

**Why we eat what we eat:  
Psychological influences on eating behavior**

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## Zusammenfassung

Die vorliegende Dissertation beschäftigt sich mit psychologischen Einflussfaktoren auf das Ernährungsverhalten. Ein tieferes Verständnis dafür, warum Menschen essen, was sie essen, ist für die Entwicklung von Interventionen, um ‚normales‘ Essverhalten zu fördern und Essstörungen vorzubeugen, von zentraler Wichtigkeit. Diese Motive des Ernährungsverhaltens können weiterhin als individuelle Einflussfaktoren, neben situativen Einflussfaktoren, eine gesunde Ernährung begünstigen (Pull-Faktoren) oder diese erschweren (Push-Faktoren). Die Identifikation von individuellen und situativen Push- und Pull-Faktoren ist zentral für die Prävention und Behandlung von Adipositas und den damit einhergehenden Erkrankungen. Diese Arbeit umfasste deshalb drei verschiedene Ziele. Das erste Ziel dieser Dissertation war die umfassende Zusammenstellung einer großen Bandbreite an Motiven des normalen Essverhaltens, sowie die Entwicklung und empirische Erprobung eines psychometrischen Messinstruments (The Eating Motivation Survey, TEMS) zur Erfassung dieser Motive. Das zweite Ziel dieser Dissertation war es, den Einfluss von individuellen Push- und Pull-Faktoren auf das Ernährungsverhalten zu untersuchen und das dritte Ziel beinhaltete die Untersuchung des gemeinsamen Einflusses von individuellen und situativen Variablen auf das Ernährungsverhalten.

In einem ersten Schritt wurden Motive aus der bestehenden Literatur extrahiert, Diätassistentinnen und -assistenten, als praktisch tätige Ernährungsexperten, interviewt, sowie strukturierte Expertendiskussionen mit Psychologinnen und Psychologen der Universität Konstanz geführt. Dieses Vorgehen ergab eine Zusammenstellung von insgesamt 331 Motiven. Auf dieser Basis wurde eine vorläufige Version des TEMS erstellt, die in einem zweiten Schritt in einer Stichprobe von 1.250 Personen getestet wurde. Exploratorische Faktorenanalysen ergaben 13 zugrunde liegende Motivfaktoren. Anhand dieser Ergebnisse wurde die vorläufige Version des TEMS in einem dritten Schritt überarbeitet. Die resultierende finale Version des TEMS mit 15 Motivfaktoren, sowie eine Kurzversion des Fragebogens, zeigten in einer weiteren Stichprobe von 1.040 Personen in

konfirmatorischen Faktorenanalysen eine gute Modelpassung. Als Motivfaktoren wurden *Appetit, Gewohnheit, Hunger, Gesundheit, Einfachheit, Genuss, Traditionen, Natürlichkeit, Gemeinschaft, Preis, Präsentation, Gewichtskontrolle, Affektregulation, soziale Normen* und *soziales Image* identifiziert. Die Aufzählung orientiert sich daran, wie häufig diese Motive als Gründe dafür, überhaupt zu essen und bestimmte Speisen zu wählen, genannt wurden. Die Faktorenstruktur zeigte sich als stabil über die Geschlechter hinweg, sowie über Personen mit niedrigem und hohem Body Mass Index (BMI) hinweg. Allerdings unterschieden sich die Geschlechter, verschiedenen BMI- sowie Altersgruppen hinsichtlich der Relevanz der Motive. Interessanterweise zeigten sich relativ hohe Zusammenhänge zwischen soziokulturellen Motiven, das heißt zwischen den Motiven, *in Gemeinschaft zu essen, sozialen Normen* oder *Traditionen gerecht zu werden*, sowie bei der Wahl von Speisen *auf den Eindruck, den dies bei anderen hervorrufen könnte, zu achten (Soziales Image)*. Diese kohäsiven Motive hingen wiederum hoch mit biologischen Motiven zusammen, wie dem Motiv, zu essen, *weil etwas appetitlich aussieht (Präsentation)* oder *weil dies mit positiven Emotionen einhergeht (Genuss)*. Im Gegensatz dazu waren *gesundheitliche* Gründe für die Wahl von Speisen nur mit dem *Bestreben nach Gewichtskontrolle* und der *Natürlichkeit von Speisen* als Motive für das Ernährungsverhalten assoziiert. Existierende Interventionen zur Förderung der Gesundheit beschränken ihren Fokus jedoch weitgehend auf diese gesundheitlichen Gründe. Um aber das Ernährungsverhalten nachhaltig zu ändern, könnte es nötig sein, diese gesundheitlichen Aspekte mit sozialen und biologischen Motiven in Verbindung zu bringen.

Um den Einfluss dieser individuellen Variablen darauf zu untersuchen, wie gesund sich die jeweiligen Personen ernähren, wurde exemplarisch der gemeinsame Einfluss des *Affektregulationsmotivs*, als potentieller Push-Faktor, und des Motivs sowie der Fähigkeit zur *Gewichtskontrolle*, als potentielle Pull-Faktoren, untersucht. In einer Querschnittserhebung mit 761 Frauen waren sowohl das Motiv als auch die Fähigkeit zur *Gewichtskontrolle* unabhängig voneinander mit einer gesünderen Ernährung assoziiert, wobei das *Affektregulationsmotiv* mit einer ungesünderen Ernährung einherging. Eine optimale

Ernährung zeigten nur Personen, bei denen sowohl das Motiv als auch die Fähigkeit zur *Gewichtskontrolle* hoch ausgeprägt waren. Jedoch berichteten selbst diese hoch kontrollierten Personen eine ungesündere Ernährung, wenn gleichzeitig das *Affektregulationsmotiv* hoch ausgeprägt war. Die ungesündeste Ernährung wiesen diejenigen Personen auf, die ein niedriges Motiv und eine niedrige Fähigkeit zur *Gewichtskontrolle*, sowie ein hohes *Affektregulationsmotiv* hatten. Folglich sollten in Theorie und Praxis bei der Frage nach Einflussfaktoren einer gesunden Ernährung sowohl begünstigende (Pull-Faktoren) als auch erschwerende (Push-Faktoren) Faktoren berücksichtigt werden.

Zuletzt wurde der gemeinsame Effekt von individuellen und situativen Einflussfaktoren auf das Ernährungsverhalten untersucht. Als situativer Einflussfaktor wurde die soziale Situation in einer experimentellen Studie manipuliert. Im Gegensatz zum Schwerpunkt vorangegangener Forschung auf negative soziale Situationen, lag der Fokus dieser Studie auf der Wirkung einer positiven sozialen Situation auf das Essverhalten im Vergleich zu einer neutralen und zu einer negativen sozialen Situation. Die Wirkung dieser situativen Einflussfaktoren wurde in Abhängigkeit des individuellen *Motivs, bei Stress mit anderen mehr oder weniger zu essen*, betrachtet. Konkret wurde die soziale Situation manipuliert, indem die Teilnehmenden entweder von einem angeblich zweiten Teilnehmenden zurückgewiesen wurden (soziale Ausschluss-Bedingung) oder sehr positives Feedback von diesem erhielten (soziale Einschluss-Bedingung). Die soziale Zurückweisung in der Ausschluss-Bedingung führte bei Teilnehmenden mit dem *Motiv, bei Stress mit anderen mehr zu essen*, im Vergleich zu Teilnehmenden ohne dieses Motiv, zu einem erhöhten Eiscreme-Konsum in einem nachfolgenden, angeblichen Geschmackstest. Die soziale Einschluss-Bedingung bewirkte hingegen, dass sich dieses Muster umkehrte. In dieser Bedingung aßen Teilnehmende, die angaben, *bei Stress mit anderen gewöhnlich weniger zu essen*, deutlich mehr Eiscreme als Teilnehmende mit der Tendenz, *bei Stress mit anderen mehr zu essen*. Folglich lässt sich der Einfluss der sozialen Situation auf das Essverhalten nur verstehen, wenn gleichzeitig das individuelle Motivmuster berücksichtigt



wird. Die Erweiterung der situativen Perspektive durch die Untersuchung einer positiven Situation zeigte, dass Personenvariablen, die in der Literatur häufig als Pull-Faktoren verstanden werden (wie z.B. die Tendenz, *bei Stress weniger zu essen*), in einer anderen Situationskonstellation zu einem umgekehrten Effekt führen können.

Im Gegensatz zum Schwerpunkt bisheriger Forschung auf pathologisches und stressbezogenes Essverhalten, beschäftigt sich die vorliegende Dissertation mit dem normalen Essverhalten und der Wirkung positiver Situationen. Um den vielen Einflüssen darauf, warum Menschen essen, was sie essen, gerecht zu werden, wurde in dieser Arbeit ein umfassender Ansatz gewählt. Dieser beinhaltet die Zusammenstellung multipler Motive sowie die Untersuchung von deren gemeinsamer Wirkung auf das Essverhalten, auch in Kombination mit situativen Variablen. Mit diesem umfassenden Ansatz war es möglich, Verknüpfungen zwischen einzelnen Motiven zu identifizieren, die Hinweise für die Entwicklung von Interventionen zur Gesundheitsförderung liefern.

## Summary

The present dissertation addresses psychological influences on eating behavior. Understanding why people eat what they eat in everyday life, that is, motives for eating behavior, is crucial for the development of interventions to promote normal eating and to prevent eating disorders. Furthermore, enhancing knowledge about both, individual and situational factors facilitating (pull factors) or impeding (push factors) healthy eating is essential for the prevention and treatment of obesity and its accompanying diseases. Accordingly, this dissertation encompassed three different goals. The first goal was to capture a wide range of motives underlying normal eating behavior and to develop on this basis a concise questionnaire, that is, the Eating Motivation Survey (TEMS). The second goal of this dissertation was to investigate the impact of these individual variables on dietary healthiness and the third goal was to examine the conjoint influence on eating behavior of both, individual and situational factors.

In a series of studies, in a first step motives were brought together from existing literature, interviews with practical working nutrition experts, and from structured expert discussions with health psychologists of the University of Konstanz. From this composition of 331 motives, we developed a preliminary version of the TEMS. In a second step, 1,250 participants filled in this questionnaire, yielding 13 motive factors in exploratory factor analysis. Based on these results, the preliminary TEMS was refined to 15 motive factors and tested in another sample of 1,040 participants in a third step. Confirmatory factor analyses yielded a satisfactory model fit for a full and a brief survey version. The motive factors were *Liking, Habits, Need & Hunger, Health, Convenience, Pleasure, Traditional Eating, Natural Concerns, Sociability, Price, Visual Appeal, Weight Control, Affect Regulation, Social Norms,* and *Social Image*, ordered according to the reported frequency of motives to trigger eating behavior. Factorial structure was generally invariant across gender and body mass index (BMI), which indicates a high stability for the Eating Motivation Survey scales. On the mean level, however, significant differences in motives for eating and food choice associated with

gender, age, and BMI emerged. Interestingly, factorial correlations suggested that socio-cultural motives such as *sociability*, *social norms*, *traditions*, and *social image* concerns were highly related to each other. However, they were also related to biological motives like *visual appeal* and *pleasure*. In contrast, *health concerns*, which are typically promoted by public health interventions, were only related with the *weight control* motive and *natural concerns*. In order to trigger sustainable eating behavior changes, health concerns may need to be positively related to social and biological incentives for eating.

To examine the impact of these individual factors on eating behavior, that is, dietary healthiness, we exemplarily investigated the conjoint impact of the motive to eat *to regulate negative affect*, as a potential push factor, and the motive and capacity for *weight control*, as potential pull factors. In a cross-sectional survey study ( $N = 761$  women) both, a high motive and capacity for *body weight control* predicted dietary healthiness independently, whereas a high *affect regulation motive* was associated with a more unhealthy dietary pattern. An optimal dietary pattern was only present in participants with both, a high motive and capacity for *weight control*. However, even these highly controlled women showed a decrease in healthy eating if they simultaneously had a high *tendency to regulate negative affective states through eating*. The most unhealthy dietary pattern was present in participants with low motive and capacity for *weight control* as well as a high *motive to eat in response to negative emotions*. Thus, in theory and practice it seems important to account for both, factors facilitating (pull factors) and impeding (push factors) healthy eating, when asking for influences on dietary healthiness.

Last, the conjoint impact of both, individual and situational influences on eating behavior was examined in an experimental setting. As situational influences we manipulated characteristics of the social situation. In contrast to previous research, focusing on stressful social situations, we focused on the effect of a positive social situation on eating behavior compared to a neutral and negative social situation. The effect of this situational manipulation was regarded in dependence of the individual *motive to eat in response to*

*stress*. Manipulating the social situation, participants were either rejected by an ostensible second participant (social exclusion condition), or the experimenter delivered very positive feedback from this second participant (social inclusion condition). Social exclusion led participants with *motive to eat in response to stress* (stress eaters) to an increased consumption of ice cream in a subsequent ostensible taste test compared to participants without this motive (stress fasters). Social inclusion, however, reversed this pattern, causing stress fasters to eat significantly more ice cream than stress eaters. Hence, understanding the impact of the social situation on eating behavior requires accounting for people's individual motives. Extending the situational perspective through the investigation of a positive social situation showed that individual variables, which have been discussed as pull factors in previous research (i.e., the *tendency to eat less when stressed*), can also act as push factors in dependence of situational variables.

In contrast to previous research, focusing on pathological and stress-related eating behavior, this dissertation addressed normal eating and the effect of positive situations. To account for the multiple factors, influencing eating behavior, this dissertation followed a comprehensive approach. This included bringing together multiple eating motives as well as the investigation of their conjoint impact on eating behavior, also in combination with situational variables. Choosing this comprehensive approach, we identified relations between eating motives, which may have implications for the development of interventions to promote health.

## 1 General Introduction

In 1900, the New York Times reported that human beings spend nearly seven years of their lives eating and drinking. More than 100 years later, probably this has not changed much. However, what did change in the last decades is the variety of available food products (McCrorry et al., 1999). Today we can choose from a virtually endless array of food items. In the western world, supermarkets offer up to 60,000 different food items. Looking at this diversity as well as at the importance of eating in our lives poses the question why we actually eat what we eat. In the past, however, research on this interesting issue has most often concentrated on the pathology of eating, namely on eating disorders or how eating behavior of already obese or overweight people can be changed. This 'pathology'-focused approach to eating behavior has become increasingly dominant in research since diet-related diseases are the leading causes of death worldwide (WHO, 2008).

In the present dissertation, the focus was switched from the pathology of eating to the question, why people eat what they eat under 'normal' circumstances, that is, in the absence of pathology. The basic idea is that, by concentrating on the 'normal' end of the eating behavior scale instead of focusing on the pathological end, factors underlying eating behavior can be identified, which might shed insights on crucial factors and mechanisms helping to prevent pathological changes and developments in eating behavior. However, what is normal eating behavior?

Much too often, normal eating behavior has simply been defined as the absence of pathology (Herman & Polivy, 1996). However, such a negative definition might not be very helpful for the development of weight loss interventions since it would imply telling obese people that, if they want to be normal-weight, they just should not be obese any more. In another attempt, the German Nutritional Society (Deutsche Gesellschaft für Ernährung) defines normal eating as eating a certain amount of calories per day, consisting of 55% carbohydrates, 30% fat, and 15% proteins, for example. While this definition contains at least concrete information about what to do, it nevertheless does not seem 'species-appropriate' to

analyze calorie content and nutrient composition of every meal before eating. Alternatively, normal eating has been defined as eating when hungry and stopping to eat when sated (Schachter, 1968; Tylka, 2006). However, Herman (1996) concluded that such a simple hunger-satiety model does not adequately capture what constitutes normal human eating since important social and cognitive influences are disregarded. Thus, a comprehensive definition of normal eating is needed, that goes beyond the absence of pathology or presence of physiological needs to allow for an efficient treatment and prevention of pathological changes in eating behavior. As Herman (1996) suggested, such a comprehensive definition for normal eating behavior can be established by taking into account also social and cognitive influences. Hence, understanding why we eat what we eat, that is, psychological motives for eating behavior, is a promising approach for a comprehensive definition of normal eating.

If we knew which motives usually trigger eating behavior, this would allow for the identification of factors facilitating ('pull' factors) and impeding ('push' factors) healthy eating behavior. Theoretically, push and pull factors can be attributed to characteristics of the individual (individual level, i.e., certain personality traits) or to characteristics of the situation (situational level, e.g., stressful situations, such as high workload or stress with other people).

Pull factors on the individual level might be traits which act as resources to resist temptations, for example. Supporting this notion, past research has shown that specific food choice motives are associated with a healthy consumption pattern. People with a high *motive to control their body weight*, for example, have been shown to eat significantly more fruits and less snacks than people with a low *motive to control their weight* (Eertmans, Victoir, Vansant, & Van den Bergh, 2005). Conversely, other individual factors might make people more vulnerable or might 'push' them to unhealthy choices. For example, people with *motive to eat in response to negative emotions* tend to consume more energy-dense foods than people without this tendency (e.g., Konttinen, Männistö, Sarlio-Lähteenkorva, Silventoinen, &

Haukkala, 2010). As a matter of course, these antagonistic push and pull factors can both occur within one person at the same time. However, previous research has mainly focused on specific push or pulls factors while neglecting their combined effects on eating behavior.

Another powerful source of push and pull factors is the situation that might interact with personal traits. Stressful situations, for example, can act as a push factor especially in vulnerable people, for example, in people with *motive to eat in response to negative emotions*. In an experimental study, Oliver, Wardle, and Gibson (2000) induced stress in an experimental condition, whereas participants in the control condition were not exposed to a stressor. Afterwards, participants were provided with an ad libitum meal. The results demonstrated that the experimental stress condition acted as a push factor only in participants with a habitual tendency *to eat in response to negative emotions*. They ate significantly more sweet and fatty foods than participants without this tendency. However, in the control condition people with *motive to eat in response to negative emotions* did not differ from participants without this motive. Thus, the effect of trait motives on eating behavior also needs to be investigated in dependence of situational influences (see Fig. 1.1 for a conceptual model).

Accordingly, the first goal of the present dissertation was to investigate which motives underlie normal eating behavior. The second goal was to shed more light on the impact of these individual factors on dietary healthiness and the third goal was to examine the conjoint influence on eating behavior of both, individual and situational factors.

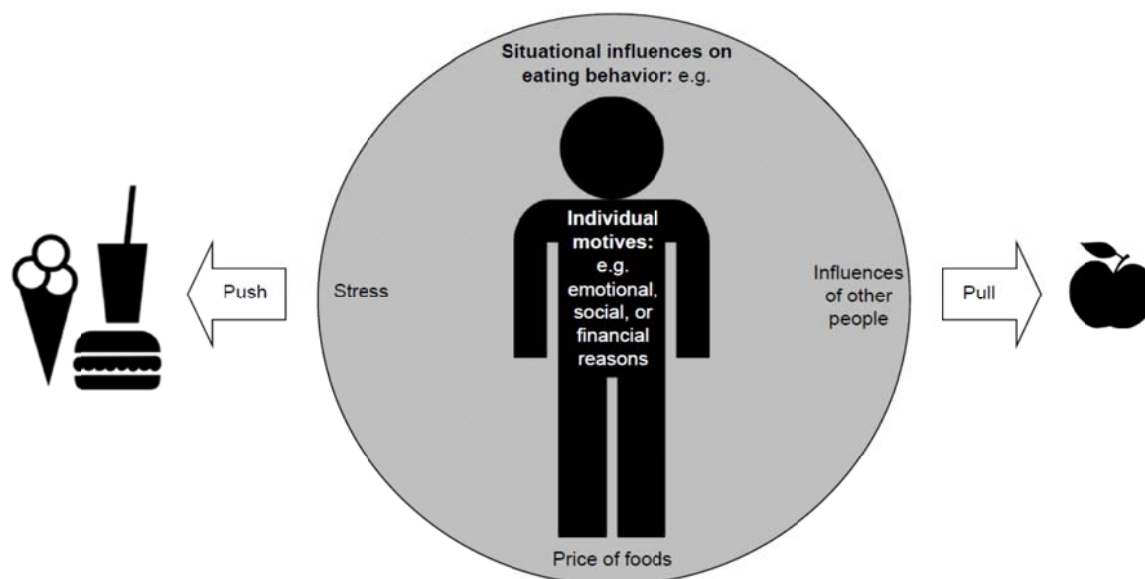


Figure 1.1. Conceptual model of factors underlying eating behavior.

## 1.1 Why do we eat what we eat? Motives for eating behavior

Asking the question why people eat, most people would certainly agree that hunger is an important reason for eating behavior. However, did you eat dessert at your mother's birthday party because you were hungry? Probably, also social reasons and the pleasure of eating made you eat it. Likewise, research has investigated several other reasons for eating beyond hunger. As named before, the *pleasure* of eating appears as an important eating motive (Jackson, Cooper, Mintz, & Albino, 2003). Furthermore, the tendency *to eat in response to emotions or external cues*, for example, the smell of freshly baked cookies, can trigger eating (e.g., Van Strien, Frijters, Bergers, & Defares, 1986). Moreover, social reasons are crucial motives for eating behavior, namely the tendency *to eat to enjoy social gatherings* as well as *eating to meet others expectations* (Jackson et al., 2003). Hence, next to hunger, there are several other powerful reasons for people to eat.



Looking at these various motives for eating, when being asked, people report even more reasons why they choose certain foods, for example, why they eat cereals with fresh fruit in the morning instead of cake. Maybe one reason for eating cereals is because it is considered healthy. Another one could be weight concerns, assuming cereals with fresh fruit to be lower in calories than cake. Additionally, eating cereals in the morning could be just a habit without thinking much about it. Steptoe, Pollard, and Wardle (1995) identified nine food choice motives which are assessed by the Food Choice Questionnaire. The *sensory appeal* of the food they eat on a typical day appeared to be most important to their participants, that is, to eat foods, which taste, look, and smell good. This food choice motive was followed by the *healthiness* and *price* of foods as well as by how *convenient* it is to access the food. Next, participants considered *natural content* and *weight control* when choosing their foods. Furthermore, Steptoe and colleagues (1995) demonstrated that *emotional reasons* not only have an impact on why we eat in general but also on specific food choices. Being in a bad mood can not only trigger the initiation of eating but can also influence food choice, for example, eating comfort foods instead of more healthy alternatives. Least important were *ethical concerns* when choosing foods and the *familiarity* of these in the study of Steptoe and colleagues (1995). Lindeman and Väänänen (2000) extended these nine motives with three value based motives including *ecological welfare*, *political values*, and *religion*. Thus, next to the fact that the initiation of eating is not only driven by feelings of hunger, there are even more important reasons for choosing certain food items.

It is important to note that the reasons for eating and those for food choice are sometimes interchangeable. *Emotional reasons* are only one example for motives underlying both the initiation of eating as well as food choice. Similarly, a lot of people do not only eat the *same* breakfast every morning for *habitual reasons* but actually do have breakfast at all out of habits, not because they are hungry. Hence, when investigating eating motives it seems crucial to capture both, motives for eating and motives for food choice. However, a comprehensive conceptualization and measurement of both, reasons for eating and reasons for food choice, still awaits development. Consequently, studies investigating more than one

eating motive are scarce, mostly targeting single eating motives, like economic, social or emotional reasons (French, 2003; Herman, Roth, & Polivy, 2003; Macht, 2008). The comprehensive examination of eating motives is, however, crucial for insights into the interplay between these motives. Moreover, it is a prerequisite for insights into which motives comparably often trigger eating behavior and which motives are less important. Therefore, the first goal of this dissertation was: a) to capture a wide range of motives underlying normal eating behavior, and - based on these findings - b) to develop an instrument to enable both, the systematic investigation and assessment of the importance of different eating motives in everyday life in a comprehensive way.

## **1.2 Individual push and pull factors**

In 2008, the World Health Organization (WHO) reported 13.6% of German men and 12.3% of German women being obese, that is, having a body mass index (BMI) of 30 kg/m<sup>2</sup> or more. These values were even more than twice as high (31.1% for males and 33.2% for females) in the USA (WHO, 2008), where obesity was set to overtake smoking as the main preventable cause of illness and premature death in 2005 (Haslam & James, 2005). Haslam and James (2005) concluded that food habits are the main amplifier of the epidemic to date. Dietary quality is crucial to prevent obesity and its accompanying diseases. The German Society for Nutrition (Deutsche Gesellschaft für Ernährung, DGE), for example, recommends to consume fresh fruits and vegetables on a daily basis, whereas the intake of sweet and fatty foods like candy or salty snacks should be restricted. To help people follow these recommendations, the knowledge of factors, underlying eating behavior, is essential. If we knew which motives underlie healthy or unhealthy choices, it should be much easier to face the problems of the obesity epidemic, because then, public health campaigns could directly target these reasons for eating. So questions to be answered in this regard are: Which factors facilitate healthy eating and pull us away from unhealthy choices? Which factors

impede healthy eating and push us to eat candy instead of an apple? And even more important: How do these push and pull factors act together?

Past research has shown that the *motive to regulate negative affect*, such as stress, by eating is associated with eating more energy-dense foods (e.g., Macht & Mueller, 2007). A possible antagonist to this push factor is the *motive to control body weight*. People with a high *weight control motive* showed a higher fiber and lower fat intake, an increased fruit and vegetable consumption and a lower consumption rate for snacks, fast-foods, and other unhealthy food items (Eertmans et al., 2005; Glanz, Basil, Maibach, Goldberg, & Snyder, 1998; Steptoe & Wardle, 1999). However, it has not been investigated yet, how the above mentioned *affect regulation motive*, as a push factor, and the *weight control motive*, as a pull factor, act together. For instance, can a high *weight control motive* compensate for a high *affect regulation motive*?

Another important pull factor is the capacity for self-control. This might be regarded as a 'second order' pull factor, that could impact both, the effect of the *affect regulation motive* and the effect of the *weight control motive* on eating behavior. To illustrate this, on the one hand, if self-control resources to perform the desired behavior are low, people could fail to follow a healthy diet despite having a high *weight control motive*. On the other hand, if people's capacity to control themselves is high, they might not give in their tendency to eat comfort foods to regulate negative affect although they have a high *affect regulation motive*. Studies examining how general self-control impacts eating behavior have shown that people high in the capacity for self-control (Junger & Van Kampen, 2010) and low in impulsivity (Nederkoorn, Guerrieri, Havermans, Roefs, & Jansen, 2009; Verplanken, Herabadi, Perry, & Silvera, 2005) are less prone to unhealthy choices than people with low self-control resources and high impulsivity. Following this outline, first, it is of special interest how the two pull factors, the *motive* and *capacity* for control, concur. Second, since push and pull factors can both occur within one person at the same time, enhancing knowledge about their conjoint impact on dietary healthiness is crucial for the prevention and treatment of diet-

related diseases. Thus, the second goal of the present dissertation was to shed some light on the effects of the outlined individual push and pull factors on dietary healthiness.

Our eating behavior is not only determined by factors within the individual but also by the situation. Moreover, certain individual factors might exert their influence only in specific situations. For instance, the impact of certain motives, such as the *motive to eat in response to stress*, might depend on certain situational variables, such as the presence of stressful situations, like high workload or stressful social interactions. Putting it differently, some motives might only become effective under specific situational circumstances.

### **1.3 Interplay between individual and situational variables**

One of the most powerful situational characteristics is the presence of others and the course of social interactions. Social interactions do not only influence eating behavior (Baumeister, DeWall, Ciarocco, & Twenge, 2005), but also health and well-being (Baumeister & Leary, 1995). In the past, there has been a lot of research investigating how the presence of others in general impacts eating behavior (Herman et al., 2003). However, there is much less research, targeting the effect of the particular quality of social situations on eating behavior. Imagine eating together with four colleagues, talking about how to build pairs for a certain task. In situation A, everybody wants to work together with you. In situation B, nobody wants to work with you. Would you eat differently in situation B as compared to situation A? Situation B is an example for a social exclusion situation. Previous research has shown that people who were rejected by others experienced pronounced distress (Williams & Nida, 2011) and this distress increased the consumption of highly palatable snack foods (Baumeister et al., 2005). For instance, Baumeister and colleagues (2005) manipulated social exclusion in an experimental setting and found that, after being excluded, participants ate nearly twice as many cookies in an ostensible taste test than included participants. Hence, stressful social situations can act as a push factor and lead people to an increased intake of highly palatable but unhealthy foods. However, experimental research to date has

focused only on the effect of negative social interactions, whereas neglecting potential individual differences.

Coming from another line of research, surveys for assessing stress-related changes in eating behavior found a more complex pattern due to individual differences. Specifically, it was shown that people differ greatly in the (self-reported) habitual effect of stress on the amount of eating. For instance, in a study by Oliver and Wardle (1999) nearly equal numbers of participants reported eating more or less than usual when stressed. Thus, social stress seems to be a push factor only in so-called 'stress eaters', that is, in people with the *motive to cope with stress through eating*. In contrast, in 'stress fasters', that is, people who report to eat less when stressed and accordingly do not exhibit such an *affect regulation motive*, social stress seems to act as a pull factor.

The other side of the coin, namely how positive social interactions or social inclusion (situation A) impact diet, has received less attention yet. However, this is an important question, considering that people generally rate their social relationships clearly positive (Skevington, Lotfy, & O'Connell, 2004). Does social *inclusion*, in the same way as assumed for the contrary stressful phenomenon social *exclusion*, act as a pull factor in some individuals, and as a push factor in others? In a diary study, Schlundt, Sbrocco, and Bell (1989), for example, found that positive social interactions were antecedents to overeating and unplanned meals in their overweight sample. In contrast, positive mood enhancement has been shown to decrease the consumption of high-caloric snack food (Turner, Luszczynska, Warner, & Schwarzer, 2010). Thus, the third goal of this dissertation was to systematically investigate effects of both, social exclusion *and* inclusion, on eating behavior. However, we were not only interested in these situational influencing factors per se but also in the impact of these *in dependence of* individual differences, that is, the *motive to eat in response to social stress*.

#### 1.4 Outline and research aims of the present dissertation

The first goal of this dissertation was to capture a wide range of motives underlying eating behavior and to develop on this basis a concise questionnaire, that is, the Eating Motivation Survey (TEMS). To create a comprehensive composition of motives for normal eating behavior, three different sources were brought together. Extending previous research, we combined motives targeted in the existing literature with motives specified by practical working nutrition experts and motives generated in discussions with health psychologists of the University of Konstanz. Specifically, through a literature review, motives were extracted from previous questionnaires and studies targeting reasons for eating and food choice, first. Second, using semi-structured interviews twelve practical working nutrition experts were asked about reasons why people eat and why they choose certain food items. Third, in-depth discussions with members of the department of psychology at the University of Konstanz, complemented the composition of eating motives. From this qualitatively developed motive composition, a preliminary version of the TEMS was constructed and quantitatively tested in a sample of 1,250 participants. The psychometric characteristics of this preliminary version were tested by conducting exploratory factor analyses. Based on these results, the preliminary TEMS was refined to reveal the final TEMS. The factor structure suggested by the exploratory factor analyses was validated in another sample of 1,040 participants through confirmatory factor analyses. In order to secure factorial validity, the structure of the motives was tested across gender, age and BMI. Additionally, the relative importance of motives was assessed by calculating mean levels across the sample and according to gender, age, and BMI.

The second goal of the present dissertation was to examine the impact of these individual factors on eating behavior, that is, dietary healthiness. Specifically, we were interested in the conjoint effect of both, factors facilitating (pull factors) and impeding (push factors) a healthy diet. Therefore, in a cross-sectional survey study ( $N = 761$  women) we investigated, first, how the motive and capacity for *body weight control*, as potential pull

factors, concur. Second, the conjoint impact of these two pull factors and the tendency for *emotional eating*, a potential push factor, was examined. To assess dietary healthiness, we used a comprehensive and validated measure for healthy eating based on the recommendations of the German Nutritional Society and results from the WHO MONICA study (cf., Winkler & Döring, 1998; 1995).

The third goal of this dissertation was to investigate the effect of situational variables on eating behavior in dependence of individual dispositions. Specifically, in an experimental setting we tested the interplay of the valence of social interactions, that is a situational variable, and the habitual tendency *to eat in response to social stress*, that is an individual vulnerability. In a first step, the impact of negative and positive social interactions, namely social exclusion and inclusion, on eating behavior was examined. In a second step, the effect of these situational variables was explored in dependence of individual differences in the self-reported habitual *motive to eat in response to social stress*. Therefore, social exclusion was manipulated by having a confederate refuse to meet participants after seeing their videotaped message. In the inclusion condition, in contrast, the experimenter delivered strong positive feedback from the ostensible second participant. After these manipulations, participants could eat as much ice cream as they wished in an ostensible taste test.

The present dissertation combines different methodological approaches to thoroughly study eating motives. First, literature reviews, structured interviews, and discussions served the goal of developing a comprehensive composition of motives for eating. From this composition, a psychometric scale for assessing eating motives was developed through exploratory and confirmatory factor analyses. Second, the impact of these motives on dietary healthiness was investigated in a cross-sectional study. To assess dietary healthiness, a broad self-report measure of dietary quality was used. Third, an experimental laboratory study allowed for causal inferences on the conjoint impact of both, individual and situational variables on eating behavior. To ensure methodological diversity, an objective measure of

the consumed amount of a highly palatable but unhealthy food, that is, ice cream, was used in this experimental study.

This dissertation enhances the current knowledge about motives for normal eating and provides a comprehensive assessment tool for these motives. Furthermore, the impact of these individual variables on dietary healthiness was explored and last, the interplay of both, individual as well as situational variables was examined.



## **2 Why we eat what we eat:**

### **The Eating Motivation Survey (TEMS)**

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## 2.1 Abstract

Understanding why people eat and why they select certain food items in everyday life is crucial for the creation of interventions to promote normal eating and to prevent the development of obesity and eating disorders. The Eating Motivation Survey (TEMS) was developed within a frame of three different studies. In Study 1, a total of 331 motives for eating and food choice were generated on the basis of different data sources (previous research, nutritionist interviews, and expert discussions). In Study 2, 1,250 respondents were provided with a set of 87 motives based on the responses from Study 1, yielding thirteen factors in exploratory factor analysis. In Study 3, 1,040 participants responded to a pool of 78 items revised and generated on the basis of Study 2. Confirmatory factor analysis yielded fifteen factors with a satisfactory model fit for a full (78 items) and brief survey version (45 items) with RMSEA .048 and .037, 90% CI .047-.049 and .035-.039, respectively. Factor structure was generally invariant across gender and BMI which indicates a high stability for the Eating Motivation Survey scales. On the mean level, however, significant differences in motivation for eating and food choice associated with gender, age, and BMI emerged. Implications of the fifteen distinct motivations to eat and choose foods in everyday life are discussed.

Keywords: Normal Eating, Food Choice, Motivation, Assessment

## 2.2 Introduction

Understanding why we eat what we eat is essential for understanding 'normal' or 'adaptive' eating behavior. In the past, most research has however focused on the pathology of eating such as eating disorders or how eating behaviors of already obese or overweight people can be changed. For example, the database Web of Science yields more than 19,000 entries with 'eating disorder' in the title and more than 157,000 entries with 'obesity' in the title, whereas 'normal eating' results in only 246 entries. Considering that despite treatment, 60% of patients with an eating disorder maintain clinically significant symptoms (Thompson-Brenner, Glass, & Westen, 2003) and interventions to reduce body weight often show small or even counterproductive long-term effects (Bacon & Aphramor, 2011; Mann, Tomiyama, Westling, Lew, Samuels, & Chatman, 2007), primary prevention efforts are particularly important. However, understanding the pathology of eating might tell us little about how to prevent people from developing dysfunctional eating behaviors. Focusing on adaptive, normal eating patterns before they get out of balance and become disordered might be more informative. Hence, an understanding of 'normal' eating behavior is needed, which goes beyond the absence of dysfunctional eating and encompasses the motives for and functions of eating in everyday life. One possibility for defining normal eating is through a comprehensive characterization of why people eat what they eat, that is, by assessing which motives trigger eating behavior in everyday life.

But why do we eat? One answer to this question is: because otherwise, we would die. Physiological factors like hunger determine, without question, our eating behavior (Schupp & Renner, 2011). Tylka (2006) suggested that adaptive eating, which she termed 'intuitive eating', is predominantly based on physiological hunger and satiety cues rather than situational and emotional cues (cf., Augustus-Horvath & Tylka, 2011). However, food has an incentive value beyond satiation since the pleasure of eating is also an important eating motivation (e.g., Jackson et al., 2003). Likewise, positive or negative emotional states (e.g., Macht & Simons, 2000; Sproesser, Strohbach, Schupp, & Renner, 2011; Tomiyama, Mann,

& Comer, 2009) or external food cues such as the smell or appearance of food items (e.g., Jansen, Mulkens, & Jansen, 2010; Van Strien et al., 1986) can trigger eating. Moreover, social reasons can prompt eating since eating together is sociable and is often an essential part of social occasions (e.g., Jackson et al., 2003). Unobtrusive real-life observations with electronically activated recorders showed that the amount of substantive conversations was significantly related to the time spent eating (Mehl, Vazire, Holleran, & Clark, 2010). In a similar vein, eating behavior can also be driven by compliance to social norms and expectations of other people (e.g., Herman et al., 2003; Robinson, Tobias, Shaw, Freeman, & Higgs, 2011; Salvy, Jarrin, Paluch, Irfan, & Pliner, 2007). Thus, in addition to hunger, there are other compelling reasons for us to eat. However, motivations to initiate eating have mostly been investigated in isolation (cf., Jackson et al., 2003). Very few measures assess more than one core motivation to eat such as the Motivations to Eat Scale, which assesses four core motives (to enhance pleasure, to cope with negative affect, to be social, and to comply with others' expectations, Jackson et al., 2003) or the Dutch Eating Behavior Questionnaire (Van Strien et al., 1986) including eating in response to negative emotions (emotional eating) and in response to external sensory cues such as the smell and appearance of food (external eating) as two core motivations to eat.

When it comes to food choice, the picture becomes even more complex. In the western world, people can choose between thousands of food products. On a daily basis people come to more than 200 food-related decisions (Wansink & Sobal, 2007). Most of these decisions are fairly quick. But why do we choose one food over another? To our knowledge, the most comprehensive conceptualization of food choice motives is the Food Choice Questionnaire (FCQ) developed by Steptoe and colleagues (1995), which encompasses nine different food choice motives for everyday life (cf., Eertmans, Victoir, Notelaers, Vansant, & Van den Bergh, 2006; Fotopoulos, Krystallis, Vassallo, & Pagiaslis, 2009; Januszewska, Pieniak, & Verbeke, 2011 for factorial validity across countries). In two samples, Steptoe and colleagues (1995) showed that the good taste, appearance, or smell of food (*Sensory Appeal*) was rated as the most important motive for food choice. The three

motives, with *Health* reflecting the healthfulness of food items, *Price* the affordability, and *Convenience* the accessibility, followed closely in rated importance. Concern over the use of additives, the selection of natural ingredients (*Natural Content*), and that the food one typically eats helps to control one's weight (*Weight Control*) were also food choice motives. Similar to emotional triggers of eating (Jackson et al., 2003), *Mood* emerged as a factor influencing food choice. The two least important food choice motives for participants were *Ethical Concerns* (e.g., environment friendly packing) and the *Familiarity* of foods. In a recent cross-country study, Januszewska and colleagues (2011) found that Sensory Appeal was the most important factor shaping food choice in samples from Belgium, Hungary, and Romania, whereas Health, Convenience, and Price were among the five most important factors overall. For Filipinos, the most important factors were Health, Price, and Mood, whereas Sensory Appeal ranked at fourth place. Lindeman and Väänänen (2000) extended the nine motives with three value based motives including *Ecological Welfare*, *Political Values*, and *Religion*. Hence, food choice and eating is a complex function of biological, learned, social-cultural, and material-economic factors.

Focusing on motives for food choice however, does not necessarily capture why we eat. Hunger, for example, motivates eating but health concerns might make us choose whole wheat pasta with broccoli instead of pizza with extra cheese. The Health and Taste Attitudes Questionnaire quantifies the initiation of eating for the pleasure of taste and choice of foods for health reasons (Roininen, Lähteenmäki, & Tuorila, 1999), thus assessing both aspects, with a special focus on pleasure and health driven motives. For other eating and food choice motives, as in the case of emotional reasons for eating behavior, the distinction is less clear-cut. Being in a negative mood state can trigger eating but can also influence the choice of specific foods, that is, comfort foods. In order to capture which motives trigger eating behavior in everyday life, motives for why people eat and why they eat what they eat need to be assessed.

Hence, the major goal of the current set of studies was not only to compile the different perspectives provided by existing research on motivations to eat and food choice, but also to extend these, including motives identified through nutritionist interviews, discussion groups by psychologists, and the authors' own considerations (Study 1). This procedure aimed to capture a wide-range of motives underlying eating behavior and subsequently develop a concise questionnaire that allows for a comprehensive, systematic, and psychometric sound measurement and investigation of motives for normal eating behavior (Study 2 and Study 3). In Study 2, the factor structure of the preliminary survey was determined and item content was refined based on data collected from a sample of 1,250 respondents. In Study 3, a further refined and extended version of the preliminary survey was tested using confirmatory factor analysis in a second sample of 1,040 respondents. In order to secure factorial validity, whether the structure of the motives was generally invariant across gender, age, and BMI was tested. Additionally, the relative importance of motives was assessed by calculating mean levels across the sample and according to gender, age, and BMI.

## **2.3 Study 1**

### **Generating motives for eating and food choice: Development of the item pool**

Motives for eating behavior were brought together through a review of previous research, expert interviews with twelve nutritionists, discussions with members of the department of psychology at the University of Konstanz, and considerations by the authors. Specifically, motives were extracted from questionnaires and research on reasons for eating and food choice, whereby questionnaires on eating disorders or directed at children or adolescents were excluded. Motives were extracted from the Food Choice Questionnaire (Steptoe et al., 1995), the Motivations to Eat Scale (Jackson et al., 2003), the Affective and Cognitive Origins of Likings and Dislikes (Letarte, Dubé, & Troche, 1997), the Food Choice Motives among Women questionnaire (Lindeman & Stark, 1999), the Ethical Food Choice

Motives questionnaire (Lindeman & Väänänen, 2000), the Health and Taste Attitudes Questionnaire (Roininen et al., 1999), the Dutch Eating Behavior Questionnaire (Van Strien et al., 1986; German version: Grunert, 1989), and the Informational Bases of Food Attitudes questionnaire (Aikman, Crites, & Fabrigar, 2006). We also reviewed the Three Factor Eating Questionnaire (Stunkard & Messick, 1985), the Eating Motivation Trait Inventory (Horner, 1998), and the Food Motivation Scale (Martins & Pliner, 1998), but these did not provide additional motives. The extracted items demonstrated a clear and substantial overlap in terms of the assessed constructs they tap into. In order to compile distinct motives, comparisons were made on item basis, and redundant items were removed from the pool. This resulted in 94 motives out of a total of 241 motives.

Twelve nutritionists from the German Dietitian Association (VDD) were asked about the reasons why people eat and choose certain food items in a semi-structured telephone interview with an open response format. Specifically, the following questions were asked: 'Which are the most important reasons and motives for people to eat?', 'Which other reasons and motives, even uncommon ones, come into your mind?', 'What influences the choice of foods?', 'Which motives and reasons influence the choice of foods in the restaurant/supermarket?'. The interviews lasted 20 minutes on average and were transcribed verbatim for further analyses. From these transcripts, 209 distinct reasons to eat and to choose certain food items were identified.

Moreover, 28 motives were generated through discussions about why people eat and why they select certain foods with psychologists in the department of psychology at the University of Konstanz. The same questions used in the semi-structured interviews with the nutritionists were used to facilitate the discussions.

In total, 331 reasons to eat and to choose certain food items were generated through the three different sources. Using the Constant Comparative Method (Glaser & Strauss, 1967), two independent groups of three researchers within the department of psychology sorted these 331 motives into categories by grouping similar motives. In a subsequent

session, the two categorization solutions were compared and used to form 26 categories. In a next step, redundancies were removed and up to eight motives were assigned per category in order to create a concise but representative spread of motives. This procedure resulted in a set of 87 motives for eating behavior.

## 2.4 Study 2

### Development of a preliminary version of the Eating Motivation Survey

In Study 2, the retrieved 87 motives from Study 1 were transformed into a closed-question format in order to form a preliminary version of the Eating Motivation Survey. The 87 items were introduced by the following item stem 'I eat because ...' or by 'I select certain foods because ...' and answers were given on a seven-point rating scale from 1 'never' to 7 'always'. The psychometric characteristics of the preliminary version were tested by conducting exploratory factor analyses.

### Participants

One-thousand five-hundred and six participants filled in the preliminary online version (Unipark survey software) of the Eating Motivation Survey. Participants were recruited through flyers and posters distributed at the University of Konstanz, as well as through links on webpages such as the university webpage or that of a German popular scientific journal (Psychologie Heute). Two-hundred fifty-six participants (17%) filled out less than 75% of the survey and were therefore excluded from analysis.

The remaining 1,250 participants (934 women) had a mean age of 34 years ( $SD = 12$ ; range 15 to 77 years). The majority (73%) had a university-entrance diploma ('Abitur'). Fifty-eight percent were working whereas 36% were still in education. The average BMI was 24 ( $SD = 4.7$ ; range 16.3 to 58.5). Comparing the study sample ( $N = 1,250$ ) with the drop-out



sample ( $N = 256$ ) showed no significant differences in terms of BMI (24 vs. 25,  $t(1495) = -1.79$ ,  $p = .074$ ), education (73% vs. 66% with university-entrance diploma,  $\chi^2(6) = 9.27$ ,  $p = .159$ ), or working status (58% vs. 54% working,  $\chi^2(4) = 2.61$ ,  $p = .625$ ). However, the study sample was slightly older (34 vs. 32,  $t(1499) = 2.13$ ,  $p = .033$ ) and included a greater percentage of women (75% vs. 65%,  $\chi^2(1) = 9.63$ ,  $p = .002$ ) than the drop-out sample.

## Data analysis

Missing values were below 5% for all variables. Missing data were imputed using the Expectation Maximization algorithm in SPSS 17.0 (cf., Gold & Bentler, 2000). Exploratory factor analyses were conducted using principal axis factoring which reproduces the initial correlation matrix more reliably than other extraction techniques (Snook & Gorsuch, 1989; Thompson, 2004). Promax rotation, which allows factors to correlate, was applied because earlier research suggests that food choice motives are correlated (e.g., Steptoe et al., 1995). The number of factors to extract was determined by the eigenvalues greater than one criterion, the parallel analysis of the eigenvalues and Velicer's minimum average partial (MAP) test (cf., O'Connor, 2000).

## Results

**Assumption testing.** First of all, measures of sampling adequacy were determined. Examining the distribution of the 87 items showed that two items ('I select certain foods for religious reasons.' and 'I select certain foods because I want to gain weight.') were severely skewed (skew > 3; kurtosis > 10) and were therefore excluded from analysis. No pair of the remaining 85 items correlated above .85 indicating no severe collinearity restrictions. Global diagnostic indicators showed adequate factorability of the correlation matrix with Kaiser-Meyer Olkin = .91 and Bartlett's test of sphericity with  $\chi^2(3570) = 53927.15$ ,  $p < .001$ .

Exploratory factor analysis with the set of 85 items yielded eighteen factors with eigenvalues greater than one. Additionally, the parallel analysis of the eigenvalues suggested the extraction of 13 factors, as did the MAP test. Inspecting the 18-factor solution, not a single item loaded highest on the 18<sup>th</sup> factor, indicating overfactoring. The 13-factor solution both combined parsimony and appeared to fit the data best. One out of 85 items ('I eat when my blood sugar is low, e.g., trembling, feeling weak, headaches.') demonstrated a corrected item-scale correlation lower than .20 and was therefore dropped from further analysis (Bortz & Döring, 2002). Factor analysis with the remaining 84 items showed a 13-factor structure accounting for 49.1% of the variance, with eigenvalues ranging from 12.9 to 1.3. To develop a concise questionnaire, five items at maximum per factor with the highest factor loadings were selected. This resulted in the retention of 53 items.

**Preliminary version of the Eating Motivation Survey.** Exploratory factor analysis with the selected 53 items yielded 13 factors with eigenvalues greater than one. The 13 factors accounted for 55.4% of the variance. Means, standard deviations, factor loadings, communalities, corrected item-scale correlations, and Cronbach's alphas are displayed in Table 2.1.

All corrected item-scale correlations were acceptable with values greater than .30 (Bortz & Döring, 2002) except for one item ('I eat because it is a mealtime.') with  $r_{i(t-i)} = .20$ . Fifty of the 53 items showed a main-loading of  $> .40$ , and 52 items showed a cross-loading less than .30, indicating a simple factor structure.

The first factor (eigenvalue = 8.71, 15.6% explained variance) describes a preference for natural foods from fair trade or organic farming. Therefore, this factor is labeled *Natural Concerns*. The second factor (eigenvalue = 5.24, 9.3% explained variance) is characterized by a tendency to eat when one is feeling sad, frustrated, or stressed and is labeled *Affect Regulation*. The third factor (eigenvalue = 3.54, 6.0% explained variance) comprises a motivation to choose food items low in fat or calories to control one's body weight and is therefore considered to be a *Weight Control* factor. The fourth factor (eigenvalue = 3.39,

5.7% explained variance), which represents a motivation to choose food items which are fast and easy to access with minimal effort, is regarded as the *Convenience* factor. The fifth factor (eigenvalue = 2.34; 3.7% explained variance) describes eating for social reasons, that is, because eating together is nice and is labeled *Sociability*. The sixth factor, *Pleasure*, (eigenvalue = 2.07; 3.1% explained variance) encompasses the taste of foods as an important eating motivation and eating to please oneself. The seventh factor (eigenvalue = 1.74; 2.4% explained variance) depicts eating because of an appealing presentation of food items and indexes *Visual Appeal* as a motive for eating behavior. The eighth factor (eigenvalue = 1.58; 2.2% explained variance) comprises financial reasons for eating behavior and is therefore labeled *Price*. The ninth factor (eigenvalue = 1.50; 1.9% explained variance), which describes eating nutritious foods for energy and to stay in shape, is labeled *Physical Well-being*. The tenth factor (eigenvalue = 1.40; 1.7% explained variance) is characterized by the consumption of food to present oneself positively in social contexts and is therefore considered to be a *Social Image* factor. The eleventh factor (eigenvalue = 1.24; 1.5% explained variance) depicts eating foods for traditional reasons and can be regarded as a *Traditional Eating* factor. The twelfth factor (eigenvalue = 1.19; 1.4% explained variance), *External Demands*, comprises eating to meet others' expectations and because of external circumstances. The thirteenth factor (eigenvalue = 1.07; 1.1% explained variance) describes the habitual eating of familiar foods and is labeled *Habits*. However, the items belonging to the factor *Habits* had an unsatisfactory internal consistency of .49 (cf., Table 2.1).

*Table 2.1.* Study 2: Means (*M*), Standard Deviations (*SD*), Factor Loadings (*a*), Communalities (*h*<sup>2</sup>), and Corrected Item-Scale Correlations (*r*<sub>*i(t-i)*</sub>) for Items of the Preliminary TEMS in Exploratory Factor Analysis with Promax Rotation (*N* = 1,250).

	<i>M</i>	<i>SD</i>	<i>a</i>	<i>h</i> <sup>2</sup>	<i>r</i> <sub><i>i(t-i)</i></sub>
<b><u>FACTOR 1: NATURAL CONCERNS (<math>\alpha = .92</math>)</u></b>					
I select certain foods because they are fair trade.	3.62	1.68	.91	.78	.83
I select certain foods because they are organic.	4.09	1.71	.90	.77	.85
I select certain foods because they are natural (e.g., not genetically modified).	4.37	1.75	.85	.72	.80
I select certain foods because they are environmentally friendly (e.g., production, packaging, transport). <sup>e</sup>	3.34	1.62	.80	.61	.73
I select certain foods because they do not contain harmful substances (e.g., pesticides, hazardous pollutants, antibiotics).	4.26	1.67	.81	.68	.79
<b><u>FACTOR 2: AFFECT REGULATION (<math>\alpha = .90</math>)</u></b>					
I eat when I am frustrated. <sup>d</sup>	2.62	1.55	.97	.85	.84
I eat when I am sad. <sup>d</sup>	2.53	1.47	.89	.75	.80
I eat when I get stressed. <sup>a</sup>	2.61	1.54	.77	.60	.72
I eat to distract myself. <sup>b</sup>	2.77	1.51	.69	.57	.70
I eat to cheer myself up. <sup>a</sup>	3.05	1.45	.70	.62	.73
<b><u>FACTOR 3: WEIGHT CONTROL (<math>\alpha = .90</math>)</u></b>					
I select certain food items because they are low in calories. <sup>a</sup>	3.75	1.70	.91	.80	.83
I select certain foods because they are low in fat. <sup>a</sup>	3.93	1.61	.83	.70	.77
I select certain foods because I am watching my weight. <sup>a</sup>	3.77	1.61	.84	.69	.76
I select certain foods because I want to lose weight.	3.41	1.60	.81	.68	.75
<b><u>FACTOR 4: CONVENIENCE (<math>\alpha = .83</math>)</u></b>					
I select certain foods because they are the most convenient (e.g., preparation, purchase).	4.56	1.31	.89	.74	.76
I select certain foods because they are quick to prepare.	4.57	1.24	.85	.73	.75
I select certain foods because they are easy to prepare. <sup>a</sup>	4.88	1.20	.71	.57	.59
I select certain foods because they are readily available (e.g., at hand, easy to get). <sup>a</sup>	4.14	1.37	.53	.51	.56
I select certain foods because they are easy to store. <sup>c</sup>	3.62	1.36	.50	.42	.52
<b><u>FACTOR 5: SOCIABILITY (<math>\alpha = .78</math>)</u></b>					
I eat because it facilitates contact with others (e.g., business meals, events).	2.95	1.27	.75	.57	.62
I eat so I can spend time with others.	3.31	1.43	.75	.56	.64
I eat because it is pleasant to eat with others.	4.48	1.30	.59	.39	.51
I eat because it is easier to discuss things while eating. <sup>c</sup>	2.26	1.23	.56	.45	.52
I eat on festive occasions because it is a part of the event. <sup>b</sup>	4.14	1.40	.44	.41	.46

Table 2.1. Continued.

	<i>M</i>	<i>SD</i>	<i>a</i>	<i>h</i> <sup>2</sup>	<i>r</i> <sub>(t-t)</sub>
<b><u>FACTOR 6: PLEASURE (<math>\alpha = .77</math>)</u></b>					
I select certain foods because I enjoy them. <sup>b</sup>	4.42	1.36	.84	.67	.71
I select certain foods in order to indulge myself.	4.38	1.26	.81	.65	.68
I select certain foods because I have an appetite for them.	5.43	.99	.43	.38	.43
I select certain foods in order to reward myself. <sup>b</sup>	3.63	1.55	.62	.57	.58
I select certain foods because they taste good. <sup>a</sup>	5.99	.85	.30	.32	.32
<b><u>FACTOR 7: VISUAL APPEAL (<math>\alpha = .76</math>)</u></b>					
I select certain foods because they spontaneously appeal to me (e.g., situated at eye level, appealing colors).	3.28	1.31	.73	.55	.64
I select certain foods because they are presented in an appealing fashion (e.g., alluring packaging, nicely served).	3.18	1.28	.69	.52	.62
I select certain foods because I recognize them from advertisements or have seen them on TV.	2.56	1.19	.60	.52	.53
I select certain foods because they look appealing. <sup>a</sup>	4.41	1.28	.60	.41	.45
<b><u>FACTOR 8: PRICE (<math>\alpha = .77</math>)</u></b>					
I select certain foods because they are inexpensive. <sup>a</sup>	4.28	1.33	.83	.71	.68
I select certain food items because they are good value for money. <sup>a</sup>	4.75	1.27	.70	.53	.52
I select certain foods because they are on sale.	3.70	1.44	.73	.54	.61
I select certain foods because they are free or complimentary.	2.95	1.48	.44	.41	.46
<b><u>FACTOR 9: PHYSICAL WELL-BEING (<math>\alpha = .76</math>)</u></b>					
I select certain foods in order to fulfill my need for nutrients, vitamins, and minerals.	4.62	1.50	.77	.61	.66
I eat because I need energy.	4.30	1.43	.57	.26	.31
I select certain foods because they keep me in shape (e.g., energetic, motivated).	4.11	1.56	.65	.67	.65
I select certain foods to maintain a balanced diet. <sup>f</sup>	4.72	1.37	.56	.64	.64
<b><u>FACTOR 10: SOCIAL IMAGE (<math>\alpha = .69</math>)</u></b>					
I select certain foods because they make me look good in front of others.	1.70	.97	.75	.53	.56
I select certain foods to stand out from the crowd.	1.52	.92	.60	.34	.50
I select certain foods because they are trendy.	1.82	.99	.55	.43	.44
<b><u>FACTOR 11: TRADITIONAL EATING (<math>\alpha = .66</math>)</u></b>					
I select certain foods out of traditions (e.g., family traditions, special occasions). <sup>c</sup>	3.32	1.38	.68	.45	.53
I select certain foods because I grew up with them.	4.08	1.28	.56	.44	.43
I select certain foods because they belong to certain situations.	3.66	1.42	.51	.44	.47
<b><u>FACTOR 12: EXTERNAL DEMANDS (<math>\alpha = .64</math>)</u></b>					
I eat because it would be impolite not to eat.	2.61	1.25	.96	.83	.57
I eat in order to avoid disappointing someone who is trying to make me happy. <sup>b</sup>	2.67	1.26	.56	.42	.47
I eat when I will not have either the time or opportunity later.	3.23	1.40	.29	.24	.32

Table 2.1. Continued.

	<i>M</i>	<i>SD</i>	<i>a</i>	<i>h</i> <sup>2</sup>	<i>r</i> <sub>i(t-i)</sub>
<b>FACTOR 13: HABITS (<math>\alpha = .49</math>)</b>					
I select certain foods because I am accustomed to eating them. <sup>a</sup>	4.55	1.34	.49	.40	.40
I select certain foods because I am familiar with them. <sup>a</sup>	5.08	1.17	.67	.53	.36
I eat because it is a mealtime.	4.19	1.52	.22	.12	.20

Note. <sup>a</sup> adapted from Steptoe et al. (1995); <sup>b</sup> adapted from Jackson et al. (2003); <sup>c</sup> adapted from Letarte et al. (1997); <sup>d</sup> adapted from Van Strien et al. (1986); <sup>e</sup> adapted from Lindeman and Väänänen (2000); <sup>f</sup> adapted from Roininen et al. (1999).

## 2.5 Study 3

### Refinement and testing of the Eating Motivation Survey

Study 3 aimed to refine and substantiate the motives found in Study 2. In a first step, items from the preliminary version of the Eating Motivation Survey were refined. Specifically, three items with insufficient psychometric characteristics such as low factor loadings or low corrected item-scale correlations were deleted (cf., Table 2.1 and 2.2). Moreover, three items were rephrased in order to increase the fit with the content of the respective scale (cf., Table 2.2). For example, two items of the Sociability scale were rephrased, and scales which appeared to include heterogeneous items and with communalities lower than .40 were rearranged. Specifically, the scale Pleasure was split into a *Pleasure* and *Liking* scale, with two and three newly generated items, respectively. Similarly, the Physical Wellbeing scale was split into a *Health* and *Need & Hunger* scale. Both scales were complemented with two and three new items, respectively. In order to retain a good representation for each scale, seventeen newly generated items were added. For example, the scale Affect Regulation was supplemented by the item 'I eat what I eat because I feel lonely' and the scale Weight Control by the item 'I eat what I eat because I am overweight'. The refinement resulted in total in a set of 78 items grouped into 15 scales (see Table 2.2). Moreover, the item stem of all items was changed into 'I eat what I eat because ...'. Answers were given on a 7-point rating scale from 1 'never' to 7 'always'.

## Participants

One-thousand two-hundred and eighty-four participants took part in an online survey (Unipark survey software). Using the snowball technique, participants were invited to the study through an E-mail sent to the student and employee register of the University of Konstanz (students  $N = 9,270$ ; employees  $N = 2,155$ ). Two-hundred and forty-four participants (19%) filled out less than 75% of the survey and were therefore excluded from analysis. The remaining 1,040 participants (745 women) had a mean age of 29 years ( $SD = 11$ ; range 18 to 77 years). The majority (89%) had a university-entrance diploma ('Abitur'). Thirty-four percent were working whereas 65% were still in education. The average BMI was  $22.8 \text{ Kg/m}^2$  ( $SD = 3.9$ ; range 15.9 to  $64.3 \text{ Kg/m}^2$ ). Comparing the study sample ( $N = 1,040$ ) with the drop-out sample ( $N = 244$ ) showed no significant differences in terms of education (89% vs. 91% with university-entrance diploma,  $\chi^2(5) = 4.30$ ,  $p = .508$ ) or working status (65% vs. 71% in education,  $\chi^2(4) = 5.15$ ,  $p = .272$ ). However, the study sample was slightly older (29 vs. 28,  $t(396.88) = 2.53$ ,  $p = .012$ ), had a lower BMI (22.8 vs. 23.4,  $t(1250) = -2.01$ ,  $p = .044$ ), and included a higher percentage of women (72% vs. 63%,  $\chi^2(1) = 6.86$ ,  $p = .009$ ) than the drop-out sample.

## Data analysis

Missing values were below 5% for all variables. Missing data were imputed using the Expectation Maximization algorithm in SPSS 17.0 (cf., Gold & Bentler, 2000). Missing values for demographic variables were not imputed (missing  $n = 1$  for age and  $n = 7$  for BMI). Confirmatory factor analyses (CFAs) using maximum likelihood solutions were conducted with AMOS 19. The item with the highest factor loading was fixed to 1.0 for each factor, respectively. Model fit was assessed by the comparative fit index (CFI), the standardized root mean squared residual (SRMR), and the root-mean-square error of approximation (RMSEA) as recommend by Kline (2011) and Hu & Bentler (1999). A good fit is indicated by a CFI close to .95, a SRMR value close to .08, and a RMSEA value close to .06 (Hu & Bentler,

1999). Because the  $\chi^2$  statistic is sample-size dependent, the  $\chi^2/df$  ratio was additionally calculated with a  $\chi^2$  not larger than 2-5 times the degrees of freedom indicating a good fit (Bollen & Long, 1993). For comparing the fit of models,  $\chi^2$  difference values were calculated for nested models and AIC for non-nested models with lower values of AIC indicating better fit (Schermelleh-Engel, Moosbrugger, & Müller, 2003).

## Results

Means and standard deviations of all items are displayed in Table 2.2. Item distributions were inspected for multivariate normality. Skewness and excess of all items were below the thresholds of 2 and 7, respectively, as suggested by Curran, West, and Finch (1996). Since items did not correlate above .85, no marked collinearity restrictions existed.

**TEMS - Full Version:** The first CFA model tested the hypothesized model with 15 correlated factors and 78 items. Standardized factor loadings and corrected item-scale correlations of all 78 items are listed in Table 2.2 and fit statistics are displayed in Table 2.3. Furthermore, factor correlations and internal consistencies are listed in Table 2.4 whereas scale means and standard deviations are displayed in Table 2.5.

The Chi-square statistic was significant ( $p < .001$ ), indicating no exact fit of the model although this is to be expected considering the large sample size (Kline, 2011). The  $\chi^2/df$  ratio, SRMR, and RMSEA, indicated a good approximative model fit, except the CFI which was below the recommended threshold of .95 (Hu & Bentler, 1999). All 78 items showed a statistically significant factor loading ( $p < .001$ ), indicating convergent validity. Only the two items 'I eat what I eat because my doctor says I should eat it.' and 'I eat what I eat because it fits the season.' had a factor loading below the recommend level of .30 (Kline, 2011). Moreover, no substantial correlations between either error terms or items located at different factors were observed. Factor correlations were between -.25 (Natural Concerns and Price) and .73 (Social Image and Social Norms) indicating sufficient discriminant validity (cf., Table



2.4). Cronbach's alpha was in the acceptable range for twelve out of the fifteen factors with values greater than .70 (see Table 2.4). However, the scale 'Social Norms' had an internal consistency of .67, mainly due to a low corrected item-scale correlation of the item 'I eat what I eat because my doctor says I should eat it'. In addition, the two scales 'Traditional Eating' and 'Need & Hunger' had a low Cronbach's alpha with values below .60, mainly due to three items with a corrected item-scale correlation below .30 (item 'I eat what I eat because it fits the season.' within the Traditional Eating scale and the items 'I eat what I eat because it is easy to digest.' and 'I eat what I eat because I'm hungry.' within the Need & Hunger scale).

In order to test whether the 15-factor solution was superior to the more parsimonious 13-factor model found in Study 2, a 13-factor model was tested by collapsing the two factors Pleasure and Liking and the factors Health and Need & Hunger into one factor, respectively. The difference between the chi-squares for the two models indicated that the 15-factor model had a significantly smaller chi-square, and thus provided a better fit than the 13-factor model,  $\chi^2(27) = 1284$ ,  $p < .001$ . Also the fit indices yielded a better fit for the 15-factor model compared to the 13-factor model (see Table 2.3).

**TEMS – Brief Version:** In a further step, a brief version of the TEMS, including 45 items, was developed (see Table 2.2). To create a brief version with three items per scale, the minimum possible (cf., Kline, 2011), items were retained by combining the following four criteria (a) high factor loading, (b) no substantial cross-loading on other factors, (c) no correlated error terms, and (d) close fit between item and content of the scale. The model fit for the brief TEMS version was good with a  $\chi^2/df$  ratio of 2.44, CFI = .94, SRMR = .042, and RMSEA = .037, 90% CI = .035 - .039. All factor loadings were significant ( $p < .001$ ) and greater than .30 (see Table 2.2). The 15 scales had good reliabilities (see Table 2.4) with Cronbach's alphas between .90 and .66, except for the *Need & Hunger* scale with an internal consistency value of .50.

Table 2.2. Study 3: Means (*M*), Standard Deviations (*SD*), Corrected Item-Scale Correlations ( $r_{i(t-i)}$ ), and Standardized Factor Loadings (*a*) for Items of the TEMS in Confirmatory Factor Analysis (*N* = 1,040).

I eat what I eat, ...	<i>M</i>	<i>SD</i>	$r_{i(t-i)}$ #	<i>a</i> #	<i>a</i> ′
<b><u>FACTOR 1: NATURAL CONCERNS</u></b>					
... because it is natural (e.g., not genetically modified). <sup>a</sup>	4.18	1.71	.82	.88	.90
... because it contains no harmful substances (e.g., pesticides, pollutants, antibiotics). <sup>a</sup>	4.16	1.62	.80	.86	.88
... because it is organic. <sup>a</sup>	4.13	1.56	.81	.86	.82
... because it is fair trade. <sup>a</sup>	3.60	1.51	.76	.78	
... because it is environmentally friendly (e.g., production, packaging, transport). <sup>a</sup>	3.67	1.55	.74	.77	
<b><u>FACTOR 2: AFFECT REGULATION</u></b>					
... because I am sad. <sup>a</sup>	2.39	1.34	.84	.89	.92
... because I am frustrated. <sup>a</sup>	2.56	1.40	.81	.86	.84
... because I feel lonely. <sup>b</sup>	2.07	1.28	.75	.81	.83
... as a distraction. <sup>a</sup>	2.79	1.44	.73	.77	
... because I feel stressed. <sup>a</sup>	3.07	1.46	.73	.77	
... because it cheers me up. <sup>a</sup>	3.50	1.44	.63	.66	
<b><u>FACTOR 3: CONVENIENCE</u></b>					
... because it is quick to prepare. <sup>a</sup>	4.68	1.21	.75	.86	.87
... because it is the most convenient. <sup>a</sup>	4.45	1.29	.71	.82	.82
... because it is easy to prepare. <sup>a</sup>	4.73	1.22	.70	.81	.83
... because it is easy and convenient to purchase. <sup>c</sup>	4.25	1.36	.55	.60	
... because it is readily available (e.g., at hand or being offered by someone). <sup>c</sup>	4.15	1.33	.36	.39	
<b><u>FACTOR 4: WEIGHT CONTROL</u></b>					
... because I want to lose weight. <sup>a</sup>	3.01	1.58	.83	.88	
... because it is low in calories. <sup>a</sup>	3.40	1.57	.81	.85	.90
... because I am overweight. <sup>b</sup>	2.79	1.58	.72	.79	
... because I watch my weight. <sup>a</sup>	3.70	1.64	.72	.77	.74
... because it is low in fat. <sup>a</sup>	3.61	1.52	.69	.73	.80
<b><u>FACTOR 5: SOCIABILITY</u></b>					
... because it is social. <sup>b</sup>	3.81	1.39	.77	.83	.88
... so that I can spend time with other people. <sup>a</sup>	3.89	1.44	.75	.80	.81
... because it makes social gatherings more comfortable. <sup>c</sup>	3.88	1.37	.76	.80	.75
... because it is pleasant to eat with others. <sup>a</sup>	4.54	1.35	.68	.73	
... because it makes a social gathering more enjoyable. <sup>c</sup>	3.27	1.39	.64	.68	
... because it facilitates contact with others (e.g., at business meals, events). <sup>a</sup>	3.05	1.36	.62	.66	

Table 2.2. Continued.

I eat what I eat, ...	<i>M</i>	<i>SD</i>	$r_{i(t-i)}^{\#}$	$a^{\#}$	$a'$
<b><u>FACTOR 6: PLEASURE</u></b>					
... because I enjoy it. <sup>a</sup>	4.67	1.20	.61	.71	.71
... in order to indulge myself. <sup>a</sup>	4.32	1.20	.60	.69	.75
... because it puts me in a good mood. <sup>b</sup>	4.08	1.42	.57	.66	
... in order to reward myself. <sup>a</sup>	3.60	1.35	.53	.65	.69
... because it is fun to eat. <sup>b</sup>	4.96	1.31	.43	.51	
<b><u>FACTOR 7: Liking</u></b>					
... because I think it is delicious. <sup>b</sup>	5.99	0.79	.69	.76	
... because I have an appetite for it. <sup>a</sup>	5.68	0.89	.67	.74	.71
... because it tastes good. <sup>a</sup>	6.09	0.74	.64	.71	.72
... because I feel like eating it. <sup>b</sup>	5.59	0.92	.62	.70	
... because I like it. <sup>b</sup>	5.94	0.81	.63	.69	.70
<b><u>FACTOR 8: VISUAL APPEAL</u></b>					
... because the presentation is appealing (e.g., packaging). <sup>a</sup>	3.27	1.27	.65	.77	.73
... because it spontaneously appeals to me (e.g., situated at eye level, appealing colors). <sup>a</sup>	3.49	1.36	.52	.62	.67
... because it is nicely presented. <sup>b</sup>	3.99	1.30	.49	.59	
... because it looks appealing. <sup>a</sup>	4.11	1.38	.49	.58	
... because I recognize it from advertisements or have seen it on TV. <sup>a</sup>	2.37	1.16	.40	.51	.59
<b><u>FACTOR 9: PRICE</u></b>					
... because it is inexpensive. <sup>a</sup>	3.95	1.38	.72	.86	.90
... because I don't want to spend any more money. <sup>b</sup>	3.62	1.45	.66	.79	.79
... because it is on sale. <sup>a</sup>	3.66	1.39	.64	.69	.64
... because it is good value for money. <sup>a</sup>	4.34	1.34	.60	.67	
... because it is free. <sup>a</sup>	2.80	1.46	.48	.50	
... because I have already paid for it. <sup>b</sup>	3.82	1.47	.45	.46	
<b><u>FACTOR 10: NEED &amp; HUNGER</u></b>					
... because I need energy. <sup>a</sup>	4.77	1.32	.37	.60	.58
... because it is pleasantly filling. <sup>d</sup>	4.60	1.23	.34	.48	.54
... because it is easy to digest. <sup>b</sup>	4.02	1.35	.18	.39	
... because I'm hungry. <sup>d</sup>	5.70	0.95	.22	.31	.39
<b><u>FACTOR 11: HEALTH</u></b>					
... to maintain a balanced diet. <sup>a</sup>	4.80	1.31	.67	.80	.81
... because it is healthy. <sup>d</sup>	5.03	1.12	.68	.80	.83
... because it keeps me in shape (e.g., energetic, motivated). <sup>a</sup>	4.37	1.37	.63	.70	.68
... in order to fulfill my need for nutrients, vitamins, and minerals. <sup>a</sup>	4.73	1.33	.63	.70	
... because it agrees with me. <sup>b</sup>	4.64	1.59	.39	.44	

Table 2.2. Continued.

I eat what I eat, ...	<i>M</i>	<i>SD</i>	$r_{i(t-i)}$ <sup>#</sup>	<i>a</i> <sup>#</sup>	<i>a</i> <sup>'</sup>
<b>FACTOR 12: SOCIAL IMAGE</b>					
... because it is trendy. <sup>a</sup>	1.77	0.91	.55	.69	.68
... because it makes me look good in front of others. <sup>a</sup>	1.71	0.95	.54	.66	.65
... because others like it. <sup>b</sup>	1.93	1.03	.50	.64	.66
... to stand out from the crowd. <sup>a</sup>	1.66	0.94	.52	.56	
... because it is considered to be special. <sup>b</sup>	2.93	1.32	.41	.49	
<b>FACTOR 13: SOCIAL NORMS</b>					
... because it would be impolite not to eat it. <sup>a</sup>	2.86	1.23	.54	.67	.80
... to avoid disappointing someone who is trying to make me happy. <sup>a</sup>	2.89	1.21	.49	.62	.74
... because I am supposed to eat it. <sup>b</sup>	1.95	1.08	.46	.57	.50
... because other people (my colleagues, friends, family) eat it. <sup>d</sup>	2.73	1.28	.37	.56	
... because my family/partner thinks that it is good for me. <sup>b</sup>	2.18	1.24	.36	.41	
... because my doctor says I should eat it. <sup>b</sup>	1.74	1.15	.20	.25	
<b>FACTOR 14: TRADITIONAL EATING</b>					
... because it belongs to certain situations. <sup>a</sup>	3.83	1.31	.43	.72	.72
... out of traditions (e.g., family traditions, special occasions). <sup>a</sup>	3.63	1.35	.49	.59	.60
... because I grew up with it. <sup>a</sup>	4.32	1.29	.41	.54	.54
... because it fits the season. <sup>b</sup>	4.67	1.34	.16	.22	
<b>FACTOR 15: HABITS</b>					
... because I eat it regularly. <sup>b</sup>	4.76	1.19	.64	.74	
... because I am accustomed to eating it. <sup>a</sup>	4.56	1.30	.63	.74	.75
... because I usually eat it. <sup>b</sup>	4.63	1.20	.62	.71	.75
... because it is a set part of my diet. <sup>b</sup>	5.02	1.24	.54	.57	
... because it is part of my daily diet. <sup>b</sup>	5.03	1.27	.52	.56	
... because I am familiar with it. <sup>a</sup>	4.78	1.16	.47	.55	.60

Note. Lines in boldface are items selected for the brief TEMS.

<sup>#</sup> analysis with all TEMS items; <sup>'</sup> analysis with brief TEMS;

<sup>a</sup> adopted from preliminary TEMS; <sup>b</sup> newly generated item; <sup>c</sup> rephrased from preliminary TEMS; <sup>d</sup> adopted from the original set of 84 items in Study 2.

**Cross-validation – measurement invariance:** In a next step, it was tested whether the factor loadings of the full and brief TEMS replicate across gender, age, and BMI. Specifically, three group comparisons were made: women ( $n = 745$ ) compared to men ( $n = 295$ ), participants younger ( $n = 725$ ) and older ( $n = 314$ ) than 30 years of age, and participants with lower ( $n = 850$ ) and higher ( $n = 183$ ) BMI than 25 Kg/m<sup>2</sup>. The model fit indices for the six subsamples are displayed in Table 2.3. For analysis, the initial two-group model with no equality constraints was compared with a two-group model where factorial loadings were constrained to be equal across the two comparison groups, respectively (cf., Thompson, 2004). Analysis yielded stable measurement weights across females and males for the full TEMS version. Specifically, the goodness of fit of the model for the two groups in combination and with no equality constraints imposed was satisfactory ( $\chi^2 = 13104$ ,  $df = 5640$ ,  $p < .001$ ,  $\chi^2/df = 2.32$ , CFI = .81, SRMR = .073, RMSEA = .036, 90% CI = .035 - .037). The model with the factor loadings constrained to be equal across groups yielded  $\chi^2 = 13176$ ,  $df = 5703$ ,  $p < .001$ ,  $\chi^2/df = 2.31$ , CFI = .81, SRMR = .073, RMSEA = .036, 90% CI = .035 - .036. The two models did not differ significantly ( $\Delta\chi^2 = 72$ ,  $\Delta df = 63$ ,  $p = .207$ ), indicating that the factor loadings related to the full version for the TEMS were invariant. From the perspective of cross-validation, this illustrated equality across gender serves as support for the 15-factor TEMS model. Similarly, invariance in measurement could be secured across the female and male sample for the brief TEMS version.

Invariance in measurement weights was also found when comparing participants with a BMI lower and higher than 25 Kg/m<sup>2</sup> ( $\chi^2 = 13327$ ,  $df = 5640$ ,  $p < .001$ ,  $\chi^2/df = 2.36$ , CFI = .81, SRMR = .070, RMSEA = .036, 90% CI = .036 - .037 for the unconstrained model and  $\chi^2 = 13403$ ,  $df = 5703$ ,  $p < .001$ ,  $\chi^2/df = 2.35$ , CFI = .81, SRMR = .070, RMSEA = .036, 90% CI = .035 - .037 when factorial loadings were constrained to be equal;  $\Delta\chi^2 = 76$ ,  $\Delta df = 63$ ,  $p = .121$ ). Highly comparable results emerged for the brief TEMS version.

Testing invariance in measurement weights across age yielded a significant difference between the constrained and the unconstrained model, with the latter yielding a

significantly better fit to the data with  $\Delta\chi^2 = 108$ ,  $\Delta df = 63$ ,  $p < .001$  (constrained model:  $\chi^2 = 13038$ ,  $df = 5703$ ,  $p < .001$ ,  $\chi^2/df = 2.29$ , CFI = .81, SRMR = .069, RMSEA = .035, 90% CI = .034 - .036; unconstrained model:  $\chi^2 = 12930$ ,  $df = 5640$ ,  $p < .001$ ,  $\chi^2/df = 2.29$ , CFI = .82, SRMR = .069, RMSEA = .035, 90% CI = .035 - .036). When comparing the two models for participants younger and older than 30 years, differences in unstandardized factor loadings appeared in the three scales: Liking, Visual Appeal, and Price. For older participants, the factor Liking was rather defined by the items 'I eat what I eat because I have an appetite for it.' and 'I eat what I eat because I feel like eating it.', whereas for younger participants, the item 'I eat what I eat because it tastes good.' loaded higher on this factor. Similarly, the factor Visual Appeal was defined by the item 'I eat what I eat because it looks appealing.' for older participants, whereas the item 'I eat what I eat because I recognize it from advertisements or have seen it on TV.' loaded higher on this scale for younger participants. Furthermore, the factor Price was defined by the item 'I eat what I eat because it is free.' in the younger sample, whereas in the older sample the item 'I eat what I eat because it is good value for money.' loaded higher on this factor. When factor loadings of these seven items were not constrained to be equal across age groups, the model fit did not differ significantly from the unconstrained model with  $\Delta\chi^2 = 69$ ,  $\Delta df = 56$ ,  $p = .115$ .

*Table 2.3. Study 3: Goodness of Fit Indices for Models of the Full and Brief TEMS for the Total Sample (N = 1,040) and Subsamples.*

<b>Model (total sample)</b>	$\chi^2$	df	$\chi^2/df$	CFI	SRMR	RMSEA	90% CI	AIC
Model 1: Full version (78 items, 15 factors)	9498	2820	3.37	.83	.070	.048	.047 to .049	10020
Model 2: Factorial reduced version (78 items, 13 factors)	10782	2847	3.79	.80	.082	.052	.051 to .053	11250
Model 3: Brief version (45 items, 15 factors)	2056	841	2.44	.94	.042	.037	.035 to .039	2444
<b>Model (subsamples)</b>								
Women: Full version (78 items, 15 factors)	7680	2820	2.72	.82	.073	.048	.047 to .049	8202
Men: Full version (78 items, 15 factors)	5420	2820	1.92	.77	.081	.056	.054 to .058	5942
Women: Brief version (45 items, 15 factors)	1843	841	2.19	.93	.046	.040	.038 to .042	2231
Men: Brief version (45 items, 15 factors)	1335	841	1.59	.91	.056	.045	.040 to .049	1723
Younger: Full version (78 items, 15 factors)	7555	2820	2.68	.82	.069	.048	.047 to .049	8077
Older: Full version (78 items, 15 factors)	5372	2820	1.91	.80	.083	.054	.052 to .056	5894
Younger: Brief version (45 items, 15 factors)	1744	841	2.07	.93	.046	.039	.036 to .041	2132
Older: Brief version (45 items, 15 factors)	1297	841	1.54	.93	.053	.042	.037 to .046	1685
BMI below 25: Full version (78 items, 15 factors)	8166	2820	2.90	.83	.070	.047	.046 to .048	8688
BMI of 25 or higher: Full version (78 items, 15 factors)	5148	2820	1.83	.71	.091	.067	.064 to .070	5670
BMI below 25: Brief version (45 items, 15 factors)	1752	841	2.08	.94	.042	.036	.033 to .038	2140
BMI of 25 or higher: Brief version (45 items, 15 factors)	1358	841	1.61	.87	.067	.058	.052 to .064	1746

*Note.* All  $\chi^2$  are significant at  $p < .001$ . CFI = comparative fit index, SRMR = standardized root mean squared residual, RMSEA = root-mean-square error of approximation, AIC = Akaike's Information Criterion.

Table 2.4. Study 3: Factor Correlations and Internal Consistencies of the TEMS ( $N = 1,040$ ).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>1 Natural Concerns</b>		.01	-.13 <sup>***</sup>	.10 <sup>**</sup>	.16 <sup>***</sup>	.07 <sup>*</sup>	.01	.07	-.25 <sup>***</sup>	.26 <sup>***</sup>	.59 <sup>***</sup>	.14 <sup>***</sup>	.02	.06	.09 <sup>*</sup>
<b>2 Affect Regulation</b>			.26 <sup>***</sup>	.32 <sup>***</sup>	.27 <sup>***</sup>	.55 <sup>***</sup>	.02	.35 <sup>***</sup>	.22 <sup>***</sup>	.04	-.06	.33 <sup>***</sup>	.45 <sup>***</sup>	.40 <sup>***</sup>	.15 <sup>***</sup>
<b>3 Convenience</b>				.03	.09 <sup>**</sup>	.20 <sup>***</sup>	.18 <sup>***</sup>	.22 <sup>***</sup>	.48 <sup>***</sup>	.24 <sup>***</sup>	-.14 <sup>***</sup>	.14 <sup>***</sup>	.25 <sup>***</sup>	.22 <sup>***</sup>	.32 <sup>***</sup>
<b>4 Weight Control</b>					.09 <sup>**</sup>	.12 <sup>***</sup>	-.11 <sup>**</sup>	.19 <sup>***</sup>	.12 <sup>**</sup>	.08	.42 <sup>***</sup>	.20 <sup>***</sup>	.21 <sup>***</sup>	.17 <sup>***</sup>	.12 <sup>***</sup>
<b>5 Sociability</b>						.53 <sup>***</sup>	.14 <sup>***</sup>	.55 <sup>***</sup>	.18 <sup>***</sup>	.22 <sup>***</sup>	.10 <sup>**</sup>	.50 <sup>***</sup>	.55 <sup>***</sup>	.73 <sup>***</sup>	.18 <sup>***</sup>
<b>6 Pleasure</b>							.51 <sup>***</sup>	.59 <sup>***</sup>	.21 <sup>***</sup>	.32 <sup>***</sup>	.10 <sup>**</sup>	.33 <sup>***</sup>	.33 <sup>***</sup>	.60 <sup>***</sup>	.20 <sup>***</sup>
<b>7 Liking</b>								.25 <sup>***</sup>	.05	.34 <sup>***</sup>	.10 <sup>**</sup>	-.13 <sup>***</sup>	-.17 <sup>***</sup>	.15 <sup>***</sup>	.09 <sup>**</sup>
<b>8 Visual Appeal</b>									.26 <sup>***</sup>	.22 <sup>***</sup>	.08 <sup>*</sup>	.50 <sup>***</sup>	.51 <sup>***</sup>	.57 <sup>***</sup>	.14 <sup>***</sup>
<b>9 Price</b>										.18 <sup>***</sup>	-.07	.19 <sup>***</sup>	.34 <sup>***</sup>	.233 <sup>***</sup>	.26 <sup>***</sup>
<b>10 Need &amp; Hunger</b>											.60 <sup>***</sup>	.10 <sup>*</sup>	.17 <sup>**</sup>	.25 <sup>***</sup>	.49 <sup>***</sup>
<b>11 Health</b>												.07	-.03	.04	.22 <sup>***</sup>
<b>12 Social Image</b>													.73 <sup>***</sup>	.55 <sup>***</sup>	.18 <sup>***</sup>
<b>13 Social Norms</b>														.64 <sup>***</sup>	.24 <sup>***</sup>
<b>14 Traditional Eating</b>															.50 <sup>***</sup>
<b>15 Habits</b>															
$\alpha^{\#}$	.92	.91	.81	.90	.89	.77	.84	.75	.82	.48	.80	.73	.67	.58	.81
$\alpha^{\prime}$	.90	.86	.88	.85	.85	.71	.75	.70	.82	.50	.81	.70	.71	.66	.74

Note. \*  $p < .05$ , \*\*  $p < .01$ ; \*\*\*  $p < .001$ , <sup>#</sup>TEMS; <sup>′</sup> brief TEMS.



**Mean-level differences between motives:** In order to explore the relative importance of the 15 different motives, data were analyzed using repeated measures ANOVA with 'motives' as within-subjects factor. Mauchly's test indicated that the assumption of sphericity was violated ( $\chi^2(104) = 3976, p < .001$ ); therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = 0.60$ ). The main effect of the motives was significant:  $F(8.44, 8767.1) = 1,348.97, p < .001, \eta_p^2 = .57$ . Post hoc analyses using the Scheffé post hoc criterion for significance indicated that almost all means of the 15 motives differed significantly with a mean difference of  $\geq 0.16, p < .05$  (see Table 2.5). An additional mixed-design ANOVA with motives as a within-subject factor and gender (male, female), age ( $\pm 30$  years of age), and BMI ( $\pm 25$  Kg/m<sup>2</sup>) as between-subjects factors also revealed a main effect for the within-subject factor motives,  $F(8.74, 8958.16) = 653.99, p < .001, \eta_p^2 = .390$ , which was qualified by an interaction between motives and gender,  $F(8.74, 8958.16) = 13.84, p < .001, \eta_p^2 = .013$ , an interaction between motives and BMI,  $F(8.74, 8958.16) = 11.25, p < .001, \eta_p^2 = .011$ , and an interaction between motives and age,  $F(8.74, 8958.16) = 14.14, p < .001, \eta_p^2 = .014$ . No other interactions involving the factor motives was statistically significant,  $p > .05$ .

Additional analysis showed that women had, on average, significant higher values than men on 10 of the 15 scales, that is, Natural Concerns, Affect Regulation, Weight Control, Sociability, Pleasure, Liking, Visual Appeal, Need & Hunger, Health, and Traditional Eating (cf., Table 2.5). Repeating the analyses for the brief TEMS revealed highly comparable results. Participants with a BMI lower than 25 Kg/m<sup>2</sup> differed from participants with BMI higher than 25 Kg/m<sup>2</sup> on six out of the 15 scales. Specifically, overweight or obese participants had significant higher scale means on the scales Affect Regulation, Weight Control, and Social Norms, whereas normal weight participants scored significantly higher on the scale Liking, Need & Hunger, and Health. Virtually the same pattern of results was found for the brief TEMS, except that the difference on the Social Norms scale was no longer statistically significant. Participants aged 30 or older had significantly higher scale means than younger participants for Natural Concerns and Health, whereas participants younger

than 30 had higher values for Affect Regulation, Convenience, Pleasure, Liking, Visual Appeal, Price, Need & Hunger, Social Image, Social Norms, and Traditional Eating. Repeating these analyses for the brief TEMS version yielded a virtually unchanged pattern of results.

## **2.6 Discussion**

In the present study series, a comprehensive questionnaire assessing why we eat what we eat in everyday life was developed. Specifically, a first set of 331 reasons why people eat and select certain foods was extracted by means of an extensive literature review, expert interviews, and group discussions in Study 1. These reasons were sorted by two independent groups of researchers and finally condensed into a set of 87 items. In Study 2, the 87 items were presented to 1,250 participants for rating. In an iterative process based on psychometric indicators and exploratory factor analyses, the 87 items were reduced to a preliminary set of 53 items representing 13 different dimensions of motives for eating and food choice. Finally, in Study 3, the items and scales were refined based on their psychometric quality and by improving their match with the content of the respective factor. The combination of these criteria resulted in a final version of the Eating Motivation Survey (TEMS) encompassing 15 factors represented by 78 items. The full as well as the brief version of the TEMS were tested in an independent sample of 1,040 participants. Confirmatory factor analysis yielded adequate fit indices and factor loadings for the proposed 15 factor structure, and cross-validation showed satisfactory invariance of measurement weights across gender, BMI, and age.

Table 2.5. Study 3: Scale Means (Standard Deviations) for the Total Sample ( $N = 1040$ ) and Subsamples ( $n = 745$  Women,  $n = 295$  Men,  $n = 725$  Participants Younger than 30 Years,  $n = 314$  Participants Aged 30 or Older,  $n = 850$  Participants with BMI Lower than 25 Kg/m<sup>2</sup>, and  $n = 183$  Participants with BMI of 25 Kg/m<sup>2</sup> or Higher).

	Overall	Women	Men	<i>t</i>	< 30 years	≥ 30 years	<i>t</i>	BMI < 25	BMI ≥ 25	<i>t</i>
<b>Liking</b>	5.86 (0.65)	5.91 (0.64)	5.72 (0.67)	4.31***	5.92 (0.63)	5.71 (0.68)	-4.91***	5.89 (0.66)	5.69 (0.61)	3.88***
<b>Habits</b>	4.80 (0.88)	4.82 (0.87)	4.74 (0.90)	1.35	4.77 (0.89)	4.85 (0.86)	1.35	4.79 (0.90)	4.80 (0.81)	-0.16
<b>Need &amp; Hunger</b>	4.77 (0.76)	4.83 (0.72)	4.62 (0.84)	3.90***	4.81 (0.75)	4.70 (0.78)	-2.14*	4.80 (0.78)	4.66 (0.69)	2.18*
<b>Health</b>	4.71 (1.01)	4.86 (0.92)	4.34 (1.12)	7.12***	4.65 (1.01)	4.85 (1.00)	2.85**	4.75 (1.00)	4.56 (1.04)	2.26*
<b>Convenience</b>	4.45 (0.97)	4.48 (0.95)	4.38 (1.02)	1.60	4.53 (0.95)	4.27 (0.99)	-4.01***	4.47 (0.97)	4.39 (0.98)	1.03
<b>Pleasure</b>	4.33 (0.94)	4.42 (0.88)	4.08 (1.03)	5.12***	4.40 (0.92)	4.15 (0.95)	-3.95***	4.33 (0.94)	4.31 (0.91)	0.22
<b>Traditional Eating</b>	4.11 (0.88)	4.20 (0.86)	3.89 (0.90)	5.07***	4.15 (0.88)	4.02 (0.86)	-2.22*	4.10 (0.88)	4.17 (0.87)	-1.03
<b>Natural Concerns</b>	3.95 (1.38)	4.11 (1.29)	3.53 (1.50)	5.89***	3.75 (1.38)	4.40 (1.26)	7.40***	3.96 (1.38)	3.85 (1.38)	0.94
<b>Sociability</b>	3.74 (1.10)	3.80 (1.08)	3.58 (1.16)	2.97**	3.77 (1.10)	3.65 (1.11)	-1.64	3.74 (1.12)	3.74 (1.04)	0.02
<b>Price</b>	3.70 (1.03)	3.69 (1.00)	3.71 (1.09)	-0.28	3.85 (1.00)	3.34 (1.00)	-7.60***	3.69 (1.03)	3.77 (1.04)	-1.02
<b>Visual Appeal</b>	3.45 (0.91)	3.58 (0.87)	3.10 (0.92)	8.00***	3.49 (0.89)	3.35 (0.95)	-2.26*	3.45 (0.92)	3.44 (0.87)	0.11
<b>Weight Control</b>	3.30 (1.34)	3.56 (1.18)	2.65 (1.26)	10.34***	3.28 (1.37)	3.36 (1.25)	0.95	3.19 (1.35)	3.80 (1.15)	-6.32***
<b>Affect Regulation</b>	2.73 (1.15)	2.94 (1.16)	2.20 (0.95)	10.57***	2.81 (1.16)	2.53 (1.11)	-3.63***	2.65 (1.11)	3.07 (1.29)	-4.05***
<b>Social Norms</b>	2.39 (0.74)	2.40 (0.73)	2.36 (0.76)	0.84	2.42 (0.73)	2.32 (0.74)	-1.97*	2.37 (0.73)	2.49 (0.77)	-2.08*
<b>Social Image</b>	2.00 (0.72)	1.98 (0.70)	2.05 (0.78)	-1.40	2.04 (0.72)	1.91 (0.71)	-2.64**	1.98 (0.71)	2.08 (0.80)	-1.52

Note. \*  $p < .05$ , \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

Through the systematization of a considerable wealth of different conceptions and measurements of motives for eating and food choice on a conceptual and empirical basis, a stable factorial structure of motives across different groups was generated. Although most motives originated in the presented studies have been suggested by previous research, seldom were multiple motives conceptualized and conjointly assessed. Interestingly, by conjointly assessing motives proposed in different questionnaires, new motive factors often emerged, tapping across different measures and questionnaires. For example, the scale Natural Concerns of the TEMS includes items from two different questionnaires. Specifically, the scale integrates the aspect of ecological welfare from the Ecological Welfare scale (Lindeman & Väänänen, 2000) with aspects of ethical concerns and concerns about the natural content of food as suggested by the Food Choice Questionnaire (Steptoe et al., 1995). An examination of the content of the single items from the newly combined scale supports the empirical notion of a consistent and meaningful scale. Conversely, two other motives related to ethical food choice, which were proposed by Lindeman and Väänänen (2000), that is, Political Values and Religion, could not be retrieved. However, this does not imply that political or religious values do not impact food choice and eating, rather it suggests that these beliefs and attitudes might be more distal, probably exerting their influence through higher-order factors such as ethical concerns or traditions. Alternatively, the type and importance of political values and religion might vary more strongly across groups as compared to other values; and therefore, they did not emerge as a higher-order factor. Admittedly, this is highly speculative and needs to be tested empirically.

Importantly, the present data clearly support previous research in replicating specific motives; thereby, suggesting that these might be core, higher-order motives. Specifically, motives revolving around the topics of health and body weight control clearly seem to represent universal motives, at least in Westernized samples. These motives have been found in many previous studies and are represented in various questionnaires such as the Food Choice Questionnaire (Steptoe et al., 1995) and the Food Choice Motives among Women questionnaire (Lindeman & Stark, 1999) as well as in studies using implicit

measures (Schupp & Renner, 2011). Likewise, affect regulation, economic reasons (i.e., price), and convenience aspects appear to emerge in different samples and measures, also suggesting a high reliability as a distinct type of motivation. Furthermore, motives addressed by Jackson and colleagues (2003), that is, eating for pleasure, to be sociable, and to meet social norms were supported by the present data.

Posing the open-ended question 'Why do you eat what you eat?' often results in the answer 'Because I am hungry, what else?'. However, the present data suggest that one of the most basic and important types of motives for eating, hunger, is difficult to represent psychometrically. Although included in the first version of the questionnaire, the preliminary TEMS (Study 2), it did not fulfill the psychometric item characteristics' requirements. In the final version of the TEMS, hunger is included in the factor Need & Hunger which also encompassed aspects of satiety and energy consumption (Study 3). Still, the factor loading is rather low, and as a consequence, the scale has an unsatisfactory Cronbach's alpha of below .60. This may explain why other questionnaires for assessing motives for eating and food choice do not include this very important and basic motive. The only scale, in which this concept is addressed, is the Intuitive Eating Scale (Tylka, 2006) which measures eating for physical and emotional reasons. However, the focus of the items is on emotional eating rather than eating triggered by physical cues. Moreover, the scale that assesses a reliance on internal hunger and satiety cues captures the capacity to recognize hunger and satiety whereas hunger as a trigger for eating is not directly assessed. Moreover, the importance of hunger as a motive for eating and food choice is unequivocally supported by the present data since it was one of the most often endorsed items (cf., Table 2.2). In both, Study 2 and 3, hunger (included in the scales Physical Well-Being and Need & Hunger) constituted the third greatest reason for eating behavior. Accordingly, we would like to argue that hunger represents a unique, one-faceted motive which by definition obscures assessment through classical psychometric scales, but which nonetheless, needs to be included in a comprehensive measurement of motives for eating and food choice.

Another motive which emerged from the present data pertains to social image considerations as triggers of eating and food choice. Although it is not among the most highly ranked motives in the array of the 15 different motives, it appears apparent that the social image of food might be an influential factor in social situations. The phenomenon that people are willing to pay comparably high prices for products which they do not find particularly palatable (i.e., caviar) finds its explanation in the idea that people assume that they can acquire a positive social image by consuming certain food items. Studies on impression management showed that people do change their eating behavior in order to convey a certain impression (Herman et al., 2003). However, one could speculate that this motive is rather implicit, and therefore, people may not be fully aware of their own intentions in this regard (Herman et al., 2003, Robison et al., 2011).

The interrelation between the factors suggests sufficient divergent validity (cf., Table 2.4). However, it appears to be evident that certain motives cluster more closely together than others. Interestingly, social image concerns showed a clear co-variation with other sociocultural motives. Social image concerns seem to covariate with the importance of social norms, traditions, and sociability for triggering and shaping eating behavior. In particular, the sociability aspect of eating seems to be at the heart of the phenomenon of 'social eating' since it shows a substantial positive co-variation with the three social aspects of eating: social norms, social image, and traditions. In a similar way, Jackson and colleagues (2003) found social and compliance motives to be interrelated (see also Herman et al., 2003 for a comprehensive model of social influence on eating). Interestingly, the present data suggest in addition that sociability reasons are positively correlated with the pleasure of eating. This association was also reported by Jackson and colleagues (2003). However, through the systematic assessment of eating motives, we found that the tendency to eat for social reasons was not only related to eating for pleasure, but also to visual appeal aspects of food. Thus, sociocultural motives appear to constitute a network of motives based on social and biological incentives for eating. On the contrary, health concerns typically promoted by public health interventions were comparably less interrelated with other motives. Specifically, they

were related with body weight control and natural concerns (cf., Steptoe et al., 1995). Comparing these two interrelation clusters suggests that the latter is more motivated by an avoidance mindset, whereas the former is primarily motivated by an approach mindset. One might speculate that for sustainable eating behavior changes, health concerns need to be positively related to social and biological incentives for eating.

The question of which types of motives trigger eating and food choice does not infer which are most influential. Comparing the different subsamples showed that the factorial structure was highly comparable across the samples. In terms of the relative importance of the 15 motives, commonalities as well as systematic differences emerged. Liking, Habits, Need & Hunger, and Health were rated as triggering eating behavior fairly often, both in Study 2 and 3. In contrast, Social Image, Social Norms, and Affect Regulation were seldom rated as a trigger for eating or food choice. This pattern is similar to the rank order found by Steptoe and colleagues (1995) with Sensory Appeal and Health being rated most important, whereas Mood, Ethical Concern, and Familiarity were rated least important. Likewise, Pleasure and Sociability were rated as being more important than Affect Regulation and Social Norms, as suggested by Jackson and colleagues (2003).

The greatest differences in the relative importance between motives emerged between women and men. Women demonstrated significantly higher means than men on 10 out of 15 TEMS scales. The difference was especially pronounced for affect regulation and body weight control reasons. Also, Steptoe and colleagues (1995) reported consistent gender differences with women having higher values on all food choice motives except Sensory Appeal and Familiarity. The fact that women rated nearly all eating motivations to influence eating behavior more often than men could be due to women being more preoccupied with food in general (Tapper & Pothos, 2010). A more specific pattern of differences in motives emerged for younger and older participants. Interestingly, younger participants gave more priority to palatable food than older participants, which could reflect a more 'short-term-oriented' eating style. In line with this reasoning, older participants gave

more priority to 'long-term-oriented' eating motives such as Health and Natural Concerns. This age difference in Health and Natural Concerns has been described before (Steptoe et al., 1995) and also seems intuitive since there is an absolute health benefit for ageing individuals and populations in adopting healthy diets (Darnton-Hill, Nishida, & James, 2004). Furthermore, younger participants' eating behavior was also more often driven by Need & Hunger, Pleasure, Convenience, Visual Appeal, and Affect Regulation, further supporting the idea that younger individuals are more often driven by short-term-related eating motives. Furthermore, younger participants seem to be more influenced by social norms and social image influences. Interestingly, in contrast to social norms and the desire to present oneself favorably to others by eating certain food items, sociability was an equally frequent endorsed reason for eating within younger and older participants. Contrary to previous results (Steptoe et al., 1995), older participants' eating behavior was no more often driven by routine than younger participants. Instead, they gave even less importance to Traditional Eating. Since changing existing routines is a big challenge in diet interventions, it is important to know that these routines are set already in young individuals. Participants with a BMI lower than 25 Kg/m<sup>2</sup> had significantly higher scale means for Liking, Health, and Need & Hunger, whereas overweight or obese participants had significantly higher scale means for Weight Control, Affect Regulation, and Social Norms. The higher importance of Liking and Need & Hunger in participants with a lower BMI and the higher importance of Affect Regulation and Social Norms in participants with a higher BMI indicate that intuitive eating (Tylka, 2006) is greater in participants with a lower BMI. They eat more often because of physiological hunger whereas those with a higher BMI rely more on social norms and emotional cues. However, since our study was cross-sectional, we do not know if eating motives, e.g., Health, cause certain BMIs or if BMI causes eating motives, e.g., Weight Control.

Taken together, the TEMS is a comprehensive measurement of why we eat and why we choose certain foods. This allows for a conjoint assessment of eating motives and adds information to a definition of normal eating behavior. By measuring eating motives, we found important information about which motives trigger eating behavior in everyday life and which



preexisting group differences may underlie eating behavior. However, there are several limitations to these studies. First, the investigated eating motives were developed in an environment where one can choose between thousands of food products every day. Thus, future research needs to investigate how these eating motives apply to other environments in which food is scarce. Second, since the participants took part in online surveys on a voluntarily basis, our samples were self-selected which may have biased the results. Replicating the results in other samples and cultures is desirable (cf., Renner et al., 2008). Third, social desirability may have affected the reporting. The complementary assessment of implicit motives should be subject to future research. Fourth, two TEMS scales (Traditional Eating and Need & Hunger) had unsatisfactory internal consistencies. Future research may face this shortcoming by adding further items to the scales. Furthermore, both the retest-reliability of the TEMS as well as the relationship between eating motives and eating should be investigated in a prospective study. The latter would add evidence to causality concerning eating motives and body weight transitions.

## **2.7 Conclusion**

Taken together, the present data suggest an array of 15 different motives for eating and food choice. Importantly, structural equality could be demonstrated across gender, BMI, and age indicating factorial validity. Although structural equality could be secured across gender, BMI, and age, clear differences in terms of the relative importance of the motives within the various subsamples emerged. Moreover, factorial correlations suggest that socio-cultural motives such as sociability, social norms, traditions, and social image concerns constitute a network of motives which is based on social and biological incentives for eating. Conversely, health concerns which are typically promoted by public health interventions were only related with body weight control and natural concerns. In order to trigger sustainable eating behavior changes, health concerns may need to be positively related to social and biological incentives for eating.

## **Acknowledgements**

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### **3 Candy or apple?**

#### **How self-control resources and motives impact dietary healthiness in women**

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### **3.1 Abstract**

People can choose between a virtually endless array of food items rising the question, which factors determine healthy or unhealthy food choice. The present study examines the impact of two contrasting motives for food choice (affect regulation and body weight control) and self-regulatory competences on healthy eating within a sample of women ( $N = 761$ ). The data show that a relative lack of self-regulatory resources combined with a high tendency to regulate negative affect through comfort eating was associated with an unfavorable dietary pattern. Accordingly, a healthy dietary pattern requires not only self-regulatory capacities but also a facilitating motive structure.

Keywords: Self-Regulation, Emotional Eating, Weight Control, Food Choice

## 3.2 Introduction

Today we can choose from a virtually endless array of food items. Modern supermarkets offer up to 60,000 different food items. This variety contributes to how much we eat (Remick, Polivy, & Pliner, 2009) and it can be also difficult not to choose tempting snack foods but more healthy alternatives on a regular basis. However, which factors determine which food is chosen? In the present study, we ask the question how facilitating ('pull') and impeding ('push') factors of healthy food choice impact healthy eating.

Recent research suggests that general self-control is an important pull factor for a healthy dietary behavior. Self-control is commonly conceptualized as a general ability to override or alter one's inner responses, as well as to interrupt undesired behavioral tendencies (Tangney, Baumeister, & Boone, 2004). A recent study showed that adolescents and young adults with a high self-control capacity spent less money on candy, snacks or soft drinks (Junger & Van Kampen, 2010). Conversely, high impulsivity is associated with an enhanced unhealthy snacking behavior (Verplanken et al., 2005) and, in a laboratory setting, impulsive participants bought more high-caloric snack food in a virtual supermarket when they were hungry (Nederkoorn et al., 2009). These findings suggest that a general, thus behavior unspecific, capacity for self-control decreases unhealthy food choices.

Another line of research suggests that not only the *capacity* for self-control impacts healthy food choice but that also the *motive* or desire for regulating food intake impacts food choice. Specifically, people who demonstrated a high motivation for controlling their body weight showed a higher fiber and a lower fat intake, an increased fruit and vegetable consumption and a lower consumption rate for snacks, fast-foods, and other unhealthy food items (Eertmans et al., 2005; Glanz et al., 1998; Steptoe & Wardle, 1999). However, the question how the motivation for regulation on the one hand and the general capacity for regulation on the other hand concur has not been examined, yet.

The motivation and capacity to regulate (unhealthy) food consumption can be conceptualized as pull factors for a regular healthy diet. However, certain factors might

counteract these pull factors. Research suggests that an important push factor is the motive to regulate negative affect or emotions by the consumption of unhealthy or high caloric food items. However, although it appears plausible that people, when being in a negative state, choose candy instead of an apple in order to comfort themselves, empirical evidence supporting this notion is mixed. Several studies showed that 'emotional eaters' consumed more energy-dense foods (e.g., Konttinen et al., 2010; Macht & Mueller, 2007), other studies did not (e.g., Adriaanse, De Ridder, & Evers, 2011; Habhab, Sheldon, & Loeb, 2009). One possible reason for the inconsistency of the results is that the urge to cope with negative affective states by comfort eating is compensated through a high motivation and capacity for self-control.

One aim of the present study was to examine the relative impact of the behavior specific tendency for body weight control and general capacity for self-control on healthy eating. A further aim was to determine the impact of the two counteracting push (i.e., tendency for emotional eating) and pull (i.e., tendency for body weight control and capacity for self-control) forces on healthy eating.

Whereas previous research mainly focused on specific consumption behaviors (i.e., snacks), the present study employed a more comprehensive and validated measure for healthy eating based on the recommendations of the German Nutritional Society and results from the WHO MONICA study (cf., Winkler & Döring, 1998; 1995). Since previous research yielded substantial and reliable gender differences with regard to the core study variables such as diet (Konttinen et al., 2010; Renner et al., 2008), body weight and affect regulation motive (Steptoe et al., 1995), and self-control (Gibson, Ward, Wright, Beaver, & Delisi, 2010), only women were included in the present study.

### 3.3 Method

#### Participants

One-thousand ninety eight women answered an online survey. Of these, 337 (31%) filled out less than 75% of the survey and were therefore excluded from analysis. The remaining 761 women had a mean age of 32.5 years ( $SD = 11$ ; range 15 to 74 years). The majority (76%) had an university-entrance diploma. The average BMI was 23.6 ( $SD = 4.6$ ; range 16.9 to 47.7). Comparing the study sample ( $N = 761$ ) with the drop-out sample ( $N = 337$ ) showed no significant difference in terms of BMI (23.6 vs. 23.8,  $t(1094) = -0.62$ ,  $p = .53$ ). However the study sample was slightly younger (32.5 vs. 34.4,  $t(558.7) = -2.30$ ,  $p = .02$ ) and better educated (76% vs. 64% with university-entrance diploma,  $\chi^2(6) = 20.51$ ,  $p = .002$ ) than the drop-out sample.

#### Measures

*General Self-control* was measured with a German translation of the Brief Self-Control Scale (BSCS, Tangney et al., 2004; available at [www.uni-konstanz.de/diagnostik/research\\_measures.htm](http://www.uni-konstanz.de/diagnostik/research_measures.htm)). The BSCS consists of 13 items such as 'I am good at resisting temptations.' ( $\alpha = .81$ ) with a five-point rating scale with [1] 'not at all like me' and [5] 'very much like me'.

*Body weight control motive.* Four items assessed body weight control as food choice motive ( $\alpha = .89$ ) with responses ranging from [1] 'never' to [7] 'always': 'I choose certain food items because they are low in calories', 'I choose certain food items because they are low in fat', 'I choose certain food items because I want to lose weight', and 'I choose certain food items to keep my weight'.

*Affect regulation motive.* Five items assessed the extent of affect regulation as food choice motive ( $\alpha = .90$ ): 'I eat because I am frustrated', 'I eat because I am sad', 'I eat to

distract me', 'I eat because I am stressed', and 'I eat to cheer me up', with responses ranging from [1] 'never' to [7] 'always'.

*Dietary behavior* was assessed with the validated food frequency questionnaire (Winkler & Döring, 1998; 1995). Participants were asked how often they eat on average food items from 15 different selected food categories (e.g., whole meal products, vegetables, fruits, chocolate, cake, meat, salty snacks) with [6] 'nearly once a day' and [1] 'never'. These 15 food categories were accumulated into a food frequency index reflecting dietary quality with a possible range of 0 to 30. According to the recommendation of the German Nutritional Society and norm values for German samples on the basis of the WHO MONICA Augsburg Dietary Survey (cf., (Winkler & Döring, 1995; Winkler, Döring, & Keil, 1991), scores of 13 or below indicate an unfavorable dietary pattern, scores greater than 13 and lower than 16 a regular dietary pattern, and scores of 16 or higher an optimal dietary pattern.

### **Analytical procedure**

Missing data were imputed using the Expectation Maximization algorithm in SPSS 17.0 (cf., Gold & Bentler, 2000). Missing values were below 5% for all variables. Structural equation models were computed with Mplus 5.1. Latent variables were based on indicators at the item level for both food choice motives. For general self-control, indicators were based on parcels which were created by the random assignment method (Little, Cunningham, Shahar, & Widaman, 2002). Parcels have a lower error variance and are, thus, more reliable than single indicators (Bandalos & Finney, 2001). Items of the three independent variables were z-standardized to test the interactions.

Model fit was assessed by the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root-mean-square error of approximation (RMSEA). A good fit is indicated by a CFI and TLI greater than .90, a RMSEA value smaller than .08, a lower bound 90% confidence interval close to zero, and an upper bound 90% confidence interval not exceeding



.10 (Tabachnick & Fidell, 2001). Because the  $\chi^2$  statistic is sample-size dependent, the  $\chi^2/df$  ratio was additionally calculated with a  $\chi^2$  not larger than 2-5 times the degrees of freedom indicating a good fit (Bollen & Long, 1993).

### 3.4 Results

Behavior specific and general self-control resources, that is, the tendency for body weight control and capacity for self-control, did not significantly covary (cf., Table 3.1). Interestingly, both food choice motives were positively related. Specifically, people with a tendency to eat in order to cope with negative affect had also a significantly higher tendency to control their body weight. Furthermore, whereas both the motivation for body weight control and the general capacity of self-control were positively correlated with a healthy dietary pattern, the latter correlation coefficient was significantly greater with Fisher's  $Z = 3.25$ ,  $p < .01$ . Moreover, the affect regulation motive was negatively related to a healthy dietary pattern. This correlation coefficient differed again significantly from the other two with Fisher's  $Z \geq 5.29$ ,  $p < .001$ .

To estimate the relative impact of general self-control, the motivation for body weight control and affect regulation, two conceptually different structural equation models were computed. In the first model, the independent additive effects of the three predictors on healthy dietary behavior were tested. In the second model, compensatory effects were examined, testing the hypothesis whether a high degree of general or behavior specific self-control may compensate a high tendency to regulate negative affect through the consumption of high caloric, palatable food.

In Model 1, the three predictors, general self-control, the motivation for body weight control, and affect regulation were specified as intercorrelated latent variables and dietary behavior as a manifest variable. Model 1 yielded a good fit,  $\chi^2(99) = 396$ ,  $\chi^2/df = 4$ , CFI = .95, TLI = .94, RMSEA = .06 (90% CI = .056, .069). The results showed, that a higher general

capacity for self-control was associated with a healthier dietary behavior ( $\beta = .25, p < .001$ ). The same holds true for the behavior specific self-control measure, the motivation for body weight control ( $\beta = .15, p < .001$ ). In contrast, the tendency to regulate negative affect through eating had a hindering effect, confirming its role as push factor. Specifically, the greater the tendency of the participants was to regulate negative affect through eating, the less healthy was their dietary pattern ( $\beta = -.09, p = .04$ ). Thus, all three predictors explained substantial variance of dietary behavior.

Table 3.1. Correlations between study variables ( $N = 761$ ).

	General self-control	Body weight control motive	Affect regulation motive	Food frequency index <sup>#</sup>
General self-control	1.00			
Body weight control motive	-.03	1.00		
Affect regulation motive	-.43***	.30***	1.00	
Food frequency index	.28***	.12**	-.15***	1.00

Note. \*\*\*  $p < .001$ , \*\*  $p < .01$ , # higher values indicate a healthier food intake.

In Model 2, interaction terms of the three variables were added. However, no interaction term reached statistical significance. Unstandardized regression weights ranged from  $-.25$  to  $.31, p > .09$ . Thus, no compensatory or synergistic effects were observed.

A final analysis determined the absolute degree of healthiness of the dietary pattern, based on German reference norms (Winkler & Döring, 1995) in dependence of the three

predictor variables. Towards this end, high and low scoring groups were defined as being one standard deviation above or below the sample mean of the respective variable (cf., Nederkoorn et al., 2009). Mean levels are based on the  $\beta$ 's and prediction equation derived from Model 1. While the dietary behavior was commonly in the regular or optimal norm range (see Fig. 3.1), clear differences in the healthiness of diet were observed in dependence of the three predictor variables. A dietary pattern in the optimal range was only observed for participants with both a high general self-control and a high motivation for body weight control. Interestingly, even these 'high self-regulators' showed a decrease in healthy eating when they had simultaneously a high tendency to regulate negative affective states through comfort eating. A further noteworthy finding is that a high general self-control had a greater facilitating effect on a healthy diet as compared to a high motivation for body weight control. Finally, the relative lack of self-regulatory resources combined with a high tendency to regulate negative affect through comfort eating was associated with the least favorable dietary pattern.

### **3.5 Discussion**

The present study revealed the simultaneous contributions of general self-control, specific body weight control motive, and affective comfort eating on dietary healthiness in a sample of women. Somewhat surprisingly, of the two pull factors facilitating a healthy diet, the general capacity for self-regulation showed stronger effects than the more behavior specific body weight control motive. Furthermore, a high tendency to regulate negative affect through comfort eating lowered dietary healthiness consistently with the notion of a push factor. Overall, the healthiness of diet was systematically related to independent push and pull factors of food choice and eating.

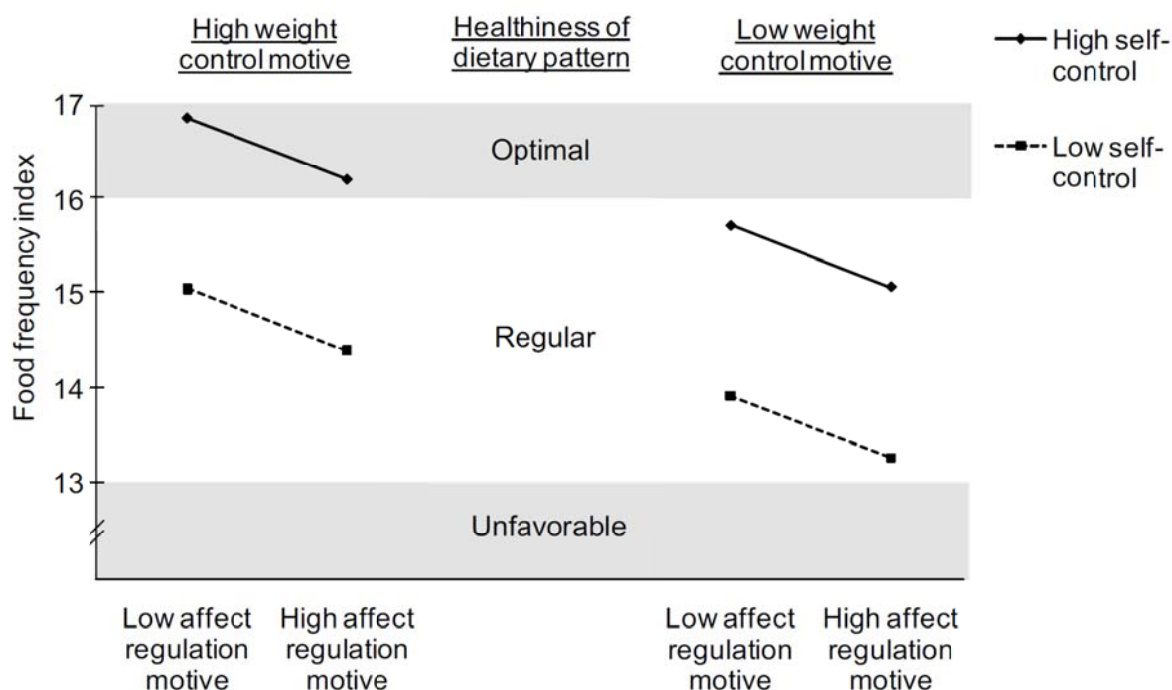


Figure 3.1. Food frequency index as a function of general self-control, body weight control motive, and affect regulation motive.

Focusing on snacking behavior, previous research already suggested that both self-control and body weight control motive modulate food choice (e.g., Junger & Van Kampen, 2010; Glanz et al., 1998). These findings are not limited to a highly specific food category, but seem to extend to a broad range of food categories as the present study used a comprehensive and validated measure of dietary healthiness. Furthermore, assessing both pull factors provides important insights into their relationship and relative importance for dietary healthiness. Self-control and body weight control motive made independent contributions to dietary healthiness, and accordingly represent two non-redundant facets of self-regulatory resources facilitating a healthy diet. Interestingly, in the present sample, general self-control showed a significantly stronger relationship to dietary healthiness than the behavior specific motivation for body weight control suggesting that ‘self-control generalists’ are better off than ‘self-control specialists’.

Given that self-control can be improved, the current data have implications for the promotion of healthy eating. For instance, a recent study showed that the training of a self-control strategy was effective in reducing strong habits of unhealthy snacking (cf., Tam, Bagozzi, & Spanjol, 2010). Furthermore, the experience of self-control in one domain can have 'spill-over' effects to unrelated domains. A longitudinal study showed that through a regulatory exercise phase, participants showed improvements in the regulation in a wide range of health-related behaviors such as a decrease in smoking and alcohol consumption and an increase in healthy eating (Oaten & Cheng, 2006). Thus, there is evidence that at least domain-specific self-control can be improved and that improved self-control leads to a healthier dietary pattern. However, rather than supporting a 'one size fits all' approach, the current findings suggest the identification and monitoring of tailored strategies to promote healthy eating depending on the individual profile of push and pull factors. Consistent with the 'value from fit' view (cf., Tam et al., 2010), effectiveness of promotion strategies targeting the domain-specific control of body weight may depend on a corresponding high personal disposition for self-control. Conversely, people with a low dispositional self-control may profit more from the implementation of external control strategies. Overall, interventions need not only to focus on the desire and capacity for body weight control but also on the general capacity for self-control.

The current study supports the notion that a high tendency to regulate negative affect through comfort eating lowered dietary healthiness in women. Inconsistent findings regarding the relationship of emotional eating and unhealthy diet have been attributed recently to the measurement of emotional eating. Specifically, the emotional eating subscale of the Dutch Eating Behavior Questionnaire (Van Strien et al., 1986) is considered to primarily measure beliefs about the relation of emotion and eating rather than the tendency to regulate negative affective states through comfort eating (Adriaanse et al., 2011). Items used in the present study specifically assess the tendency to regulate negative affect through eating. Thus, the current measure of the affect regulation motive appears useful to assess emotional eating and is predictive for unhealthy dietary behavior.

Beyond methodological issues, the present study has further implications why previous studies were inconsistent. Specifically, emotional eating is but one factor contributing to food choice and dietary healthiness. The simultaneous consideration of the push and pull factors in the present study suggests that a high tendency to regulate negative affect by eating can be counteracted by high self-control. This reasoning is based on the finding that high emotional eating was associated with less general self-control but increased motivation for body weight control. Accordingly, the relationship between emotional eating and dietary healthiness in a given study may depend on the proportion of participants with high or low self-control. Overall, general self-control seems to be an important moderator of food choice and healthy diet, opposing the push factor emotional eating, and influencing the extent to which foods are considered tempting (De Ridder & De Wit, 2006).

Some limitations of the present study need to be considered. Healthy eating was defined according to the recommendations of the German Nutritional Society (Winkler & Döring, 1995). However, at present, there is no commonly accepted definition of healthy or unhealthy eating, and thus, the classification is debatable. All variables were self-reported and the complementary assessment of objective measures is desirable. Importantly, validation data for the used food frequency questionnaire showed good agreement with a continuous 7-day diary record (Winkler & Döring, 1995). Causal inferences cannot be drawn on the basis of the present cross-sectional data. And finally, only German women were included in the present study. Therefore, the findings cannot be generalized across gender or cultures (cf., Renner et al., 2008).

## **Acknowledgements**

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## **4 What if Bridget Jones` little sister ate more when she is loved?**

### **Differential effects of social inclusion and exclusion on eating behavior**

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## 4.1 Introduction

Remember the last time you felt included and loved by others. Did you eat more or less than usual? And what about the last time you felt excluded and rejected by others. Did you eat more and gained weight as the famous movie character Bridget Jones did? Or did you rather lose your appetite? Until now, research on this topic has most often focused on the effects of social exclusion on eating behavior. In an experimental study, Baumeister and colleagues (2005) found indeed that people ate more highly palatable but unhealthy food items during acute interpersonal stress episodes as compared to when included by other people. However, there is evidence for interindividual differences in people's responses to social stress. Survey studies showed that people differ greatly in the (self-reported) habitual effect of stress on the amount of eating. For instance, in a study by Oliver and Wardle (1999) nearly equal numbers of participants reported eating more or less than usual when stressed. Thus, some people seem to have learned to cope with stress by eating whereas others do not show this pattern.

But what about the effects of positive social interactions? How does eating behavior change when people are loved and included by others? In the past, research has nearly neglected this other side of the coin even though the need to belong is an important motive which influences emotional as well as cognitive processes and has a great impact on health and well-being (Baumeister & Leary, 1995). Hence, the purpose of this study was to fill in this gap by investigating effects of social inclusion as compared to exclusion on eating behavior. Furthermore, we aimed to examine how individual differences in self-reported habitual eating response to stress, as a learned coping mechanism, moderate the effects of experimentally manipulated inclusion or exclusion on eating behavior.

## 4.2 Method

Two hundreds and fifty-one students and members of the University of Konstanz took part in this study receiving 10 €. In order to compare people with habitual tendency to eat less vs. more when socially stressed, those who reported no change ( $n = 110$ ) were excluded. The remaining 41 male and 100 female participants had a mean age of 24 years ( $SD = 6$ ) and a mean BMI of  $23 \text{ Kg/m}^2$  ( $SD = 3$ ). Participants were randomly assigned to the social inclusion ( $n = 44$ ), exclusion ( $n = 46$ ) or neutral condition ( $n = 51$ ). In the social inclusion condition, the experimenter delivered strong positive feedback from an ostensible second same-sex participant who was introduced to participants by a videotaped message. Social exclusion was manipulated by having a same-sex confederate refuse to meet participants after seeing their videotaped message (see Stillman et al., 2009). In the neutral condition, the first study was skipped because the ostensible second participant had to cancel participation.

After these manipulations, participants had to taste and rate three different kinds of ice cream (170 g each) for approximately twelve minutes. Following this, participants filled in some questionnaires, assessing their weight and height, as well as dietary restraint (Herman & Polivy, 1980). Furthermore, they reported their habitual eating pattern in response to social stress on a 5-point scale. After participants had been carefully debriefed, the remaining ice cream was weighed. The study protocol was approved by the ethical committee of the University of Konstanz.

## 4.3 Results

Participants who reported to habitually eat much less and less than usual were combined for analysis ( $n = 96$ ) as were participants who reported to habitually eat much more and more than usual ( $n = 45$ ). A 3 (inclusion vs. exclusion vs. neutral condition)  $\times$  2 (habitual tendency to eat less vs. more when socially stressed) ANOVA on grams of ice

cream eaten revealed neither a main effect of the condition nor of the habitual tendency to eat less or more, but a significant interaction between these factors ( $F(2,135) = 7.7, p = .001, \eta_p^2 = .10$ ; see Figure 4.1). As expected, in the social exclusion condition participants, who reported a habitual tendency to eat more when socially stressed, ate significantly more ( $M = 147$  g,  $SD = 73, n = 17$ ) than participants with a habitual tendency to eat less when socially stressed ( $M = 86$  g,  $SD = 48, n = 29$ ;  $F(1,135) = 12.4, p = .001, \eta_p^2 = .08$ ). This difference disappeared in the neutral condition ( $M = 111$  g,  $SD = 52, n = 16$  vs.  $M = 112$  g,  $SD = 58, n = 35$ ;  $F(1,135) = 0.008, p = .928, \eta_p^2 = .00$ ). However, in the social inclusion condition the reversed pattern was found. In this condition participants with a habitual tendency to eat less when socially stressed ate significantly more ice cream ( $M = 130$  g,  $SD = 60, n = 32$ ) than participants with a habitual tendency to eat more when socially stressed ( $M = 92$  g,  $SD = 35, n = 12$ ;  $F(1,135) = 3.9, p < .05, \eta_p^2 = .03$ ).

Focusing on participants with a habitual tendency to eat more when socially stressed showed a constant and significant decrease in intake the more they were included ( $F(2,135) = 3.6, p < .05, \eta_p^2 = .05$ ). For participants with a habitual tendency to eat less when socially stressed the reversed pattern emerged. They ate significantly more the more they were included ( $F(2,135) = 4.6, p < .05, \eta_p^2 = .06$ ). There were no effects of restraint eating or BMI on eating behavior.

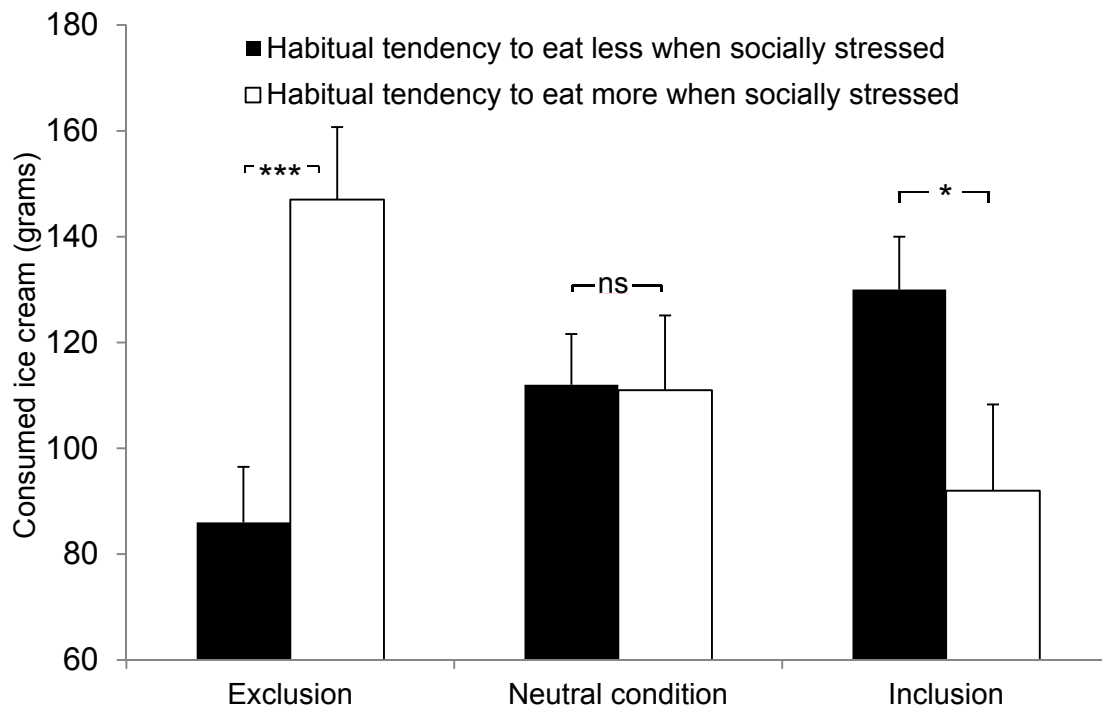


Figure 4.1. Significant interaction between condition and habitual tendency to eat less or more when socially stressed ( $F(2,135) = 7.7$ ,  $p = .001$ ,  $\eta_p^2 = .10$ ). Error bars indicate standard errors of the mean. \*  $p < .05$ , \*\*\*  $p < .001$ , ns not significant.

#### 4.4 Discussion

We found important individual differences in the effects of experimentally manipulated inclusion or exclusion on eating behavior in dependence of people's self-reported coping with stress by eating. The increased intake of participants with a habitual tendency to eat more when stressed in the exclusion condition as compared to the neutral condition could be due to impaired self-regulation (Baumeister et al., 2005) whereas their decreased intake in the inclusion condition could reflect a push in self-regulation through a positive social interaction. At the same time, this eating pattern can be described as emotion regulation eating, that is, "stress eaters" regulated their stress-related negative emotional state through

eating (Macht, 2008) whereas the more they were included the less they needed to regulate their emotions by eating.

For people with a habitual tendency to eat less when stressed, it is more difficult to explain their behavior with a self-regulation approach. However, Macht (2008) identified this decrease in eating in congruence with emotions experienced in stress as emotion-congruent modulation of eating behavior. In other words, “stress fasters” seem to lose their appetite when socially stressed and eat more the more they are included. In conclusion, future research and practice should consider both, effects of negative as well as positive social interactions on eating behavior paying attention to individual differences in learned functions of food.

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## 5 General Discussion

### 5.1 Summary

Spending nearly seven years of our lives eating and drinking in an environment where we could spend even more time on choosing between thousands of food products, poses the question why we eat what we eat. The present dissertation sheds some light on this topic. Table 5.1 summarizes the main findings. Extending previous research, which focused mostly on the pathology of eating, in a first step, a wide range of motives underlying normal eating behavior was brought together and systematized, resulting in a comprehensive questionnaire, that is, the Eating Motivation Survey. This constitutes a promising approach for a comprehensive definition of normal eating that goes beyond the absence of pathology or presence of physiological needs. In a second step, we provided evidence how these individual variables impact dietary healthiness, which is an important question with regard to diet-related diseases being the leading causes of death worldwide (WHO, 2008). In contrast to previous research, which focused mostly on the effect of single push or pull factors on eating behavior, we demonstrated how push and pull factors act together. In a third step, this focus on individual influences on eating behavior was further expanded by illustrating how individual and situational variables impact eating behavior simultaneously.

Table 5.1. Aims, results and conclusions.

Chapter	Aims	Results	Conclusions
2	To capture a wide range of motives underlying normal eating behavior and to develop on this basis a concise questionnaire, that is, the Eating Motivation Survey.	15 motive factors underlying normal eating behavior were empirically identified: <i>Liking</i> <i>Habits</i> <i>Need &amp; Hunger</i> <i>Health</i> <i>Convenience</i> <i>Pleasure</i> <i>Traditional Eating</i> <i>Natural Concerns</i> <i>Sociability</i> <i>Price</i> <i>Visual Appeal</i> <i>Weight Control</i> <i>Affect Regulation</i> <i>Social Norms</i> <i>Social Image</i>	The Eating Motivation Survey allows for a comprehensive, systematic, and standardized measurement of why we eat what we eat. This enables an investigation of the interplay between different eating motives and adds information to a definition of normal eating behavior.
3	To explore the impact of individual motive variables on dietary healthiness:  To examine the conjoint impact of the motive as well as capacity for <i>body weight control</i> , as pull factors, and the <i>affect regulation motive</i> , as push factor, on healthy eating.	Both, the motive and capacity for <i>body weight control</i> predicted dietary healthiness independently, whereas the <i>affect regulation motive</i> was associated with a more unhealthy dietary pattern. An optimal dietary pattern was only present in participants with both, a high motive and capacity for <i>weight control</i> .	High control resources allow for a healthy diet despite a concurrently high <i>affect regulation motive</i> . Thus, when investigating individual determinants of dietary healthiness, both push and pull factors need to be considered.
4	To examine the conjoint influence on eating behavior of both, individual (i.e., <i>motive to eat in response to social stress</i> ) and situational factors (i.e., social exclusion and inclusion).	Compared to participants without habitual tendency <i>to eat in response to stress</i> (stress fasters), in those participants with this tendency (stress eaters), social exclusion led to an increased consumption of ice cream in a subsequent taste test. Social inclusion, however, reversed this pattern, causing stress fasters to eat significantly more than stress eaters.	The impact of the individual <i>motive to eat in response to social stress</i> on eating behavior depends on situational influences. Consequently, future research and practice, targeting determinants of eating behavior, should account for both, individual as well as situational variables.



## **5.2 The other side: Leaving pathological and stress-related eating behind**

This dissertation aimed to switch the focus of previous research on pathological and stress-related eating to an investigation of normal and positive eating behavior. The basic idea was that a deeper understanding of normal eating allows for insights on crucial factors and mechanisms, helping to prevent pathological changes and developments in eating behavior. In a similar vein, the focus of previous research on the effect of social stress on eating (e.g., Baumeister et al., 2005), seems to conflict with the fact that positive social interactions are predominant in most people's life (Skevington et al., 2004). Thus, in chapter 2 we provided an approach of defining normal eating behavior that goes beyond the absence of pathology (Herman & Polivy, 1996) through a comprehensive assessment of eating motives. Furthermore, whereas previous research mostly ran positive social interactions only as control conditions when investigating the effects of social stress (e.g., Baumeister et al., 2005), we explicitly tested the effects of positive and negative social interactions on eating behavior in chapter 4. In dependence of people's motivational dispositions, positive social interactions were found to act as either a push or a pull factor, explaining previous discrepancies in the effect of these interactions on eating behavior (cf., Schlundt et al., 1989; Turner et al., 2010). Thus, this dissertation provides a first step into a deeper understanding of normal and positive eating.

## **5.3 The comprehensive view**

Figure 1.1 displays a conceptual model of factors underlying eating behavior. Eating behavior seems to be driven by a complex pattern of multiple determinants both on an individual and situational level. Consequently, for a full understanding of why people eat what they eat, a comprehensive view is necessary. Following this comprehensive view, in a first step, multiple individual motives for eating and food choice were simultaneously considered and comparably assessed, as presented in chapter 2. In a second step, the combined impact of these motives on eating behavior was exemplarily investigated, as illustrated in chapter 3.

In a third step, this individual perspective was extended by situational variables. In chapter 4, we exemplarily investigated how individual factors act together with situational variables. Our findings demonstrate that push and pull factors can occur both on an individual and situational level and even more important: that an individual factor can push in one situation and pull in another! The same seems to be the case for situational variables, that is, a certain situation can be a push factor in one person and a pull factor in another one. This dissertation showed that, on an individual level, the *motive to eat in response to social stress*, acted as a push factor only in stressful situations, whereas it was a pull factor in positive social situations. On a situational level, a positive social interaction acted as a pull factor only in individuals with *motive to eat in response to stress*, whereas this was a push factor in individuals without such a motive.

Furthermore, attention should be paid to the matching between individual and situational variables. In chapter 4, eating behavior changed in dependence of the matching between individual and situational variables. The same might be true for other individual and situational factors. Thinking of interventions on a situational level, for example, effects may highly depend on whether they match with an individual's disposition. For instance, people with a high *convenience* and low *health* motive might benefit most from those interventions that decrease the ease of accessing unhealthy snack foods (Faith, Fontaine, Baskin, & Allison, 2007), thereby removing the situational incentive value of these foods (e.g., candy from vending machines). For people who already display a low *convenience* and high *health* motive on an individual level, such interventions might not be effective. Furthermore, information campaigns about the calorie content of certain foods, aiming to act as a situational pull factor, might be ineffective for people with a low *weight control* and high *pleasure* motive. Instead, information campaigns, targeting on the pleasure of eating healthy foods, might be more effective for these people. Another approach to manipulate situational incentives of certain foods, is the taxing of unhealthy foods. However, evidence concerning the use and impact of food taxes on eating behavior is inconsistent (Caraher & Cowburn, 2005). One reason for this divergence could lie in the fact that some people exhibit a higher

*price motive* than others. Such interventions might be ineffective for people with a low *price motive* but very effective for people scoring high on this motive. These examples illustrate the importance of an in-depth consideration of multiple individual and situational factors, as well as their matching to each other for a full understanding of eating behavior.

#### 5.4 Motives in relation

In this dissertation, several interesting patterns of related motives were discovered. In chapter 2, the cohesive motives *health*, *weight control* and *natural concerns* did not cluster together with social and biological eating motives. However, social motives were highly related to each other as well as to *eating for pleasure* and *eating because of an appealing presentation of foods*. This could imply that there might be different types of eaters, for example, highly controlled health-eaters, scoring high on the motives *health*, *weight control* and *natural concerns*, and, in contrast, social pleasure-eaters, scoring high on social and biological motives. Comparing these two interrelation clusters suggests that the latter might be more motivated by an avoidance mindset, whereas the former might be primarily motivated by an approach mindset. The idea that adaptive functioning is thought to reflect a balance between approach and avoidance systems (Schlund, Magee, & Hudgins, 2011) illustrates the importance of integrating both mindsets in behavior change interventions. In a similar vein, Harrison, Treasure, and Smillie (2011) showed that a high avoidance mindset combined with a low approach mindset was associated with the risk of developing eating disorders. Thus, in order to trigger sustainable eating behavior changes, health and weight control concerns may need to be positively related to social and biological incentives of eating.

These interrelation clusters are furthermore similar to the difference pattern, observed between younger and older people in chapter 2. Younger participants gave more priority to *pleasure*, *need & hunger*, *visual appeal*, and *affect regulation* as eating motives, whereas older participants scored higher on the motives *health* and *natural concerns*. We interpreted

the pattern observed in younger participants as more short-term-oriented whereas the motive pattern of older participants was understood as being more long-term-oriented. Linking these observations to the interrelation clusters described above shows an essential overlap in motive patterns between 'approach-oriented social pleasure-eaters' and short-term-oriented younger participants, on the one hand, and between 'avoidance-oriented controlled health-eaters' and long-term-oriented older participants on the other hand. Evidence for such motive clusters comes from previous research. 'Socially oriented eaters' (Stewart & Tinsley, 1995) and 'food for mood consumers' (Honkanen & Frewer, 2009) were opposed to 'health oriented eaters' (Stewart & Tinsley, 1995) and 'natural food consumers' (Honkanen & Frewer, 2009). Thus, there might be a shift in motive patterns with age, with health-related long-term motives being more present in older age and socio-biological short-term motives more prevalent in younger age.

Another qualitatively different motive pattern has been reported for overweight and normal-weight people (chapter 2). Participants with a BMI lower than 25 Kg/m<sup>2</sup> had significantly higher scale means for the motives *liking*, *need & hunger*, and *health*, whereas overweight or obese participants had significantly higher scale means for *weight control*, *affect regulation*, and *social norms*. This difference pattern points into another direction than the clusters outlined above. However, previous research has also reported these kinds of clusters, where a pattern of motives focusing on internal cues, such as *hunger* and *taste*, was opposed to a pattern of motives that involves rather thoughts about *weight control* (Horacek & Betts, 1998). The rank order of the importance of eating motives (Table 5.1) illustrates that normal-weight people scored even higher than overweight people on the most important motives (*liking*, *need & hunger*, and *health*), and even lower on the least important motives (*weight control*, *affect regulation*, and *social norms*). Hence, differences in the importance of eating motives seem to be greater in normal-weight people than in overweight people.

## 5.5 Social influences on eating behavior

This dissertation provides new insights into social influences on eating behavior. Social phenomena can have considerable impacts on eating (Delormier, Frohlich, & Potvin, 2009). In chapter 2, we identified four social motives underlying eating behavior, that is, *sociability*, *traditional eating*, *social norms*, and *social image*. Concerning their valence, the two motives *sociability* and *traditional eating* can be considered as rather positive social motives as they involve pleurably eating in social situations. In contrast, the motives *social norms* and *social image* are more based on complying to social pressure and can thus be considered as more unpleasant social influences. These imposing eating motives were rated to seldom underlie eating behavior, whereas the more positive social motives *sociability* and *traditional eating* were rated to influence eating behavior more often.

In chapter 4, we switched from this individual perspective to social influences on a situational level. Similarly to the described positive and negative social motives, we investigated the influence of positive and negative social situations on eating behavior. We were especially interested in the effect of positive social situations, since they, fortunately and similar to positive individual social motives, appear to play a more important role in most people's life (Skevington et al., 2004). We found that, depending on individual variables, both positive and negative social situations acted as a push factor in some participants and as a pull factor in others. This poses the interesting question whether, in a similar vein, positive and negative social motives can act as push factors in one situation and as a pull factor in others. For instance, how do the *sociability* or *social norms* motive impact eating behavior in different situations?

Evidence to answer this question comes from research concerning the phenomena of 'social facilitation' and 'social modeling' (Herman et al., 2003). Social facilitation denominates the finding that pleurably eating together with other people increases food intake, the higher the number of people (Redd & De Castro, 1992). However, this increase seems to be especially strong when people eat together with friends and family (De Castro, 1994). Given

that people with a high *sociability motive* more often eat together with other people than people with low *sociability motive*, we could assume that the effect of this motive on eating behavior is dependent on the situational variable with whom people are eating: The *sociability* motive might be a push factor only when people eat with family and friends. In a similar vein, research on the effects of social modeling on eating behavior suggests that the *social norms* motive could act as a push factor in situations in which the 'model' eats a lot and a pull factor if the model eats very little (Nisbett & Storms, 1974).

## 5.6 Eating in response to negative emotions

The *motive to eat in response to negative emotions* was addressed in all studies included in chapter 2, 3, and 4. In chapter 2, this motive arose in a comprehensive composition of motives for normal eating. Although, compared to other motives, it does not influence eating behavior very often, it nevertheless seems to be a core eating motive, since previous research has found this motive, too (e.g., Jackson et al., 2003; Steptoe et al., 1995; Van Strien et al., 1986). We found that the *motive to regulate negative affect through eating* shows an interesting variation in dependence of person characteristics, like gender, age, and BMI. It seems to play a more important role in women, younger and overweight people than in men, older and normal-weight people.

Chapter 3 suggests that the association between the *affect regulation motive* and BMI might be mediated through eating behavior. The *affect regulation motive* appeared as a push factor to more unhealthy choices. However, when targeting the effect of this push factor on eating behavior, this dissertation demonstrated that other factors, pulling people away from unhealthy choices, also need to be regarded. As shown in chapter 3, people with high *affect regulation motive* can nevertheless follow a healthy diet if control resources are high.

Reviewing previous research suggests two different mechanisms in people with a high as opposed to those with a low *affect regulation* motive (Macht, 2008). People with a

high *motive to regulate negative affect through eating* may exhibit 'emotion regulation eating', whereas people scoring low on this motive might exhibit 'emotion-congruent eating'. Specifically, emotion-congruent eating means to decrease intake when being in a bad mood, due to a slowing of cognitive processes, motor activity, as well as a decrease of interest and attention to the outside (Macht, 2008). Being in a positive mood is supposed to increase the perception and processing of stimuli, as well as the readiness to engage in activities, and can therefore increase eating behavior (Macht, 2008). In contrast, emotion regulation eating involves eating more, the more negative emotions exist, in order to regulate these through eating. When in a positive mood, eating decreases because of the absence of negative emotions to regulate (Macht, 2008). In chapter 4, we found that the intake of people with a high *motive to eat in response to stress*, displaying one example for a negative emotion, followed the rules of emotion regulation eating, increasing intake in stressful situations and decreasing it in a positive situation. In contrast, the intake of people without *motive to eat in response to stress* was in line with the requirements of emotion-congruent eating, increasing intake in positive and decreasing intake in stressful situations.

Another interpretation of these results can be given through differentiating between push and pull factors on the individual and situational level. Looking at push and pull factors at a situational level, in dependence of individual differences, one situation can act as a push factor in one person and as a pull factor in another person. For people without *motive to eat in response to stress*, positive situations appeared as push factors whereas negative situations acted as pull factors. The reversed pattern emerged for people with a high *motive to eat in response to stress*. On an individual level, the *affect regulation motive* might act as a push factor only in situations, inducing negative affect. It might be a pull factor in positive situations.

In conclusion, by the comprehensive view on eating behavior this dissertation exemplarily demonstrates that a high *affect regulation motive* is not necessarily associated

with an unhealthy dietary pattern. Instead, its effect might be dependent on situational variables and can be compensated by individual pull factors.

## 5.7 Implications for future research

The findings of this dissertation provide several starting points for future research. A first issue concerns a dynamic perspective in investigating why we eat what we eat. Beginning with motives for eating behavior, it is due to future research to clarify whether these are stable traits. Previous research (Lindeman & Väänänen, 2000; Steptoe et al., 1995) has reported a sufficient test-retest reliability of eating motives over a time period of two or three weeks. However, it still needs to be investigated whether eating motives are also stable across longer time periods like several months. Additionally, it has to be examined whether there are differences between motives in stability. For instance, are biological motives, such as the *pleasure* or *visual appeal motive*, more stable than health- or weight-related motives? A further topic, following a dynamic view, is to investigate the conjoint effects of individual and situational factors on eating behavior. Longitudinal studies are needed to explain the causal impact of push and pull factors on eating behavior. In this dynamic view, it can also be tested if eating behavior mediates the relationship between pull or push factors (i.e. the *affect regulation motive*) and physiological variables, such as the BMI and other risk factors for cardiovascular diseases. Considering people's individual motives and responses to situational variables, future research could establish individual 'vulnerability- and resources-profiles' which constitute one possibility to face the obesity epidemic.

The second issue, coming up from the findings of this dissertation, is the focus on normal eating. Two directions for future research are suggested. One direction involves extending the investigation of the explicit motives - addressed in this dissertation - by the simultaneous consideration of implicit motives, as described in the next paragraph. The other direction comprises reversing the traditional inference from pathology to normal eating, such



as inferring from the absence of pathology the presence of normality (Herman & Polivy, 1996). Inferring from normal to pathological eating behavior, future research could examine which motives for normal eating behavior predict or prevent pathological changes in eating behavior in a dynamic way. For instance, there is evidence for an association between certain eating motives and eating disorders. Steptoe and colleagues (1995) reported, for example, a positive association between a high *weight control motive* and dietary restraint, which has been discussed to precede eating disorders (Polivy & Herman, 1985). Similarly, Jackson and colleagues (2003) reported that a high tendency *to cope with negative emotions through eating* is associated with symptoms of eating disorders, such as bingeing and purging. However, these associations need to be further investigated in dynamic longitudinal studies, examining which motives predict eating disorders. Furthermore, they need to be complemented by evidence on which motives prevent the development of eating disorders.

The assessment of implicit eating motives may further extend knowledge about normal eating behavior. Concerning non-eating-related motives, such as the power, achievement, and affiliation motive, there is a long tradition of simultaneously assessing implicit and explicit motives (Kehr, 2004). McClelland, Koestner, and Weinberger already stated in 1989 that implicit motives, guiding spontaneous behavior, and explicit motives, which are rather elaborated, seldom correlate significantly with each other and relate to different classes of behavior. Recently, a special issue in the journal *Motivation & Emotion* addressed the issue of new directions in implicit motive research (Kehr, Thrash, & Wright, 2011). Until now, research has not targeted implicit eating motives as a central theme. Hence, future studies should fill in this gap by developing measurement tools of implicit eating motives. For instance, such a tool could involve the subliminal priming (Bar & Biederman, 1998) of words associated with certain eating motives (e.g., the word 'calories' representing the *weight control motive*, or the word 'stress' representing the *affect regulation motive*) and the subsequent presentation of food-words (e.g., 'ice cream'). A shorter reaction time after the prime 'calories' than after the prime 'stress' could indicate a higher implicit *weight control* motive as compared to an implicit *affect regulation* motive.

A third issue for future research constitutes the focus on positive eating. A next step in further focusing on eating in response to positive situations, could lie in conducting diary studies. Participants could be asked, for example, to keep daily diaries about their eating behavior as well as about their positive and negative social interactions. It would also be conceivable to establish event-based records, in which either according to positive or negative situations emerging eating motives are assessed, or, alternatively, in eating situations people are asked about their prevailing motives and positive or negative situations. This would allow for insights into individually different dietary changes in response to positive and negative social interactions in everyday life. Controlling in such diary studies for the amount of performed physical activity as well as for compensatory eating behavior after situation-induced eating or non-eating would allow for important inferences how social situations affect health. Over and above, one could disentangle these effects even more by differentiating motive types on the person level, such as stress eaters and stress fasters.

Further directions for future research include studies on how eating motives act together as well as studies on the matching of situational influences to individual factors. In a comprehensive way, future research has to find out how situational influences affect eating behavior in dependence of certain individual factors. For instance, it could be investigated how situational interventions work together with individual motives. Focusing on social influences, as powerful determinants of eating behavior (Herman et al., 2003), future research could examine in which situations social motives act as a push or pull factor. Additionally, it is subject to future research to examine how certain motives can be brought together. One question is, for example, whether focusing on the pleasure of eating healthy foods, brings together biological motives, such as the *pleasure of eating*, and health-related motives. These studies can profit from information about which motives cluster together.

## 5.8 Concluding remarks

This dissertation contributes to answering the question why people eat what they eat, that is, clarifying the manifold psychological influences on eating behavior. In chapter 1, a conceptual model of factors underlying normal eating behavior was presented. This comprehensive framework integrates individual factors (e.g., *the motive to eat in response to negative affect*) as well as situational factors (e.g., the social situation). A psychometrically sound assessment tool, the Eating Motivation Survey, was presented that enables the comprehensive and comparable measurement of eating motives, accounting for the complexity of individual triggers for eating behavior. Furthermore, the present dissertation shifts the prevailing focus on negative situations to an investigation of eating in positive situations.

While a spontaneous answer to the question 'Why do you eat what you eat' is 'Because I'm hungry, what else?', the present dissertation identified 15 individual motive factors underlying eating behavior. For a full understanding of what determines eating behavior, these motives need to be regarded in combination with each other as well in combination with situational variables. The presented results show that the same individual variable can facilitate healthy eating in one situation and impede it in another. Thus, this dissertation cleared up on the heterogeneous previous research results by paying attention to the 'bigger picture'. Consequently, the findings and models of this thesis provide an approach for integrating the existent 'research patchwork'. Combining survey as well as experimental data, it allowed to adequately meet the complexity of human eating behavior.

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## List of Contributions

The present thesis is part of my (GS) work as a doctoral student in the research project EATMOTIVE funded by the Federal Ministry of Education and Research (BMBF) and supervised by Prof. Dr. Britta Renner (BR) and Prof. Dr. Harald Schupp (HS). Stefanie Strohbach (ST) who worked also as doctoral student in the research project EATMOTIVE, contributed to parts of the study series. In the following, contributions of BR, HS, ST, and GS are detailed based on the criteria suggested by the International Committee of Medical Journal Editors (ICMJE; <http://www.icmje.org/>).

BR and HS developed the first studies ideas (Chapter 2-4). GS and ST participated in the generation of the study design. GS and ST conducted the studies (Chapter 2-4), including participants recruitment and data collection under supervision of BR and HS. Data analyses (Chapter 2-4) were conducted by GS with important intellectual input from BR. GS prepared the manuscript draft for Study 2 and 3 (Chapter 3-4) with important intellectual input from BR and HS. BR prepared the manuscript draft for Study 1 (Chapter 2) with important intellectual input from GS. HS and ST assisted in revising the first draft of the paper. All authors approved the final manuscripts (Chapter 2-4).