How emotions affect eating: A five-way model

Michael Macht

Department of Psychology, University of Würzburg, Marcusstr. 9-11, 97070 Würzburg, Germany

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Abstract

Despite the importance of affective processes in eating behaviour, it remains difficult to predict how emotions affect eating. Emphasizing individual differences, previous research did not pay full attention to the twofold variability of emotion-induced changes of eating (variability across both individuals and emotions). By contrast, the present paper takes into account both individual characteristics and emotion features, and specifies five classes of emotion-induced changes of eating: (1) emotional control of food choice, (2) emotional suppression of food intake, (3) impairment of cognitive eating controls, (4) eating to regulate emotions, and (5) emotion-congruent modulation of eating. These classes are distinguished by antecedent conditions, eating responses and mediating mechanisms. They point to basic functional principles underlying the relations between emotions and biologically based motives: interference, concomitance and regulation. Thus, emotion-induced changes of eating can be a result of interference of eating by emotions, a by-product of emotions, and a consequence of regulatory processes (i.e., emotions may regulate eating, and eating may regulate emotions).

Keywords: Emotion; Eating; Mood; Emotional eating; Restrained eating; Motivation; Food choice

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Introduction

Emotions serve distinct motivational functions and contribute essentially to control of basic behavioural...
systems in animals and men (e.g. Frederickson, 1998; Frijda, 1986; Izard & Ackerman, 2000; Plutchik, 1984; Tomkins, 1963). Specific emotions such as anger, fear, sadness, and joy, as well as moods that are thought to last longer and be more diffuse (e.g. Ekman, 1992; Frijda, 1993) have been found to affect eating responses along the entire process of ingestion: motivation to eat (Macht & Simons, 2000), affective responses to foods (Ferber & Cabanac, 1987; Willner & Healy, 1994), food choice (e.g. Gibson, 2006; Oliver & Wardle, 1999), chewing (Macht, 1998), eating speed (Krebs, Macht, Weyers, Weijers, & Janke, 1996), amount ingested (Greeno & Wing, 1994 for a review), as well as metabolism and digestion (Blair, Wing, & Wald, 1991; Wing, Blair, Epstein, & McDermott, 1990). Surveys demonstrate that most people experience changes of eating in response to emotional stress (on average 30% an increase and 48% a decrease of appetite or intake, Table 1). Epidemiological data indicate that stress-related eating is associated with increased body weight (Laitinen, Ek, & Sovio, 2002). Not surprisingly, effects of emotions on eating have been studied extensively, but due to their variability it remains difficult to predict how an emotion affects eating in a given group of persons.

Emotions can increase food intake in one group of persons, e.g. restrained eaters, but decrease food intake in another group, e.g. non-restrained eaters. Furthermore, different emotions may increase or decrease eating in the same group of individuals. For example, boredom may be associated with increased appetite, but sadness with decreased appetite (e.g. Pudel & Richter, 1980). This twofold variability (across individuals and emotions) has been neglected by previous research. Based on an individual difference model, it was mostly examined whether eating habits predispose people to increase food intake in response to negative emotions (Greeno & Wing, 1994). The present paper introduces an integrative model that takes into account both individual characteristics and emotion features. First, the empirical evidence on variability of emotion-induced changes of eating is summarized briefly.

### Variability of emotion-induced changes of eating

#### Variability across individuals

A series of experiments showed that restrained eaters (as identified by questionnaire; e.g. Herman & Mack, 1975; Stunkard & Messick, 1985) consume more food than non-restrained eaters in response to fear and negative mood states (for a review, see Greeno & Wing, 1994, also Heatherton, Striepe, & Wittenberg, 1998; Rotenberg & Flood, 1999; Rutledge & Linden, 1998; Tuschen, Florin, & Baucke, 1993). Restrained eating refers to a persistent pattern of eating-related cognitions and behaviours in order to reduce or to maintain body weight (Herman & Mack, 1975). Another experiment demonstrated that emotional eaters (also identified by questionnaire; van Strien, Frijters, Bergers, & Defares, 1986) consume more sweet, high-fat foods in response to emotional stress than non-emotional eaters (Oliver, Wardle & Gibson, 2000). Field studies showed that negative emotional states in everyday life can be associated with a tendency to eat as an emotion regulation strategy (Macht, Haupt, & Ellgring, 2005; Macht & Simons, 2000). Emotional eating is thought to be instigated in order to cope with negative emotions (Bruch, 1973; Kaplan & Kaplan, 1957).

Probably, the influences of both eating habits are reflected in effects of emotions on binge eating. Negative emotions have been found to increase the tendency to binge in bulimia nervosa and the binge eating disorder (experiments: Agras & Telch, 1998; Cattanach, Malley, & Rodin, 1988; Chua, Touyz, & Hill, 2004; Gluck, Geliebter, Hung, & Yahav, 2004; Telch & Agras, 1996; field studies: Alpers & Tuschen-Caffier, 2001; Cooper & Bowskill, 1986; Davis, Freeman, & Garner, 1988; Johnson & Larson, 1982; Kenardy, Arnow, & Agras, 1996). Taken together, studies indicate that restrained eaters increase food intake, emotional eaters consume more sweet, high-fat foods, and binge eaters tend to binge in response to negative emotions.

By contrast, normal eaters (i.e. normal-weight persons whose emotional and restrained eating scores fall within the normal range) are usually assumed to reduce food intake in response to negative emotions (Herman & Polivy, 1984; Schachter, Goldman, & Gordon, 1968). The evidence does not support this assumption. Table 2 summarizes experimental studies in normal-eating populations: 43% of the results indicate an increase, 39% a decrease and 26% no change of eating in response to emotions (as shown by Bellisle et al. (1990), in the latter studies possibly one part of the sample reduced and the other part increased food intake).

Similarly, surveys and field studies showed that stress and negative emotions can be associated with both increased and decreased motivation to eat and food intake.

<table>
<thead>
<tr>
<th>Change of eating</th>
<th>N</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>11% more appetite, 70% less appetite</td>
<td>364</td>
<td>Krumbacher and Meyer (1963)</td>
</tr>
<tr>
<td>16% more appetite, 38% less appetite</td>
<td>1950</td>
<td>Pudel and Richter (1980)</td>
</tr>
<tr>
<td>25% more appetite, 32% less appetite</td>
<td>1024</td>
<td>Pudel (1984)</td>
</tr>
<tr>
<td>44% eat more, 48% eat less</td>
<td>80</td>
<td>Willenbring et al. (1986)</td>
</tr>
<tr>
<td>4% eat more, 55% eat less</td>
<td>475</td>
<td>Popper et al. (1989)</td>
</tr>
<tr>
<td>49% eat more, 51 do not eat more</td>
<td>500</td>
<td>Spillman (1990)</td>
</tr>
<tr>
<td>55% eat more, 45% do not eat more</td>
<td>101</td>
<td>Weinstein et al. (1997)</td>
</tr>
<tr>
<td>38% eat more, 42% eat less</td>
<td>212</td>
<td>Oliver and Wardle (1999)</td>
</tr>
</tbody>
</table>
Based on this evidence, it is difficult to predict how normal eaters change eating in response to emotions. Variability across emotions

Dimensions used to classify emotions, namely valence (pleasure–displeasure), arousal (e.g. Greenwald, Cook, & Lang, 1989; Russell & Feldman Barrett, 1999) and intensity (Frijda, Ortony, Sonnemans, & Clore, 1992), have been found to make an essential contribution to variability of emotion-induced changes of eating. There is clear evidence that emotions differing in valence and arousal or intensity exert different influences on eating.

Animal studies point to a role of intensity for the direction of effects of emotional stress on food intake. Rats decrease food intake during intense noise (Alario, Gamaillo, Beato, & Trancho, 1987; Paré, 1964), in response to intense electric shock (Strongman, 1965; Weiss, 1968), and during chronic stress (Sampson, Muscat, Philips, & Willner, 1992: Willner, Muscat, & Papp, 1992), but increase food intake or eating speed in response to low or moderate noise and electric shock (Krebs et al., 1996; Kupferman, 1964; Rasbury & Shemberg, 1971; Sherrer, 1965; Strerritt, 1963; Strongman, Coles, Remington, & Woonkey, 1970; Ullman, 1951, 1952). Results of a human study correspond to these data (Mehrabian, 1980). Participants imagined themselves in various emotions and reported how much they would eat during each of these emotions. Compared with low-arousal states (e.g. boredom, depressive mood) high-arousal states (e.g. tension, fear) were reported to inhibit food intake. These results support the view that high-arousal or intense emotions decrease food intake whereas low- to moderate emotions may increase food intake (Robbins & Fray, 1980).

### Table 2

Effects of emotions on eating: experimental studies in normal subjects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Eating measure</th>
<th>Emotion</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase</td>
<td>Food intake</td>
<td>Negative mood</td>
<td>Lowe and Maycock (1988)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fear</td>
<td>Willner et al. (1998)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arousal</td>
<td>Pines and Gal (1977)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arousal</td>
<td>Bellisle et al. (1990)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arousal</td>
<td>Glass (1967)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arousal</td>
<td>Cantor et al. (1982)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arousal</td>
<td>Grunberg and Straub (1992)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boredom</td>
<td>Abramson and Stinson (1977)</td>
</tr>
</tbody>
</table>
|         |                | Anger            | Pollard, Steptoe, Canaan, Davies, & Wardle, 1995; Rosenfield & Stevenson, 1988; Slochower, 1983; Steptoe, Lipsey, & Wardle, 1998; Stone & Brownell, 1994; Striegel-Moore et al., 1999; Wardle, Steptoe, Oliver, & Lipsey, 2000; Weidner, Kohlmann, Dotzauer, & Burns, 1996). Based on this evidence, it is difficult to predict how normal eaters change eating in response to emotions.

### Variability across emotions

Dimensions used to classify emotions, namely valence (pleasure–displeasure), arousal (e.g. Greenwald, Cook, & Lang, 1989; Russell & Feldman Barrett, 1999) and intensity (Frijda, Ortony, Sonnemans, & Clore, 1992), have been found to make an essential contribution to variability of emotion-induced changes of eating. There is clear evidence that emotions differing in valence and arousal or intensity exert different influences on eating.
Human studies demonstrated that positive and negative emotions could differ markedly in their effects on eating. Negative emotions such as anger, fear, and sadness may increase impulsive eating (i.e., fast and irregular eating directed at any food available), eating to regulate the emotional state and consumption of junk food, but decrease food pleasantness. By contrast, joy and other positive emotions increase food pleasantness and consumption of healthy foods (Lyman, 1982; Macht, 1999; Macht, Roth, & Ellgring, 2002).

To summarize, high-arousal or intense emotions suppress eating, and negative emotions can increase or decrease food intake. Little is known about effects of positive emotions on eating and about differences between negative emotions such as anger, sadness and fear in their effects on eating. Clinical studies indicate that anger is an important antecedent of binge eating (Arnow, Kenardy, & Agras, 1992). It has also been suggested that disgust contributes to the maintenance of pathological eating patterns and may complicate attempts to normalize eating (Troop, Treasure, & Serpell, 2002).

**Previous theories**

During the past decades, a number of theories have attempted to explain the manifold effects of emotions on eating. Whereas emotion-induced increase of food intake was explained by psychological mechanisms (Bruch, 1969, 1973; Heatherton & Baumeister, 1991; Herman & Polivy, 1984; Slochower, 1983), physiological mechanisms were proposed to explain emotion-induced decrease of intake (Herman & Polivy, 1984; Schachter et al., 1968; Willner, 1997). Biologically oriented theories emphasized the adaptive function of changes of feeding behaviour in stressful situations (Cantor, 1981; Lima, 1987; Whishaw, Dringenberg, & Comery, 1992). As can be seen from Table 3, previous theories aim at different phenomena, propose different mediating mechanisms and differ in scope. It has been a major problem for research that theories were mostly treated separately. Therefore, a general framework is provided in the following. It is suggested that emotions affect eating in five basic ways, which encompass phenomena addressed by previous theories.

**A five-way model**

As shown above, a number of factors were identified that make an essential contribution to emotion-induced changes of eating: arousal/intensity, valence and food relatedness of emotions as well as restrained and emotional eating. Taking into account these factors as antecedents, effects of emotions on eating can be classified into five basic classes:

1. Emotions aroused by food stimuli affect food choice.
2. Emotions high in arousal or intensity suppress eating due to incompatible emotional responses.
3. Emotions moderate in arousal or intensity affect eating depending on motivations to eat:
   - (a) In restrained eating, negative and positive emotions enhance food intake due to impairment of cognitive control.
   - (b) In emotional eating, negative emotions elicit the tendency to be regulated by eating and, as a consequence, enhance intake of sweet and high-fat foods.
   - (c) In normal eating, emotions affect eating in congruence with their cognitive and motivational features.

The flow diagram in Fig. 1 gives a visual presentation.
Emotions of low arousal or intensity are not expected to affect eating. In the following, each class is described in detail.

**Food-induced emotions control food choice**

Food-induced emotions are powerful determinants of food choice (Galef, 1996; Martins & Pliner, 2005; Rozin & Schulkin, 1990). Tasting energy-dense food such as sugar and fat evokes positive affective responses that promote ingestion, whereas tasting bitter compounds, which are correlated with toxins, evokes negative affective responses that promote rejection (Rosenstein & Oster, 1988; Steiner, 1979). The biological basis of these affective reactions is demonstrated in homology across primate species (Steiner, Hawilo, Glaser, & Berridge, 2001). Notably, food-induced emotional responses encompass full-blown emotions, in particular, neophobia and disgust (Raudenbush & Frank, 1999; Rozin & Fallon, 1987).

Appetitive food-related stimuli can elicit a strong desire to eat or craving that can be conceived as an additional variant of food-induced emotions. Such craving co-occurs with a number of autonomic responses (Nederkoorn, Smulders, Havermans, & Jansen, 2004; Nederkoorn, Smulders, & Jansen, 2000) which vary across individuals and can contribute to binge eating (Jansen, 1998). A number of studies demonstrated heightened cue reactivity in restrained eaters, binge eaters and bulimics as compared to controls (Carter, Bulik, McIntosh, & Joyce, 2001; Federoff, Polivy, & Herman, 2003; Karhunen, Lappalainen, Tammela, Turpeinen, & Uusitupa, 1997; Staiger, Dawe, & McCarthy, 2000), although lack of differences between groups has also been reported (e.g. Klaijner, Herman, Polivy, & Chhabra, 1980; Overduin, Jansen, & Eilkes, 1997). It is important to recognize that in some persons by contingent pairing of emotions and eating, emotions may become food-related cues and thus elicit eating (Booth, 1994).

**Intense emotions suppress food intake**

Animal studies demonstrated that intense or chronic stress sharply decreases food intake (for reviews see Greeno & Wing, 1994; Robbins & Fray, 1980, Section “Variability across emotions”). Consequently, it was proposed that a decreased food intake is the “natural” response to stress.
(Herman & Polivy, 1984; Schachter et al., 1968). In fact, intense emotions are linked with both behaviours and physiological responses that interfere with eating. For example, intense sadness is associated with behavioural deactivation and withdrawal from the environment. Intense fear motivates flight and avoidance, and is also associated with autonomic responses inhibiting motivation to eat. Stress-induced physiological changes may interfere with digestion by delaying glucose absorption and gastrointestinal transit (Blair et al., 1991; Wing et al., 1990).

Negative and positive emotions impair cognitive eating controls

Restraint theory suggested that emotional stress disinhibits dietary restraint and therefore increases food intake (Herman & Polivy, 1984). In this view, negative emotions were thought to undermine restrained eaters’ ability to continue dieting, because they impose a “more urgent concern (i.e., how to cope with the stressor) than even dieting” and lead to eating “as if the diet boundary had been knocked down” (p. 152). The diet boundary was conceived as “the dieter’s self-imposed quota for consumption on a given occasion” (p. 149). Although this appeared to be a plausible explanation, the common experimental design comparing individuals with high or low scores on restraint scales was not appropriate to test putative mediating mechanisms (Greeno & Wing, 1994).

An alternative explanation was suggested by Boon, Stroebe, Schut, and Jansen (1998). According to their “limited capacity hypothesis”, restrained eaters’ food intake is increased, if their cognitive capacity to maintain restricted food intake is limited by distraction (be it emotional or not). Processing of emotional stimuli requires attention, and since cognitive capacity is limited, cognitive control over eating may be impaired. The overeating response was attributed to ironic processes, i.e., the more people exert cognitive control, the higher their vulnerability to overeating will be. A number of experimental studies supported this assumption (Boon, Stroebe, Schut, & JIntema, 2002; Boon et al., 1998; Lattimore & Caswell, 2004; Lattimore & Maxwell, 2004; Vreugdenberg, Bryan, & Kemps, 2003; Wallis & Hetherington, 2004; Ward & Mann, 2000).

Emotional eating theory originated from psychodynamic thinking, but can be related to a number of more recent approaches. The core assumption of the theory (i.e., that negative emotions induce eating and are, as a result, reduced) has been viewed from a learning perspective, with negative emotions as eliciting stimuli, eating as operant behaviour, and its consequence, the eating-induced reduction of negative emotions, as negative reinforcement (Booth, 1994). Regulation was also taken into account by biological approaches which conceptualized arousal-induced eating as “adjunctive behaviour” or “displacement activity” that reduces arousal (Cantor, 1981). Finally, eating has been viewed as a strategy to improve negative mood (Thayer, 1989, 2001), to mask stress (masking hypothesis; Polivy & Herman, 1999), or to escape from aversive self-awareness (escape theory; Heatherton & Baumeister, 1991).

In spite of its popularity and plausibility, the concept of emotional eating does however face some unresolved problems. Above all, the underlying mechanisms are far from clear. Usually, nutrient-dependent physiological changes are proposed to mediate mood-elevating effects of eating. Carbohydrate-rich meals may lead to a postprandial improvement of mood (for reviews see Benton & Donohoe, 1999; Christensen, 1993, 1997; Gibson & Green, 2002) and also to reduced stress responses in emotionally labile subjects (Markus, Panhuysen, & Tuiten, 1998). These effects were explained by meal-induced increase of brain serotonin availability (Wurtman, 1982). However, relatively small proportions of protein in a meal may deteriorate the increase of tryptophan levels at the blood–brain barrier and, thus, an increase of brain serotonin. Since most carbohydrate-rich meals in everyday life contain some protein, the ecological validity of the serotonin hypothesis can be questioned (Benton, 2002). Another physiological mechanism is suggested by animal data demonstrating that ingestion of high fat and carbohydrate “comfort foods” (Wansink, Cheney, & Chan, 2003) reduces activity of the hypothalamo-pituitary–adrenal axis and dampens stress responses (Dallman et al., 2003).

The main problem with both the serotonin and the endocrine hypothesis is that emotional effects of eating can occur only with delay. Such delayed effects might be useful for coping with chronic stress, but not for responding to negative emotions, as they arise from unpredictable stimuli such as daily hassles. In order to cope with these emotions, it would be most efficient to reduce their intensity immediately. Indeed, sweet solutions have been shown to rapidly calm stress responses in human newborns (Smith, Fillion, & Blass, 1990). Similarly, in adults, experimentally
induced negative mood is improved immediately and selectively after eating palatable food, and this effect is most pronounced in persons scoring high on emotional eating (Macht & Müller, 2007). This suggests that immediate positive affective reactions elicited by palatable foods diminish the impact of stress. Additionally, it may be important here that eating distracts from the experience of negative emotions (Spitzer & Rodin, 1983). One might speculate that immediate effects of eating based on hedonistic mechanisms and distraction, play a major role in the regulation of everyday emotions and constitute a common phenomenon that applies to the general population. By contrast, in binge eating, immediate hedonic effects may be backed up or substituted by delayed and long-lasting physiological effects of chronic high fat and carbohydrate consumption.

Emotions modulate eating in congruence with emotion features

During negative mood, negative verbal information is retrieved more readily than positive information, and conversely, positive information is retrieved more readily during positive mood (for a review, see Berkowitz, 2000, pp. 78–83). This congruency effect was also shown for recognition of palatable and unpalatable food flavours (Pliner & Steverango, 1994) as well as for emotion-induced changes of eating. Sadness has been found to decrease and joy to increase food pleasantness and motivation to eat (Macht et al., 2002; Willner & Healy, 1994). These changes can be explained by emotion features. Sadness is associated with a slowing of cognitive processes and motor activity (Izard & Ackerman, 2000), with an absence of interest (Frijda, 1986, p. 22), and with a lowering of attention to the outside (Barr-Zisowitz, 2000). By contrast, joy is associated with an increased capability to perceive and process stimuli and an increased readiness to engage in activities (Frederickson, 1998; Frijda, 1986; Izard & Ackerman, 2000). Such emotion-congruent changes of eating can be conceived as a by-product of emotional activation, and should mostly occur, if emotions are elicited during eating.

Discussion

The present paper proposes five basic classes of emotion-induced changes of eating that can be predicted by antecedent conditions and point to basic functional principles relating emotions and eating. Depending on emotion features and eating habits emotion-induced changes of eating can be a result of interference (suppression of food intake; impairment of cognitive eating controls), a by-product of emotions (emotion-congruent modulation of eating), and a consequence of regulatory processes (emotional control of food choice; eating to regulate emotions). Future research may examine whether these principles can be applied to relations between emotions and other biologically motivated behaviours such as thirst, sex and aggression. To improve understanding of the manifold effects of emotions on eating research has to disentangle mediating mechanisms and to identify relations between classes of emotion-induced changes of eating. In particular, two problems remain to be resolved.

Emotion-induced eating in restrained and emotional eaters

Negative emotions increase food intake in restrained eaters as well as intake of sweet, high-fat food in emotional eaters (Section “Variability across individual”). To explain these findings, it was suggested that emotional eaters eat to reduce negative emotions. By contrast, restrained eaters were thought to increase food intake, because emotions impair cognitive control over their restricted eating pattern (Sections “Negative and positive emotions impair cognitive eating controls” and “Negative emotions elicit eating to regulate emotions”). Although restrained and emotional eating appear to reflect different neurobiological processes (Volkow et al., 2003), it remains unclear whether increased consumption in response to emotions is in fact mediated by different mechanisms in restrained and emotional eaters. The present model suggests two ways to test empirically the assumption of different mechanisms.

First, emotional and restrained eaters should differ in their eating responses to various emotions and stressors. Provided that cognitive control of eating can be impaired by a variety of influences, restrained eaters should increase food intake in response to both negative and positive emotions and also to cognitive demand. By contrast, emotional eaters should increase eating only in response to negative emotions. Second, emotion-induced eating should exert different effects on emotional state in emotional and restrained eaters. Consistent with the assumption that emotional eaters increase food intake to reduce negative emotions, they can be expected to report reduced negative emotions due to eating. By contrast, restrained eaters should experience no change of mood due to emotion-induced eating or may even report deterioration of mood (because of fear to gain weight).

There is some evidence supporting these predictions. Restrained eaters have indeed been shown to increase food intake not only in response to negative emotions, but also to positive emotions (Cools, Schotte, & McNally, 1992; Tuschen et al., 1993) and cognitive demand (e.g. Wallis & Hetherington, 2004); it remains, however, to be examined whether emotional eaters’ intake can also be increased by positive emotions and non-emotional stressors. Also, improvement of experimentally induced negative mood by eating has been found to be correlated with emotional, but not with restrained eating (Macht & Müller, 2007). In spite of this evidence, however, more studies comparing emotion-induced changes of eating in restrained and emotional eaters are needed.
Emotion-induced eating in normal eaters

In normal eaters, negative emotions decrease or increase food intake. The five-way model explains decreased intake, depending on emotion intensity, by emotion-congruent modulation (Section “Intense emotions suppress food intake”) or emotional suppression of eating (Section “Emotions modulate eating in congruence with emotion features”), but it remains unclear how to explain increased intake in normal eaters. To understand this phenomenon, it should be recognized that emotional and restrained eating are regarded as continuous variables and that persons are classified as emotional or restrained eaters, if they score high on these continua. For example, emotional eaters may be defined as lying above the 80th percentile of scores in the most appropriate norm group (van Strien, 2002; personal communication). These persons can be expected to eat in order to regulate negative emotions frequently and consistently across situations. Presumably, a high proportion of their meals and snacks is based on the motivation to eat in order to cope with negative emotions. Persons with low scores of the emotional eating scale (e.g. below the 50th percentile) can be expected to experience this motivation, if at all, less frequently and less consistently. However, normal eaters with moderate emotional eating scores (e.g. between the 60th and 80th percentile) may occasionally also eat to cope with negative emotions. In these persons, a transient tendency to regulate emotions by eating may enhance consumption during emotions, although they are not classified as emotional eaters.

It has indeed been demonstrated that normal eaters increase motivation to regulate emotions by eating in response to negative emotions induced in the laboratory (Bekker, van de Meerendonk, & Mollerus, 2004) and experienced in everyday life (Macht et al., 2005; Macht & Simons, 2000). Similarly, normal eaters may occasionally restrict eating, although they do not score very high on restraint scales, and thus enhance their susceptibility to emotion-induced eating. It can therefore be assumed that normal eaters increase intake due to transient shifts in motivations to eat. In other words, impairment of cognitive eating controls and emotion regulation eating (Sections “Negative and positive emotions impair cognitive eating controls” and Negative emotions elicit eating to regulate emotions) may occasionally also occur in normal eaters.

Future research is needed to test the hypothesis that transient shifts in motivations to eat enhance susceptibility in normal eaters to increase intake in response to emotions. A suitable starting point for an experimental approach could be a study by Willner et al. (1998), who reinforced responses with chocolate under a progressively increasing work requirement and showed that craving for and intake of chocolate were increased by depressive mood. It remains to be examined whether the linking of operant responding for food and depressive mood can transiently increase motivation to eat in order to regulate mood in persons not classified as typical emotional eaters.

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