

Mindful Eating and Mindless Eating

The Science and the Practice

Jean L. Kristeller and Elissa Epel

Introduction

Eating can be a largely automatic and mindless behavior. Mindful eating is eating while fully aware of the process, noticing both the pleasantness and the internal and external states influencing hunger and satiety, and desire for food. Humans can eat mindfully naturally, but tend not to under the influence of habitual patterns, if they are in emotional states or even slightly distracted (Wansink, 2007). Thus, mindless eating is the more common mode, and in the contemporary food-abundant environment, mindless food choices and overeating can be argued to be contributing substantially to the current epidemic of obesity. Engaging in mindful eating, regardless of how this is cultivated, is a critical aspect of healthy balanced eating and, presumably, weight management.

Here we present a theoretical framework applying the concept of mindfulness to eating behavior and review key studies that address the different ways we regulate eating, including conscious efforts and unconscious influences. We focus on several key factors that contribute to mindless eating—limited interoceptive awareness, poor emotion regulation and emotional eating, negative self-judgments, and other limits of self-control.

The training programs that have been developed and applied to mindful eating, described later, include formal meditation practice, guided mindful eating exercises, other guided mindfulness experiences, and informal ways to engage qualities of mindfulness focused on awareness of one's internal experience, external context (both social and environmental), nutritional knowledge, and cultivating a self-compassionate attitude. Aspects of the mindful state, such as awareness of bodily cues and emotions and a kind attitude toward oneself, can uniquely target these aspects of eating.

Mindfulness as described by Langer (1992) is the ability to be present and engaged and sensitive to aspects of one's current environment. This leads to openness to new

experiences, flexible problem solving, and low levels of automatic thinking or mindlessness. There is substantial overlap between the natural state of mindfulness and the cultivation of mindfulness through meditative practices. The emergent qualities from the natural state of mindfulness such as openness to new experiences and creative problem solving are likely important factors in mindful-eating treatment effects. Indeed, taking a mindful approach to eating can lead to insight and emergent wisdom in making novel and healthier choices. Such training encourages individuals to become more aware in the moment of their experiences of eating in regard to the flavor and appeal of food; of their decisions about when to initiate eating and when to stop; and of their choices regarding what to eat for both psychological and physiological value.

Training in mindful eating shows powerful potential to transform problematic overeating into more optimal self-regulated behavior. Anecdotally, participants in our mindful-eating programs report shifts in their awareness of their experience of food, from noticing that only a few bites, rather than a huge serving, of a favorite binge food may produce an even higher level of satisfaction, to recognizing that emotions, from anger to boredom, trigger much of their eating and that when they are mindful, they can rely on physical feedback signals to know when to stop eating.

By now, several clinical studies have shown that mindful-eating training can help with binge eating, eating regulation in nonbingers, and at least short-term weight loss. We provide a description of the most well-studied program, Mindfulness-Based Eating Awareness Training (MB-EAT; Kristeller & Bolinskey, 2013; Kristeller & Hallett, 1999; Kristeller, Wolever, & Sheets, 2013). We explain how this program enhances self-regulation of eating and review the studies in relation to key elements of mindful eating. Eating provides an important example of a health behavior that can be mindless or mindful and serves as a prototype of how shifts toward mindfulness can even change a behavior that has been shaped by life-long patterns, characterized by struggle and conflict, to a salutary experience of pleasure in eating healthier and smaller amounts of food. When guided, most people can have a pleasant experience of mindful eating on their first focused attempt. The challenge is often in guiding people to notice mindless eating and infuse their daily routines with more mindful eating. While specific aspects of mindful eating can become more habitual, by definition it will always be flexible, rather than “automatic”; however, engaging mindful eating can eventually become fluid and require little sense of effortful attention.

Factors Affecting Eating Behavior

Eating is complex and often mindless

Creating a balance between physical and psychological needs for food is inherently complex, and has become even more so in our contemporary society, marked by increasing food abundance and marketing manipulation. Eating is well regulated by homeostatic signals that maintain caloric balance, but these signals are easily overridden for survival purposes. Indeed, it can be argued that among bio-behavioral processes that can be self-regulated (e.g., need for sleep, hydration, temperature balance),

eating is the most flexible and most easily taken to extreme levels in regard to both overeating and undereating.

Eating regulation follows the model of *allostasis* rather than homeostasis. Allostasis refers to the biological or behavioral fluctuations to maintain stability with the dynamic environment. Allostatic systems have a wide “operating range” rather than a narrowly maintained setpoint, as in homeostatic regulation of systems such as temperature. The mean and range of caloric intake are influenced by internal signals in interaction with the environment, and by factors such as chronic stress (Bjornorp, 2001). There are different patterns of dysregulated “eating allostasis”—caloric intake can become chronically elevated, or disordered—with many ups and downs. Both can create metabolic strain and allostatic load, the damage due in part to elevated or fluctuating peaks of insulin and glucose, and sometimes cortisol. Trying to eat markedly less, or dieting, can be stressful and may promote further dysregulation of eating and allostatic load (Cottone et al., 2009; Tomiyama et al., 2010; Tremblay & Chaput, 2012), and is even linked to immune cell aging, a marker of allostatic load (Kiefer, Lin, Blackburn, & Epel, 2008).

Certainly, prior to the modern age, food and feasting have been used for celebration, to mark social occasions, and as representative of abundance. Obesity was considered a hallmark of well-being, often depicted in classic art as a desirable state, and even religious statues of the Buddha often represent him as morbidly obese. Ability to gain weight conveyed survival benefits during the course of human development (King, 2013). One difference in contemporary society is that much of the obesity today is associated with mindless overeating of the cheap but highly palatable, low-quality food dominating the food choices in many communities today. Many of those who live in poorer urban neighborhoods are exposed daily to the potent combination of primarily unhealthy food and high stress. In modern times, in the United States and increasingly elsewhere, a highly sophisticated food industry has taken advantage of the science of making inexpensive food maximally palatable in regard to high fat and sugar. Such stimulating food, and fast food in general, can trigger even more rapid and mindless eating (Adam & Epel, 2007; Garber & Lustig, 2011). These days, most people *need* to exert some level of dietary restraint over their behavior, in order to maintain a healthy adult weight. The power of modern advertising, which shapes our behavior in ways we aren't aware of (Harris, Bargh, & Brownell, 2009), the food-rich environment, and triggers for mindlessness, like frequent stress and multitasking, create powerful conditions for frequent overeating in the United States, impacting even those not necessarily genetically prone to obesity, to join in more mindless eating and to develop what we might term “mindless obesity.”

Interoceptive awareness

Effectively balanced eating is based in part on appropriate use of interoceptive awareness. This includes awareness of bodily sensations related to both eating (hunger, sensory-specific satiety, stomach fullness, and “body” satiety) and other physical experiences (muscle tension, breathing, fatigue, thirst), as well as awareness of relevant mental states (emotions, cognitions). Interoceptive awareness can be blunted in

people with eating disorders, including obesity, but may be modulated by attention (Brondel et al., 2007; Raynor & Epstein, 2001; Remick, Polivy, & Pliner, 2009; Sørensen, Møller, Flint, Martens, & Raben, 2003). Core elements of training in mindful eating focus on cultivating awareness of physical hunger experience, taste “satisfaction,” and various types of satiety signals. We suggest that the phenotype of dysregulated eating is driven in large part by *attentional dysfunction*—a lack of mindful attention. Mindfulness training helps promote sensitivity to interoceptive feedback signals and helps individuals become more aware of how their bodies may reflect stress (muscle tension, rapid breathing) and the types of emotional states (such as the distinction between anxiety and anger) or cognitive patterns (“I deserve this [food]” or “I have blown my diet anyway”) that often drive overeating. Recently, imaging studies have shown that mindfulness training can alter functional connectivity between the dorsomedial prefrontal cortex and the posterior insula, an area thought to regulate the perception of bodily awareness (Farb, Segal, & Anderson, 2013).

Stress, emotion regulation, and emotional eating

One common reason people overeat is in response to negative emotions, that is, emotional eating. “Stress-eating” largely overlaps with emotional eating—in that it refers to eating in response to a discrete stressor with negative affect implied whether consciously experienced or not. Some degree of emotional eating may be normative or even adaptive; for example, most individuals will acknowledge eating more in response to stress without related weight or eating dysregulation problems (Kristeller & Rodin, 1989). Emotional eating may also occur in response to positive emotions, for pleasure, for celebration, or to relax without any particular stressor present. However, excessive levels of emotional eating (including “stress eating”) are part of a larger profile of maladaptive habitual coping, or ineffective emotion regulation attempts. The coping literature describes passive coping as a set of strategies that may temporarily manage emotions but do not help solve the situation, in contrast to the range of active coping options. Eating and substance use are a form of “passive coping”—they tend to blunt negative emotions but in themselves do not improve adaptation to situations. For example, in one study, unsupportive social interactions, a particularly potent social stressor, induced more passive coping behavior including emotional eating (Raspopow, Matheson, Abizaid, & Anisman, 2013).

Emotion-regulation strategies, like coping, tend to be categorized into more adaptive strategies, such as reappraisal, and more ineffective strategies, such as denial and avoidance. Emotional eating may also be part of an avoidant strategy. Indeed, one experimental study examined reappraisal, suppression, and no coping in response to a negative mood induction. Those who were assigned to use suppression or no emotion-regulation strategy ate much more in the lab (Taut, Renner, & Baban, 2012). Eating is often the coping method of choice when no other options feel available.

The experiential avoidance of negative affect is thought to be an important driver of binge eating. The escape from aversive self-awareness may be one self-regulatory motive for emotional eating. Binge eating is associated with a narrowing of attention that allows one to overeat (Heatherton & Baumeister, 1991). Low self-awareness is

associated with eating more after a distressing task (Heatherton, Polivy, Herman, & Baumeister, 1993). Weight-loss treatments focused on increasing acceptance of negative affect have been promising so far (Lillis, Hayes, & Levin, 2011). For people who are restricting food intake in order to lose weight, emotional eating is usually a particularly ineffective coping strategy because it triggers so much distress and self-recriminating thoughts associated with eating “comfort foods” (such as sweets or high-fat snacks) that cancel out the transient relief one may have felt during eating that even more stress is created.

There is growing empirical evidence that stress or stress eating promotes weight gain, a concept that seems self-apparent to those who struggle with overeating. The relationship is complex, depending in part on whether one views oneself as a stress eater, rather than stress operating as a “main effect” across people. A number of studies have found that people who self-report they are “stress eaters” do indeed tend to eat more when under stress (van Strien, Herman, Anschutz, Engels, & de Weerth, 2012). In adults, exposure to stress alone affects eating differently depending on initial weight status. For example, a large study across 13 European countries examined weight changes in those who were under high job stress. Those already overweight tended to gain weight, and those who were lean tended to lose weight, under high job stress (Nyberg et al., 2012). These findings might be explained in part by people’s individual tendencies for emotional eating.

Mindfulness can interrupt and help reregulate longstanding patterns of excessive emotional eating in several ways. First, simply bringing more awareness to the pattern may help someone better identify emotion-related triggers for craving or wanting certain foods. Second, bringing mindfulness to choice may help someone recognize the need to engage other coping strategies, whether to initially relax or to actually address the stress-related trigger. In addition, cultivating an appreciation of the comfort value of favorite foods counteracts the restrictive nature of more typical recommendations; comfort foods are no longer forbidden and can be eaten, but in much smaller quantities and with the intention of self-soothing—followed by more active coping strategies. Finally, mindfulness can bring balance to overeating as a source of pleasure or celebration, shifting the focus from quantity of food to cultivating an overall sense of enjoyment. All of these mindfulness strategies can enhance self-awareness to decrease inappropriate emotion-related eating and, in individuals with marked binge eating patterns, prevent full-blown lapses or the state of dissociation sometimes sought with binge eating.

Self-criticism

Self-judgment is another common theme underlying eating: “I’m a ‘good’ person for eating organic vegetables,” or more commonly, “I’m terrible for wanting another doughnut.” Such voices of judgment further separate people from immediate experience. Suspending such conditioned patterns allows space for alternative choices that may feel inherently more satisfying than if they feel prescribed by others. As noted above, a positive-feedback loop can develop where negative emotional responses trigger overeating. Guilt and shame about unhealthy eating behavior, regardless of how it

is triggered, naturally feed back into the positive cycle of triggering overeating, further causing negative feelings. This in turn triggers negative thoughts about the self that can spiral and lead to the “abstinence violation effect” (AVE), identified by Marlatt in relation to drug and alcohol addiction (Marlatt & Gordon, 1985), and is also applicable to eating behavior (Herman & Polivy, 2011; Polivy, 1976). Within the drug and alcohol arena, in which total abstinence is commonly sought, even a small “slip” may trigger intense negative self-appraisal, leading to a sense of futility and a subsequent “relapse.” In the arena of eating, the AVE response may be triggered by a wide variety of food that has been labeled “bad” and is therefore to be avoided. Often, such restrictions are highly unrealistic. Mindfulness can be engaged in several ways to assist with this very powerful and common reaction, both in individuals with eating disorders and in those who are trying to maintain restrictive diets, and can lead to more self-acceptance. Clearly, the formal practice of intentionally holding a kind attitude and an informal “cognitive” mindfulness can promote learning from one’s mistakes, as well as a more conscious acceptance of oneself (Carson & Langer, 2006).

Eating Behavior: From Automatic to Self-Regulated

On average, normal and overweight individuals make about 200 decisions per day regarding food intake, while those who are obese make more than 300 (Wansink & Sobal, 2007). These choices involve a wide range of decision-making, which might be considered to combine three modes of eating—mindless eating (automatic), self-control over eating (effortfully restraining), and self-regulation (flexibly regulating) of eating behavior.

The automaticity of eating

When we are mindless, we rely on automatic processing, where past knowledge or behaviors overly determine the present, and within which we are almost blind to the current context (see Chapter 1). This leads to the rigidity of habits like overeating. Automatic behavior is not necessarily dysfunctional *but may lead to choices that are experienced as uncontrollable and unconscious*. The fact that people are not in full control over their eating does not need a study citation, given the high rates of obesity. Eating behavior virtually always involves some level of automatic processes, and thus fits in the definition of mindless behavior (Langer, 1992). Eating behavior also includes many conscious choices, including choice regarding food purchases, what to eat, and how much to eat. It is striking, nevertheless, how much we are influenced by factors outside of our conscious awareness. For example, people’s eating behavior is influenced by food packaging and marketing, and television watching, but people often have no insight into their preferences (Boulos, Vikre, Oppenheimer, Chang, & Kanarek, 2012; Cohen & Babey, 2012; Wansink, 2010). Experimental studies have shown that when people eat, yet did not intend to, they create post-hoc stories about their behavior, thereby showing that the causes of their behavior are not fully conscious (Moldovan & David, 2012).

How do we shift from mindlessness to mindfulness? One important core aspect of training in mindful eating is simply training awareness. As awareness heightens, levels of frustration with seemingly unconscious patterns decrease. Individuals may note becoming more aware of a myriad of aspects of eating that had previously been largely automatic or unconscious, including specific triggers for overeating, whether emotional, social, or environmental; reasons for stopping eating, such as parental messages about “always cleaning your plate”; and making food choices, such as “supersizing” fast food meals, in order to save money. Without increased awareness, it is impossible to begin to interrupt these longstanding habits and patterns effectively.

Willpower, self-management, and self-regulation

We find it useful to differentiate between the concepts *willpower*, *self-management*, and *self-regulation*, particularly in relation to eating.

Willpower or self-control Willpower can be conceptualized as the most “mindless” approach, an effortful attempt to resist strong desires, often by using a structured diet very different from usual patterns of eating, and with little or no skill or use of self-management techniques. Willpower relies on “effortful vigilance,” the bare mental power of inhibiting an unwanted impulsive behavior. Exerting willpower may be essential for situations when one feels strong urges and cravings. People who are high on this capacity (trait self-control) tend to be more stress resistant in that they have more stable moods, which predicts more stable autonomic activity throughout the day (Daly, Baumeister, Delaney, & MacLachlan, 2012). So, in contrast to automatic behavior, when exerting willpower, one is paying attention and exerting effort to change or stop eating behavior. That is one step toward meeting one’s intention, but it is a tough road if that is one’s only way of regulating eating. Such inhibition attempts, or “resist” behaviors, take a lot of cognitive effort and can be disrupted by factors such as cognitive load or mere depletion from repeated earlier attempts at self-control (Muraven & Baumeister, 2000). Many lab studies have shown that this capacity is a limited resource, and a recent Ecological Momentary Assessment (EMA) study additionally demonstrated these effects in the real world. Specifically, cumulative efforts over the day lead to depletion of willpower or self-control. Throughout the day, the more people tried to resist a behavior, such as eating, the more likely they were to engage in the unwanted behavior later (Hofmann, Vohs, & Baumeister, 2012). This might help explain why people tend to overeat in the afternoon and evening, the time of day that provides a perfect storm of factors that lead to decreases in control, such as physical hunger (including low glucose), fatigue, stress, and cumulative depletion from earlier in the day.

What does loss of control look like in the brain? People with impulse-control problems with overconsumption of drugs or food have common neurological alterations in areas related to reward, incentive motivation, and stress reactivity (Sinha & Jastreboff, 2013). There are alterations, for example, in the dopaminergic ventral tegmental area, and reduced activity in areas of the prefrontal cortex, the master control center, as well as low interoceptive awareness (Volkow, Wang, Tomasi, & Baler, 2013).

However, whether such changes are causative or simply reflective of repeated dysfunctional regulation is less clear.

Obesity per se may be only a very crude proxy for poor self-control, as excess weight reflects a wide range of behavioral phenotypes. People with binge-eating disorder clinically show poor self-control, and this can be measured as reactivity in part to food or stress. They tend to have greater responses to food cues (Sobik, Hutchison, & Craighead, 2005). Obese binge eaters, but not obese nonbingers, show hypoactivity in areas important to impulse control (ventromedial prefrontal cortex and insula; Balodis et al., 2013). Obese nonbingers are often “grazers”; habitual overeating rather than extreme lack of control leads them to gain excess weight over a period of years.

We also know that people already low on self-control over eating, those with high levels of brittle or ineffective dietary restraint and high levels of disinhibition, tend to eat more when under cognitive load or exposed to a stressor (Gibson, 2012). Therefore, these aspects of poor control over eating are prime targets for mindfulness interventions. Efforts at self-control include avoidance of negative emotional experiences that takes up a lot of cognitive effort and can impede rather than promote behavioral change. Further, since cravings and impulses are not necessarily under personal control, trying not to have intrusive thoughts about a certain food can backfire and lead to more distress, cognitive load, and self-critical thoughts. Evidence is increasing that suppression or avoidance of particular experiences may actually strengthen the underlying associated conditioning (Wegner, Schneider, Carter, & White, 1987) and is more effortful than mindful acceptance (Alberts, Schneider, & Martijn, 2012). Mindfulness training can help reduce experiential avoidance, as well as defuse critical thoughts with loving-kindness practices.

Self-management We prefer to use the term self-management to describe a higher level of ability to manage behavior than through sheer willpower or self-control. Self-management, such as that encompassed by cognitive-behavioral approaches to changing eating behavior or weight loss, can be highly effective. Such self-management processes include a wide range of strategies, such as avoidance (putting the cookies away rather than just resisting their pull), substitution, reconditioning, or cognitive reframing. These approaches draw on learning theory but may be relatively fragile in the face of repeated challenges or until substantive relearning has occurred. Mindfulness can certainly be exercised to identify triggers and look for opportunities to interrupt or shift automatic patterns, until new patterns are learned. Mindfulness can also be powerful in identifying the need to engage self-management strategies, but we would argue that mindfulness approaches extend beyond self-management to encompass self-regulation processes.

Self-regulation In contrast to both willpower/self-control, and self-management, self-regulation refers to the flexible control that people can engage with little struggle. Self-regulation, based on integrating physiological and psychological homeostasis (Kristeller, in press; Schwartz, 1975), represents the ability to respond without being overly influenced by, for example, food cues, or emotional states. Self-regulation engages naturally occurring internal processes that are experienced as requiring relatively little effort to maintain. For example, one man enrolled in a mindful-eating

workshop found the first exercise of mindfully—and slowly—eating raisins was almost immediately powerful in changing life-long patterns of eating so rapidly that all of his family members teased him about it. He noted that he had tried many times to “slow down” using “willpower,” without success. One month after this brief exercise, he reported he was now eating all his food more slowly, with no additional effort, and enjoying it far more!

As Langer and others show, biological functioning is quite malleable based on attentional mindset. Obesity and binge eating now have been linked to a strong pattern of metabolic dysregulation and altered neural processing. One would think eating behavior would thus be somewhat immutable. While there is a growing literature showing neurological correlates of addictive-like behavioral disorders, it is remarkable that the experience of mindful eating can transform a struggle to control eating into one of eating with a high level of regulation and discernment, and can do so very quickly. For example, one woman in the MB-EAT program, upon mindfully eating several small pieces of a commercially available chocolate snack cake, was shocked to find them increasingly unappealing with each bite, as they were a food she had previously binged on, and indeed had had some anxiety about even trying. In an even more extreme example, we know that eating can be highly dysregulated in Prader-Willi Syndrome, due to neurological genetic reasons and aberrations in mechanisms that control satiety, such as low ghrelin. However, in a case study of an adolescent with PW syndrome, training in mindful eating promoted lower and much more regulated intake, followed by substantial weight loss, thus overriding a known biological driver of overeating (Singh et al., 2008).

What does optimal self-regulation look like? Highly self-regulated eating simply looks different. It includes a fine balance between functional eating based on caloric need, and eating based on important psychological, social, and cultural roles of food (Kristeller et al., 2013). The beauty of adaptive regulation over eating is that the amount and speed of eating in these contexts are flexible, moderate, and not rigidly controlled like the constraints of structured dieting, or the famine/feast patterns of a binge eater (restricting early in the day and then overeating in the afternoon/evening). Self-regulation also allows for substantial variability in food intake, like that required to meet fluctuating needs based on changes in activity, season, and menstrual cycle (Pliner & Fleming, 1983).

Natural triggers for eating, including hunger, cognition, or emotion, can be responded to either mindfully or mindlessly, as shown in Figure 47.1. Eating is triggered by hunger as well as external and other internal cues, such as social cues, seeing or smelling food, and experiencing stress or negative emotions. Habitual reactions to these triggers constitute much of mindless eating. Eating in response to negative emotions in particular involves prolonged reactivity and subsequent attempts to avoid negative affect. For some, especially those trying to restrain their eating, any of these triggers can lead to feelings of a lack of control. Mindful responses to triggers including intentional observation of thoughts, feelings, and bodily sensations, marked by a high level of interoceptive awareness of both feelings and bodily sensations of hunger and satiety. There is greater acceptance of negative emotions rather than attempts to avoid them with food or other means. When one then intentionally chooses to eat, the process of eating mindfully is a different

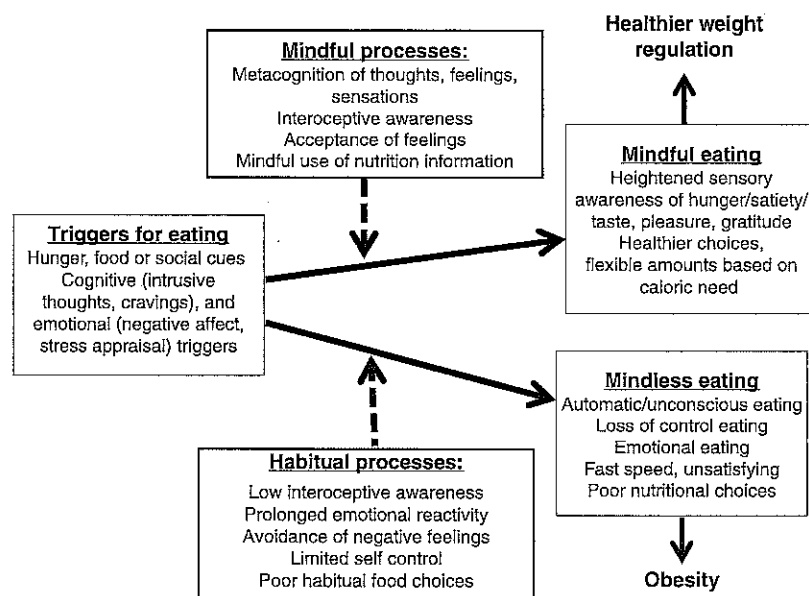


Figure 47.1 Mindful versus mindless regulation of eating and weight. This figure illustrates the dynamic processes operating in mindful versus mindless responses to triggers for eating, including variations in awareness of interoceptive cues, engagement versus avoidance of feelings, and habitual reaction versus mindful decisions regarding nutrition and quantity of food intake.

experience. There is sensory awareness throughout, pleasure from noticing the experience, and intake that is more reflective of true caloric need. Mindful eating also shapes food choices to be healthier rather than what is most easily available or satisfying to the stressed brain. The neurobiological state of mindful eating is dominated by activity in the frontal control areas of the brain, whereas more mindless eating is dominated by the limbic and reward areas of the brain.

We have given examples of how mindfulness can reengage more effective self-regulatory processes in regard to eating. The treatment of obesity or binge eating can be more effective if it includes learning the components naturally inherent in good self-regulation, as well as some formal aspects of mindfulness training. Below we describe the MB-EAT program, delineating further how it addresses these processes outlined above and reviewing related research.

Clinical Applications

Training mindful eating

Mindful eating engages many aspects of experience, including thoughts, emotions, the physical self, the social self, and general self-awareness and self-acceptance. Mindfulness can be applied to all the senses, to the process of eating, to

decision-making in choosing food and the other myriad choices—what to eat in the moment, how much to eat, when to stop—and of course, to the very experience of food itself. In the training, we share with participants that one of our goals is to help them engage their “inner gourmet,” a striking contrast to the message of most approaches to managing eating and weight.

Individuals learn to recognize that many of their eating choices are inherently “mindless,” under the power of old patterns that are no longer serving them well (the concept of “priming,” as discussed by Langer in Chapter 1) or are functionally dysregulated patterns that have slowly developed over time as eating becomes increasingly unbalanced. An example of the first is the extremely common tendency to not finish eating until the “plate is clean”; 60-year olds will tell us that they still do this because their mother told them to do so. An example of the second are binge patterns, often driven by a combination of caloric restraint (“I’m being good.”), stress, and the AVE. Both types of patterns often shift dramatically once awareness of physical hunger and satiety experiences are engaged, along with awareness of taste satisfaction. Strikingly, engaging such processes is experienced as taking little effort and as making eating generally *more* enjoyable, rather than less.

The MB-EAT program, unlike virtually all dieting approaches to weight management, also emphasizes the complexity of eating, and decisions around eating, rather than attempting to simplify these with particular dietary recommendations that are to be followed rigidly. The need for flexibility, curiosity, and “experimenting” with food choices and experiences is continually emphasized. We tell people to “play with their food,” communicating this with both a light touch and a sense of enjoyment in exploring new choices and alternatives.

MB-EAT

The MB-EAT program, as it developed, has been informed by several important lines of theoretical perspectives within psychology: the value of increasing interoceptive awareness in treating dysregulation disorders (Schwartz, 1975, 1976); the internal-external model of obesity and food intake regulation (Rodin, 1978, 1981; Schachter, 1971); and the value of meditation and mindfulness-based components in interrupting stress reactivity and cultivating psycho-biological stability, growth, and wisdom (Benson, 1975; Kabat-Zinn, 1990; Kristeller, 2007). The core elements include training in mindfulness meditation; guided mindfulness practices related to eating and food, self-acceptance, and body awareness; and cultivation of healthier, mindful use of nutritional and physical activity information.

The program is offered in a group format, with the number of sessions ranging from seven (Kristeller & Hallett, 1999) to nine or 10 (Kristeller et al., 2013; Miller, Kristeller, Headings, Nagaraja, & Miser, 2012) to 16 (Daubenmier et al., 2011), depending on the addition of material related to complementary components including nutritional information, exercise, and stress management. Four types of mindfulness training exercises are used: 20-min breath/thought awareness practice; guided mindful eating practice; other guided mindfulness practices (e.g., mindful walking; body scan; “forgiveness” meditation); and “mini-meditations.” These last

may be as brief as a few breaths, or as long as 1–2 min; they are used both within sessions, particularly in the context of eating experiences, and outside of sessions, as a way to center and focus awareness, engage mindful attention, and disconnect from the “chattering mind.” Sitting meditation is framed to participants as core to the program for several reasons. First, it is presented as a way to become aware of inner experience, beginning with the breath and other feelings in the body, and then extending to thoughts and feelings. Second, the relaxation quality of the experience is acknowledged, as the breath slows down, and the “relaxation response” is engaged. Third, it is pointed out that learning to bring mindful awareness to something as simple as the breath, with a quality of curiosity and engagement, means that this quality of mindfulness will become easier to bring to almost any activity, including those that have long been habitual. Finally, the value of meditation as a wisdom tradition is reiterated, in that both insight and a sense higher or even spiritual meaning may emerge from a period of quiet sitting practice, the nature of it depending somewhat on their religious belief system.

The core elements are presented to participants as cultivating both “inner” wisdom and “outer” wisdom. Inner wisdom components largely entail heightened awareness of, and appropriate response to, physical, emotional, and cognitive aspects of food choices, eating, and self-acceptance. Outer wisdom components address how to understand and make “wiser” choices based on the personal relevance of the enormous amount of nutritional and physical activity information that is available. The concept of wisdom is very purposefully engaged as a way to communicate personal choice, flexibility, and the inherent value of suspending longstanding ways of perceiving and behaving in the world, opening oneself up to options that may shift and fluctuate in their value and appeal.

Inner wisdom: Hunger awareness Most participants readily acknowledge that they are unduly sensitive to all types of eating triggers that have little to do with physical hunger. The concepts of mindfully tuning into physical hunger, rated on a scale of 1–10 on level of intensity, and learning how to distinguish such experiences from a myriad of other triggers for eating, are core themes. However, it is also emphasized that even “balanced” normal-weight individuals eat for reasons other than physical hunger, and that the goal is to create this better “balance” for oneself. The use of self-rating scales is borrowed from psychophysics in that it is emphasized that each person’s internal “scale” is unique to their own experience, but inherently valid.

Inner wisdom: Fullness awareness Fullness is also introduced as a powerful feedback signal that is far more appropriate to use to stop eating than whether other people are still eating or food is still left on the plate. The same scale, 1–10, is used, but it is emphasized that hunger and fullness are not just at opposite ends of a single dimension, as they involve different neurological processes and feedback systems. The program uses an exercise of drinking a large bottle of water (16–20 oz.) to experience the related experience of stomach distention in the moment—and also make the point that water, which has no biological impact on hunger, will still contribute to levels of fullness. Even for individuals with binge-eating disorder, this exercise often has an immediate impact, as they connect, mindfully, with the discomfort of this experience.

Inner wisdom: Taste experience One of the most powerful aspects of the MB-EAT program is helping individuals become aware of taste, by cultivating awareness of their “inner gourmet.” Mindful eating occurs throughout the program, beginning with raisins, adapted from the Mindfulness-Based Stress Reduction program, moving to more challenging foods (chocolate, cheese, and cookies), and then toward healthier foods. Again, participants are challenged to rate the pleasure of their experience on a 10-point scale—and then to notice how quickly taste sensation decreases as “taste satiety” is engaged. Even “normal” eaters, participating in brief mindful-eating workshops, are often startled to discover the impact of mindful awareness both on increasing initial enjoyment and then on letting go of the need to eat more, as the enjoyment quickly fades as taste buds habituate to flavors. Conversely, when they become mindful, individuals are sometimes startled by realizing that their “taste satisfaction” from familiar foods is far less than they anticipated.

Inner wisdom: Food-choice experience Choosing foods is often done mindlessly. We might order the restaurant “special” when we really would prefer something else, choose the snack at a party that was easiest to reach, or pick “one of everything” at a breakfast buffet. The first practice in the MB-EAT program on choosing mindfully presents two “snack” foods: corn chips or shortbread cookies. One is salty, and one is sweet; each is familiar; and neither would be chosen because it is inherently “healthier.” We ask individuals to reflect on how they are making their choice, to fully experience eating the food, and to mindfully observe any thoughts or emotions occurring while they eat. Participants are then encouraged to take this “mindful choosing” into their daily environment. Even subtle mindful choices may make a difference. One MB-EAT member, who often ate relatively healthy frozen meals at her office for lunch, noted that she would just grab the top box out of the freezer, eat it while scanning emails, and then often feel unsatisfied—ending up going to the snack machine for something “special.” Instead, when she took a few moments to choose the meal that most “called” her that day, she found she ate it with much more pleasure, felt more satisfied, and was less likely to seek out something else afterwards. Choice is essential for well-being. Even in rodent studies, those that had choice benefitted more in their stress-responsive system. Some rats got a choice of palatable food versus chow; these rats consumed more highly palatable food and showed reductions in their subsequent stress reactivity. Those that had palatable food only did not benefit similarly (la Fleur, Houshyar, Roy, & Dallman, 2005).

This relatively simple “choice” experience is then followed in the program with several others, including a far more challenging “pot luck” meal, for which group members bring in one “healthier” dish to share and one dish that they acknowledge as less healthy but want to keep as part of their regular eating program (macaroni and cheese almost always appears). This experience engages food choices based not only on initial appeal but also on taste satisfaction (when they return for “seconds”), on choosing quantities of food to eat, and on being sensitive to implicit social pressure, as they are aware of who brought each dish.

Inner wisdom: Awareness of thoughts, emotions, and other triggers Throughout the program, beginning with mindfully eating raisins, participants are encouraged also to

be mindfully aware of other thoughts, feelings, and situations that trigger or accompany eating. This expands into considering complex chains of events, thoughts, and feelings that may terminate in a binge episode. We emphasize that what may feel like an uncontrollable cascade of events can be observed and reflected on more mindfully, and interrupted at virtually any point. Although this process is initially focused on issues associated with eating, participants often note that introducing these few moments of "mindful awareness" can help them at other times interrupt emotional reactions, such as anger, that otherwise feel overwhelming.

Inner wisdom: Body awareness and acceptance Virtually all participants in our programs, even those with lower-level weight issues, feel in a struggle in relation to their bodies. We very gently introduce body awareness, including a body-scan exercise (Loring, 2010) that first incorporates simply noticing physical experience (i.e., tension in different places) and then identifying both positive and negative self-judgment about different parts of the body. This followed by a "healing self-touch" practice, in which mindful awareness is brought first to the surface of the body, and then deeper into awareness of muscles and bone, in a positive way. One intent of this practice is to bring mindful awareness and appreciation to parts of the body that are functioning well; generally, people acknowledge that they had never considered that their bones and muscles serve them in many ways throughout the day, regardless of the weight they carry. We then continue to mindful walking, extending the sense of awareness to more substantial movement than chair yoga, encouraging a quality of mindfulness both when walking slowly and at a more normal pace.

Outer wisdom: Awareness of food choices In the MB-EAT program, one focus is to improve self-control efforts by paying attention to the content of what is eaten over the day, and to move these choices toward a level of more balanced self-regulation. We have found that most of our participants, whether individuals with binge-eating patterns or not, associate considering the caloric values of food they choose to eat with failed attempts at dieting and with self-restriction. They prefer to be "mindless" about calories than to experience the anxiety, frustration, and self-recrimination that often follows from considering calories or other nutritional guidelines. Therefore, we've developed a number of ways to help people engage this important information with more flexibility and self-acceptance. One core component is the "500 calorie challenge." Instead of "counting calories," we emphasize the importance of identifying small changes in food choices that can be made, adding up to decreases of about 500 kcal/day (or 3500 kcal/week, the average amount needed to lose one pound), while maintaining or even heightening the pleasure gained from food. Most people find that when they mindfully review what they are typically eating, it is actually easy to find ways to remove this amount of calories without missing it—for example, less mayonnaise on a sandwich; a smaller steak; one or two fewer sodas; a smaller bowl of ice cream. Doing so is thus empowering, rather than discouraging; it also communicates the value of exercising mindfulness in the moment, yet without the attitude of "self-policing" that often accompanies rigorous self-monitoring of all food intake. Other elements of this "outer wisdom" component include becoming more aware of serving sizes and making healthier nutritional choices, dependent on personal

needs, yet allowing for smaller amounts of highly preferred richer or more calorically dense foods.

Outer wisdom: Awareness of physical activity As noted above, most of our participants are very uncomfortable with their bodies, caught up in negative self-judgment and generally feeling quite insecure about taking on any type of physical activity. We have approached increasing healthy mindfulness in this area by providing everyone with pedometers, first using them simply to track the number of steps taken, and then to increase their steps gradually. This has proved very popular across a wide range of weight levels and eating issues. Initially, participants are encouraged to identify ways to increase steps simply as part of their daily patterns. For example, one very heavy woman realized that once she came home from work (at a desk job), she spent almost the entire evening sitting on a couch, even having other family members prepare dinner or snacks and bring these to her. She began changing this pattern simply by looking for opportunities within her own home to walk, very quickly multiplying the number of steps she recorded on her pedometer, along with noticing benefits in flexibility and well-being. The group is also encouraged to seek out and share other opportunities for more vigorous activity in the community, from walking clubs to senior swim programs to joining the YWCA, but with an emphasis on exploring possibilities, rather than setting up unrealistic goals that are unlikely to be sustained.

Empirical Support for MB-EAT-Based Interventions

There have been several popular books on mindful eating that have no doubt helped many people, written from a Buddhist perspective (Altman, 1999; Bays, 2009; Kabatznick, 1998) or a more secular perspective (May & Fletcher, 2012; Somov, 2008). In terms of empirically validated programs, this is a young field. To date, several randomized trials have been conducted on MB-EAT and its derivative programs, with three trials completed and three ongoing, by Kristeller and colleagues. Several other investigations, particularly focused on eating disorders, have drawn on other mindfulness platforms, including Dialectical Behavior Therapy (Safer, Robinson, & Jo, 2010) and a small study with Mindfulness-Based Cognitive Therapy (Alberts, Thewissen, & Raes, 2012).

Our initial proof-of-concept study used a single-group, extended baseline/follow-up design (Kristeller & Hallett, 1999), allowing us to evaluate individual differences more carefully if group effects were inconsistent. The participants were primarily middle-aged women who were obese with binge-eating disorder. We retained 18 of 20 participants at the end of a 1-month follow-up, with effects consistent enough to analyze as group data. Although four women still met criteria for BED (at 2 or more binges/week), the average number of binges per week dropped from over 4 to about 1.5; furthermore, the size of the remaining binges decreased markedly, consistent with the value of mindfulness awareness to empower suspension of habitual reactivity. This level of improvement was also reflected in decreases on the Binge Eating Scale (BES; Gormally, Black, Daston, & Rardin, 1982) from the "severe" range to just higher than having "little or no problem" with binge eating. Depression also decreased markedly

to subclinical levels. Perhaps most important was that improvement was significantly predicted by the amount of time participants reported using eating-related mindfulness meditation.

Our next study, which included men as well as women, was a two-site randomized clinical trial with Duke University (Kristeller & Wolever, 2011; Kristeller et al., 2013). In addition to individuals who met full criteria for BED, including loss of control and subsequent distress, we also included individuals who reported that their bingeing was more "planned"; this tended to be more true of men and individuals from lower SES levels. Generally, they noted that "they had given up" trying to control themselves—or that almost everyone they knew engaged in similar behavior. Note that such attitudes are similar to those of stable alcoholics, whose heavy drinking (e.g., 6–8 drinks/night) is normative for their social group, even as they recognize that this level of drinking is problematic. In fact, one man in our program noted that he had "eating buddies," rather than "drinking buddies." Otherwise, the sample was highly similar in weight and age to the pilot study. In this study, the nine-session MB-EAT program was compared to a psycho-educational/cognitive behavioral (PECB) treatment based on the Duke Diet and Fitness Center obesity treatment program, and to a wait-list control. Elements were added that placed greater emphasis on nonjudgment and cultivation of self-acceptance.

Not surprisingly, the MB-EAT and PECB groups showed similar improvements in behavior and on the BES, as both provided safe, structured contexts. However, most measures indicative of more self-regulated eating (e.g., the Hunger scale of the Three-Factor Eating Questionnaire; Stunkard & Messick, 1985) had a greater improvement in the MB-EAT group. Total meditation practice, calculated as a total index of sitting, guided, and "mini-meditations," again predicted improvement on multiple measures with more of the variance carried by time spent using "mini-meditations." However, to our concern, some individuals actually gained weight (in both conditions); some individuals appeared, based on interviews, to have allowed themselves more general "permissiveness" around food and eating, even while reducing bingeing. This led us to consider that the "inner gourmet" needed to be balanced by stronger development of "outer wisdom" mindfulness related to overall reduction in food intake and self-regulation skills explicitly tied to food choice. It was encouraging, however, that the mechanism of change for those who did lose weight appeared to be mindfulness.

Therefore, our next trial (Kristeller & Bolinskey, 2013) added more "outer wisdom" elements to the program, as described above, and was expanded to 10 sessions with two follow-up sessions. Another goal of this study was to expand the sample beyond individuals with binge-eating disorder, yet also to enroll a sufficient number of individuals in the trial to be able to investigate whether the effects of including more nutritional components was viable for those with BED. This was accomplished by enrolling only heavier individuals (again both men and women) whose body mass index was at least 35 (moderate or morbid obesity). In doing so, we found that about 30% had binge-eating disorder. Preliminary analyses show effects consistent with those observed in our previous research and, most encouraging, patterns that are highly parallel between those with and without BED. These results strongly suggest that, when mindfully engaged, very heavy individuals, regardless of underlying patterns of eating, responded equally well to both the "inner wisdom" and the "outer wisdom"

components of the program. Furthermore, incorporating the "outer wisdom" components contributed to a weight loss in both groups of about 7 lbs at immediate post, or approximately 1 lb per week from when they began the 500 Calorie Challenge. Notably consistent with engaging "outer wisdom" was a greater improvement than in the control group on the Cognitive Restraint scale of the Three-Factor Eating Questionnaire, an indicator of "healthy restraint," for both groups of individuals.

The MB-EAT program has been modified to incorporate more "stress management" components, in 16 sessions, to be used with an even broader range of individuals, with lower levels of binge eating and obesity. Pilot data support the value of addressing these stress-related aspects of obesity (Daubenmier et al., 2011), and a larger trial is in progress. Other investigators (Dalen et al., 2010) have incorporated elements of MB-EAT into a 6-week program linking healthier eating with exercise for obese individuals, referred to as Mindful Eating and Living (MEAL), also finding in a nonrandomized pilot study improvement in healthy restraint, decreases in weight, and improvement on other indicators of dysregulated eating. Timmerman and Brown (2012) enrolled overweight and obese women, targeting their 6-week intervention, adapted from MB-EAT, on the overeating that often occurs in restaurants, and showing improvements in weight and nutritional balance.

MB-EAT has also been modified for an overweight/obese population with noninsulin-dependent diabetes (Miller et al., 2012). In this study, MB-EAT-D was compared to a fairly intensive medical nutrition therapy-based group program (Smart Choices). Both interventions showed relatively comparable improvement on most variables assessed. It may be that when specific health goals are desired, a combination of a targeted program and the MB-EAT program would be most effective. For heavier individuals with more compulsive overeating patterns, the MB-EAT-D program might be provided first, possibly with the reverse order for those more comfortable with highly structured guidelines, such as those recommended within Smart Choices. Consistent with this, we have had individuals participate in the MB-EAT program and then return to more structured weight-loss approaches, such as Weight Watchers, with considerably more success once they had developed the capacity to be more mindful, less judgmental, and more flexible in making their own choices.

Conclusions

Given our brain's response to an increasingly palatable food environment, coupled with modern multitasking and chronic stress, it is not surprising that our society is in the midst of an escalating epidemic of obesity and compulsive overeating. Applying mindfulness to food intake and food choice therefore seems to be a tremendously valuable application of the psychological capacity for cultivating balanced awareness, improved attention skills, and a means to disengage from well-entrenched cognitive, emotional, and behavioral habits and patterns. Such applications might occur both in the societal context and as part of clinical interventions for people seeking treatment for obesity and compulsive overeating.

Here we have reviewed some key components of the basic science of food intake, and susceptibility to automatic or mindless overeating for various reasons. At the core of

overeating are overlearned patterns and poor self-regulatory skills. Clinical trials so far support that shifts from mindless habitual eating toward mindful strategies promotes more regulated eating, and either weight maintenance or weight loss within a wide range of individuals. Although further research is certainly needed, particularly linking clinical application to changes in underlying mechanisms, mindful eating is a natural state that can be trained and enhanced, that can be incorporated into private and public health prevention and treatment programs.

References

- Adam, T. C., & Epel, E. S. (2007). Stress, eating and the reward system. *Physiology & Behavior*, 91(4), 449–458.
- Alberts, H. J., Schneider, F., & Martijn, C. (2012). Dealing efficiently with emotions: Acceptance-based coping with negative emotions requires fewer resources than suppression. *Cognition & Emotion*, 26(5), 863–870.
- Alberts, H. J., Thewissen, R., & Raes, L. (2012). Dealing with problematic eating behaviour. The effects of a mindfulness-based intervention on eating behaviour, food cravings, dichotomous thinking and body image concern. *Appetite*, 58(3), 847–851.
- Altman, D. (1999). *Art of the inner meal*. San Francisco, CA: Harper.
- Balodis, I. M., Molina, N. D., Kober, H., Worhunsky, P. D., White, M. A., Rajita, S., . . . Potenza, M. N. (2013). Divergent neural substrates of inhibitory control in binge eating disorder relative to other manifestations of obesity. *Obesity*, 21(2), 367–377.
- Bays, J. (2009). *Mindful eating*. Boston, MA: Shambala Publications.
- Benson, H. (1975). *The relaxation response*. New York, NY: Morrow.
- Bjorntorp, P. (2001). Do stress reactions cause abdominal obesity and comorbidities? *Obesity Reviews*, 2(2), 73–86.
- Boulos, R., Vikre, E. K., Oppenheimer, S., Chang, H., & Kanarek, R. B. (2012). ObesiTV: How television is influencing the obesity epidemic. *Physiology & Behavior*, 107(1), 146–153.
- Brondel, L., Romer, M., Van Wymelbeke, V., Walla, P., Jiang, T., Deecke, L., & Rigaud (2007). Sensory-specific satiety with simple foods in humans: No influence of BMI? *International Journal of Obesity*, 31(6), 987–995.
- Carson, S. H., & Langer, E. J. (2006). Mindfulness and self-acceptance. *Journal of Rational-Emotive and Cognitive-Behavior Therapy*, 24(1), 29–43.
- Cohen, D. A., & Babey, S. H. (2012). Contextual influences on eating behaviours: Heuristic processing and dietary choices. *Obesity Reviews*, 13(9), 766–779.
- Cottone, P., Sabino, V., Roberto, M., Bajo, M., Pockros, L., Frihauf, J. B., . . . Zorrilla, E. P. (2009). CRF system recruitment mediates dark side of compulsive eating. *Proceedings of the National Academy of Sciences of the United States of America*, 106(47), 20016–20020.
- Dalen, J., Smith, B. W., Shelley, B. M., Sloan, A. L., Leahigh, L., & Begay, D. (2010). Pilot study: Mindful Eating and Living (MEAL): Weight, eating behavior, and psychological outcomes associated with a mindfulness-based intervention for people with obesity. *Complementary Therapies in Medicine*, 18(6), 260–264.
- Daly, M., Baumeister, R. F., Delaney, L., & MacLachlan, M. (2012). Self-control and its relation to emotions and psychobiology: Evidence from a Day Reconstruction Method study. *Journal of Behavioral Medicine*. [Epub ahead of print]
- Daubenmier, J., Kristeller, J., Hecht, F. M., Maninger, N., Kuwata, M., Jhaveri, K., . . . Epel, E. (2011). Mindfulness intervention for stress eating to reduce cortisol and abdominal fat among overweight and obese women: An exploratory randomized controlled study. *Journal of Obesity*, 2011, 651936.
- Farb, N. A., Segal, Z. V., & Anderson, A. K. (2013). Mindfulness meditation training alters cortical representations of interoceptive attention. *Social Cognitive and Affective Neuroscience*, 8(1), 15–26.
- Garber, A. K., & Lustig, R. H. (2011). Is fast food addictive? *Current Drug Abuse Reviews*, 4(3), 146–162.
- Gibson, E. L. (2012). The psychobiology of comfort eating: Implications for neuropharmacological interventions. *Behavioural Pharmacology*, 23(5–6), 442–460.
- Gormally, J., Black, S., Daston, S., & Rardin, D. (1982). The assessment of binge eating severity among obese persons. *Addictive Behaviors*, 7(1), 47–55.
- Harris, J. L., Bargh, J. A., & Brownell, K. D. (2009). Priming effects of television food advertising on eating behavior. *Health Psychology*, 28(4), 404–413.
- Heatherton, T. F., & Baumeister, R. F. (1991). Binge eating as escape from self-awareness. *Psychological Bulletin*, 110(1), 86–108.
- Heatherton, T. F., Polivy, J., Herman, C. P., & Baumeister, R. F. (1993). Self-awareness, task failure, and disinhibition: How attentional focus affects eating. *Journal of Personality*, 61(1), 49–61.
- Herman, C. P., & Polivy, J. (2011). The self-regulation of eating: Theoretical and practical problems. In K. D. Vohs & R. F. Baumeister (Eds.), *Handbook of self-regulation* (2nd ed., pp. 522–536). New York, NY: Guilford Press.
- Hofmann, W., Vohs, K. D., & Baumeister, R. F. (2012). What people desire, feel conflicted about, and try to resist in everyday life. *Psychological Science*, 23(6), 582–588.
- Kabat-Zinn, J. (1990). *Full catastrophe living*. New York, NY: Delacorte Press.
- Kabatnick, R. (1998). *The Zen of eating*. New York, NY: Penguin Putnam.
- Kiefer, A., Lin, J., Blackburn, E., & Epel, E. (2008). Dietary restraint and telomere length in pre- and postmenopausal women. *Psychosomatic Medicine*, 70(8), 845–849.
- King, B. M. (2013). The modern obesity epidemic, ancestral hunter-gatherers, and the sensory/reward control of food intake. *American Psychologist*, 68(2), 88–96.
- Kristeller, J. L. (2007). Mindfulness meditation. In P. Lehrer, R. Wookfolk & W. E. Simes (Eds.), *Principles and practices of stress management* (3rd ed.). New York, NY: Guilford Press.
- Kristeller, J. L. (in press). Mindfulness, eating disorders and food intake regulation. In B. D. Ostafin, M. D. Robinson, B. P. Meier. (Eds.). *Mindfulness and self-regulation*. New York, NY: Springer.
- Kristeller, J. L., & Bolinsky, P. K. (2013). *Comparable responses of obese bingers and non-bingers to Mindfulness-Based Eating Awareness Training*. Manuscript in preparation.
- Kristeller, J. L., & Hallett, C. B. (1999). An exploratory study of a meditation-based intervention for binge eating disorder. *Journal of Health Psychology*, 4(3), 357–363.
- Kristeller, J. L., & Rodin, J. (1989). Identifying eating patterns in male and female undergraduates using cluster analysis. *Addictive Behaviors*, 14(6), 631–642.
- Kristeller, J. L., & Wolever, R. Q. (2011). Mindfulness-based eating awareness training for treating binge eating disorder: The conceptual foundation. *Eating Disorders*, 19(1), 49–61.
- Kristeller, J. L., Wolever, R. Q., & Sheets, V. (2013). Mindfulness-Based Eating Awareness Training (MB-EAT) for binge eating: A randomized clinical trial. *Mindfulness*, 19(1), 49–61.
- la Fleur, S. E., Houshyar, H., Roy, M., & Dallman, M. F. (2005). Choice of lard, but not total lard calories, damps adrenocorticotropin responses to restraint. *Endocrinology*, 146(5), 2193–2199.

- Langer, E. J. (1992). Matters of mind: Mindfulness/mindlessness in perspective. *Consciousness and Cognition*, 1(3), 289–305.
- Lillis, J., Hayes, S. C., & Levin, M. E. (2011). Binge eating and weight control: The role of experiential avoidance. *Behavior Modification*, 35(3), 252–264.
- Loring, S. (2010). *Eating with fierce kindness*. Oakland, CA: New Harbinger.
- Marlatt, G. A., & Gordon, J. R. (Eds.). (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York, NY: Guilford Press.
- May, M., & Fletcher, M. (2012). *Eat what you love, love what you eat, with diabetes*. Oakland, CA: New Harbinger.
- Miller, C. K., Kristeller, J. L., Headings, A., Nagaraja, H., & Miser, W. F. (2012). Comparative effectiveness of a mindful eating intervention to a diabetes self-management intervention among adults with type 2 diabetes: A pilot study. *Journal of the Academy of Nutrition and Dietetics*, 112(11), 1835–1842.
- Moldovan, A. R., & David, D. (2012). Features of automaticity in eating behavior. *Eating Behaviors*, 13(1), 46–48.
- Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, 126(2), 247–259.
- Nyberg, S. T., Heikkilä, K., Fransson, E. I., Alfredsson, L., De Bacquer, D., Björner, J. B., . . . IPD-Work Consortium. (2012). Job strain in relation to body mass index: Pooled analysis of 160 000 adults from 13 cohort studies. *Journal of Internal Medicine*, 272(1), 65–73.
- Pliner, P., & Fleming, A. S. (1983). Food intake, body weight, and sweetness preferences over the menstrual cycle in humans. *Physiology & Behavior*, 30(4), 663–666.
- Polivy, J. (1976). Perception of calories and regulation of intake in restrained and unrestrained eaters. *Addictive Behaviors*, 1, 237–243.
- Raspow, K., Matheson, K., Abizaid, A., & Anisman, H. (2013). Unsupportive social interactions influence emotional eating behaviors. The role of coping styles as mediators. *Appetite*, 62, 143–149.
- Raynor, H. A., & Epstein, L. H. (2001). Dietary variety, energy regulation, and obesity. *Psychological Bulletin*, 127(3), 325.
- Remick, A. K., Polivy, J., & Pliner, P. (2009). Internal and external moderators of the effect of variety on food intake. *Psychological Bulletin*, 135(3), 434–451.
- Rodin, J. (1978). Stimulus-bound behavior and biological self-regulation: Feeding, obesity, and external control. In G. E. Schwartz & D. Shapiro (Eds.), *Consciousness and self-regulation* (Vol. 2, pp. 215–239). New York, NY: Plenum.
- Rodin, J. (1981). Current status of the internal-external hypothesis for obesity: What went wrong? *American Psychologist*, 36, 361–372.
- Safer, D. L., Robinson, A. H., & Jo, B. (2010). Outcome from a randomized controlled trial of group therapy for binge eating disorder: Comparing dialectical behavior therapy adapted for binge eating to an active comparison group therapy. *Behavior Therapy*, 41(1), 106–120.
- Schachter, S. (1971). Some extraordinary facts about obese humans and rats. *American Psychologist*, 26, 129–144.
- Schwartz, G. E. (1975). Biofeedback, self-regulation, and the patterning of physiological processes. *American Scientist*, 63(3), 314–324.
- Schwartz, G. E. (1976). Self-regulation of response patterning: Implications for psychophysiological research and therapy. *Biofeedback and Self-Regulation*, 1(1), 7–30.
- Singh, N. N., Lancioni, G. E., Singh, A. N., Winton, A. S. W., Singh, J., McAleavey, K. M., Adkins, A. D. (2008). A mindfulness-based health wellness program for an adolescent with Prader-Willi syndrome. *Behavior Modification*, 32(2), 167–181.

- Sinha, R., & Jastreboff, A. M. (2013). Stress as a common risk factor for obesity and addiction. *Biological Psychiatry*, 73(9), 827–835.
- Sobik, L., Hutchison, K., & Craighead, L. (2005). Cue-elicited craving for food: A fresh approach to the study of binge eating. *Appetite*, 44(3), 253–261.
- Somov, P. (2008). *Eating the moment*. Oakland, CA: New Harbinger.
- Sørensen, L. B., Møller, P., Flint, A., Martens, M., & Raben, A. (2003). Effect of sensory perception of foods on appetite and food intake: A review of studies on humans. *International Journal of Obesity*, 27(10), 1152–1166.
- Stunkard, A. J., & Messick, S. (1985). The Three Factor Eating Questionnaire to measure dietary restraint, disinhibition and hunger. *Journal of Psychosomatic Research*, 29(1), 71–83.
- Taut, D., Renner, B., & Baban, A. (2012). Reappraise the situation but express your emotions: Impact of emotion regulation strategies on ad libitum food intake. *Frontiers in Psychology*, 3, 359.
- Timmerman, G. M., & Brown, A. (2012). The effect of a mindful restaurant eating intervention on weight management in women. *Journal of Nutrition Education and Behavior*, 44(1), 22–28.
- Tomiyama, A. J., Mann, T., Vinas, D., Hunger, J. M., DeJager, J., & Taylor, S. E. (2010). Low calorie dieting increases cortisol. *Psychosomatic Medicine*, 72(4), 357–364.
- Tremblay, A., & Chaput, J. P. (2012). Obesity: the allostatic load of weight loss dieting. *Physiology & Behavior*, 106(1), 16–21.
- van Strien, T., Herman, C. P., Anschutz, D. J., Engels, R. C., & de Weerth, C. (2012). Moderation of distress-induced eating by emotional eating scores. *Appetite*, 58(1), 277–284.
- Volkow, N. D., Wang, G. J., Tomasi, D., & Baler, R. D. (2013). Obesity and addiction: Neurobiological overlaps. *Obesity Reviews*, 14(1), 2–18.
- Wansink, B. (2007). *Mindless eating: Why we eat more than we think*. New York, NY: Bantam Books.
- Wansink, B. (2010). From mindless eating to mindlessly eating better. *Physiology & Behavior*, 100(5), 454–463.
- Wansink, B., & Sobal, J. (2007). Mindless eating: The 200 daily food decisions we overlook. *Environment and Behavior*, 39(1), 106–123.
- Wegner, D. M., Schneider, D. J., Carter, S., & White, T. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology*, 53, 5–13.