moreover, perceived discrimination, weight stigma concerns, and negative emotional symptoms were also positively correlated ($r = 0.460-0.721, p < 0.001$).

Mediation effect testing

Model 6 in the PROCESS macro was used to examine the serial mediators (i.e., perceived discrimination and weight stigma concerns) in the association between dispositional mindfulness and negative emotional symptoms. A summary of the mediation effect test is shown in Table 3, and the graphic is displayed in Fig. 1. As predicted, dispositional mindfulness has a negative association with negative emotional symptoms in obesity populations. The direct effect is $-0.43 [t = -3.17, p < 0.001; 95\% \text{ BCa CI} = (-0.69, -0.16)]$. Another three indirect paths were also tested. The indirect effect of dispositional mindfulness on negative emotional symptoms through perceived discrimination was significant [effect = $-0.26, 95\% \text{ BCa CI} = (-0.50, -0.11)$]. However, the indirect effect of dispositional mindfulness on negative emotional symptoms through weight stigma concerns was insignificant [effect = $-0.01, 95\% \text{ BCa CI} = (-0.09, 0.02)$]. The third indirect effect examined the path from dispositional mindfulness to negative emotional symptoms through perceived

Table 1 Results of descriptive statistics of variables and gender differences

Variables	Total sample		Males		Females		<i>t</i> -test
	Mean	SD	Mean	SD	Mean	SD	
BMI	30.17	2.53	31.03	2.66	29.40	2.14	5.82***
Dispositional mindfulness	3.08	0.26	3.07	0.25	3.09	0.26	−0.59
Perceived discrimination	0.85	0.96	0.83	0.97	0.87	0.95	−0.34
Weight stigma concerns	2.48	1.63	2.39	1.55	2.55	1.70	−0.83
Negative emotional symptoms	0.77	0.66	0.81	0.69	0.73	0.64	0.99

****p* < 0.001

discrimination and weight stigma concerns. The results indicated that the indirect effect was significant [effect = −0.12, 95% BCa CI = (−0.23, −0.03)].

Discussion

Obese individuals suffered dual negative impacts involving physical health and weight-based discrimination experiences. The discrimination they perceived and their concerns with being the target of stigma contributed to their psychological ill-being. A number of studies have supported the efficiency of MBIs or training in improving mental health by alleviating negative emotional symptoms (Baer 2003). However, the internal mechanism has not yet been fully studied (Coffey and Hartman 2008). The current research used cross-sectional studies to illustrate the mediational role of perceived discrimination and weight stigma concerns on the association between dispositional mindfulness and negative emotional symptoms. The relationship between dispositional mindfulness and stigma-relevant mediators (i.e., perceived discrimination and weight stigma concerns) as well as the mechanisms through which mindfulness affects negative emotional symptoms are partially demonstrated by the results. With the special coping styles of non-judgmental acceptance, mindfulness is believed to reduce the adverse effect of perceived discrimination and weight stigma concerns. Thus, mindfulness training

targeted at stigma-relevant factors could offer further help with their psychological well-being to obese individuals.

Based on several existing models or mechanisms explaining how mindfulness works, finding a reverse connection between mindfulness and perceived discrimination is reasonable. According to the Intention, Attention, and Attitude Model constructed by Shapiro et al. (2006), mindfulness, with intentional attention and non-judgmental attitude, brings about re-perceiving (i.e., a change in perspective). Re-perceiving is a meta-mechanism of action and provides a place to “stand back and simply witness” (Shapiro et al. 2006, p. 5) when things emerge, leading to additional mechanisms such as self-regulation, value clarification, and flexibility. Self-regulation refers to the process of remaining stable or being adaptive to changes, which is the opposite of automatic, habitual reactive patterns (e.g., emotional eating and binge eating). Value clarification is the ability to decide on what is important according to a person’s own values and is significantly related to perceived discrimination because prejudice devalues individuals at a cognition level (Pascoe and Richman 2009). Furthermore, cognitive, emotional, and behavioral flexibility enables people to cope with undesired influences from their current negative experience. Exposure suggests attention to feelings and sensations rather than escaping and avoiding them. Drawing on the above-mentioned model, experienced discrimination is the target of re-perceiving skills and is expected to explain the potential mechanisms linking mindfulness and negative emotional symptoms. Similarly, the

Table 2 Correlation between variables

Variables	1	2	3	4	5
BMI	–	−0.170**	0.295***	0.348***	0.137**
Dispositional mindfulness		–	−0.336***	−0.267***	−0.321***
Perceived discrimination			–	0.721***	0.502***
Weight stigma concerns				–	0.460***
Negative emotional symptoms					–

p* < 0.01, *p* < 0.001

Table 3 Regression coefficients, standard errors, and model summary for the impact of dispositional mindfulness on negative emotional symptoms

Antecedent	Consequent					
	M ₁		M ₂		Y	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
X (dispositional mindfulness)	-1.25***	0.21	-0.18	0.27	-0.43***	0.13
M ₁ (perceived discrimination)			1.21***	0.07	0.21***	0.05
M ₂ (weight stigma concerns)					0.08**	0.03
Constant	4.70***	0.63	2.00*	0.86	1.70***	0.43
	$R^2 = 0.11$		$R^2 = 0.52$		$R^2 = 0.30$	
	$F = 37.07***$		$F = 157.63***$		$F = 40.80***$	

Y = negative emotional symptoms

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

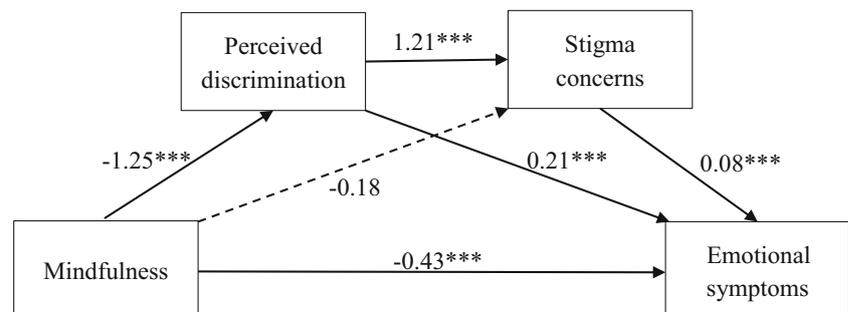
three mechanisms (emotion regulation, non-attachment, and reduced rumination) proposed by Coffey and Hartman (2008) also illustrate the relationship between mindfulness and negative emotional symptoms. The symptoms, including rumination, depression, anxiety, and devalued self-concept, that arise from perceived discrimination can be accepted non-judgmentally and thus attenuated.

Our results also indicated the unexpected and insignificant relationship between mindfulness and weight stigma concerns; this may be partly because weight stigma concerns are caused by exposure to messages that stigmatize obesity (Major et al. 2014), which exist in everyday life whether individuals are disposed to mindfulness or not. Another explanation may be that mindfulness exerts its effect by increasing self-concept clarity whereas it cannot act on weight stigma concerns directly. However, a preliminary evaluation of the acceptance and mindfulness-based workshop (ACT) mentioned above indicated significant reductions in weight-related stigma in intervention participants (Lillis et al. 2009). The divergence of these findings may lie in the exclusion of the ‘observing’ facet in our analysis, while the ACT intervention included the component of observation (Baer 2003). Future re-examining of the effect of mindfulness on weight stigma concerns is of significance because of the reasons listed above and the close relationship between weight

stigma concerns and psychological distress (Hunger et al. 2015).

Existing research on the relationship between mindfulness and obesity has focused solely on clinical experiments involving MBIs and the direct changes and outcomes of obese people after interventions. In contrast, the current study focused more on the underlying paths through which mindfulness training influenced obese subjects psychologically and as a result contributed to their mental well-being. The inner path that links mindfulness and negative emotional symptoms through the two stigma-relevant mediators could constitute a promising approach to designing a modified mindfulness-based intervention targeted at obese individuals. This inner path emphasizes the practice of coping with perceived weight discrimination and stigma concerns. Concentrating on the cognitive effect of mindfulness rather than weight control may be more efficient since some studies found no significant weight change after MBIs (Chacko et al. 2016).

The results of this study should be interpreted with caution given its multiple limitations. First, although the participants were screened according to WHO standards, they were not clinically diagnosed as obese. Clinically diagnosed obese participants should be recruited to enable more thorough research. Second, the selection of (obese) subjects also presented a limitation to the generalizability of this study because

Fig. 1 PROCESS results for serial mediation model unstandardized coefficients are presented. The dashed line is not statistically significant *** $p < 0.001$ 

individuals could also be affected negatively by stigmatized messages and have concerns about being target of weight stigma despite not being overweight (Hunger et al. 2015; Major et al. 2014). Thus, the beneficial function of mindfulness on negative emotional symptoms that can be generalized from obese to non-obese populations should be tested in the future. Third, the causal relationships remain to be confirmed because of the cross-sectional and non-laboratory nature of the present data. To clarify the causal chain, a longitudinal mediation model and consideration of the influence of baseline states of dispositional mindfulness, perceived discrimination, weight stigma concerns, and negative emotional symptoms are indispensable. A randomized controlled trial that examines the pre- and post-intervention levels of perceived discrimination and weight stigma concerns would be more rational to support their mediational effect. Finally, more outcome variables should be incorporated into mindfulness-obesity studies, for example, whether mindfulness facilitates benign social behaviors and enhances interpersonal relationships or whether mindfulness reduces the rate of psychosis and even the suicide rate in obesity populations.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethics statement Ethical approval for the study was granted by Department of Sociology, Wuhan University, and the approved protocol was followed.

Informed consent Participants signed a written informed consent prior to the study.

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