From the Department of Consumer Research, Communication and Food Sociology
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The Situational Nature of Eating:
An Exploration of Eating Situations and Their Relationship to Meat Consumption

DISSERTATION

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Submitted by
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I declare that the doctoral thesis here submitted is entirely my own work, written without any unauthorised help by a third party and solely with the assistance referred to in the thesis. I have indicated in the text those texts that have been quoted from already published sources, either verbatim or by analogy and all statements based on verbally conveyed information. During the research carried out by me and referred to in the doctoral thesis, I have at all times followed the principles of good scholarly practice as defined in the Statute of Justus Liebig University Giessen for Ensuring of Good Academic Practice.

Gießen, September 2024

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Patricia Wowra

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Abstract

This dissertation investigates eating situations and their relationship to dietary behaviors, particularly meat consumption. Meat consumption was chosen as an example of a dietary behavior in the context of a dual crisis of human and planetary health. The research is presented in a conceptual article followed by two empirical articles. The conceptual article lays the theoretical groundwork for the empirical studies by addressing key challenges in research on (eating) situations, elaborating a novel approach for defining, conceptualizing, and measuring eating situations. The first empirical article describes the most common eating situations during meals and examines how often individuals eat in the same situations (i.e., situational stability). The second empirical article specifically explores the relationship between eating situations and meat consumption.

The key insights and findings presented in this dissertation can be summarized briefly as follows. First, the conceptual article elaborates a comprehensive approach for researching eating situations. Based on a synthesis of previous efforts to define concepts in this field, the definition that I propose defines eating situations as comprised of combinations of various cues within multiple dimensions. Here I make the case for research to include both situational dimensions that are external to the individual (e.g., location) and internal (e.g., affect) and to confine its focus to concrete, brief, and dynamic dimensions rather than more abstract, longer-term, and static dimensions. To identify the dimensions that make up eating situations, I draw on and refine the taxonomy developed by Bisogni et al. (2007). Applying this taxonomy, the first empirical article finds that the most common breakfast situations comprise combinations of the dimensions “social”, “affect”, and “hunger”, whereas lunch and dinner situations are characterized by varying combinations of the dimensions “social”, “affect”, and (concurrent) “activity”. While indicating a moderately high level of situational stability regardless of the meal type, the findings show considerable variation among participants. The second empirical article finds that meat consumption is associated with multiple situational dimensions, specifically revealing that meat consumption is more likely if individuals eat meals in situations when they are hungry, together with others, and at noon or in the evening. This association is shown to be driven by situational rather than individual differences, suggesting, for example, that meat is more likely to be eaten when individuals are hungry regardless of their typical hunger levels.

In addition to providing a coherent definition and conceptualization of (eating) situations suitable for future research, this dissertation contributes specifically to our

understanding of eating situations and their relationship to dietary behaviors in several ways. Key contributions include introducing and applying a novel approach for researching this important relationship by combining a taxonomy-based measurement of eating situations with a diary study. By focusing on multiple dimensions simultaneously, this approach provides a holistic perspective on situations. As a further contribution to research, I develop a new index to measure situational stability. By applying this approach to the case of meat consumption, I demonstrate the influences of eating situations on a behavior highly relevant to human and planetary health. These theoretical and empirical insights have significant implications for behavior intervention research, potentially increasing its effectiveness in promoting healthy and environmentally sustainable diets.

Keywords: eating situations, dietary behavior, meat consumption, diets, health, sustainability, cues, time, location, hunger, social, activity, affect, cluster analysis, multilevel logistic modeling

Contents

Glossary

Term	Definition
Cues	Cues are the stimuli that comprise a situation, such as "being at home" or "being with friends" when eating. Cues can be grouped into different situational dimensions like "location" or "social setting". For example, the cues "at home", "at the office", or "at a restaurant" all pertain to the situational dimension "location". Synonym in this dissertation: feature (mainly used in Article II)
(Situational) Characteristics	(Situational) characteristics describe the qualities of a situation in a way similar to how we can describe a person in terms of their traits. For example, characteristics such as "social" or "conflictual" denote the psychological meaning of cues in a situation. Situational characteristics are inherently subjective as they depend on an individual's perceptual-cognitive processing of cues.
Classes	Situations can be grouped into abstract classes based on similar cues (e.g., all situations that occur at home) or similar profiles of characteristics (e.g., all situations that are perceived as conflictual).
(Situational) Dimensions	Situational dimensions such as "location" and "social setting" denote the factors that comprise situations, with each dimension encompassing multiple cues. For example, "location" denotes the physical space of a situation and encompasses all related cues, such as "at home", "at the office", or "at a restaurant".
Level (of situational dimension)	"Level" denotes the degree of abstraction, duration, and dynamicity of a situational dimension on a continuum from low (concrete, brief, and dynamic) to high (abstract, long-term, and stable). For example, "social setting" is a low-level dimension, whereas "density of food outlets" is a higher-level dimension. Note that the level of a dimension cannot be determined exactly but is best understood as a guiding principle that makes it possible to compare different concepts.

Situation	Situations are conceptualized as comprised of combinations of various cues within multiple dimensions. For example, the situation of writing this dissertation includes cues like “at home” (from the situational dimension “location”), “alone” (from the situational dimension “social setting”), and “working on a laptop” (from the situational dimension “activity”).
Taxonomy	In this dissertation, taxonomies of dimensions are explored as systems for classifying and describing situations (Berge & Raad, 1999). In this dissertation, I apply the taxonomy of Bisogni et al. (2007) to identify situational dimensions relevant for eating situations.
Type (of situational dimension)	“Type” refers to whether a situational dimension is internal or external, i.e., within or outside an individual. For example, “affect” is an internal dimension, whereas “location” is external.
Variation at between-person level	In this dissertation, between-person variation refers to an association between eating situations and meat consumption that is due to individual differences. For example, an individual might be more likely to eat meat when they typically eat with others, regardless of whether others are present during a specific meal.
Variation at within-person level	In this dissertation, within-person variation refers to an association between eating situations and meat consumption that is due to situational differences. For example, an individual might be more likely to eat meat when eating with others during a specific meal as compared to when eating alone, regardless of whether they typically eat with others.

Introduction

As we know intuitively and from research, situations have a profound impact on our dietary behaviors. Depending on the situation, we may be more or less likely to choose to eat a healthy meal or indulge in fast food (Tyrrell et al., 2017), limit our food intake or eat beyond our hunger level (Higgs & Ruddock, 2020), or buy high-calorie snacks or opt for fresh fruit (Larson et al., 2017). Despite their impacts on what and how we eat, eating situations have not been extensively studied, leaving substantial gaps in our theoretical and empirical understanding of the relationship between eating situations and dietary behaviors. This dissertation aims to bridge these gaps by developing an approach to investigate eating situations and applying this approach to explore the relationship between eating situations and people's consumption of meat. Meat consumption was selected as an example of a specific dietary behavior with important ramifications for health and the environment.

This introductory chapter sets the stage for the dissertation by providing a rationale for its focus on dietary behaviors and discussing the importance of eating situations. I[1] elaborate on the ways in which dietary behaviors affect health and the environment, focusing on meat consumption in particular as a major driver of problems in both areas. This section concludes that gaining a better understanding of dietary behaviors and how to change them is crucial for mitigating these environmental and health issues. The next section reviews previous approaches to understanding dietary behavior, highlighting how the impacts of eating situations have often been overlooked in prior research, which has tended to focus more on the socio-psychological factors related to such behavior. I argue that situational factors deserve closer examination, making the case that a clear understanding of these factors and their impacts is integral to a comprehensive understanding of dietary behaviors. Finally, I outline the research aims and contributions of this dissertation and provide an overview of its structure.

Dietary Behaviors and their Impacts on Health and the Environment

My rationale for focusing on dietary behaviors in this dissertation relates to the significant dual impacts of such behaviors on health and the environment. Unhealthy dietary behaviors not only lead to a spectrum of health issues, including cardiovascular disease and obesity, but also negatively impact the environment, exacerbating problems such as greenhouse gas emissions and deforestation (Tilman & Clark, 2014).

[1] Throughout this dissertation I use the pronoun "I" to refer to the work as a whole, switching to "we" in the context of the empirical articles. However, it is important to acknowledge that the research presented here is the result of collaboration between myself and colleagues.

Unhealthy diets are the leading cause of poor health worldwide (Mozaffarian, 2016). In recent decades, there has been a shift towards unhealthier diets. Among the reasons for this shift is that portion sizes have increased (Diliberti et al., 2004; Duffey & Popkin, 2011; Popkin & Duffey, 2010; Wansink et al., 2005), highly processed foods and fast food have become much more widely available (Lauria et al., 2021; Moosburger et al., 2020; Rauber et al., 2018; Vandevijvere et al., 2019), and dietary diversity has decreased (Verger et al., 2021). These changes have been linked to a rise in chronic non-communicable diseases, including obesity, cancer, and heart disease (Afshin et al., 2019; Lane et al., 2021; Rauber et al., 2018; Zlatevska et al., 2014). Given these negative associations, it is important to examine the specific dietary behaviors that pose health risks.

Meat consumption stands out as a particularly impactful dietary behavior. While meat is an important source of nutrients like protein, iron, zinc, and vitamin B12 (Mottet et al., 2017; World Cancer Research Fund & American Institute for Cancer Research, 2007), its overconsumption is associated with multiple adverse health risks. These include an increased risk of developing non-communicable diseases such as cardiovascular disease (e.g., hypertension or heart disease), diabetes mellitus, and certain types of cancer (Bouvard et al., 2015; Fardet & Boirie, 2014; Mozaffarian, 2016; Neuenschwander et al., 2019). Many of these adverse health risks can be attributed to high levels of saturated fat, cholesterol, and other harmful substances that are primarily found in red and processed meat (World Cancer Research Fund & American Institute for Cancer Research, 2007) and have been associated with an increased risk of mortality (Mozaffarian, 2016). Furthermore, the health implications of meat consumption are compounded by the widespread use of antibiotics in meat production, which has been linked to the emergence of antibiotic-resistant bacteria, presenting a growing public health concern (Monger et al., 2021).

The overconsumption of meat is especially prevalent in many high-income countries, where meat consumption often exceeds recommended intake levels (Parlasca & Qaim, 2022). In Germany, for example, average annual meat consumption per person is about 78.8 kg, greatly exceeding the recommended annual intake of 15.6–31.2 kg per person (DGE, 2014). This pattern is even more pronounced in Australia and the USA, where average annual meat consumption per person is approximately 121.5 kg and 128.6 kg, respectively (FAO, 2024). Again these figures far exceed the recommended intake proposed by national dietary guidelines in these countries, which are 23.7 kg per capita per year for Australia and 38.3 kg for the USA (National Health and Medical Research Council, 2013; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020). While reducing meat consumption in high-income countries is crucial for mitigating adverse health effects and promoting better health outcomes, the disparities between recommended and actual levels of meat consumption highlight the need for a greater understanding

of influences on dietary behavior as a basis for more effective efforts to change harmful patterns of consumption.

My motivation for centering this dissertation on dietary behaviors, and particularly on meat consumption, also stems from their environmental impacts. From agricultural production to food waste management, dietary behaviors have consequences for the entire food system, which has been identified as one of the main drivers behind environmental pressures (Campbell et al., 2017; Conijn et al., 2018; Ivanovich et al., 2023). These pressures are far-reaching, affecting all planetary boundaries (Steffen et al., 2015). As a major driver of climate change, for example, the food system contributes to a third of global greenhouse gas emissions (Crippa et al., 2021). Agriculture currently occupies about 40–50 percent of the Earth's habitable land (Campbell et al., 2017; Tilman & Clark, 2014), with the environmental consequences of current farming methods and land use including devastating effects on biodiversity. The food system is also the largest user of fresh water, exacerbating water scarcity in many regions (Campbell et al., 2017).

Meat production is an especially significant contributor to these negative impacts on the environment, alone accounting for roughly half of all emissions from food systems (Niles et al., 2018; OECD/FAO, 2021). Meat production is also associated with high resource demands in terms of water (Ran et al., 2017), land use (Poore & Nemecek, 2018), and fertilizer (Liu et al., 2016). These high resource demands make meat consumption a central target for strategies aimed at reducing environmental impacts.

With growing acknowledgement of the link between dietary behaviors and the dual challenges of health and environmental sustainability, there has emerged a growing consensus on the need for a large-scale shift towards healthier and more environmentally sustainable dietary behavior (Bodirsky et al., 2020; Creutzig et al., 2018; Niles et al., 2018). A prime example of the various diets proposed as sustainable alternatives to current trends is the Planetary Health Diet (Willett et al., 2019). This diet prioritizes plant-based foods (fruits, vegetables, whole grains, legumes, and nuts) combined with much more moderate consumption of animal-based foods (fish, poultry, and dairy products) and greatly reduced intake of red meat, sugar, and highly processed foods. To balance health benefits with environmental sustainability, the diet proposes a maximum annual meat consumption of 15.65 kg per person (Koch et al., 2019; Willett et al., 2019). Implementing the Planetary Health Diet would thus require a significant shift in dietary behaviors, mainly in high-income countries (Parlasca & Qaim, 2022; Willett et al., 2019). Simulation studies have shown this would entail widespread changes not just on the part of small groups, but across the population (Eker et al., 2019). In Germany, for example, more than half the population would need to change their diets (Koch et al., 2019), including substantially reducing their meat consumption. To meet the recommendations of the Planetary Health Diet, German consumers

would need to shift from eating meat on a daily basis to a much more moderate frequency of approximately once a week. In order to achieve this dietary shift, a better understanding of the factors that influence dietary behavior is needed.

Understanding Dietary Behaviors

Dietary behaviors are shaped by a multitude of factors (Chevance et al., 2021; Dunton, 2018; Stok et al., 2017). Traditionally, research has predominantly focused on the influence of socio-psychological factors like age, gender, attitudes, and motives for eating (Kemper et al., 2023; Koch et al., 2021; Pfeiler & Egloff, 2020; Sych et al., 2019; Verain, Bouwman, et al., 2022). A notable aspect of this research has been a strong reliance on intentions as a proxy for actual behavior. However, other studies have shown that intentions are a poor predictor of actual behavior (Webb & Sheeran, 2006). Given this discrepancy, current research is estimated to account for only a limited portion of explained variance in behavior, meaning, among other things, that it lacks robust predictive power (Yarkoni & Westfall, 2017).

A prevailing focus on socio-psychological factors has also resulted in researchers overlooking the situational factors that impact dietary behavior, leading to decontextualized accounts and thus a limited understanding of such behavior (Maugeri et al., 2022; Papies et al., 2022). This oversight is all the more important to address given that findings from recent research strongly underscore the importance of situations in shaping dietary behavior. For example, dietary behaviors vary considerably depending on the situation in which eating occurs (Wahl et al., 2020), with studies showing that meat consumption is significantly more likely when people are eating in restaurants and cafes than when eating at home (Horgan et al., 2019). Prior research further indicates that socio-psychological factors are not separate from but closely interact with eating situations (Maki & Rothman, 2017). For instance, the salience of different eating motives, such as weight control, differ significantly depending on whether one is eating alone or with others (Verain, van den Puttelaar, et al., 2022). Indeed, all strategies employed to change dietary behavior are strongly affected by eating situations, including not just location and social setting but also time of day. For instance, individuals are more likely to increase their intake of healthy foods when eating dinner than when eating breakfast (Bouwman et al., 2022; Verain, Bouwman, et al., 2022). Despite outstanding gaps in research, it is already certain that dietary behaviors are deeply embedded in the situations in which they occur (Dutriaux et al., 2023; Funder, 2009; Papies et al., 2022).

The impacts of eating situations are also often neglected in efforts to change dietary behaviors, with the majority of behavior change interventions focused exclusively on socio-psychological factors (Barker & Swift, 2009; Department of Health and Department of Children, Schools and Families, 2008; Harguess et al., 2020; Kwasny et al., 2022). Furthermore, such interventions are mostly developed and tested in single situations, with little attention paid to

whether the chosen situation is the one that counts or which situational factors are likely to influence the effectiveness and outcomes of the intervention, typically omitting any consideration of whether an intervention apt for one situation is transferable to another situation (Abrahamse, 2020; Kwasny et al., 2022; Laffan, 2021; Thomas et al., 2022). The consequence is a pressing need for more theoretical and empirical research on eating situations and their relationship with dietary behaviors (Meiselman, 1992; Rauthmann, 2015; Yang et al., 2009).

Research Aims & Structure of Dissertation

To address this research gap and thus contribute to our understanding of the situational nature of dietary behavior, this dissertation answers the following two overarching research questions:

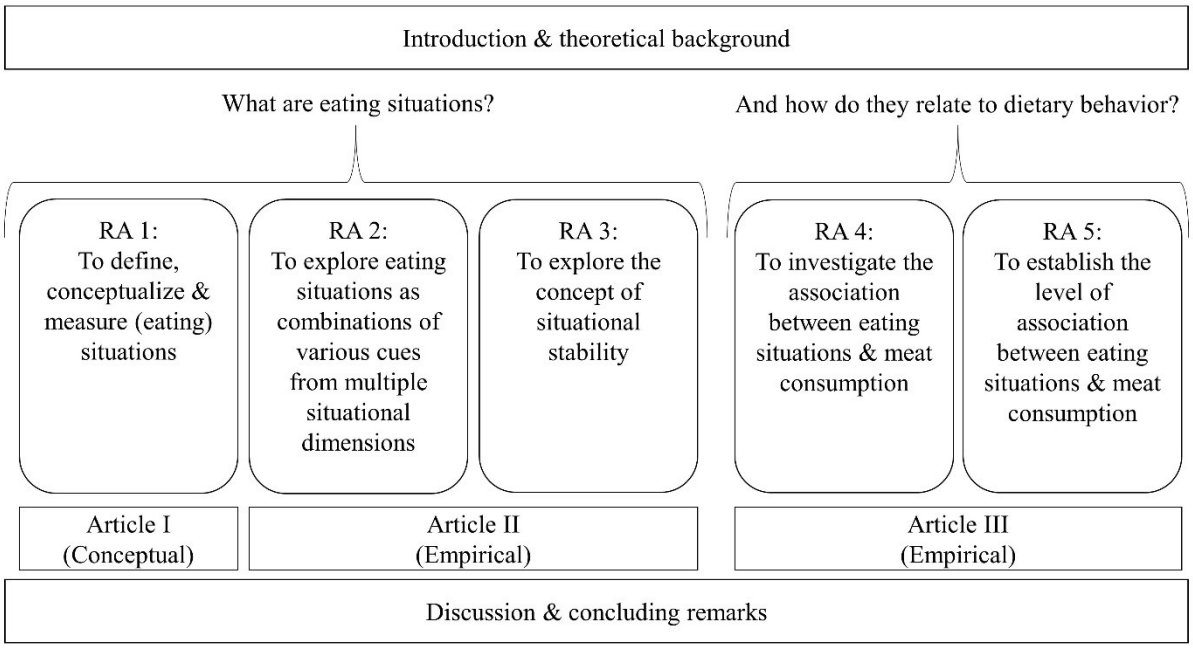
What are eating situations? And how do they relate to dietary behavior?

Addressing the first of these questions contributes to research on (eating) situations in general and is answered in this dissertation by pursuing three specific Research Aims (RA). First, I aim to define and conceptualize (eating) situations and elaborate a method for measuring these situations (RA1). Then, I aim to apply this conceptualization and method to provide an empirical description of eating situations. Since eating situations are conceptualized as comprising combinations of various cues within multiple dimensions, I aim to capture situations not just by using a single dimension, but by using combinations of multiple dimensions, such as location (e.g., at home), social setting (e.g., with family), and any activities undertaken concurrently with eating (e.g., watching TV) (RA2). Also, I aim to explore situational stability to provide insights into how often individuals eat in the same situations (RA3).

In addressing the second overarching research question, I contribute more specifically to research on the relationship between eating situations and dietary behaviors, with a particular focus on meat consumption, exploring this question via two research aims. First, I aim to investigate in which eating situations meat is more likely to be consumed (RA4). Then, I explore whether the observed association between eating situations and meat consumption is due to variation at within-person level (due to situational differences) or at between-person level (due to individual differences) (RA5). Figure 1 provides an overview of this dissertation and its research aims.

Figure 1

Overview of dissertation



As shown in Figure 1, the five research aims are addressed through one conceptual article and two empirical articles. The conceptual article (Article I) introduces the theoretical foundation of this dissertation. After elucidating the key considerations and challenges involved in investigating situations in the realm of dietary research, Article I elaborates a definition and conceptualization of eating situations as comprising cues within multiple dimensions, and further proposes a method for measuring eating situations in research. Applying this approach, Article II examines eating situations during meals and describes situational stability, i.e., how often individuals eat in recurring situations. Article III investigates the relationship between eating situations and meat consumption, identifying the situational dimensions associated with meat consumption and determining whether this association is due to variation at within-person level or at between-person level.

Theoretical Background

In this chapter, I briefly present the theoretical background for each of the research aims to lay the groundwork for the articles that follow.

Research Aim 1: To define, conceptualize, and measure (eating) situations

To establish a solid theoretical foundation for investigating (eating) situations, I first review and address key shortcomings in extant approaches. Previous research has struggled with defining, conceptualizing, and measuring situations in general, with eating situations demanding further specific considerations (Rauthmann, 2015; Rauthmann et al., 2015). The term "situation" itself has been defined differently across disciplines and is often used interchangeably with related but different concepts such as "environments" and "contexts" (Geukes et al., 2017; Pennanen et al., 2020; Rauthmann, 2021; Verain, Bouwman, et al., 2022; Xu et al., 2019). This inconsistency of definitions has hindered the development of a clear conceptualization of situations. While there is general consensus that a situation is a multidimensional construct encompassing key dimensions such as time and location (Papies et al., 2022; Verhoeven et al., 2014), fundamental disagreements persist as to the specific dimensions that comprise situations and which dimensions should be considered (or excluded) when analyzing situations (Rauthmann, 2015). As a consequence, existing research on situations focuses on heterogeneous sets of dimensions, thereby impeding the integration of findings across studies and disciplines. These disparities in definitions and conceptualizations further impact how situations are measured. Such uncertainties and variations in conceptualizing situations have led to the application of a diverse range of approaches, meaning we still lack a set of standardized research tools (Mak et al., 2012; Maugeri et al., 2022; Morshed et al., 2020; Rauber et al., 2022; Schoedel et al., 2023). In aiming to address these challenges, I propose a clear definition and comprehensive conceptualization of situations as well as a taxonomy-based approach to measuring eating situations. To define situations, I synthesize insights from various fields, including personality psychology and nutritional sciences. To conceptualize eating situations, I adapt and apply the taxonomy of eating situations developed by Bisogni et al. (2007), which details the following eight dimensions of eating situations: food and drink; time; location; physical condition; social setting; activities; mental processes; and recurrence. Finally, as a means to measure eating situations, I argue for the adoption of taxonomy-based measurement and summarize various methods. The insights and proposals developed in the first article form the cornerstone of my dissertation and inform the subsequent empirical studies (see Chapter 4, Articles II and III).

Research Aim 2: To provide a holistic description of eating situations

With this dissertation, I aim to advance a holistic understanding of eating situations. This entails conceptualizing and exploring eating situations as comprised of combinations of various cues (e.g., eating "at home" and "with others") within multiple situational dimensions (e.g., "location" and "social setting"), or what I term "whole eating situations". Adopting such a holistic perspective recognizes that situations in everyday life are inherently complex, simultaneously involving multiple dimensions. For example, having dinner in a restaurant with friends in a good mood combines multiple situational dimensions, including time, location, social setting, and affect. Focusing on only one of these dimensions would thus fail to provide an accurate account or representation of the eating situation in which people's various dietary behaviors occur.

Prior research has often been limited to examining either single dimensions or multiple dimensions in isolation (Ahlgren et al., 2005; Horgan et al., 2019; Laska et al., 2011; Mak et al., 2012; Shams-White et al., 2021). For example, studies have separately indicated that dining out (Ritzel & Mann, 2023) *or* eating with others (Horgan et al., 2019) tends to increase meat consumption. While such findings are valuable, studies following this limited approach inevitably fall short of fully capturing the multidimensional nature of everyday life situations, neglecting the co-occurrence of multiple dimensions. For example, studying these dimensions in isolation fails to account for the fact that eating out is often associated with eating with others, rendering it difficult to differentiate the specific influences of each dimension on behavior. As such, I argue that this limited approach actually hinders our understanding of behavior. This argument is supported by evidence from laboratory studies showing that behavior differs significantly when individuals are faced with multi-dimensional eating situations as compared to when only a single dimension is considered (Goldman et al., 1991; King et al., 2004; Piqueras-Fiszman & Jaeger, 2015; Vartanian et al., 2017). For example, analyzing the influence of social intake norms on consumption without considering levels of hunger would yield a distorted picture, since the effect of social intake norms on actual food consumption is moderated by the hunger levels of individuals (Vartanian et al., 2017). Therefore, to better understand eating situations and their impacts on behavior, we need to investigate situations holistically.

Investigating whole eating situations is a new area of research, with studies only recently beginning to explore eating situations as combinations of various cues within multiple dimensions (Maugeri et al., 2022; Neves, Fontes, Nogueira, Melo, et al., 2022; Neves, Fontes, Nogueira, Pereira, et al., 2022; Onita et al., 2021; Piqueras-Fiszman & Jaeger, 2015; Rauber et al., 2022). These studies have identified and analyzed a variety of different eating situations by applying a diverse range of methodologies (e.g., cluster analysis or exploratory factor analysis), focusing on different demographic groups (mostly children or young adults from various cultural contexts) and behaviors (e.g., eating ultra-processed foods or specific food groups such as meat products). Despite

these advances, a significant limitation of these studies is the lack of any shared taxonomy to inform the selection of situational dimensions to consider, leading to the use of different sets of dimensions that often cannot be compared across studies. To address these limitations, I adapt and apply a taxonomy of dimensions developed by Bisogni et al. (2007) that comprehensively conceptualizes eating situations. Adopting such a descriptive and taxonomy-based approach is essential for future research, not least because it enables researchers to identify situations that naturally emerge from empirical evidence instead of imposing preconceived ideas of situations. As such, applying this approach can ultimately enhance our understanding of which situations exert influence on dietary behaviors (Baumeister et al., 2007; Finnigan, 2020).

Research Aim 3: To explore the concept of situational stability

The concept of "situational stability" relates to how often individuals eat in the same situations. For example, individuals exhibiting a high degree of situational stability might frequently and regularly eat breakfast alone at home while working, whereas individuals with low situational stability might alternate irregularly between eating at home and at the office. Investigating situational stability is important because stability is closely linked to behavioral consistency (Finnigan, 2020; Sherman et al., 2010). This link is based on the premise that all behavior is to some degree a function of a situation, from which it follows that similar situations are likely to elicit consistent behavior (Dutriaux et al., 2023; Maher et al., 2021; Nilsson et al., 2017; Sherman et al., 2010; Sherman et al., 2015). The link between situational stability and behavioral consistency is particularly important in the context of health and environmental sustainability. Dietary behaviors need to be performed consistently over time in order to have a positive impact on health and environmental sustainability. For example, the health benefits associated with increased fruit and vegetable consumption are contingent upon their regular intake over time. Therefore, individuals might be more likely to maintain these beneficial dietary behaviors over time if the situations that promote healthy and environmentally sustainable eating are recurring. Hence, understanding the stability of eating situations is crucial, as it can offer insights into the consistency of dietary behaviors.

While the importance of situational stability is widely recognized, the concept nonetheless remains largely unexplored (Sherman et al., 2015). Previous research has mainly focused on the stability of individual situational dimensions, largely neglecting the stability of whole situations (Dutriaux et al., 2023; Kilb & Labudek, 2022; Stojanovic et al., 2022). Furthermore, most existing research relies heavily on self-report measures in cross-sectional designs to assess stability (e.g., Kilb & Labudek, 2022; Stojanovic et al., 2022). In such studies, participants typically self-evaluate how stable their situations are using scales ranging from "unstable" to "stable" (e.g., Dutriaux et al., 2023). As a more objective approach to assessing stability, a study by Maher et al. first assessed

situations before deriving a stability score based on these situations (2021). However, lacking a taxonomy of situational dimensions, this study was focused on only three dimensions rather than the whole situation. To address these research gaps, this dissertation develops and applies a novel tool for objectively assessing the situational stability of whole eating situations. This tool, conceptualized as an index, quantifies how often a person eats in the same situation, while taking into account the total number of eating situations.

Research Aim 4: To investigate the association between eating situations and meat consumption

The relationship between eating situations and meat consumption is investigated in this dissertation with a specific focus on which situational dimensions are associated with a higher or lower likelihood of meat consumption. While previous research has investigated this relationship, most studies to date lack a comprehensive taxonomy for conceptualizing eating situations and are typically centered on a limited set of situational dimensions. For example, previous research has associated meat consumption with the dimensions of time (Horgan et al., 2019; Laffan, 2021), location (Biermann & Rau, 2020; Horgan et al., 2019; White, 2021), and social setting (Biermann & Rau, 2020; Christie & Chen, 2018; Horgan et al., 2019), indicating that meat is more likely to be consumed at noon and in the evening, when eating out, and when eating with others. To the best of my knowledge, however, no studies have yet investigated the impacts on meat consumption of other key situational dimensions such as a person's hunger or their engagement in other activities while eating. Adapting Bisogni et al.'s (2007) taxonomy of dimensions to elaborate a comprehensive conceptualization of eating situations, I aim to provide a more nuanced understanding of how different dimensions of eating situations relate to meat consumption.

Research Aim 5: To explore whether the association between eating situations and meat consumption is due to variation at within-person level (i.e., due to situational differences) or at between-person level (i.e., due to individual differences)

As the fifth and final research aim of this dissertation, I zoom in closer on the relationship between eating situations and meat consumption to investigate whether this association is due to variation at *within-person level* or at *between-person level*. Variation at the within-person level would suggest that eating situations are associated with meat consumption due to situational differences. For example, an individual might be more likely to eat meat when eating with others as compared to when eating alone regardless of whether they typically eat with others. In contrast, variation at the between-person level would indicate that eating situations are associated with meat consumption due to individual differences. For example, an individual might be more likely to eat meat when they typically eat with others, regardless of whether others are present during a specific meal.

With this exploration, I address a critical question and key distinction in researching how situations are associated with dietary behavior, i.e., the question of whether it is the situation itself or an individual's typical situation that shapes their dietary behavior. Applying this distinction enables us to identify more clearly how eating situations influence meat consumption and whether it is situations or individuals in typical situations that have more impact. This distinction has profound implications for research and practice related to behavior intervention. If the variation of this association is primarily at within-person level, this would suggest that interventions should focus on modifying the situation itself. To address social effects within the situation, for example, interventions could highlight the popularity of vegetarian options. Conversely, if the variation of this association is at between-person level, interventions should focus on the individual. To address social effects at the individual level, for instance, interventions could encourage individuals to act as role models by serving vegetarian meals to their guests (Funk et al., 2020).

Although previous research has confirmed the association between eating situations and meat consumption, it has not explicitly investigated the question of how situations are associated with dietary behavior. This gap in research on meat consumption is especially notable when contrasted with research on other dietary behaviors. For instance, research on snacking has differentiated between variation in the association of situations with snacking at within- and between-person level (Allan et al., 2019; Leow et al., 2021). Accordingly, this dissertation sets out to explore the relationship between eating situations and meat consumption and to ascertain whether variations in association stem from within- or between-person level.

Methodology

Online Diary Study

Articles II and III are both based on an online diary study, though each article pursues distinct research aims. In Article II, my colleagues and I explore whole eating situations and explore the concept of situational stability, while in Article III, my colleagues and I explore the relationship between eating situations and meat consumption. The method of an online diary study was chosen for multiple reasons. First, diary studies are characterized by high ecological validity compared to laboratory studies, since participants in diary studies report on their behavior in their natural setting, i.e., "in the real world" (Lades et al., 2022; Wrzus & Mehl, 2017). This contextualization makes the results more reliable. Second, diary studies are well-suited for capturing temporal dynamics such as situational stability, since diaries capture multiple measurements over time (Wrzus & Mehl, 2017). Third, diary studies mitigate recall bias, as measurements are temporally and spatially closer to the actual experience (Perski et al., 2022; Wrzus & Mehl, 2017). Fourth, online diary studies are

a cost-efficient alternative to other repeated measures research designs like Ecological Momentary Assessment (EMA). Fifth, the online format used for our study ensured wide accessibility because the questionnaire could be filled out on any device with an Internet connection. This format was selected as suitable since 91 percent of households in Germany have access to the Internet (Eurostat, 2023); and though older individuals are less likely to use the Internet (GfK, 2018), I deemed this limitation acceptable for the exploratory nature of the study. Lastly, online diary studies provide convenience and flexibility for participants, enabling participants to self-administer the questionnaire within a time range set by the researchers. Reducing disruptions to participants' daily routines in this way makes it more likely that participants will complete the diary study and thus that the study will capture more realistic data about their daily lives.

The diary study investigated eating situations and dietary behavior for five consecutive work-days. For each day, participants were given access to a questionnaire in which all eating situations throughout the day were recorded.

Questionnaires

Programmed using the *Qualtrics* platform, the questionnaire first informed the participants about the study's aim and procedure and obtained their consent, further providing participants with an assurance that they were free to withdraw at any point without consequences. The participants were instructed to complete the questionnaire at the end of each day after their last meal, reporting all meals consumed during the day and giving details of the corresponding eating situations. I focused on meals as the main unit of analysis, with "meals" defined as regular and planned eating episodes that can include multiple foods and a beverage (Bisogni et al., 2007). Meals in this sense represent the main context for food consumption in Western societies (Almoosawi et al., 2016; Kant, 2018; Wittig et al., 2017). In Germany, for instance, approximately 80 percent of people's total daily energy intake is consumed during meals (Almoosawi et al., 2016; Wittig et al., 2017). A focus on meals is particularly relevant to this dissertation's emphasis on meat consumption, since meals are the predominant context in which meat is consumed (Angelsen et al., 2023; Schösler et al., 2012).

The questionnaires used closed-ended format questions to ensure that all the necessary variables were reported on, as well as to reduce the burden on participants, since such questions are easier and faster to answer. This question format further enables the collection of large volumes of quantitative data for analysis. A detailed description of the questionnaire and the operationalization of the variables can be found in the method sections of each empirical article (see Chapter Research). The full questionnaires are provided in the Appendix.

Sample

Study participants were recruited in collaboration with the market research company *Aproxima*, enabling us to obtain a diverse and high-quality sample by leveraging *Aproxima*'s panels while also reducing issues such as bot responses. The sample was obtained using simple random convenience sampling, chosen for its efficiency and practicality in gathering a broad range of participants (diverse in terms of age, employment status, etc.). It is important to note that we did not aim for a representative sample due to the exploratory nature of the study and budget constraints.

Three criteria were established for inclusion in the sample: that participants were from Germany, were at least 18 years old, and did not follow a vegetarian or vegan diet. The requirement for participants to be from Germany was imposed in order to guarantee a similar cultural context, since it is known that dietary behaviors and eating situations differ significantly across cultures (Laffan, 2021; Orfanos et al., 2007; Weichselbaum et al., 2009). The requirement for participants to be at least 18 years old was applied because children and adolescents typically have a different degree of autonomy in their dietary behaviors which could affect the study's focus. The requirement for participants to not follow a vegetarian or vegan diet was applied because one of the key aims of this dissertation is to investigate meat consumption.

For the diary study, two sample sizes had to be considered for both participants and meals. Although we would ideally have determined the optimal sample size through statistical power analysis, this was not possible due to the unavailability of necessary parameters in existing research. Instead, we based the sample size in part on recommendations in the existing literature (Maas & Hox, 2005; Ohly et al., 2010; Sommet & Morselli, 2017) and in part on practical considerations. Our goal was to recruit a minimum of 200 participants, each reporting their dietary behavior over a five-day period, with an average of two to three meals per day (Wittig et al., 2017). This was projected to result in a sample of 2,000 to 3,000 observed meals. The final sample consisted of 230 participants who collectively reported on a total of 2,461 meals.

Data Analyses

Data from the online diary study were used in Articles II and III. Both articles adopted an exploratory descriptive approach to address the research aims. This approach is well-suited for fields with limited prior research, emphasizing the description of phenomena and ultimately leading to a deeper and more nuanced understanding (Scheel et al., 2021). Consistent with this exploratory approach, data-driven analyses were employed in both studies.

In Article II, cluster analyses were employed to identify the most common eating situations (see Research Aim 2). As a method that groups elements based on their similarity regarding selected variables, cluster analysis is aimed at maximizing within-group similarity and minimizing between-

group similarity (Clatworthy et al., 2005). Cluster analyses were specifically used in this article to group eating situations based on similarity in terms of their situational dimensions.

In Article III, multilevel logistic regression analyses were employed to investigate the relationship between situational dimensions and meat consumption (see Research Aims 4 & 5). Such analyses involve statistical models designed to estimate the likelihood of an event occurring while also accounting for the hierarchical nature of the data (Sommet & Morselli, 2017). In Article III, we employed multilevel logistic regression to estimate the likelihood of meat consumption, while recognizing that meals are nested within individuals.

Research

In this chapter, I present the following three articles:

- Article I: Wowra, P. (2024). Investigating Eating Situations: An Approach for Defining, Conceptualizing and Measuring Situations in Dietary Behavior Research. [Unpublished Manuscript]
- Article II: Wowra, P., Joanes, T., & Gwozdz, W. (2023). In Which Situations Do We Eat? A Diary Study on Eating Situations and Situational Stability. *Nutrients*, 15(18), 3967. https://doi.org/10.3390/nu15183967.
- Article III: Wowra, P., Joanes, T., Geiger, S.M. & Gwozdz, W. (2024). Situations Matter for Meat Consumption: A Diary Study of the Within- and Between-Person Associations. *Ernährungs Umschau*, 71(12): 182–92. e14–9. https://doi.org/10.4455/eu.2024.046.

Articles II and III were collaborative efforts between my colleagues and myself. My contribution to these multi-author publications consisted of being responsible for the conceptualization, methodology, analysis, writing and editing of the manuscripts, and visualization of the results.

Investigating Eating Situations –An Approach for Defining, Conceptualizing and Measuring Situations in Dietary Behavior Research

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Abstract

This article proposes an approach for investigating situations in dietary behavior research. In elaborating this approach, I provide insights into how researchers can overcome three key challenges often encountered when investigating (eating) situations: the lack of a clear definition, heterogeneous conceptualizations, and inappropriate measurements. I first outline different perspectives on how to define situations before proposing and elucidating a refined definition specifically tailored to the study of dietary behavior. Second, I address challenges in conceptualizing eating situations, offering an overview of various taxonomies previously developed by scholars. Here, I introduce and propose refinements to a taxonomy developed by Bisogni et al. (2007) as an exemplary taxonomy for conceptualizing eating situations. Finally, I discuss three methodological strategies to advance the measurement of situations, namely adopting a taxonomy-based measurement, combining subjective and objective measures, and applying intensive longitudinal research designs. As an overarching contribution, this paper serves as a guide for future research, enabling the investigation of situational aspects of dietary behaviors.

Keywords: Situation, context, cue, classes, eating, dietary behavior.

1. Introduction

The eating situation is an important determinant of dietary behavior (Elliston et al., 2017; Onita et al., 2021; Pennanen et al., 2020). Research has established the strong and multifaceted influence of several situational dimensions, with studies exploring the impact on dietary behavior of eating location (Ortega et al., 2020), the presence of others while eating (Hetherington et al., 2006), and individuals' engagement in concurrent activities (Bellisle et al., 2004). Despite confirming the importance of such influences, research on eating situations still needs to overcome fundamental challenges related to defining, conceptualizing, and measuring such situations in the first place (Funder, 2009; Hogan, 2009; Mason et al., 2020; Maugeri & Barchitta, 2019; Rauthmann, 2015; Rauthmann & Sherman, 2020; Rauthmann et al., 2015; Reis, 2008; Yang et al., 2009).

The first of these challenges is that previous research often lacks a clear definition of what constitutes a "situation", leading to terminological ambiguity as the term "situations" is often used interchangeably with terms such as "environments" and "contexts" that denote different concepts (Meiselman, 1996; Onita et al., 2021; Rauthmann et al., 2017). Second, and closely related to this ambiguity, previous research has struggled with conceptualizing situations in general and not just in relation to eating. While there is widespread consensus that a situation is a multidimensional construct, what exactly these dimensions are and which should be considered when researching situations remains subject to debate (Rauthmann, 2015). In the absence of a taxonomy, many studies limit their focus to just a few selected situational dimensions (Neves et al., 2022). Third, these challenges related to defining and conceptualizing situations extend to the measurement of situations. Again, most studies that measure situations do not apply any taxonomy as a basis for identifying which dimensions to assess, but instead rely on previous literature or intuition. These non-taxonomy-based approaches to measure situations have resulted in a multiplicity of diverse measurement approaches, making comparisons and integration across studies difficult. Furthermore, most studies rely on subjective measures and cross-sectional research designs that might introduce biases and result in an oversight of the dynamic nature of situations. Collectively, these three challenges undermine knowledge-building in the field of eating situation research (Rauthmann et al., 2017). The current state of research often resembles list-like findings, lacking any framework for integration. This hinders not only theory development on situations but also the systematic investigation of eating situations and their relationship to dietary behaviors (Reis & Holmes, 2012; Stelick & Dando, 2018).

With this article, I elaborate an approach to investigating eating situations that specifically addresses these three challenges in the field, establishing a clear definition of situations, presenting

a comprehensive taxonomy of dimensions within eating situations, and discussing strategies to advance the measurement of situations. This approach integrates the latest developments in situation research (Rauthmann, 2015; Rauthmann & Sherman, 2020; Rauthmann et al., 2015) with specific insights from research on dietary behavior (Goldschmidt et al., 2017; Schneider-Worthington et al., 2022; Schüz et al., 2015). Such integration helps to ensure the proposed approach is both theoretically sound and practically relevant for investigating the situational nature of dietary behavior.

2. Defining Situations

Defining situations has always been a challenge in research (Baumeister et al., 2007; Rauthmann & Sherman, 2020; Reis, 2008). In very broad terms, situations can be defined as "a set of fleeting, dynamic, and momentary circumstances" (Rauthmann & Sherman, 2020, p. 473). In the first section below, I focus on defining situations in more detail, beginning by distinguishing between the three categories of situational information available, i.e., cues within dimensions, characteristics, and classes (Rauthmann, 2015; Rauthmann et al., 2015). In this article, my focus is on *cues within dimensions*, e.g., cues like "at home" or "at a restaurant" that fall within the dimension "location". I then further characterize situational dimensions based on two qualities: *type* (internal or external to the individual) and *level* (in terms of abstraction, duration, and dynamicity). Ultimately, I argue for a definition of situations that takes into account both internal and external dimensions and conceptualizes situations as characterized by a low level of abstraction, short duration, and high dynamicity.

2.1. Categories of Situational Information

Situations can be defined using different categories of information: cues within dimensions, characteristics, and classes. *Cues within dimensions*, such as the cues "being at home" or "being with friends", refer to the composition of a situation and comprise the stimuli encountered by individuals. Cues can be grouped within different *situational dimensions* like "location" or "social setting". For example, the situational dimension "location" denotes the physical space and encompasses all related cues such as "at home", "at the office" or "at a restaurant", while the situational dimension "social setting" denotes the social circumstances an individual encounters and encompasses all related cues such as "being with friends", "being with family" or "being alone". *Characteristics* refer to the psychological meanings of these cues, such as "social" or "conflictual". Situational characteristics are inherently subjective as they are dependent on the individual's perceptual-cognitive processing of cues. They can be used to describe the qualities of a situation in a way similar to describing a person in terms of their "traits". Lastly, *classes* refer to groups of situations that can be formed based on similar cues (e.g., by grouping all situations that

occur at home) or similar profiles of characteristics (e.g., by grouping all situations that are perceived as conflictual).

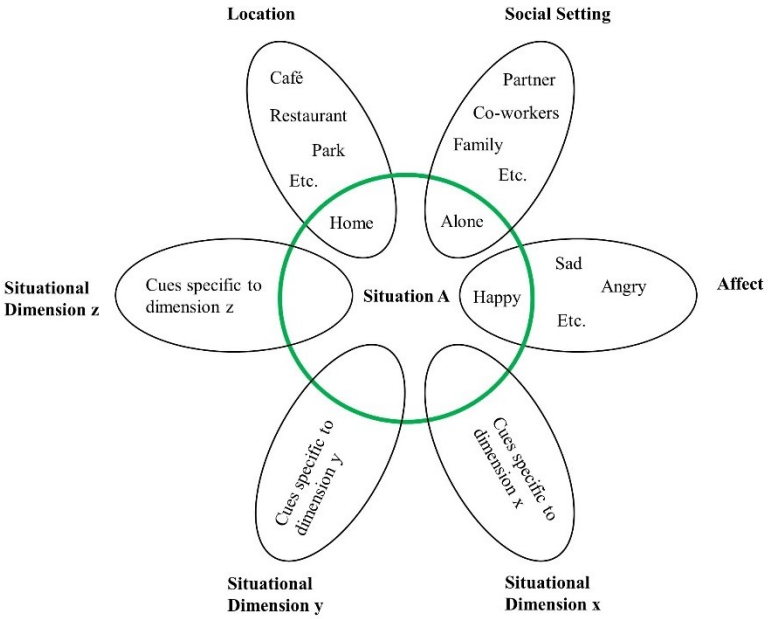
Researchers investigating eating situations have the option of focusing either on cues within dimensions or characteristics as categories of situational information. However, there are several reasons for focusing on cues within dimensions rather than situational characteristics. First, cues as tangible elements not dependent on subjective individual interpretation provide an immediate and non-psychological understanding of a situation (Funder, 2006; Schoedel et al., 2023). Focusing on cues thus ensures that research is grounded in elements that can be clearly identified and analyzed without the variability introduced by subjective perceptions. Second, cues are the foundation for any further processing of a situation and thus merit investigation on this account alone (Reis, 2008; Reis & Holmes, 2012). In other words, cues serve as the raw data that can then be processed into situational characteristics and potentially combined into classes. Establishing a solid understanding of cues lays the foundation for analyzing how situations are perceived and interpreted. Finally, the specificity provided by studying cues is especially important when considering practical applications of knowledge about the impacts of situations, such as when designing interventions to change behavior. By identifying and targeting specific cues within a situation, behavior change interventions can be more precisely tailored to enhance their effectiveness. Such a high level of specificity in intervention design would be difficult to achieve by focusing only on situational characteristics, above all because the link between cues and characteristics remains under-researched (Schoedel et al., 2023). In sum, focusing on cues enables scholars to adopt a more objective, foundational, and practical approach to understanding situations.

Figure 1 provides a visual representation of how situations can be described by a combination of various cues within multiple situational dimensions, as depicted in Panel (a). Here, the ovals represent the various dimensions that encompass numerous cues. In this figure, Panel (a) illustrates a specific situation of an individual in a happy mood eating popcorn at home alone, as shown in Panel (b). This situation is represented in Panel (a) by the green circle that encompasses the cues “at home”, “alone” and “happy”, spanning the dimensions of “Location”, “Social Setting” and “Affect”.

Figure 1

Schematic representation of a situation as comprising a combination of various cues from multiple dimensions

(a) (b)



Note. Panel (a) provides a visual representation of how situations can be described by a combination of various cues within multiple situational dimensions. Panel (b) depicts a specific situation of an individual in a happy mood eating popcorn at home alone. The picture was AI-generated using replicate.com.

2.2. Qualities of Situational Dimensions

Having defined situations in terms of cues within dimensions, the next step in the approach I propose is to define the specific dimensions that comprise a situation. Beyond "location" and "social setting", previous research has taken numerous other dimensions into account, including "activities" (Vainik et al., 2015), "proximity of supermarkets" (Bschaden et al., 2021), and "goals" (Kwasnicka et al., 2016; Ratneshwar et al., 2001). This inclusivity of concepts has added to the vagueness surrounding the use of the term "situation" which poses a challenge for research on eating situations, impeding the synthesis of research findings and thus the advancement of research overall. Accordingly, it is vital to specify which situational dimensions are encompassed within a situation. To address this question, I explore two qualities that can be used to define situational dimensions, i.e., their type and their level. Here, "type" refers to whether dimensions are internal or external to an individual, while "level" refers to the degree of abstraction, duration, and dynamicity of dimensions.

Type: Situations Encompassing Internal and External Dimensions

Definitions of situations differ based on the type of situational dimensions considered, which can be internal (i.e., within the individual, like the dimensions affect and hunger) or external (i.e., outside the individual, like the dimensions location and social setting). In the field of situation research, there is an ongoing debate as to which types of situational dimensions should be included (Rauthmann et al., 2015; Saucier, 2017). In essence, two opposing views are espoused in this debate, with some scholars arguing for the inclusion of both internal and external dimensions (e.g., Lewin, 1936; Papies et al., 2022) and others arguing that only external dimensions should be included (e.g., Rauthmann & Sherman, 2020; Reis & Holmes, 2012). Below, I broadly outline the arguments for each of these views. (For a deeper discussion of this debate, see Saucier (2017) or Rauthmann et al. (2015).)

Proponents of an inclusive approach that comprises both internal and external dimensions in analyzing situations can trace the roots of this perspective back to the seminal work of Kurt Lewin (1936) on situations. Lewin posited that in order to understand and predict behavior (B) one must consider the "whole situation" (S) in which this behavior occurs, formulating this proposition as B = f(S). For Lewin, the "whole" situation can only be described by including both internal ("person" P) and external ("environment" E) dimensions, resulting in the formula B = f(PE). The argument that a situation's internal dimensions are just as important as its external dimensions for understanding a situation is supported by empirical observations that individuals often describe situations in terms of internal dimensions, such as affect (e.g., happy or sad) or physical conditions (e.g., sick or tired) (Block & Block, 1981; Saucier et al., 2007).

Proponents of the view that situations should be defined only by external dimensions (Rauthmann et al., 2015; Reis & Holmes, 2012) base this argument primarily on the potential pitfalls of incorporating internal dimensions in defining situations, contending that this can lead to a conceptual and methodological conflation of the situation and the person experiencing the situation. Such conflation creates a circular logic wherein a situation simultaneously influences and is influenced by the individual's internal states, making it challenging to discern cause and effect. When studying the relationship between situations and stress, for example, including stress as a dimension of the situation might lead to circular reasoning as stress would be both a dimension and an effect of the situation, blurring the line between the situation and the individual's response. This argument for differentiating between external and internal dimensions to avoid confusion has been formulated by Rauthmann as the Circularity Principle (Rauthmann, 2016; Rauthmann et al., 2015).

Here, I propose a definition of eating situations that includes both internal and external dimensions. This approach is appropriate for several reasons. First, it provides a comprehensive understanding of the eating situation insofar as it captures all the momentary influences that may

influence behavior (Belk, 1975; Lewin, 1936). Second, studies have consistently shown that internal dimensions, such as affective states, play an important role in shaping eating behavior, hence including internal dimensions is crucial for the field of dietary research (e.g., Bailey et al., 2023; Goldschmidt et al., 2017; Schneider-Worthington et al., 2022; Schüz et al., 2015). Finally, including both types of dimensions is also practical, not least because differentiating between internal and external dimensions is often not as straightforward as it may initially appear. Many dimensions are subject to interpretational ambiguity, blurring the lines between internal and external dimensions (Finnigan, 2020). For example, a social situation can be seen as both an external cue (being around other people) and an internal cue (feeling socially connected). I further contend that excluding internal dimensions creates an artificial separation that potentially limits our understanding of the situation. In short, a definition of situations that includes both internal and external dimensions offers a more accurate and practical approach for research on dietary behavior.

Level: Situations Encompassing Concrete, Brief and Dynamic Dimensions

The second quality used to define situational dimensions is their level of abstraction, duration, and dynamicity (Rauthmann et al., 2015). For example, "location" and "affect" are low-level dimensions in the sense of being concrete, brief, and dynamic, whereas "density of supermarkets in the area" and "friend network" are high-level concepts, being abstract, long-term, and relatively static. It should be noted that the level cannot be determined precisely but is best understood as a guiding principle that enables the comparison of different concepts with one another.

Definitions of situations differ according to the levels of the dimensions included (Bisogni et al., 2007). Some definitions focus exclusively on concrete, brief, and dynamic dimensions, while others consider more abstract, long-term, and static dimensions (Rauthmann et al., 2015). In some studies, situations are defined to include dimensions from different levels, e.g., by blending low-level dimensions like social setting with high-level dimensions such as density of food outlets (Elliston et al., 2017; Schoedel et al., 2023). Nevertheless, I align with most contemporary situation research in defining situations in terms of low-level dimensions that can be characterized as concrete, brief, and dynamic (Rauthmann et al., 2015), above all because this focus accounts for the momentary circumstances in which behavior occurs and further helps distinguish "situation" from related concepts such as "environment" and "context". In sum, my proposed definition of situations encompasses internal and external dimensions characterized as concrete, brief, and dynamic.

Combining Type and Level

Table 1 organizes situational dimensions based on the qualities of "type" and "level". The proposed definition of situations is outlined in green in the rectangle that includes internal and

external low-level dimensions. Internal low-level dimensions, also referred to as "states", are momentary conditions within an individual that can change rapidly, including physiological and perceptual states such as hunger or affect (Rauthmann, 2021). These dimensions are distinct from higher-level concepts such as psychological characteristics (e.g., attitudes and intentions), or traits and socio-demographics (e.g., identity and income) that are more regular, recurrent, and change more slowly (McAdams & Pals, 2006; Rauthmann & Sherman, 2020). External low-level dimensions, also referred to as "micro-environments", are any momentary conditions outside the individual that can change rapidly, such as location or social setting (Rauthmann, 2021). As illustrated in Table 1, micro-environments differ from higher-level concepts such as meso-environments (e.g., "proximity of supermarkets") or macro-environments that refer to any regular, recurrent or slowly changing condition (e.g., "Germany" or "the 21st century") (Rauthmann, 2021; Rauthmann & Sherman, 2020).

Table 1

Organization of various concepts according to their type and level

		Type	
		Internal	External
Level in terms of abstraction, duration and dynamicity	Low Level (Concrete, brief & dynamic)	States (e.g., hunger, affect)	Micro-Environment (e.g., location, social setting)
		Psychological Characteristics (e.g., attitude, intention)	Meso-Environment (e.g., proximity of supermarkets, friend network)
		Traits & Sociodemographics (e.g., identity, income)	
	High level (Abstract, long & stable)		Macro-Environment (e.g., Germany, 21st century)

Note. Table 1 organizes various concepts according to their type and level, with "type" referring to whether dimensions are internal or external to an individual and "level" denoting the degree of abstraction, duration, and dynamicity of dimensions in a continuum from "low" (e.g., concrete, brief, and dynamic) to "high" (e.g., abstract, long-term, and stable). As outlined in the green box, the definition I propose encompasses internal and external situational dimensions characterized by a low level of abstraction, duration and dynamicity. The table draws on insights from Rauthmann et al. (2015).

3. Conceptualizing (Eating) Situations

Building on the preceding definition, this section explores the conceptualization of (eating) situations through taxonomies. As classification systems that provide a structured approach to describing situations by categorizing and listing their different dimensions (Meyer, 2014), taxonomies are a valuable tool for determining which specific dimensions to focus on when investigating situations. Below, I first discuss the importance of taxonomies in situation research and address some of the prevailing challenges in the field before zooming in on the context of dietary behavior and presenting a taxonomy for eating situations developed by Bisogni et al. (2007).

3.1. Taxonomies of Situational Dimensions

The importance of taxonomies when studying situations has been consistently emphasized in the literature (Reis & Holmes, 2012). As valuable organizational tools that facilitate the structuring of findings, taxonomies are a good starting point for developing theories, helping to formulate hypotheses and explore causal characteristics (Reis, 2018; Reis & Holmes, 2012). Without a taxonomy, research often produces a "list-like structure" of findings rather than a dense, integrated, and coherent network of findings that together explain a phenomenon (Reis & Holmes, 2012). In short, taxonomies of situational dimensions can provide a framework for investigating situations and thus play an important role in unifying research on situations (Finnigan, 2020).

Despite widespread acknowledgement of their importance, relatively few taxonomies have been developed for situational dimensions. Most existing taxonomies focus on situational characteristics rather than dimensions (Parrigon et al., 2017; Rauthmann et al., 2014; for an overview of situation taxonomies see Horstmann et al., 2018). The reason for the scarcity of dimension-based taxonomies lies in the challenging nature of selecting which cues within dimensions to include, since an almost infinite number of cues and dimensions could potentially be included (Horstmann et al., 2018). Beyond the dimensions of location and affect, for example, a taxonomy could encompass dimensions such as time, temperature, and sound. Despite this challenge, scholars have made several notable efforts to develop taxonomies of situational dimensions, as outlined in Table 2.

Table 2

Overview of taxonomies for situational dimensions

Situational Dimensions	Taxonomy				
	Belk, 1975	Pervin, 1978	Magnusson, 1981	Saucier et al., 2007	Noftle & Gust, 2015
Time	Temporal perspective	When?	-	-	Time
Location	Physical surroundings	Where?	Physical setting	Locations	Space
Social setting	Social surroundings	Who?	Other persons, Roles	(Social) associations	Persons, Roles, Activities of others, Mental states of others
Activities	-	What?	Task, Rules	Activities	-
Mental processes	Antecedent states	-	Goals, Perceived control, Expectancies, Needs and motivations, Affective tones or emotions	Passively experienced processes	Mental states of the self
Other	Task definition		Complexity, Clarity, Strength, Promotion vs. Restriction	-	Events

Note. These taxonomies are not specific to eating situations.

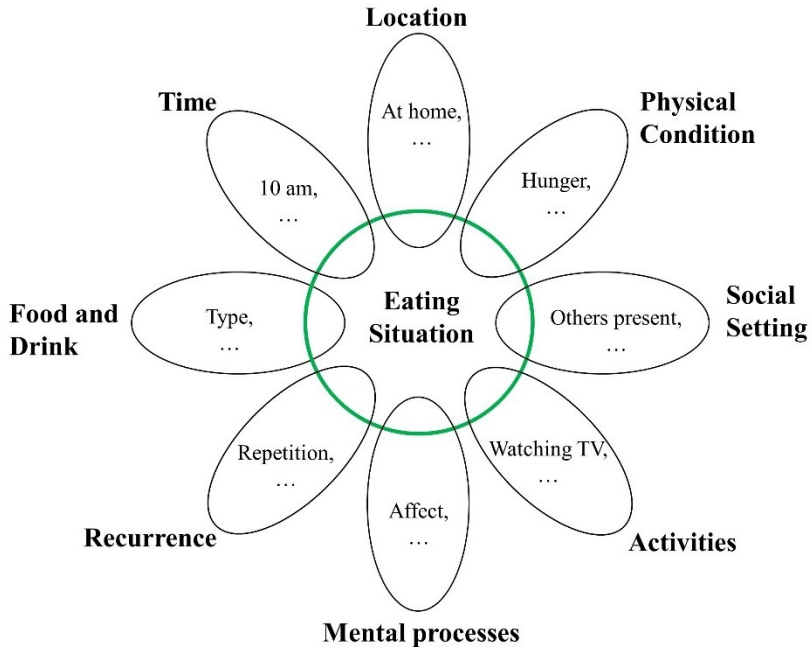
While these previous taxonomies provide a good starting point, they may not be well-suited for investigating eating situations. First, not all these taxonomies align with the proposed definition of situations, e.g., Pervin's (1978) taxonomy does not include internal dimensions. Second, since they were originally developed to describe situations in general (e.g., working, socializing, etc.), not all of their dimensions may be applicable or relevant to understand eating situations, e.g., the dimensions of "Complexity" and "Clarity" in Magnusson's (1981) taxonomy. A taxonomy is needed that both aligns with the proposed definition of situations (encompassing internal and external dimensions characterized as concrete, brief, and dynamic) and that is tailored to the context of eating behavior. On this basis, I adopt an exemplary taxonomy by Bisogni et al. (2007) for describing eating situations.

3.2. Taxonomy of Situational Dimensions Specific to Eating Situations

Bisogni et al.'s (2007) taxonomy was developed specifically to understand eating and drinking situations. As shown in Figure 2, this taxonomy identifies eight situational dimensions: *Food and Drink*, i.e., the actual food and drink consumed during an eating episode (e.g., meat); *Time*, i.e., time of the day (e.g., 10 a.m.) or time in relation to other activities or events (e.g., "after waking up"); *Location*, i.e., the place where the food is eaten (e.g., at home or in a restaurant); *Physical Condition*, i.e., bodily conditions related to nourishment (e.g., hunger and (de)hydration), or other states such as fatigue and illness; *Social Setting*, i.e., the presence of other people and their characteristics (including the number of people and their genders); *Activities*, i.e., other behaviors that co-occur during eating (e.g., watching TV); *Mental Processes*, i.e., internal states present when eating, including affect and emotions; and *Recurrence*, i.e., the extent to which an individual repeats certain eating and drinking situations.

Figure 2

Taxonomy of eating situation dimensions



Note. Adapted from Bisogni et al., 2007.

Bisogni et al.'s (2007) taxonomy is useful for analyzing eating situations as it is both consistent with the definition proposed above and was developed specifically to understand the situational nature of eating. Another important aspect of this taxonomy is its emphasis on highly salient dimensions (Schoedel et al., 2023) This is important because salient dimensions such as the presence or absence of others are likely to be perceived uniformly by different individuals, unlike weak dimensions such as distant objects (such as windows or pictures of art) that are more open to selective perception and subjective interpretation. By including only highly salient dimensions, the taxonomy maintains a sharp focus on the key situational aspects that influence dietary behavior.

While proposed as an exemplary taxonomy, the taxonomy nonetheless has certain limitations that merit refinement. First, the dimension of "recurrence" within the taxonomy creates a conceptual discrepancy. Unlike the other dimensions that can be characterized as concrete, brief, and dynamic, "recurrence" refers to the repetition of situations rather than describing an immediate cue within a situation, rendering "recurrence" somewhat more abstract, long-term, and static, thus diverging from the definition's focus on otherwise low-level dimensions. Second, the inclusion of the dimension "food and drink" may need to be reconsidered. This dimension refers to the behavior in the situation and

when researching the relationship between situations and dietary behavior, it is useful to draw a clear distinction between the behavior and the situation in which it occurs (Belk, 1975). Finally, the taxonomy could be expanded by incorporating additional relevant dimensions, such as the dimension "event" to refer to specific occasions like birthday dinners or barbecues that impact dietary behavior (Letarte et al., 1997). To expand and validate the taxonomy, future research could undertake a comparative analysis of multiple taxonomies (e.g., Desmet & Schifferstein, 2008; Kauppinen-Räisänen et al., 2013; Letarte et al., 1997) as a basis for attaining a more comprehensive and overarching taxonomy.

In sum, notwithstanding certain limitations in need of refinement, Bisogni et al. 's taxonomy (2007) offers a solid foundation for advancing research. Applying this taxonomy as a taxonomy for systematically conceptualizing eating situations enables a thorough exploration of their multidimensional nature. Further refining and extending this taxonomy is not only beneficial for the study of eating behaviors but also has the potential to contribute more broadly to our understanding of situational influences across a range of behaviors.

4. Measuring Eating Situations

As eating situations are a complex concept, their assessment is equally challenging. The current state of assessing situations is characterized by an absence of standardized instruments, a reliance on subjective measures, and a tendency towards cross-sectional research designs (Laffan et al., 2023; Mak et al., 2012; Maugeri et al., 2022; Morshed et al., 2020; Rauber et al., 2022; Schoedel et al., 2023; Verain, van den Puttelaar, et al., 2022). These limitations have led to several challenges, including significant heterogeneity in findings stemming from different dimensions being assessed, biases introduced by self-reporting, and an oversight of the dynamic nature of situations. Addressing these challenges requires a shift in our approach to measuring eating situations. In this section, I advocate for three methodological strategies that advance the measurement of eating situations: a) adopting a taxonomy-based approach for situation measurement to capture a comprehensive spectrum of dimensions, b) combining subjective and objective methods to provide a more accurate portrayal of situations, and c) applying intensive longitudinal research designs, like diary studies or Ecological Momentary Assessments (EMA), to capture the dynamic nature of eating situations. Implementing these three strategies will significantly advance our understanding of eating situations and how they relate to dietary behavior.

4.1. Adopting a Taxonomy-Based Measurement

The cornerstone of advancing the measurement of eating situations lies in the adoption of a comprehensive taxonomy. This approach first requires establishing a clear definition and

comprehensive conceptualization of eating situations before a measurement instrument is developed. This is necessary as there is currently no validated instrument available for measuring dimensions of situations in general and eating situations in particular (Horstmann et al., 2018; Rauthmann et al., 2014).

Adopting a taxonomy-based measurement of situations offers several advantages. First, it supports the development of both qualitative and quantitative instruments. For example, researchers can use the taxonomy as the basis for a standardized questionnaire or observation protocol to collect data that are consistent in terms of the dimensions being measured. This is paramount in a field where there is not yet a consensus on a validated instrument for measuring situational dimensions. Second, it ensures that all dimensions of the eating situation are systematically assessed. The lack of an accepted taxonomy often results in an incomplete conceptualization of the situation, potentially overlooking crucial aspects that affect dietary behavior. For example, when situations are assessed with only social setting and location, other dimensions such as concurrent activities or hunger levels might be overlooked. Finally, the adaptation of a taxonomy-based measurement advances the field of situation research. It allows for the systematic comparison of findings across different studies, enhancing the accumulation of knowledge and allowing for the iterative refinement of the taxonomy itself. This not only improves our understanding of eating situations but also significantly increases the reliability and validity of research in this field.

4.2. Combining of Subjective and Objective Measures

The second strategy for advancing the measurement of situations involves the combination of subjective and objective measures. Subjective measures gather data in the form of participants' self-reports on their current or recalled experiences (e.g., Verain, Bouwman, et al., 2022). These measures rely on individuals' perceptions and memories to provide researchers with insights into participants' experiences. They often use closed-ended questions (Mak et al., 2012; Rauber et al., 2022) involving rating scales (e.g., with participants rating their hunger or mood on a seven-point scale as in Bauer et al., 2022), binary choices (e.g., with participants indicating social setting with either "alone" or "with others" as in Bouwman et al., 2022), and multiple-choice options (e.g., with participants indicating social setting with the following options: "alone", "with household", "with family", "with friends", "with colleagues" or "other" as in Verain, Bouwman, et al., 2022).

Conversely, objective measures collect data via technological tools such as sensors and cameras, also known as mobile sensing (e.g., Brown et al., 2017; Harari & Gosling, 2023). These methods circumvent the need for individuals to provide data on situations directly. For example, location can be tracked via GPS sensors (e.g., Ortega et al., 2020), social setting can be analyzed via

images from wearable cameras (e.g., Gemming et al., 2015), and activity can be monitored via smartphone app usage (e.g., Schoedel et al., 2023). For an overview of the different information captured by objective measures, see Harari and Gosling (2023).

The combination of subjective and objective measures offers a comprehensive approach to measuring situations, leveraging their respective strengths. Subjective measures are cost-effective and easy to administer. They lend themselves to the assessment of internal dimensions, such as hunger and affect, as these dimensions are dependent on participant introspection. Conversely, objective measures are often unobtrusive as they can record data without the participants' involvement (Gemming et al., 2015), providing automatic, continuous, and detailed measurement. They are apt for the assessment of external dimensions, such as location, time, or social setting. Incorporating both subjective and objective measures to assess eating situations can provide a richer analysis of the situation. This not only enriches the depth of our situational assessment but also maintains a balance between financial feasibility and reduction of participants' burden.

4.3. Applying Intensive Longitudinal Research Designs

The third strategy for advancing the measurement of eating situations is applying intensive longitudinal research designs. Traditionally, situational data has been collected in cross-sectional designs, as in the case of national nutritional surveys where individuals report on their behavior and situations retrospectively (Alblas et al., 2021; Mak et al., 2012; Rauber et al., 2022). However, there is a growing trend toward applying intensive longitudinal research designs, that involve repeated measurements of an individual's behavior and situations in close temporal proximity to their occurrence (Bauer et al., 2022; Elliston et al., 2017; Maugeri & Barchitta, 2019; Verain, Bouwman, et al., 2022). Notable examples of intensive longitudinal research designs include diary studies and Ecological Momentary Assessments (EMAs). In diary studies, participants complete brief questionnaires at the end of each day to document their behaviors and situations throughout the day (Debeuf et al., 2018; Wrzus & Mehl, 2017). EMA studies capture behaviors and situations more frequently and immediately, by prompting participants to report on their behaviors and situations several times a day.

Intensive longitudinal research designs have several benefits in the measurement of situations. First, they enable researchers to collect data in real-world settings, allowing for an authentic assessment of situations as they unfold in individuals' daily lives (Shiffman et al., 2008; Wrzus & Mehl, 2017). This approach minimizes recall bias, providing insights that are closer to the individuals' experience. Furthermore, intensive longitudinal research designs are particularly adept at capturing the fluctuations of eating situations over time. Given the diversity of eating situations throughout a day - ranging from

solitary breakfasts during a commute, to lunches with colleagues while working, to dinners at home with family - it is crucial to measure these situations multiple times a day to accurately capture their intra-individual variability. Finally, intensive longitudinal research designs are crucial for exploring the relationship between eating situations and dietary behavior (Kockler et al., 2018; Mason et al., 2020). As dietary behavior can vary extensively within individuals over time and across different situations (Chevance et al., 2021; Wahl et al., 2020), applying intensive longitudinal research designs can help to identify patterns between eating situations and dietary behavior. For example, an EMA-based study highlighted the role of eating situations in adopting healthy eating strategies, demonstrating that dining with others can foster a greater openness to increasing healthy foods (Verain, Bouwman, et al., 2022).

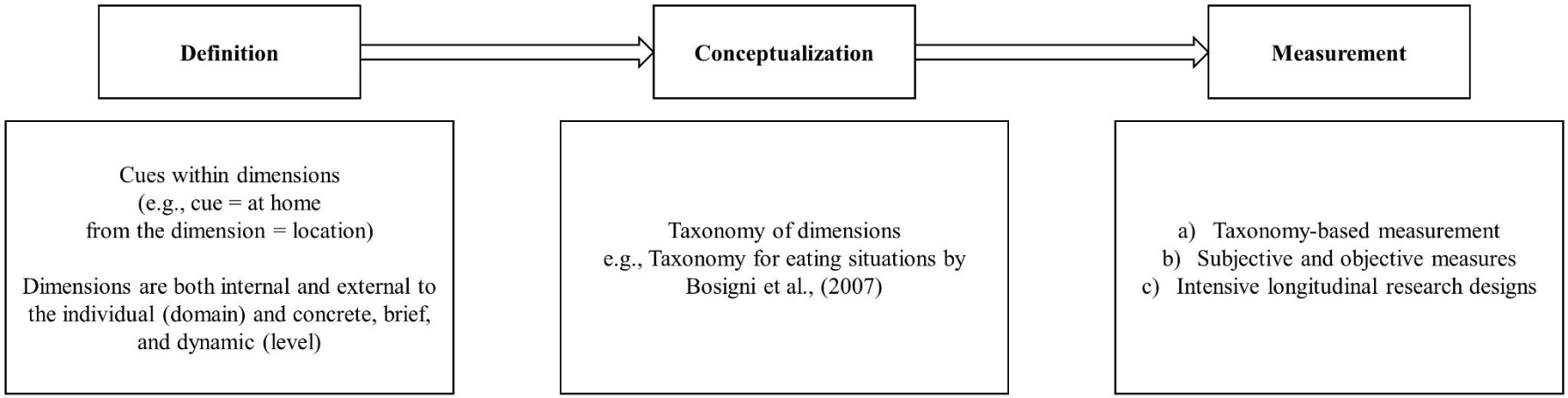
5. Conclusion

In this article, I have presented a structured approach to investigating eating situations, addressing the three main research challenges of defining, conceptualizing, and measuring eating situations. Figure 3 provides a comprehensive visual overview of this approach. The upper section of Figure 3 outlines the challenges of defining, conceptualizing, and measuring (eating) situations, while the lower section highlights the main points of the approach. Figure 3 also illustrates how each step is connected and integral to the overall process. Throughout this article, I have argued that the definition of eating situations chosen by a researcher inherently determines the taxonomy used to conceptualize these situations, while the taxonomy, in turn, significantly influences how situations are measured. Given that all these steps impact the type and quality of findings gained from empirical research, it is important to consider each step carefully.

As a practical means of effectively navigating these interconnected steps, this article has proposed that researchers carefully define eating situations as a basis for identifying tailored conceptualizations that accurately reflect the multidimensional nature of eating situations. Such conceptualizations can then guide the development of precise and relevant measurement tools. It is important to note that this proposed approach and example are not presented as a definitive solution but as a starting point for researchers investigating eating situations. By adopting this approach, researchers can establish a strong foundation for the study of eating situations, ultimately enhancing our understanding of these situations and how they relate to dietary behavior.

Figure 3

Guide to define, conceptualize and measure eating situations



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In Which Situations Do We Eat? A Diary Study on Eating Situations and Situational Stability

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Abstract: Eating situations are crucial for understanding and changing eating behavior. While research on individual situational dimensions exists, little is known about eating situations as a whole. This study aimed to fill this gap by identifying eating situations as combinations of multiple situational dimensions and describing how stable individuals eat in those situations. In a five-day online diary study, 230 participants reported a total of 2461 meals and described the corresponding eating situation using predefined situational dimensions. Divisive hierarchical cluster analyses were conducted separately for breakfast, lunch, and dinner, resulting in unique cluster solutions that characterized the most common eating situations. The most common breakfast situations were characterized by a combination of the dimensions social, affect, and hunger. The most common lunch and dinner situations were characterized by varying combinations of the dimensions social, affect, and activity. Based on the identified situations, a situational stability index was developed to describe how stable individuals eat in the same situations. The findings suggest high interindividual differences in situational stability, which were associated with socio-demographic characteristics like age or employment. This study enhances our understanding of the situational aspects of eating behavior while offering tools to describe eating situations and situational stability.

Keywords: situation; context; food environment; eating behavior; meal pattern; diary study

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1. Introduction

Over the past decades, Western diets have fallen short in terms of quantity, quality, and diversity [1]. This shortfall is also noticeable in the context of meal consumption. Meals are defined as regular and planned eating episodes that include multiple foods and a beverage [2]. They form an integral part of Western eating behaviors, with breakfast, lunch, and dinner being traditional meal types [3]. Current trends in meal consumption include the supersizing of portions [4–7], the wide availability of fast and highly processed foods [8–11], and the decline in dietary diversity [12]. These unhealthy trends have been linked to chronic non-communicable diseases, including obesity [1,11,13,14]. To mitigate such health outcomes and promote healthy diets, understanding the determinants of meal consumption is necessary.

Among the determinants of meal consumption, one holds particular significance as it is temporally and physically close to the behavior: the eating situation. The eating situation describes the specific circumstances in which eating occurs and is composed of situational dimensions internal (e.g., hunger or affect) and external to the person (e.g., temporal or social) [2]. Eating situations have been widely recognized as having a powerful impact on our eating behavior [2,15–21]. Accordingly, what we eat and why we eat vary not only between people but also between eating situations [22].

To better understand how eating situations impact eating behavior, it is essential to identify the situations in which people eat. To date, little is known about eating situations as a whole. Previous approaches to investigating eating situations have (1) either focused on individual situational dimensions (e.g., social—[23] or location—[24]), (2) explored multiple situational dimensions but independently from each other (e.g., location, social, and affect—[25] or time and location—[17]), or (3) preselected specific eating situations (e.g., eating out in fast-food restaurants—[26] or eating during a lunch break at work—[27]). While these approaches provided valuable insights into situational aspects of eating behaviors, they were associated with several shortcomings. First, focusing on an individual situational dimension limits understanding the multitude of situational influences on eating. Second, independently exploring multiple situational dimensions fails to account for the complex interactions between dimensions in real-life eating situations. Finally, investigating preselected eating situations may not accurately capture the diversity of eating situations individuals encounter daily. These limitations highlight the need for a more comprehensive and holistic approach to studying eating situations.

In addition to identifying eating situations, it is valuable to explore how stable these situations are for an individual. This so-called situational stability refers to the recurrence of eating situations within an individual over time. To illustrate, suppose an individual recurrently eats breakfast in the same situation (e.g., eating breakfast alone daily at 8 a.m. while working in the office). In that case, their eating behavior can be described as situationally stable. Conversely, suppose an individual eats breakfast in varying situations (e.g., sometimes at home with the family, sometimes alone in the office). In that case, their eating behavior can be described as situationally unstable.

Investigating situational stability is important, as it complements research on the underlying processes driving eating behaviors, ranging from deliberate to automatic [28]. Previous research has associated situational stability with automatic processes across different behaviors [29–31]. These automatic processes are considered more resistant to change. For example, recurrently eating breakfast in the same situation might make the behavior more automatic and potentially more difficult to change [30]. In such cases, interventions could target the recurring situation to facilitate effective behavior change. However, the degree to which eating occurs in stable situations remains largely unexplored. This study aims to bridge this gap by exploring situational stability.

Furthermore, situational stability is likely to vary between individuals depending on socio-demographic characteristics. For instance, parents with young children may prefer to adhere to a strict eating pattern, whereas students may need to be more flexible with their eating patterns depending on their schedule. Examining situational stability across socio-demographic groups facilitates the design of interventions by identifying different target groups and addressing their needs. To the best of our knowledge, there are no studies on situational stability and its relation to different socio-demographic groups.

In summary, the objectives of this study are twofold. The first research objective (RO1) is to identify the most common eating situations as combinations of multiple situational dimensions. The second research objective (RO2) is to describe situational stability and its association with socio-demographic characteristics. Each research objective will be analyzed separately for each meal type (breakfast, lunch, and dinner).

To achieve these research objectives, (a) a multidimensional framework was applied to define eating situations; (b) a repeated-measures design was employed to capture real-life situations; and (c) a data-driven methodology was utilized to identify the most common eating situations.

(a) The multidimensional framework used to define eating situations was introduced by Bisogni et al. [2]. They describe eating situations as comprising seven situational dimensions: time, location, hunger, social, activity, affect, and situational stability. A depiction of the framework can be seen in Figure 1. The left image illustrates the first six situational dimensions that together describe the immediate eating situation. Each situational dimension can be further characterized by features that describe the eating

situation in more detail. For example, the situational dimension of time can be described more precisely with features like "8 a.m." or "after waking up". The right image depicts the dimension of situational stability. Although situational stability is listed as one of the seven situational dimensions in the framework, it must be considered separately as it represents an aggregation of eating situations within an individual over time. Applying this framework addresses the limitation of examining individual situational dimensions in isolation. Instead, it characterizes eating situations as a combination of multiple situational dimensions, facilitating a holistic perspective on eating situations.

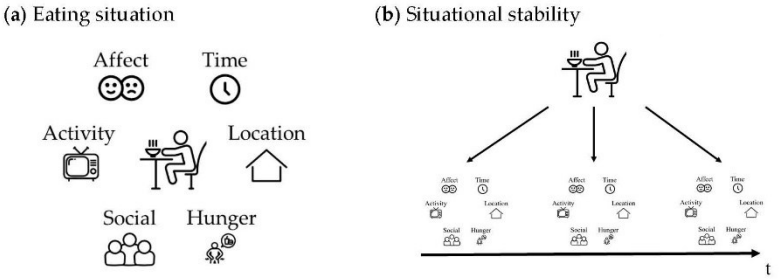

Figure 1. Eating situation and situational stability. The figure depicts two images. (**a**) The left image illustrates the concept of an eating situation comprising six situational dimensions, including time, location, hunger, social, activity, and affect. (**b**) The right image illustrates situational stability, which refers to the recurrence of eating situations within an individual over time. The figure has been adapted from Bisogni et al. (2007) [2].

(b) Another notable feature of this study is the repeated-measures design as a diary study. In a diary study, individuals describe their eating situations repeatedly across multiple days. This design is well-suited for studying repeated-occurrence behaviors, such as eating, that recur frequently in various situations [32,33]. The diary study enables data collection close to the individuals' experiences, providing a realistic reflection of their eating situations. Also, it enables obtaining a large sample of eating situations within individuals [32,33], thus capturing the diversity of eating situations [34]. The repeated-measures design addresses the limitations of previous research that relied on cross-sectional designs when investigating situational aspects of eating. Additionally, the diary study permits the description of situational stability, for which multiple observations across time for each individual are needed.

Last, (c) the study utilizes a data-driven methodology of cluster analyses to identify eating situations by identifying patterns of co-occurring situational dimensions. Unlike approaches that focus on situational dimensions independently or limit the study to a preselected set of situations, this methodology allows for the discovery of naturally occurring combinations of situational dimensions. By considering these combinations, the data-driven approach provides a nuanced understanding of eating situations [2].

2. Materials and Methods

A repeated-measures design as a diary study was employed. Data were collected by the German market research company Aproxima on weekdays from the 11th until the 15th of January 2021. A five-day time frame was decided upon to capture a whole working week. Participants had access to the online questionnaire each day from 7 p.m. until noon the following day and were instructed to fill out the questionnaire after their last meal of the day. On the first day, participants were informed about the theme of the study (investigating eating behavior) and received instructions for the diary study. They were also asked for consent to participate in the study and completed a short intake survey on

socio-demographic characteristics (age, sex, employment, household composition, and income).

2.1. Participants

The participants were eligible to take part in the study if they were at least 18 years old and did not follow a vegetarian or vegan diet. All participants were compensated for each day they took part in the diary study. Compensation was staggered so that more money was offered on the first and last days to motivate participants to complete the study (in total, EUR 3.80). Of the 481 participants starting the study on the first day, 230 completed all five days (response = 47.82%). Drop-out analysis found socio-demographic differences between participants who completed the five days and those who dropped out; see Table S1 in the Supplementary Material. Participants who worked part-time or did not work were more likely to complete the study than those who worked full-time. Also, participants who lived in households without children were more likely to complete the study than those who lived with children. Only the 230 participants who completed the diary entries for all five days were included in the analyses. The socio-demographic characteristics of the final sample are presented in Table 1.

Table 1. Socio-demographic characteristics of the final sample.

Socio-Demographic Characteristics	Mean/N	(SD/%)
Age	42.70	17.25
Sex		
Male	135	58.70%
Female	95	41.30%
Employment status		
Full-time	102	44.35%
Part-time	36	15.65%
In education	24	10.43%
Non-working	67	29.13%
Missing	1	0.43%
Household composition		
Other adults in the household		
No	37	16.09%
Yes	177	76.96%
Missing	16	6.96%
Children in the household		
No	147	63.91%
Yes	47	20.43%
Missing	36	15.65%
Monthly household net-income		
≤EUR 450	5	2.17%
EUR 450–<1500	42	18.26%
EUR 1500–<2500	64	27.83%
EUR 2500–<4000	71	30.87%
≥EUR 4000	44	19.13%
Missing	4	1.74%

2.2. Measures

In the daily diary survey, participants reported how many meals they had eaten that day (excluding snacks), assigned each to a meal type (breakfast, lunch, dinner), and described the situation in which they had eaten their meal. Participants characterized the situations using the six situational dimensions (time, location, hunger, social, activity, and affect) of the multidimensional framework, which was outlined by Bisogni et al. [2]. Each situational dimension was assessed with one item to ensure a short response time for the participants. Only the dimension affect was assessed with a short scale, which was subsequently transformed into a single numerical value. Furthermore, all situational

dimensions with numerical values were dichotomized. These steps were implemented to give each situational dimension equal weight in the analyses.

The time of day was measured by a drop-down menu in hourly intervals. Descriptive analysis revealed a trimodal distribution, meaning that eating occurred during three peak times: morning, midday, and early evening. These peaks were significantly associated with the self-reported meal types (breakfast, lunch, and dinner), $X^2(4, N = 2461) = 4007.3$, $p < 0.001$. Thus, time was dropped as a situational dimension.

The location was assessed with the question about where the meal was taken with the following options: "at home", "at someone else's home", "in a canteen, cafeteria, fast-food chain, restaurant, a snack bar or similar", "at the workplace", "on the road (e.g., on the bus, in the train, in the car, . . .)", "outside in nature (e.g., a park)" or "in another place". Due to low counts in all other locations apart from "at home", they were combined into a single category, referred to as "elsewhere". The low counts of options outside the home can potentially be explained by the impact of the COVID-19 pandemic and the associated restrictions on eating behavior. Consequently, the final options for location were "home" and "elsewhere".

Hunger prior to meal consumption was measured by a unipolar visual analog scale, from 0 (not at all hungry) to 100 (extremely hungry) [35]. Hunger was dichotomized into "hungry" and "satiated" for each meal type using a median split. The median score across all meals was 62. Specifically, the median score for breakfast was 60, for lunch it was 65, and for dinner it was 64.

The social dimension was measured by whether other people had been present while eating. Participants could answer either "with others" or "alone".

For activity, participants indicated whether they did something else in addition to eating and could answer either "with activity" or "without activity". The participants were given examples of activities such as watching TV, browsing the Internet, or working.

The affect was assessed by a shortened version of the positive and negative affect schedule (PANAS; [36,37]). The positive affect (PA) subscale consisted of the three positive affect items: happy, relaxed, and energized. The negative affect (NA) subscale consisted of the three negative affect items: angry, afraid, and sad. Participants rated how they felt on a 7-point scale, ranging from 1 (not at all) over 4 (moderately) to 7 (extremely). Both subscales (PA and NA) emerged as separate factors tested by multilevel factor analysis: $X^2(16) = 113.4$; CFI = 0.96; TLI = 0.93; RMSEA = 0.05. To avoid prioritizing the situational dimension of affect in the analyses by including both PA and NA, only NA was kept as a proxy for affect. This decision was supported by literature demonstrating the importance of negative affect for eating behavior [38–40]. For the analysis, the affect was dichotomized into "high negative affect" and "low negative affect" separately for each meal type using a median split (the median was 1 across all meals and meal types).

2.3. Statistical Analysis

All statistical analyses were performed using R Studio (version 4.0.2). To investigate in which situations people eat their meals (RO1), a data-driven methodology was utilized by conducting divisive hierarchical cluster analyses. The cluster analyses were performed separately for each meal type (breakfast, lunch, and dinner). Within the cluster analyses, the Gower coefficient was used to measure the distance in the clustering process [41,42]. The optimal number of clusters was determined using the elbow method and the average silhouette width [42], whereby both methods always led to the same results. The resulting clusters represent the most common situations for each meal type.

To describe situational stability (RO2), an index was developed accounting for how often an individual ate a meal in the same situation (stability) and how certainly a person can be categorized as eating in recurrent eating situations (certainty). The situational stability index ranges from 0 (very unstable) to 1 (very stable) and was calculated by the following:

$$Situational\ Stability\ Index = 1 - \frac{(N_{situations} - 0.5)}{N_{meals}}$$

On the one hand, the index reflects how stable individuals eat in the same situation. The index has a reference value set at 0.5, which can be considered a neutral value; it indicates neither high nor low situational stability. If a person tends to eat in the same situation, the index results in values above 0.5 (high situational stability). However, if a person tends to eat in different situations, the stability index results in values below 0.5 (low situational stability). Consider the following example: Participants A and B ate five breakfasts during the diary study (N_{meals} = 5). Participant A always ate breakfast in the same situation ($N_{stiuations}$ = 1), while Participant B ate breakfast in three different situations ($N_{situations}$ = 3). Participant A would receive an index score of 0.90, while Participant B would receive an index score of 0.30. Hence, individuals score higher on the index if they eat meals in the same situation. Individuals score lower on the index if they eat meals in different situations.

On the other hand, the index also reflects the certainty with which a person can be categorized as situationally stable or unstable in their eating patterns. Consider the comparison between Participant A, who ate five breakfasts during the diary study (N_{meals} = 5), always in the same situation ($N_{situations}$ = 1), and Participant C, who ate breakfast twice during the five days (N_{meals} = 2), also always in the same situation ($N_{situations}$ = 1). Although both participants ate stably in the same situation, they differed in the number of reported meals. Participant A's eating behavior is well documented (featuring five breakfasts), and it can be inferred with high certainty that this person has a high level of situational stability. In contrast, the data on Participant C's eating behavior are limited (featuring two breakfasts). Although it seems that Participant C also eats stably in the same situation, this assumption cannot be made with the same certainty as for Participant A. Thus, the more information available about a person's eating pattern (more meals), the more certain one can infer whether that person tends to eat in the same or different situations. The index reflects this difference in certainty by correcting the number of reported meals. In this example, Participant A would receive a higher situational stability score (stability index = 0.90) than Participant C (stability index = 0.75).

In terms of certainty, the case of one meal (N_{meals} = 1) is interesting. If a person eats breakfast only once during the observed period, no assumptions can be made about whether this person eats breakfast in the same or different situations. There were not enough data to categorize their situational stability. Due to the uncertainty in categorizing participants who report only one meal, the index will result in a score of 0.5.

The index is calculated separately for each meal type (breakfast, lunch, and dinner) to account for varying eating patterns depending on the meal type. For example, a person might always eat breakfast in the same situation (alone at home) but dinner in different situations (sometimes alone and sometimes with friends). The situational stability index as a function of meals and situations is exemplified in Table 2.

Table 2. Values of the situational stability index as a function of meals and situations in which the meals were eaten.

Situational Stability Index		**N_{meals}** [1]						
		1	**2**	**3**	**4**	**5**	**6**	**etc.**
$N_{situations}$ [2]	1	0.50	0.75	0.83	0.88	0.90	0.92	…
	2		0.25	0.50	0.63	0.70	0.75	…
	3			0.16	0.35	0.50	0.58	…
	4				0.13	0.30	0.42	…
	5					0.10	0.25	…
	6						0.08	…
	etc.							…

[1] N_{meals} = Number of meals a person ate during the observed period. [2] $N_{situations}$ = Number of different eating situations into which the meals were categorized.

In addition, the association between the situational stability index and socio-demographic characteristics was examined (RO2). For this purpose, correlation analyses (Spearman's rank correlations) and mean comparison tests (Mann–Whitney U tests and Kruskal–Wallis tests) were conducted. Non-parametric tests were chosen due to the non-normal distribution of the situational stability index. Subsequently, pairwise comparisons were performed using post hoc Dunn tests with Bonferroni correction.

3. Results

On average, participants reported 10.74 meals over 5 days, including about 3.35 breakfasts, 3.45 lunches, and 3.9 dinners; see Table 3. Most meals were eaten at home, with dinner being the most frequent and lunch the least. Regarding the other situational dimensions—hunger, social, activity, and affect—no clear pattern emerged, as about half of the meals were eaten in either of the two options. For example, about half of the meals were eaten hungry and the other half satiated. These findings were consistent across all meals, although variations in social and activity were observed between the meal types. More dinners were eaten with others than lunches, and slightly more lunches were eaten with others than breakfasts. Also, more breakfasts and dinners were accompanied by an activity than lunches. For a detailed description of the situational dimensions individually and across all meals, see Table 4.

Table 3. Descriptive statistics on the average number of reported meals across all five days.

	Mean	Median	SD	Range
All	10.74	11	3.56	1–22
Breakfast	3.35	4	2.10	0–11
Lunch	3.45	4	1.88	0–7
Dinner	3.9	5	1.72	0–8

Table 4. Frequencies and percentages of the situational dimensions overall and per meal type.

	N (%)	Meal Type			
		All	Breakfast	Lunch	Dinner
	Total number of meals	2461 (100%)	770 (31.29%)	794 (32.26%)	897 (36.45%)
Situational Dimensions	Location Home (vs. elsewhere)	2115 (85.94%)	686 (89.09%)	599 (75.44%)	830 (92.53%)
	Hunger [1] Hungry (vs. satiated)	1220 (49.57%)	349 (45.32%)	375 (47.23%)	444 (49.50%)
	Social With others (vs. alone)	1128 (45.84%)	274 (35.58%)	364 (45.84%)	490 (54.63%)
	Activity With (vs. without activity)	1237 (50.26%)	403 (52.34%)	344 (43.32%)	490 (54.63%)
	Affect [1] High (vs. low negative affect)	1142 (46.40%)	337 (48.96%)	364 (45.84%)	401 (44.70%)

[1] The situational dimensions of hunger and affect were dichotomized using a median split.

3.1. RO1: Eating Situations for Breakfast, Lunch, and Dinner

The cluster analyses were conducted to identify the most common eating situations. Eating situations can be described by varying combinations of situational dimensions (location, hunger, social, activity, and affect). In the following section, the results of the cluster analyses will be presented separately for breakfast, lunch, and dinner. For each meal type, the most common eating situations will be briefly described (N > 100 meals/situation). Descriptive data on all eating situations for each meal type can be found in the Supplementary Material (see Tables S2–S4).

3.1.1. Breakfast

The cluster analysis for breakfast yielded a six-cluster solution (see Figure 2). The most common situations were labeled according to their dimensions: (B1) Breakfast at home, satiated and alone (34% of all breakfasts); (B2) Breakfast at home, hungry and alone (25%); (B3) Breakfast at home, with others and a low negative affect (17%); (B4) Breakfast at home, with others and a high negative affect (14%).

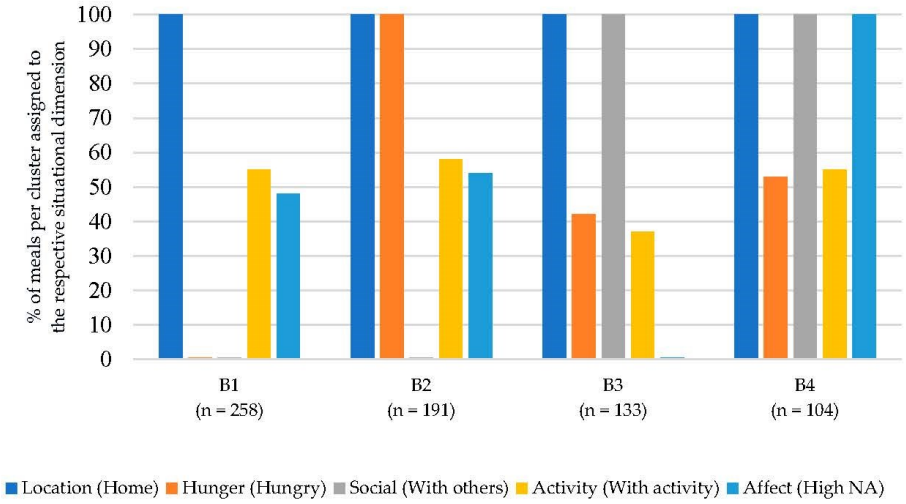

Figure 2. Description of the four most common eating situations for breakfast.

Situations B1 and B2 described situations in which breakfast was eaten at home and alone. The main difference between the two situations resulted from the situational dimension of hunger: B1 described situations in which breakfast was eaten satiated, while B2 described situations in which breakfast was eaten hungry. The dimensions of activity and affect played a minor role in defining these breakfast situations.

Situations B3 and B4 described situations in which breakfast was eaten at home and with others. The situations differed in affect: B3 was characterized by a low negative affect, whereas B4 was characterized by a high negative affect. The dimensions of hunger and activity played a minor role in defining these breakfast situations.

3.1.2. Lunch

The cluster analysis for lunch resulted in an eight-cluster solution (see Figure 3). The most common situations were labeled according to their dimensions: (L1) Lunch at home, no other activity, and a low negative affect (25% of all lunches); (L2) Lunch at home, alone, and a high negative affect (20%); (L3) Lunch at home with another activity and a low negative affect (18%); (L4) Lunch at home with others and a high negative affect (13%).

Situations L1 and L3 both described situations in which lunch took place at home with a low negative affect. The situations differed in terms of activity: L1 described situations in which eating was the sole activity, while L3 described situations in which meals were accompanied by another activity. Also, the situations differed slightly regarding the social dimension: In L1, a slightly higher portion of lunches were eaten with others compared to L3. The dimension of hunger played a minor role in defining these lunch situations.

Situations L2 and L4 described situations in which lunch was eaten at home with high negative affect. The situations differed in terms of the social dimensions: L1 described situations in which lunch was eaten alone, while L4 described situations in which lunch

was eaten with others. The dimensions of hunger and activity played a minor role in defining these situations.

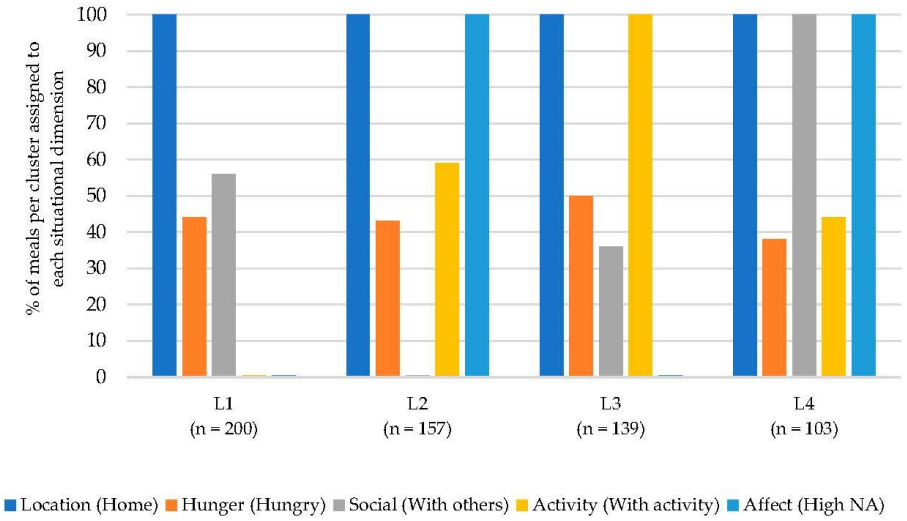

Figure 3. Description of the four most common eating situations for lunch.

3.1.3. Dinner

The cluster analysis for dinner resulted in a seven-cluster solution (see Figure 4). The most common situations were labeled according to their dimensions: (D1) Dinner at home with others and a low negative affect (30% of all dinners); (D2) Dinner at home, alone and a low negative affect (22%); (D3) Dinner at home, with another activity and a high negative affect (21%); (D4) Dinner at home with no other activity and a high negative affect (19%).

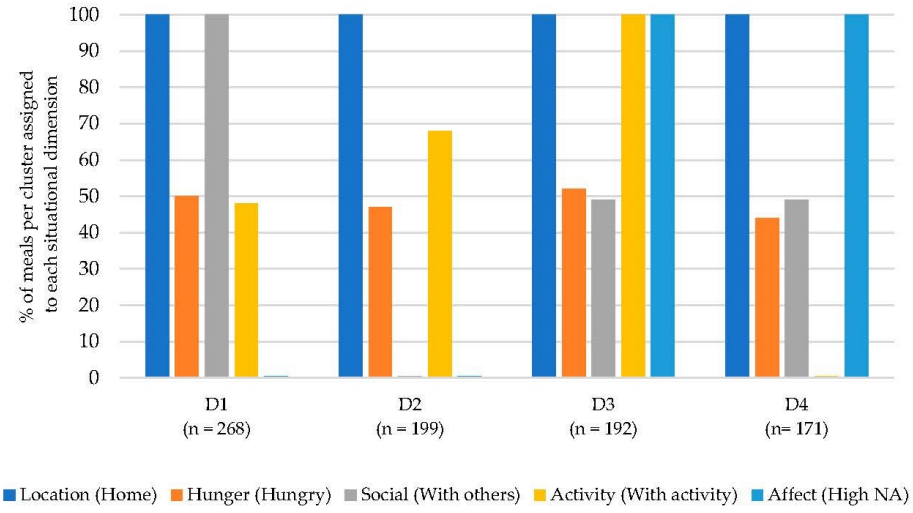

Figure 4. Description of the four most common eating situations for dinner.

Situations D1 and D2 described situations in which participants ate dinner at home with low negative affect. The situations differed in terms of the social dimension: D1 described situations in which dinner was eaten with others, while D2 described situations in which dinner was eaten alone. Also, the situations differed slightly in whether dinners were accompanied by another activity (D2) or not (D1). The dimension of hunger played a minor role in defining these situations.

Situations D3 and D4 described situations in which dinner was eaten at home with a high negative affect but differed in activity: D3 described situations in which dinner was accompanied by another activity, while D4 described situations in which eating dinner was the sole activity. The dimensions of hunger and social played a minor role in defining these situations.

3.2. RO2: Situational Stability and Its Association with Socio-Demographic Characteristics

Next, situational stability and its association with socio-demographic characteristics were explored. The situational stability index was calculated per person based on the previously identified situations. In this study, the mean situational stability index was above the reference value of 0.5 for each meal type, indicating that the sample tended to eat in recurring situations for breakfast, lunch, and dinner (see Table 5). As the mean stability index was similar across all meal types (between 0.62 and 0.68), it can be concluded that there were no differences in situational stability between breakfast, lunch, and dinner. Also, the degree of situational stability differed considerably among participants, with some having unstable eating patterns (e.g., dinner: 0.10) and others having very stable eating patterns (e.g., dinner: 0.93). This indicates high interindividual differences in situational stability.

Table 5. Situational stability averaged per meal type.

Meal Type	$N_{participants}$ [1]	Mean	SD	Range
Breakfast	191	0.67	0.18	0.13–0.90
Lunch	200	0.62	0.20	0.13–0.90
Dinner	210	0.68	0.19	0.10–0.93

[1] $N_{participants}$ = Number of participants who reported at least one meal for the respective meal type.

Regarding the association between situational stability and socio-demographic characteristics, the results suggest that situational stability was associated with age, employment status, and adults and children in the household (see Table 6). Age was positively correlated with situational stability across all meal types, indicating that the older the participants, the more stably they ate their meals in the same situation. The association between employment status and situational stability varied depending on the meal type. For breakfast, participants in education had lower situational stability than those employed full-time ($p < 0.05$) or those not working ($p < 0.001$). For lunch, participants who were not working had higher situational stability than those employed full-time ($p < 0.05$). However, for dinner, no association between employment status and situational stability was found. Adults and children in the household were also associated with situational stability, but only at breakfast. Although the overall test showed an association between adults in the household and situational stability, none of the pairwise comparisons in the post-hoc tests were significant after controlling for multiple tests. Participants living without children scored higher on situational stability during breakfasts than those living with children ($p < 0.05$). Finally, participants' sex and income were unrelated to situational stability, regardless of the meal type.

Table 6. Association between situational stability and socio-demographic characteristics per meal type.

Socio-Demographic Characteristics	Meal Type		
	Breakfast	**Lunch**	**Dinner**
	Test Statistic [1] N, Mean (SD)	**Test Statistic [1] N, Mean (SD)**	**Test Statistic [1] N, Mean (SD)**
Age	$r(189) = 0.35$ ***	$r(198) = 0.14$ *	$r(208) = 0.20$ **
Sex	$U = 4735.5$	$U = 4709.5$	$U = 5544.5$
Male	112, 0.66 (0.19)	122, 0.62 (0.21)	120, 0.68 (0.20)
Female	79, 0.68 (0.18)	78, 0.63 (0.18)	90, 0.69 (0.19)
Employment status	$H(3) = 20.28$ ***	$H(3) = 8.83$ *	$H(3) = 7.59$
Full-time	83, 0.67 (0.19)	91, 0.60 (0.19)	95, 0.66 (0.19)
Part-time	28, 0.64 (0.18)	30, 0.59 (0.21)	31, 0.74 (0.17)
In education	22, 0.54 (0.17)	22, 0.63 (0.20)	23, 0.62 (0.24)
Non-working	57, 0.74 (0.13)	56, 0.69 (0.19)	60, 0.72 (0.17)
Missing [2]	1, 0.42 (-)	1, 0.63 (-)	1, 0.50 (-)
Household composition			
Other adults in the household	$H(2) = 6.63$ *	$H(2) = 0.28$	$H(2) = 0.35$
No	29, 0.74 (0.16)	33, 0.64 (0.21)	33, 0.69 (0.22)
Yes	149, 0.66 (0.19)	152, 0.62 (0.19)	162, 0.68 (0.19)
Missing	13, 0.63 (0.12)	15, 0.61 (0.21)	15, 0.70 (0.19)
Children in the household	$H(2) = 10.41$ **	$H(2) = 2.65$	$H(2) = 2.98$
No	119, 0.70 (0.17)	128, 0.64 (0.20)	134, 0.70 (0.21)
Yes	42, 0.61 (0.21)	38, 0.59 (0.19)	43, 0.66 (0.17)
Missing	30, 0.62 (0.17)	34, 0.60 (0.21)	33, 0.68 (0.17)
Monthly household net-income	$H(5) = 11.04$	$H(5) = 3.86$	$H(5) = 5.27$
≤EUR 450	5, 0.77 (0.13)	5, 0.71 (0.25)	4, 0.72 (0.20)
EUR 450–<1500	37, 0.68 (0.17)	39, 0.62 (0.18)	40, 0.71 (0.20)
EUR 1500–<2500	48, 0.72 (0.17)	57, 0.65 (0.20)	56, 0.71 (0.18)
EUR 2500–<4000	61, 0.66 (0.17)	60, 0.61 (0.21)	67, 0.68 (0.21)
≥EUR 4000	36, 0.59 (0.20)	35, 0.61 (0.18)	40, 0.64 (0.18)
Missing	4, 0.65 (0.32)	4, 0.55 (0.23)	3, 0.70 (0.20)

[1] For the test statistics, r (Spearman's rank correlation coefficient), U (Mann–Whitney U test), or H (Kruskal–Wallis test) values are reported, as the normality assumption for the situational stability index was not met. [2] *SD* could not be calculated because only one participant was assigned to "Missing". * indicates $p < 0.05$. ** indicates $p < 0.01$. *** indicates $p < 0.001$.

4. Discussion

The present study offers novel insights into the situational aspects of meal consumption. By adopting the multidimensional framework proposed by Bisogni et al. [2], multiple situational dimensions were considered and combined to compose eating situations. By employing a repeated-measures design and a data-driven methodology, the variety of daily eating situations was captured and the most common ones identified. Furthermore, the stability of these eating situations was explored by developing a situational stability index. The association between situational stability and social-demographic characteristics, such as age or employment, was investigated. In the following, the implications of these findings and directions for future research will be discussed.

4.1. Eating Situations as Combinations of Situational Dimensions

The first objective of this study was to identify eating situations. Eating situations were characterized by unique combinations of situational dimensions. The uniqueness of each eating situation was determined by the specific combinations of different situational dimensions and their respective features, which varied depending on the meal type. This approach provided a more detailed picture of eating situations compared to describing individual situational dimensions independently. In this section, the study's findings will be revisited in the context of previous research, and the added insights provided by this approach will be illustrated.

4.1.1. Breakfast

This study found that the two most common breakfast clusters (B1 and B2) were characterized by eating at home and alone. This finding is consistent with previous research on individual situational dimensions, indicating that most breakfasts are eaten at home and primarily alone [43–47]. Moreover, the finding extends existing research by highlighting the combinations of situational dimensions, specifically between social and either hunger (for B1 and B2) or affect (for B3 and B4), in defining the most common breakfast situations.

Despite previous literature suggesting that individuals often engage in other activities while eating breakfast [48], this study's findings did not indicate that activity played a defining role in characterizing the four most common breakfast situations. Instead, activity in combination with social and affect served as the basis for defining the two minor breakfast situations (B5 and B6); see Table S2 in the Supplementary Material.

4.1.2. Lunch

Previous research on lunch situations has consistently emphasized the role of the dimensions social and activity [18,49]. Studies focusing on individual situational dimensions have observed that about half of all lunches are eaten when other people are present, and most lunches are eaten while engaged in another activity [47,48,50]. Also, prior research has identified lunch situations characterized by a combination of the dimensions social and activity, such as eating with family while watching TV [18,49]. The findings align with previous studies while also expanding upon them. Specifically, they highlight the role of social and activity in combination with affect when defining lunch situations (see L1–L4).

Interestingly, the findings emphasize the combination of activity and affect in defining lunch situations. This combination was observed for meals eaten at home (L1 and L3: both with low negative affect but differed in activity) and outside the home (L7 and L8: both accompanied by activity but differed in negative affect) (see Table S3 in the Supplementary Material). Taken together, nearly 50% of the observed lunches involved a combination of activity and affect, underscoring their importance in investigating lunch situations.

4.1.3. Dinner

Similar to lunch, previous research on dinner situations has also highlighted the combination of the dimensions social and activity [18,49]. For children and adolescents, common eating situations include eating a family meal while watching TV, eating while watching TV, or eating while being with friends. The present study is consistent with previous research regarding the importance of social and activity, but variations in the specific combinations of these situational dimensions were observed. This discrepancy could be attributed to various factors, including differences in samples (adults vs. children and adolescents) or differences in situational dimensions (e.g., the present study included affect as a situational dimension, which, in combination with social and activity, made up the most common eating situations). These differences in findings across studies warrant more research on dinner situations using a comprehensive set of situational dimensions.

4.1.4. Summary

In summary, this study found unique combinations of situational dimensions that made up the most common eating situations. For breakfast, combinations of hunger, social, and affect resulted in the most common eating situations, while for lunch and dinner, varying combinations of social, activity, and affect defined the most common eating situations. Two aspects stand out: First, the combination of social and affect played a significant role in defining eating situations across all meal types. The most common eating situations unique to each meal type were then distinguished by combining social and affect with other situational dimensions. For breakfast, the most common eating situations were characterized by combinations of social, affect and hunger. For lunch and dinner, the most common eating situations were characterized by combinations of social, affect, and activity.

Second, although the eating situations for lunch and dinner shared the same set of situational dimensions, they differed in the specific combinations of these dimensions. For lunch, eating situations with high negative affect differed depending on whether individuals ate alone or with others, while eating situations with low negative affect differed depending on whether individuals engaged in another activity while eating. For dinner, the pattern was reversed: eating situations featuring high negative affect differed depending on whether individuals engaged in another activity while eating, and situations with low negative affect differed depending on whether individuals ate alone or with others. These differences in combinations might result from distinct features prevalent during lunch and dinner. For example, for social, lunch might be eaten with co-workers, while dinner might be eaten with family. Further investigation is needed to fully understand these differences.

Overall, examining combinations of situational dimensions can be a valuable addition to the mere description of individual situational dimensions. By identifying patterns of co-occurring situational dimensions, real-life eating situations can be more accurately represented. This enables researchers and practitioners to better understand the situations in which people eat and how different situational dimensions are interrelated.

Identifying eating situations can benefit behavior change interventions promoting healthy eating. By pinpointing the specific situations in which individuals eat, researchers and practitioners can prioritize their resources to address the most common eating situations. This approach acknowledges that eating behaviors are situation-dependent and that interventions need to be tailored to the unique situation in which they occur. In order to tailor interventions to situations, researchers should decide on a specific meal type. This is supported by the findings of this study and previous research, which have highlighted that eating situations vary greatly depending on the meal type [18,49]. Interventions should, therefore, focus on the most common situations per meal type. For example, for breakfast, researchers may target eating at home alone while feeling satiated (B1). Tailoring interventions to the most common eating situations associated with each meal type could enhance their effectiveness in changing behavior.

4.2. Stability of Eating Situations within and between Individuals

The second objective of this study was to describe situational stability and explore its association with socio-demographic characteristics. For that, a situational stability index was developed to examine how often individuals eat in the same eating situations. The findings demonstrate considerable variation in situational stability between individuals, indicating that some people tended to eat in the same situations while others tended to eat in varying situations.

The analysis further revealed different socio-demographic characteristics associated with situational stability, including age, employment status, and adults and children in the household. Regarding age, this study found that the older the participants, the more stable their eating situations were, regardless of meal type. Older adults may have developed more homogeneous daily routines and adhered to them more strictly than younger adults [51]. In contrast, younger adults may have more varied daily routines (e.g., irregular schedules during their education) and may strive for flexibility, including in their eating routines (e.g., eating out with friends at new places). Regarding employment status and adults and children in the household, this study found different associations depending on the meal type. These differences may be attributed to differences in timing, demands related to work, school, or unemployment, or other people's needs that affect the establishment and maintenance of eating routines. For example, parents may need to be more flexible in the mornings to accommodate the children's needs, leading to less situational stability during breakfast. These findings highlight the role of socio-demographic characteristics in shaping the recurrence of eating situations.

In addition to the findings presented in this study, the stability index can be of use for future research. The following sections discuss the interpretation of the index, its

contribution to research on processes determining eating behavior, and some conceptual considerations about the stability index.

Regarding the interpretation of the index, it is essential to clarify that situational stability does not indicate the quality of one's diet. Eating in recurring eating situations should not be automatically equated with a healthy diet, nor should eating in varying situations be equated with an unhealthy one. Situational stability merely indicates how often individuals eat in the same situations. Future research will have to evaluate the impact of situational stability on eating behaviors and health outcomes.

That said, situational stability can complement research on the processes determining eating behavior, which encompass a spectrum from automatic to deliberative [28]. These processes might be linked to different levels of situational stability [29]. On the automatic end of the spectrum, eating behavior might be structured by fixed daily routines or automatically triggered by habits. For example, people might eat dinner because they adhere to the family's eating schedule (daily routines) or because they always eat dinner at 8 p.m. (habits). Such automatic eating processes are often facilitated or triggered by recurring eating situations [29,30]. On the deliberative end of the spectrum, people might eat because they consciously decide to and want to satisfy varying motives, such as hunger, appetite, time constraints, social influences, and more. In this case, eating motives and the resulting eating behavior may vary greatly between different eating situations [52]. Hence, an avenue for future research could be to explore how situational stability conceptually and empirically relates to automatic or deliberate eating.

The situational stability index is a useful tool for researching situational influences on eating. The application of the index is not limited to eating behaviors during meal consumption. It can encompass other eating behaviors (such as snacking) and other populations (such as non-German samples). To do so, some adjustments to the index might be necessary. In the following, some conceptual considerations will be discussed when using or adapting the situational stability index, namely meal skipping, the optimal number of days or eating occasions, and the sampling of situations.

An intriguing challenge for the situational stability index involves how to handle meal skipping, which refers to the omission of one or more meals throughout the day [53]. For example, Person A might only eat three breakfasts across a five-day observation period, while Person B might eat five breakfasts across the same period. Researchers need to decide whether to penalize the score for individuals who skip meals. In this study, the decision was made not to penalize for meal skipping. This decision was based on the uncertainty about the reasons for skipping meals. People may regularly skip a meal on a particular day because of their work schedule or may not even adhere to the traditional 3-meals-a-day pattern. Therefore, instead of penalizing meal skipping, the stability index was calculated as a function of the total number of meals a person reported. This approach accounts for the number of meals skipped. However, it might not be the perfect solution, and future research may need to develop more nuanced methods for incorporating meal skipping into the stability index.

A second consideration for researchers applying the situational stability index is to determine the appropriate number of occasions to observe. While this study took an exploratory approach to determining situational stability and cannot provide a specific recommendation, two suggestions can be offered when deciding on the number of occasions. First, the frequency of the behavior in question should be taken into account. If the behavior occurs often during the day, fewer days may be needed, as more observations can be made in one day. Second, the level of accuracy of the stability index required for the purpose should be considered. If the aim is to detect slight variations in situational stability, a more precise index is needed. This may require a longer period of observation. In summary, the chosen number of occasions observed should align with the research objective.

The last conceptual note pertains to sampling situations when assessing situational stability. Just as sampling participants should strive to represent the population or a particular subgroup for valid generalizations, selecting eating situations should adhere

to the same principle [54]. For that, it is important to acknowledge that eating situations within weekdays, weekends, or seasons may be more similar than those between weekdays and weekends or across different seasons [3,55]. This variation in similarity is also mirrored in eating behaviors, which differ between weekdays and weekends as well as between seasons [56–60]. Hence, in cases where researchers focus on a specific type of eating situation (e.g., lunches during weekdays), the stability index might skew towards higher values. However, in cases where researchers seek a broader view across different situations, the stability index may display greater variability. Therefore, the sampling of eating situations must be determined based on the researcher's goal.

Situational stability is also valuable when designing behavior change interventions to promote healthy eating behaviors. It offers valuable insights into which type of intervention might be most effective for which target group. Generally, interventions can target either the situation or the person. Interventions targeting the situation might be more effective for individuals with high situational stability, as eating situations are easy to target due to their stability, and the behavior might be closely linked to these situations. Such interventions could focus on modifying the recurring situations to disrupt unhealthy eating habits or pairing new eating behaviors with these situations. However, this type of intervention might be less suitable for individuals with low situational stability, as they eat in varying situations, which might be more challenging to target. In these cases, interventions could focus on the person instead of the situation. This can be carried out by addressing the motives that drive eating behavior or suggesting strategies to improve self-control or goal adherence. Here, the association between situational stability and socio-demographic characteristics might help identify homogenous groups that can benefit from the same type of intervention. Tailoring interventions to address the needs of different populations can enhance their effectiveness in promoting healthy eating behaviors.

In summary, situational stability furthers understanding the temporal dynamic of eating situations and can inform behavior change interventions. By recognizing participants with high or low situational stability, researchers and practitioners can tailor interventions to either modify the situation or support the individual to promote healthy eating behavior.

4.3. Strengths and Limitations

The study has three major strengths. First, it expands on previous research by not only describing individual situational dimensions but also by representing eating situations as combinations of situational dimensions that vary across meal types.

Second, it equips future research with tools to identify eating situations and describe situational stability. These tools can be applied to other eating behaviors in addition to meal consumption (e.g., snacking) and adapted for culturally or demographically different populations (e.g., non-Germans or only employed people).

Third, the diary study as a form of repeated measure design offers advantages in terms of methodology and content. Methodologically, obtaining multiple measurements improves data quality as participants report closer to the time their behavior occurred. This is advantageous compared to cross-sectional research, which relies on participants recalling past eating situations. Such retrospective recall can introduce recall biases due to the temporal and spatial distance from the actual eating occasion. From a content perspective, the diary method allows for analyzing situational stability as a function of multiple meals within each person. This approach offers a more accurate indicator than self-reports in cross-sectional research, where participants estimate how often they think they eat in the same situations.

While this study offers more profound insights into eating behavior, three limitations must be addressed. First, data were collected during the COVID-19 pandemic. The pandemic disrupted eating routines on an unprecedented scale. External constraints reduced the large variety of eating situations to a minimum: homes were the central eating location, as many people worked from home and restaurants were closed; contact restrictions prevented social dinners with friends and family; and home-schooling children

while working created a double burden for families. Consequently, the results of this study must be interpreted and generalized with caution. Future research should collect up-to-date data on eating situations to validate current findings and avoid restricting interpretations of eating situations to the COVID-19 period. Collecting up-to-date data will also capture potential changes in eating situations that might have occurred since the midst of the pandemic.

The second limitation concerns the generalizability of the results, which is constrained by several factors. First, the sample consisted of German participants, and eating situations might differ across different cultural backgrounds. Second, the sample does not fully represent the entire population of Germany. Individuals from other socio-demographic backgrounds might eat in situations not adequately represented in the study. Finally, the analysis indicated differences in drop-out rates depending on socio-demographic characteristics (see Table S1 in the Supplementary Material). Different drop-out rates might introduce a bias into the data. These limitations reiterate the importance of exercising caution when generalizing the findings. Moreover, they highlight the need for more research on eating situations involving diverse samples.

The final limitation concerns the conceptualization of the situational dimensions. In this study, each situational dimension was conceptualized using only one feature. For instance, activity was defined by whether individuals engaged in an activity while eating. However, it is important to recognize that each situational dimension can encompass multiple features [2]. For instance, the dimension activity could have also been conceptualized by considering the specific type of activity, such as "watching TV" or "working". Including additional features for each situational dimension could lead to a more precise description of eating situations. In this study, eating situations for lunch and dinner were defined by varying combinations of social, activity, and affect. However, the type of activity might vary depending on the meal type [61]. For instance, during lunch, activity might entail working while eating, whereas during dinner, it might entail watching TV. Future research could explore multiple features to provide a more detailed picture of eating situations.

5. Conclusions

In conclusion, this study has contributed to understanding the situational aspect of meal consumption by shedding light on eating situations and situational stability. The findings emphasize the importance of considering combinations of situational dimensions to describe eating situations instead of exploring them in isolation. Identifying the most common eating situations for each meal type offers a realistic depiction of real-life eating situations. These insights can be used to tailor interventions that effectively address these specific situations. Furthermore, the situational stability index offers valuable insights into the variability of eating situations and can inform research on eating processes that may range from deliberative to automatic.

The essential question of what type of food people eat in different eating situations was left unanswered in this study. Future research can expand on this study by assessing which eating situations relate to meal quantity, quality, diversity, and subsequent health outcomes. In what eating situations do we eat highly processed foods? Are there intra- and interindividual differences in situational stability for those behaviors? With the methods presented here, future research will be able to investigate the situational aspects of eating behavior in depth and thus contribute to the challenges in the field of health and sustainability.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/nu15183967/s1, Table S1: Socio-demographic characteristics of completers and non-completers plus drop out analysis. Table S2: Description of the clusters for breakfast. Table S3: Description of the clusters for lunch. Table S4: Description of the clusters for dinner.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data will be made available upon request.

Conflicts of Interest: The authors declare no conflict of interest.

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Situations matter for meat consumption: A diary study of the within- and between-person associations

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Abstract

While previous research on understanding meat consumption has predominantly focused on personal factors, such as attitudes or sociodemographic characteristics, less attention has been given to the role of situational factors such as location and social setting. This study aimed to investigate such situational factors associated with meat consumption and whether they relate to meat consumption due to within-person associations (such as eating a meal with others or alone) or between-person associations (such as some individuals typically eat meals with others while other individuals typically eat alone). Finally, the role of sociodemographic characteristics for meat consumption was explored. A five-day diary study was conducted in which 230 participants recorded 2,461 meals and the corresponding situations. The results of multilevel logistic regressions indicate that meat consumption was more likely to occur when meals were eaten hungrily, together with others, and at noon or in the evening. The association of hunger and time with meat consumption was due to within-person associations, while the association of social setting with meat consumption was due to both within-person and between-person associations. No sociodemographic characteristics were associated with meat consumption. These findings have important implications for understanding meat consumption and designing effective interventions tailored to either persons or situations.

Keywords: Situations, Meat, Multilevel Logistic Regression, Sociodemographic Characteristics, Within-person Association, Between-person Association.

1. Introduction

Meat consumption has been identified as a high-impact behavior detrimental to planetary and human health [1, 2]. The production of meat is a key driver behind the transgression of several planetary boundaries, including climate change, biochemical flows (nitrogen and phosphorous cycles), and the alteration of biosphere integrity [3, 4]. Meat consumption also has implications for human health, as its overconsumption is associated with an increased risk of developing non-communicable diseases. In particular, excessive consumption of red and processed meat has been associated with health risks such as cardiovascular diseases, cancer, diabetes, and an increased risk of mortality [5, 6]. This is especially relevant for high-income countries, where meat consumption per capita exceeds the recommendations made by national or international dietary guidelines [7]. For instance, in 2022, the average weekly meat consumption per capita in Germany was 1,000g [8, 9]. In contrast, the German Nutrition Society (DGE) recommends an intake of no more than 300-600g of meat per week, while the EAT-Lancet Commission proposed in their Planetary Health Diet an intake of no more than 200g of meat per week [3, 10]. Hence, reducing meat consumption in high-income countries is pivotal for transitioning towards a healthier and more sustainable food system. Achieving this requires an understanding of factors that influence meat consumption.

Most prior research on meat consumption has investigated psychological factors at the level of the individual [11], including cognitive or affective factors [12, 13]. These factors have been targeted in interventions to change meat consumption (e.g., 14). Although focusing on psychological factors is effective in changing intentions, it has proven less effective in changing and maintaining reduced meat consumption (e.g., 15). Our present study proceeds from the premise that this ineffectiveness can be partially attributed to the neglect of situations that impact meat consumption [16, 17].

‘Situations’ here are defined as ‘momentary encounters with those elements of the total environment which are available to the individual at a particular time’ [18]. A situation can exert a powerful influence on behavior, acting either as a predictor of behavior itself or as a facilitator or barrier to translating intentions into behavior [19]. For example, while learning about the environmental impacts of livestock may lead an individual to intend to reduce the consumption of meat products, this intention might not translate into behavior in certain situations, such as when eating at a restaurant where vegetarian options are not offered or when dining with a friend who loves to eat meat.

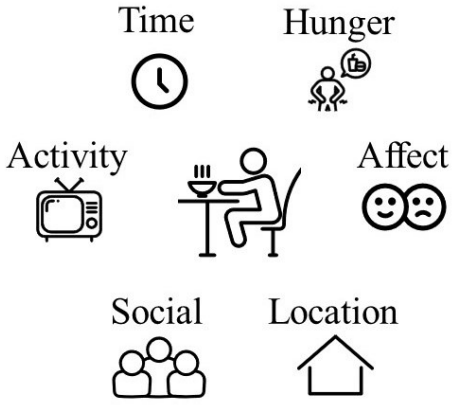
The role of situations in understanding and changing behavior has generally been under-investigated and under-theorized [20]. This is also true for meat consumption, as most studies are conducted in laboratory or online settings with questionable ecological validity (e.g., 21). Even when studies are conducted in 'real life', typically only a few factors of eating situations (such as location or the presence of other people) are considered at a time and in isolation from each other (e.g., 22). As a consequence, we lack more comprehensive assessments of eating situations. This is further exacerbated as few theories include situational factors in their frameworks or specify what these factors are, how they influence behavior, and how they interact with psychological factors (e.g., 23). Hence, there remains a gap in our empirical understanding of how situations influence behaviors, including meat consumption.

1.1. Conceptual framework and state of research

To conceptualize eating situations, we identified six relevant situational factors based on the conceptual framework developed by Bisogni et al. [24]: hunger, mood, location, social setting, activity, and time (see Figure 1). Each of these factors consists of various features, e.g., 'time' can be described more precisely as '8 a.m.' or 'after waking up'. In the following, we briefly review previous literature with regard to each factor.

Figure 1.

Prototypical Representation of Eating Situations



Hunger refers to levels of satiety. Notably, prior research has observed a discrepancy between anticipated and perceived satiety for dishes with and without meat. While the *perceived* level of satiety is similar or even higher after eating a dish with plant-based protein sources than for a dish with meat, the *anticipated* satiating effect of meat is significantly higher than in the case of meat-reduced dishes [25, 26]. This is consistent with other findings showing that meat

is typically considered a central component of a 'proper' meal, with high satiating power [27, 28]. These factors may lead to higher meat consumption when people feel hungry.

Mood here refers to the affect at mealtime. In this study, our interest is in both positive and negative affect since affect has been shown to play a vital role in eating in general [29]. However, limited research has examined the links between meat consumption and positive or negative affect. Previous studies focus on the effects of stress on meat consumption, with inconclusive findings [30, 31].

Location refers to the settings in which eating takes place. Studies found that eating out is associated with a higher likelihood and greater quantity of meat consumption, even among individuals who intend to reduce their meat consumption [32, 33].

Social setting refers to the presence or absence of others during a meal. It has been found predictive of meat consumption in former studies, with the likelihood and quantity of meat consumption increasing when eating with others [32, 33]. Besides this overall finding, meat consumption has been found to increase when eating with family members [32, 33] and to decrease when eating with strangers [34].

Activity concerns whether eating is undertaken as a stand-alone activity or simultaneously with another activity, such as watching TV or browsing the Internet. We are unaware of any prior study investigating the association between meat consumption and eating while performing other activities. While such an association has been found for other dietary behaviors such as snacking (e.g., the consumption of sweet snacks has been associated with watching TV, see 35), it remains to be seen whether this association pertains in the case of meat consumption.

Time refers to the time of day (e.g., morning) or day of the week (e.g., Sunday). Studies found that meat is most likely consumed at noon and in the evening, however, different peak times of meat consumption are observed across countries [32, 33].

Prior research on the relationship between situation and meat consumption has tended to be unsystematic and overly narrow by only focusing on selected situational factors. Our study addresses this gap by assessing the associations between a theory-based set of situational factors and meat consumption.

Moreover, an important aspect of this relationship is rarely assessed: whether situations are associated with meat consumption due to within-person association (e.g., eating a meal with others or alone) or between-person association (e.g., some individuals typically eat with others while others typically eat alone). For example, the *within-person association* of meat consumption and social setting reflects whether an individual is more likely to eat meat when

eating with others in a given situation than when eating alone. This means that a person is more likely to eat meat during a meal when others are present, regardless of whether they typically eat alone or with their family. The *between-person association* of meat consumption and social setting reflects whether individuals who tend to eat with others are more likely to eat meat than individuals who tend to eat alone. This means that a person who typically eats with their family is more likely to eat meat, regardless of whether other people are present during a specific meal. In the current study, we take account of this by decomposing the association between situational factors and meat consumption into its within-person and between-person association. Applying this distinction enables us to identify more clearly how the eating situation influences meat consumption and whether it is situations or individuals in typical situations that matter most.

Finally, prior research has also linked meat consumption with sociodemographic characteristics such as age, gender, income, and household composition. Higher meat consumption was found to be related to younger age, men, and households without children [7, 36, 37]. The relationship between meat consumption and income varies depending on the cultural context [36, 37]. Accordingly, our study also examined the role of these sociodemographic characteristics.

In summary, we seek to address the following exploratory research questions (RQ):

RQ 1: Which situational factors are associated with meat consumption?

RQ 2: What is the relative importance of within- and between-person associations of each of the situational factors and meat consumption?

RQ 3: What role do sociodemographic characteristics play in meat consumption?

This study contributes significantly to the literature by shifting the focus from individual-level determinants of meat consumption to the situations in which meat consumption occurs. By distinguishing between within-person and between-person associations, it offers a deeper understanding of how situations are linked to meat consumption. The insights gained can be used to develop interventions that are tailored to the eating situations. Hence, this study not only broadens the field of meat consumption research but also increases the potential for practical applications in promoting healthier and more sustainable diets.

2. Materials and Methods

2.1. Procedure

The online diary study was conducted on five consecutive days in the period January 11–15, 2021, through an online questionnaire that was available for participants to complete from 7 p.m. until noon the following day. To minimize the impact of self-selection and social desirability bias, the purpose of this study was framed neutrally. Participants were informed

that the study aimed to investigate dietary behaviors of consumers, without explicitly mentioning meat consumption. The participants were instructed to fill out the questionnaire after their last meal of the day and to report their eating behaviors for that day, including how many meals they had eaten (excluding snacks), in which situations they had eaten, and whether they had eaten meat. All participants were compensated.

2.2. Participants

The study aimed to recruit a sample of adult meat-eaters in Germany and therefore included individuals who were at least 18 years old and not following a vegetarian or vegan diet. The participants were recruited by the German market research company Aproxima via online panels using simple random sampling. Of the 481 people who started the study, 230 respondents completed all five days of the diary study, reporting a total of 2,461 meals (770 breakfasts, 794 lunches and 897 dinners)[2]. The final sample comprised 230 participants, see Table 1 for a description.

[2] In attrition analyses, we found differences between participants who completed all five days and those who dropped out regarding sociodemographic characteristics and meat consumption on the first day, see Table S1 and Table S2 in the supplementary material. For a discussion of these implications, see Limitations and Future Research.

Table 1

Sociodemographic characteristics of the sample

Sociodemographic characteristics	***Mean / N***	***SD / %***
Age	42.7	17.22
Gender		
Male	135	58.70%
Female	95	41.30%
Employment status		
Full-time	102	44.35%
Part-time	36	15.65%
In education	24	10.43%
Non-working	67	29.13%
Missing	1	0.43%
Monthly household net-income		
< 450 €	5	2.17%
450 – < 1.500 €	42	18.26%
1.500 – < 2.500 €	64	27.83%
2.500 – < 4.000 €	71	30.87%
≥ 4.000 €	44	19.13%
Missing	4	1.74%
Adults in the household		
No adults	37	16.09%
Other adults	177	76.96%
Missing	16	6.96%
Children in the household		
No children	147	63.91%
Children	47	20.43%
Missing	36	15.65%

Note. Sample (N_{ID} =230) consists of respondents who filled in all five diary days.

2.3. Measures

Most variables were assessed with a single item to reduce the response time of the questionnaire.

Meat consumption as the dependent variable was measured by asking participants to identify whether the meals they ate and recorded contained meat, including dishes with processed meat such as cold cuts or Bolognese sauce with minced meat. This question was dichotomous, requiring either ‘meat’ or ‘no meat’ in response.

Hunger was assessed with the question ‘How hungry were you before the meal?’. Participants could answer on a unipolar visual analogue scale ranging from 0 (not at all hungry) to 100 (extremely hungry) [38]. For the analyses, the scale was divided by 10 to facilitate interpretation in the multilevel logistic models and ranged from 0 (not at all hungry) to 10 (extremely hungry).

Mood during mealtimes was assessed using the abbreviated version of the positive and negative affect schedule (PANAS) [39, 40]. It consists of two subscales with three items each, with the items 'happy', 'relaxed', and 'energized' comprising the positive affect subscale and the items 'angry', 'afraid', and 'sad' comprising the negative affect subscale. These items were rated on a 7-point scale from 1 (not at all) through 4 (moderately) to 7 (extremely).

Location was determined with the question 'Where did you eat the meal?'. The responses were dichotomized into 'home' or 'elsewhere'.

Social setting[3] was measured with the question 'Were other people present during the meal?'. The response options were dichotomous, either 'with others' or 'alone'.

Activity was assessed with the question 'Did you do anything else besides eating?', with examples of activities including watching TV, working, or surfing the Internet. The participants could answer either 'with activity' or 'without activity'.

Time was measured via a drop-down menu which was divided into one-hour intervals. Since preliminary analysis revealed three peaks of meal consumption during the day, we transformed this variable into a categorical variable with three values: 'morning', 'noon', and 'evening'.

The **sociodemographic characteristics** we assessed comprised age (in years), gender (female vs. male), employment status (in four categories: full-time, part-time, in education, non-working), net monthly household income (in five categories: <450 €, 450–<1,500 €, 1,500–<2,500 €, 2,500–<4,000 €, and ≥4,000 €), whether children or other adults lived in the household. These sociodemographic characteristics were recorded on the first day of the study.

2.4. Statistical Analyses

All statistical analyses were performed using RStudio (Version 4.0.2). Given the binary nature of the dependent variable and the nested structure of the data, with meals (level 1) nested in persons (level 2), two-level logistic models were fitted[4]. The multilevel structure of this study and the variables examined at each level are displayed in Table 2.

[3] Additionally, we incorporated another cue of social setting that measured whether other people present also ate meat. The participants could answer with either 'the other person(s) ate meat', 'the other person(s) did not eat meat', 'some of the other people ate meat' and 'do not know if the other person(s) ate meat'. While this second social cue was not included in the models to ensure equal weight of each situational dimension in the analysis, it was employed in a supplementary analysis to investigate whether meat consumption was more likely when others also ate meat, see Table S3 in the supplementary material.

[4] A prior analysis checked if a 3-level structure with meals (level 1) nested in days (level 2) nested in persons (level 3) was necessary. Since the variance of the day-level was close to zero (= 0.0037), two-level models were fitted.

Table 2

Multilevel structure and variables assessed at each level

Levels	Variables
2 = Person	Age, gender, employment status, income, children and adults in the household
1 = Meal	Hunger, positive affect, negative affect, location, social setting, activity, time DV: Meat consumption

Note. DV = Dependent variable.

A two-level logistic model was fitted for each RQ with different predictor variables. All models were fitted with random intercepts and fixed slopes, i.e., each person's intercept could vary, while the slopes of the independent variables were fixed across individuals. Odds ratios (OR) and associated 95% confidence intervals (95% CIs) were estimated.

Null Model: First, a null model (without predictors) was estimated (AIC = 3150.86, Log-likelihood = -1574.43). This model was used to estimate the intraclass correlation coefficient (ICC), which quantifies the percentage of the observed variance in meat consumption that can be attributed to between-person differences. As indicated in the ICC, 31% of the variability in the odds of eating meat could be explained by between-person differences. The Null model therefore confirmed the necessity of the multilevel structure.

Model 1: To examine the association between situational factors and meat consumption (RQ 1), a model was fitted with all the situational factors (level-1 variables) uncentered, i.e., each factor containing both their within- and between-variations.

Model 2: To further investigate the decomposed effects of the situational factors (RQ 2), a model was fitted in which each situational factor was decomposed into its between-person and within-person variation. This was accomplished by creating two variables for each situational factor to account for the respective variation. For the between-person variation, each situational factor was averaged per person (also called a 'cluster mean'; see 41 or 42), reflecting differences between persons, e.g., that some people typically eat out more often than others. For the within-person variation, each situational factor was centered around the respective person's average (also called 'centered within cluster'; see 41 or 42), reflecting situational differences within an individual, e.g., being hungrier at one meal than at another. In this way, we constructed a model separating situational factors into their within- and between-person variation.

Model 3: Finally, we examined the role of sociodemographic characteristics (level-2 variables) for meat consumption (RQ 3). For this purpose, Model 2 was extended to include sociodemographic characteristics (age, gender, employment status, income, children, and adults in the household). Age was grand mean-centered, while the other sociodemographic characteristics were included as uncentered variables in the model.

3. Results

For a descriptive overview of the situational factors, both uncentered and decomposed into their within-person and between-person variation, see Table 3. All of the fitted models can be found in Table 4.

Table 3.

Description of the situational factors depending on the different centering options

Type	Situational factor	Variable	*Mean*	*SD*	*Min*	*Max*
Continuous variable	Hunger	Uncentered	6.11	2.00	0	10
	0 = Not at all hungry	WP	0	1.50	-5.45	8.89
	10 = Extremely hungry	BP	6.07	1.50	0	10
	Positive affect	Uncentered	4.33	1.17	1	7
	1 = Not at all	WP	0	0.74	-3.3	2.93
	7 = Extremely	BP	4.32	0.92	1.24	6.4
	Negative affect	Uncentered	1.81	1.19	1	7
	1 = Not at all	WP	0	0.66	-3.67	5.53
	7 = Extremely	BP	1.83	1.01	1	5
Binary variable	Location	Uncentered	0.14	0.35	0	1
	0 = Home	WP	0	0.28	-0.92	0.94
	1 = Other	BP	0.13	0.21	0	1
	Social Setting	Uncentered	0.46	0.5	0	1
	0 = Alone	WP	0	0.34	-0.93	0.93
	1 = With others	BP	0.44	0.37	0	1
	Activity	Uncentered	0.5	0.5	0	1
	0 = Without activity	WP	0	0.34	-0.92	0.93
	1 = With activity	BP	0.51	0.38	0	1
Categorical variable: Dummy coded	Time: Noon	Uncentered	0.32	0.47	0	1
	0 = Other	WP	0	0.44	-0.83	0.91
	1 = Noon	BP	0.32	0.2	0	1
	Time: Evening	Uncentered	0.36	0.48	0	1
	0 = Other	WP	0	0.46	-0.83	0.93
	1 = Evening	BP	0.36	0.18	0	1

Note. We report on three types of variables for each situational factor: The uncentered variable, the variable resulting from between-person centering (between-person variation = BP) and the variable resulting from the within-person centering (within-person variation = WP).

The uncentered variable is reported on the scale on which it was measured. For example, negative affect was measured from 1 (not at all) to 7 (extremely).

The BP variable is an individual-level variable that reflects the average value across all meals per person. The minimum (min) and maximum (max) values of the BP indicate the lowest and highest average value of the situational factor across all participants, respectively. For example, the average negative affect across all meals per person varies between 1 (some individuals reported on average low negative affect) and 5 (some individuals reported on average high negative affect). The mean of the average negative affect ratings across all participants was 1.86 (*SD* = 1.01).

The WP variable is a meal-level variable that reflects the deviation of the situational factor for a given meal from the person's mean. As a result of the centering, the mean of all the WP values is always 0. The min and max values indicate the most negative and positive deviations of a situational variable for a given meal from the BP (average of the situational factor for a specific person) (e.g., 3.67 points below their average negative affect or 5.53 points above their average negative affect).

For binary and categorical variables, the uncentered cluster mean represents the proportion of the variable compared to the reference value. For more information on centering in multilevel models, see [41].

Table 4.
Overview of all the fitted two-level logistic models

	Model 1 (N_{Meals} = 2461, N_{ID} = 230)		**Model 2** (N_{Meals} = 2461, N_{ID} = 230)		**Model 3** (N_{Meals} = 2461, N_{ID} = 230)	
Situational factors	**OR**	**CI**	**OR**	**CI**	**OR**	**CI**
Hunger						
Uncentered	1.12***	1.05 – 1.19				
Within-person			1.14***	1.06-1.22	1.14***	1.06 - 1.22
Between-person			1.04	0.90-1.19	1.05	0.91 – 1.22
Positive Affect						
Uncentered	0.96	0.85 - 1.07				
Within-person			0.96	0.84-1.09	0.96	0.84-1.09
Between-person			0.99	0.79-1.24	0.93	0.74-1.17
Negative Affect						
Uncentered	0.99	0.88 - 1.11				
Within-person			0.98	0.85-1.13	0.98	0.85-1.13
Between-person			1.02	0.83-1.26	0.96	0.77-1.19
Location	Reference = Home					
Uncentered	1.09	0.79 - 1.52				
Within-person			1.03	0.73-1.46	1.04	0.73-1.47
Between-person			1.70	0.65-4.44	2.11	0.74-5.99
Social	Reference = Alone					
Uncentered	1.99***	1.55 - 2.56				
Within-person			1.93***	1.45-2.56	1.93***	1.45-2.56
Between-person			2.24**	1.30-3.88	1.89*	1.01-3.55
Activity	Reference = Without activity					
Uncentered	1.31*	1.02 – 1.68				
Within-person			1.28	0.97-1.70	1.28	0.96-1.70
Between-person			1.39	0.82-2.36	1.37	0.81-2.32
Time: Noon	Reference = Morning					
Uncentered	2.96***	2.28 - 3.83				
Within-person			3.04***	2.33-3.96	3.04***	2.33-3.97
Between-person			1.82	0.58-5.74	2.09	0.66-6.59
Time: Evening	Reference = Morning					
Uncentered	3.40***	2.64 - 4.38				
Within-person			3.47***	2.68-4.50	3.48***	2.68-4.51
Between-person			2.11	0.62-7.24	3.20	0.92-11.16
Sociodemographics						
Age					1.00	0.99-1.02
Gender					Reference = Female	
Male					1.35	0.89-2.05

Employment status			Reference = Full-time
Part-time			1.01 0.55-1.87
In education			1.34 0.64-2.83
Non-working			1.68 0.92-3.06
Missing			8.11 0.41-158.78
Monthly Household Net-Income			Reference = 1.500 - 2.500€
< 450€			1.61 0.43-6.10
450€ - < 1.500€			0.69 0.37-1.27
2.500€ - < 4.000€			0.84 0.51-1.41
≥ 4.000€			0.62 0.34-1.14
Missing			1.04 0.21-5.18
Adults in the household			Reference = No adults
Other adults			1.31 0.72-2.39
Missing			1.43 0.50-4.09
Children in the household			Reference = No children
Children			1.44 0.81-2.53
Missing			0.71 0.38-1.35
Random effects			
ICC	.34	.33	.32
Person-level-variance	1.71	1.66	1.52
Model fit statistics			
AIC	2966.32	2978.42	2990.21
Log-likelihood	-1473.16	-1471.21	-1464.11
Difference Log-likelihood	101.27***	102.2***	109.32***
Df	8	16	29

Note. OR = Odds ratios, CI = Confidence Intervals, ICC = Intraclass Correlation Coefficient, AIC = Akaike information criterion, The Null Model served as a baseline model without predictors, Model 1 was fitted with all the situational factors (level-1 variables) uncentered, Model 2 model was fitted with each situational factor decomposed into its between-person and within-person variation, Model 3 extended Model 2 by including sociodemographic characteristics, Model comparison: Model 1, 2 and 3 were compared against the Null Model (ICC = .31; Person-level variance = 1.44; AIC = 3150.86; Log-likelihood = -1574.43), *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

3.1. Which situational factors are associated with meat consumption?

To assess the association between situational factors and meat consumption, we fitted a two-level logistic model without centering the situational factors, see Model 1 in Table 4. The

following situational factors were associated with meat consumption: hunger, social setting, activity, and time. The odds of eating meat increased by 1.12 (OR = 1.12; 95% CI: 1.05-1.19) when hunger increased by one unit. The odds of eating meat were 1.99 times higher (OR = 1.99; 95% CI: 1.55-2.56) when other people were present during a meal than when eating alone. The odds of eating meat while engaged in other activities were 1.31 times higher (OR = 1.31; 95% CI: 1.02-1.68) than when not doing anything besides eating. In terms of time, the odds of eating meat at noon or in the evening were 2.96 or 3.40 times higher (at noon: OR = 2.96; 95% CI: 2.28-3.83; in the evening: OR = 3.40; 95% CI: 2.64-4.38) than in the morning. These results suggest that eating meat was more likely when hungry, eating with others, doing something besides eating, and eating at noon or in the evening.

3.2. What is the relative importance of within- and between-person associations of each situational factor and meat consumption?

To investigate the association between situational factors and meat consumption in more depth, we decomposed the situational factors into their within- and between-person variations, see Model 2 in Table 4. The associations between hunger and meat consumption as well as time and meat consumption were purely within-person. Thus, within a given person, the odds of eating meat increased on average by 1.14 (OR = 1.14; 95% CI: 1.06-1.22) when hunger increased by one unit. Meals eaten at noon and in the evening on average had 3.04 or 3.47 times the odds of containing meat (at noon: OR = 3.04; 95% CI: 2.33-3.96; in the evening: OR = 3.47; 95% CI: 2.68-4.50) than meals in the morning. We found no statistically significant association between the between-person variables of hunger and time with meat consumption. This suggests differences between individuals in general hunger levels and eating times were not associated with the likelihood of consuming meat. In other words, our findings indicate that meat consumption did not differ between individuals who typically experience more hunger than others or between people who typically eat most of their meals during later times of the day.

Social setting was associated with a higher likelihood of meat consumption both within- and between-person. The within-person association indicated, that within a given person, on average, eating a meal with other people resulted in 1.93 times greater odds of eating meat (OR = 1.93; 95% CI: 1.45-2.56) than eating alone. The between-person association indicated that a person who ate all their meals with other people would on average have 2.24 times higher odds of eating meat (OR = 2.24; 95% CI: 1.30-3.88) than a person who eats all their meals alone. This suggests that situational and individual differences in social setting were associated with the likelihood of eating meat. In other words, our findings indicate that meat consumption was

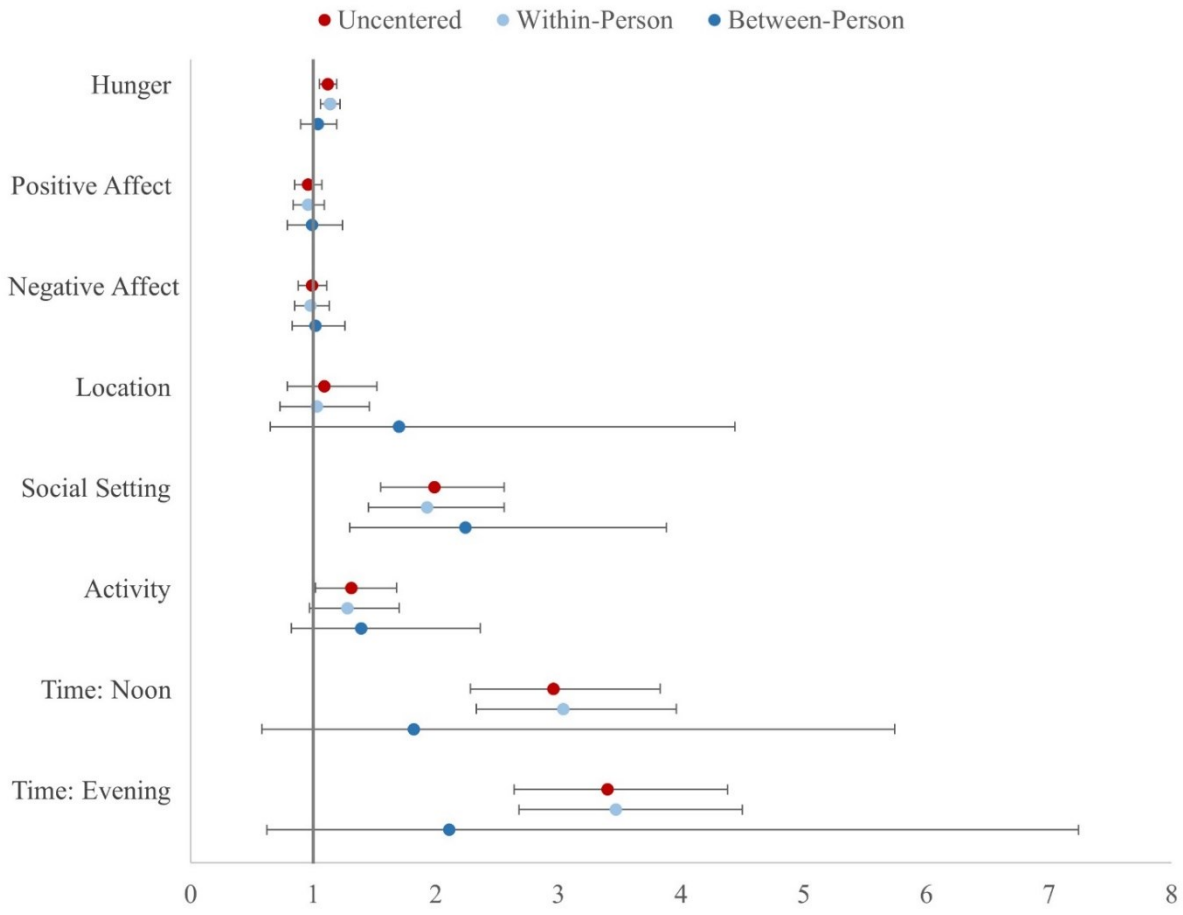
more likely in situations when other people were present, and for individuals who typically ate with others.

Although engaging in another activity while eating was positively associated with meat consumption in the uncentered model (Model 1), we found no association when differentiating between within- and between-person. The remaining situational factors (positive and negative affect as well as location) were not associated with meat consumption either within-person or between-person.

These findings show that eating meat is more likely in a situation when one is hungry, rather than for individuals who typically feel hungrier than others. Eating meat is also more likely in a situation where meals are eaten at lunchtime and in the evening, rather than for individuals who typically eat at these times. Additionally, eating meat is more likely in a situation when one eats with others, as well as for individuals who typically eat with others. Figure 2 illustrates which situational factors were associated with meat consumption (Model 1) and how each association can be decomposed into its respective within-and between-person association (Model 2).

Figure 2.

Odds Ratios for Association of Meat Consumption and Situational Factors based on Logistic Multilevel Models



Note. OR with respective 95% CI for meat consumption. Situational factors are either presented uncentered (Model 1) or decomposed into their respective within-and between-person variation (Model 2).

3.3. What role do sociodemographic characteristics play in meat consumption?

Finally, to account for sociodemographic characteristics, we extended the model by age, gender, employment status, income, and children and adults in the household, see Model 3 in Table 4. The associations between the situational factors and meat consumption remained similar to those in Model 2. However, none of the sociodemographic characteristics were

associated with meat consumption, which suggests that the likelihood of meat consumption did not differ by sociodemographic characteristics[5].

4. Discussion

This exploratory study has examined the relationship between eating situations and meat consumption, focusing on 1) situational factors associated with meat consumption, 2) the relative importance of within- and between-person association of the situational factors and 3) the role of sociodemographic characteristics. Our results show that 1) hunger, advanced time (noon or evening), the presence of other people, and engaging in a second activity while eating were associated with an increased likelihood of eating meat. These results for time and social setting are consistent with findings in previous literature, whereas the results for hunger and activity have not previously been shown. We further investigated 2) whether the associations between the situational factors and meat consumption can be attributed to situational (within-person) or individual (between-person) differences. For hunger and time, the results were due to within-person and not between-person association, i.e., they were an effect of the situation (e.g., momentary hunger) and not the person (e.g., some people being hungrier than others). Social setting was the only situational factor associated with meat consumption both within- and between-person, since both the social setting in a given eating situation and the social setting a person typically eats in played a role in meat consumption. Contrary to previous research, 3) no sociodemographic characteristics were related to the likelihood of meat consumption. In summary, our findings highlight the importance of eating situations for meat consumption, especially situational differences, compared to individual differences and sociodemographic characteristics.

Below we present possible explanations for our findings and suggest leverage points for interventions to address each situational factor (hunger, time, social setting, and activity) with its respective association (within- vs. between-person). It should be emphasized that our findings are primarily descriptive and hence cannot confirm causality, meaning we cannot state, for example, that hunger causes greater meat consumption.

4.1. Explanation of findings and leverage points for interventions

Hunger: Our study identified hunger as an important situational factor for meat consumption. The association between meat consumption and hunger was due to within-person association, i.e., the hungrier a person was in a situation, the higher the likelihood of eating

[5] We also fitted a model using only the sociodemographic characteristics and no situational dimensions. Again, we found that no sociodemographic characteristics were associated with meat consumption.

meat during a meal. These results must be interpreted in the context of the sample, which includes only individuals who eat meat, so we cannot determine whether they hold true for vegetarians or vegans. Nonetheless, our findings align with previous research that has found people anticipate meatless dishes to be less satiating compared to dishes with meat [26, 25], meaning our results could be moderated by beliefs that vegetarian meals are less satiating than meals with meat [28]. Accordingly, interventions to reduce meat consumption could aim to change beliefs about the satiety of vegetarian meals. For instance, advertising filling and hearty vegetarian dishes as such could impact food choices when people are hungry in a given eating situation [43]. In addition, interventions could focus on ensuring the availability of satiating vegetarian meals in restaurants and canteens. While previous interventions have shown that increasing the availability of vegetarian meals and increasing the distance between vegetarian and non-vegetarian meals are effective ways to reduce meat consumption [22, 44], our results suggest that such interventions could be further augmented by focusing specifically on satiating vegetarian meals rather than just any vegetarian meals, e.g., spaghetti with soy Bolognese sauce rather than vegetarian salads.

Time: Consistent with previous research findings, our study found time to be associated with meat consumption, with meat being more likely to be consumed at noon and in the evening compared to in the morning. Again, this was due to the within-person association of time with meat consumption, i.e., the actual times at which people ate their meals rather than people tending to eat all their meals later in the day. One potential explanation for this association is that cultural norms may dictate the composition of dishes for different meal types (breakfast, lunch, and dinner). In Western societies, many people perceive meat as an integral part of a proper lunch and dinner, which is reflected in popular and traditional recipes [45]. To facilitate the transition to a meat-reduced diet while preserving such recipes, meat could be replaced or blended with plant-based meat alternatives in traditional lunch or dinner dishes. Additionally, efforts could be undertaken to shift norms towards a new definition of what constitutes a ‘proper’ lunch and dinner. These efforts could include governments issuing national dietary guidelines recommending less meat, restaurants and canteens offering more vegetarian lunches and dinners or reducing portions of meat while increasing portions of vegetables; and celebrities or athletes acting as role models by promoting vegetarian meals as proper lunch and dinner meals [46, 47].

Social Setting: Social setting was the only situational factor significantly associated with meat consumption within-person and between-person, i.e., meat consumption was more likely both when other people were present in an eating situation than when eating alone and

among individuals who, on average, ate more meals with others than alone. Interventions targeting social settings could thus focus on eating situations where meals are eaten with others (within-person) and on individuals who typically eat with others (between-person).

The within-person association between social setting and meat consumption could be due to preparing and sharing the same meal when eating together. These results align with previous research that identified the convenience of preparing the same meal when eating with others as a driver of meat consumption [48]. Similarly, it could be mediated by a widespread perception that meat is an integral part of an appropriate meal when eating with guests [32, 27]. Another explanation for the within-person association could be social modeling effects in the eating situation whereby people use the behavior of others as a guide for their behavior [49]. Since the majority of people worldwide consume meat, eating with others could tilt a person's food choice toward meat consumption. This notion is supported by the supplementary analysis, which examined the association between meat consumption and whether other people ate meat in the situation, see Table S3 in the supplementary material. The supplementary analysis indicates that meat consumption was more likely when others ate meat than when they did not. Interventions could also take advantage of these social modeling processes. For example, communication strategies could draw attention to others' behavior by pointing out the vegetarian choices of other customers, or by emphasizing that only a limited number of vegetarian options remain [49, 50].

Regarding the between-person association between social setting and meat consumption, this association may result from people within a social network following similar diets. For example, studies have found that committed meat-eaters tend to have fewer vegetarians in their social networks (household, family, and friends) compared to non-committed meat-eaters and vegetarians [51]. It is likely that individuals who typically eat with others from their social network feel they have to adjust their own food choices to meet the needs of others, e.g., in deciding what to cook for a family or which restaurants to go to when eating out with friends, thereby potentially locking in dietary behaviors, including how often or how much meat they consume. However, since individuals can have a far-reaching impact on their social network, interventions to address this between-person association between meat consumption and social setting could target meat-eaters within a social network of other meat-eaters. This could be done by offering cooking classes for couples and families or by targeting people who host meals, encouraging them to act as role models by serving vegetarian meals to their guests [52].

Despite a large body of research on the social factor of meat consumption, prior studies have not distinguished or ascertained whether findings regarding this factor are due to situational (within-person) or individual (between-person) differences. Our results suggest this is an important distinction that should be applied in future studies, not least because it entails different implications for intervention research. Specifically, future research could focus on whether a specific meal or meals in general are eaten with others, the types of relationship the individual has with others present at meals and the dietary habits and identities of those present.

We recognize that the proposed strategies to address the within- and between-person association of social setting may not exclusively influence each association but can also have positive spillover effects. For example, if new social norms are established as to what is appropriate to eat with guests as a strategy for within-person association, these norms may further extend into a social network and change the dietary behaviors of individuals who typically eat with others (between-person effect) [53]. Similarly, targeting individuals who typically eat with others as a strategy for addressing the between-person association will most likely affect the dietary choices of these co-eaters present in a given eating situation (within-person effect) [54]. We thus consider social setting to be a promising leverage point for interventions to reduce meat consumption since individuals can act as multipliers and role models in situations and within their networks, which could lead to cultural and lifestyle changes on a larger scale [49].

Activity: Finally, we conclude that there is inconclusive evidence for a link between meat consumption and engaging in a secondary activity while eating. Although there was a significant, albeit small, association between activity and meat consumption, no effect was found when activity was decomposed into its within- and between-person variation. Further work is required to deepen our understanding of what specific activities individuals are engaged in while eating meat.

4.2. Limitations and Future Research

Notwithstanding the valuable insights yielded by our research into situational influences on meat consumption, this study has several limitations. First, data were collected in January 2021 at the height of restrictions related to the COVID-19 pandemic, which resulted in major disruptions of normal eating routines [55, 56]. In Germany, there was a notable increase in self-prepared meals [55, 57] and a shift towards primarily eating at home due to the closure of restaurants and physical workplaces [56]. Additionally, there has been an increase in the frequency of communal meals. Caution is therefore advised when interpreting and generalizing these results.

Another limitation relates to potential biases in the final sample, which may be attributed to the non-representative sample (underrepresentation of women [58]) and that is further skewed due to potentially biased attrition (higher dropout rates among frequent meat eaters). To reduce this bias, future research could use representative samples and reduce the self-selection bias by incorporating other food categories to conceal the study's specific purpose.

A third possible limitation relates to the role of sociodemographic factors in meat consumption. Unlike previous research, our study detected no significant differences in meat consumption among our participants in terms of their sociodemographic characteristics. These null findings may be due to methodological limitations such as using a non-representative sample or excluding individuals following a vegetarian or vegan diet, but they could be attributed to the difference in our measurement of meat consumption (quantity vs. frequency). Future research could endeavor to capture both the frequency and quantity of meat consumption to provide a more comprehensive picture of both aspects.

Furthermore, each situational factor was conceptualized by one feature (e.g., social setting was dichotomized into 'alone' vs. 'others present'). Future research could include more features to conceptualize situational factors in more detail (e.g., social setting could be further described by the gender of the people present and their relationship to the person eating [33]).

As a promising avenue for future research, the combined role of situational factors such as hunger and time, sociodemographic factors such as gender and age, and psychological influences such as intention and values on meat consumption is yet to be determined. Investigating the degree to which these are interrelated and how they interact would provide us with a more comprehensive understanding of the underlying mechanisms that drive behavior [59]. Future research could investigate interactions such as sociodemographic characteristics that determine in which situations individuals eat meat, situational variables that hinder people from implementing their intentions, or individuals selecting eating situations according to their goals [60]. In short, our study indicates that future research would benefit from a better understanding of situation-person interactions.

5. Conclusion

Our diary study underscores the importance of situational influences on eating behavior, particularly meat consumption, and contributes to the ongoing efforts to design more effective interventions to reduce meat consumption. Our results suggest that future research should focus not only on who eats meat but also when, with whom, how hungry they are when eating, and what people do while eating. While acknowledging the importance of tailoring interventions to

specific sociodemographic groups, we contend it may be equally important to identify meat-specific eating situations and tailor interventions accordingly.

6. Supplementary Tables

Table S1.

Sociodemographic characteristics of completers and non-completers plus attrition analysis

Sociodemographic characteristics	**Completers (*N* = 230)**	**Non-completers (*N* = 251)**	**Logistic regression** DV = Completion of diary study	
	***M*(*SD*) / *N* (%)**	***M*(*SD*) / *N* (%)**	**OR**	**CI**
Age	42.70 (17.25%)	38.04 (16.68%)	1.00	0.98 – 1.01
Sex				
Male	135 (58.7%)	133 (52.99)	Reference	
Female	95 (41.30%)	118 (47.01)	1.34	0.90 – 1.99
Employment status				
Full-time	102 (44.35%)	125 (49.80)	Reference	
Part-time	36 (15.65%)	28 (11.16)	1.99*	1.09 – 3.68
In education	24 (10.43%)	50 (19.92)	0.67	0.35 – 1.24
Non-working	67 (29.13%)	47 (18.73)	2.05*	1.15 – 3.71
Missing	1 (0.43%)	1 (0.40)	1.32	0.05 – 37.06
Household composition				
Adults in the household				
No adults	37 (16.09%)	49 (19.52%)	Reference	
Other adults	177 (76.96%)	184 (73.31%)	1.51	0.89 – 2.58
Missing	16 (6.96%)	18 (7.17%)	2.09	0.81 – 5.43
Children in the household				
No children	147 (63.91%)	131 (52.19%)	Reference	
Children	47 (20.43%)	68 (27.09%)	0.57*	0.35 – 0.94
Missing	36 (15.65%)	52 (20.72%)	0.56	0.31 – 1.00
Monthly household net-income				
≤ 450 €	5 (2.17%)	6 (2.39%)	0.91	0.23 – 3.45
450 – < 1.500 €	42 (18.26%)	54 (21.51%)	0.82	0.46 – 1.44
1.500 – < 2.500 €	64 (27.83%)	68 (27.09%)	Reference	
2.500 – < 4.000 €	71 (30.87%)	75 (29.88%)	1.13	0.69 – 1.86
≥ 4.000 €	44 (19.13%)	41 (16.33%)	1.42	0.79 – 2.58
Missing	4 (1.74%)	7 (2.79%)	0.76	0.18 – 2.84

Note. To compare the participants who had completed the diary study with those who had not, a logistic regression was performed. Completion of all five days of the study was the dependent variable (DV). The sociodemographic variables served as independent variables. The odds ratios (OR) and confidence intervals (CI) are reported. * indicates $p < .05$.

Participants who worked part-time or did not work were more likely to complete the study than those who worked full-time. Also, participants who lived in households without children were more likely to complete the study than those with children.

Table S2.

Meat consumption and situational factors on the first day for completers and non-completers plus attrition analysis

Meat consumption and situational factors	**Completers (*N* = 230)**	**Non-completers (*N* = 251)**	**Logistic regression** DV = Completion of diary study	
	***M*(*SD*)**	***M*(*SD*)**	**OR**	**CI**
Meat consumption	0.44 (0.39)	0.55 (0.41)	0.47*	0.29 – 0.77
Hunger	5.93 (1.76)	5.66 (1.96)	1.09	0.98 – 1.21
Positive affect	4.23 (1.05)	4.20 (1.10)	1.02	0.84 – 1.24
Negative affect	1.96 (1.19)	1.96 (1.23)	0.99	0.83 – 1.18
Location	0.12 (0.25)	0.14 (0.29)	0.73	0.35 – 1.53
Social	0.56 (0.44)	0.51 (0.44)	1.44	0.91 – 2.28
Activity	0.48 (0.44)	0.46 (0.44)	1.20	0.76 – 1.89

Note. We compared the level of meat consumption and the situational factors on the first day of the diary study between those participants who had completed the diary study with those who had not. Logistic regression was performed was performed for this purpose. Completion of all five days of the study was the dependent variable (DV). Meat consumption and the situational factors served as independent variables and were calculated as the average across all meals on the first day of the diary study. The odds ratios (OR) and confidence intervals (CI) are reported. * indicates $p < .05$.

Participants who reported a lower frequency of meat consumption were more likely to complete all five days of the diary study than those who reported a higher frequency of meat consumption.

Table S3.

Supplementary analysis: Two-level logistic model with the feature whether other(s) ate meat in the situation

	Model (N_{Meals} = 1128, N_{ID} = 168)	
Situational factors	**OR**	**CI**
Hunger	1.00	0.90 – 1.11
Positive affect	0.95	0.80 – 1.14
Negative affect	0.91	0.76 –1.10
Location	Reference = Home	
Other	1.06	0.61 – 1.85
Other(s) eating meat	Reference = No	
Yes	65.24***	38.28 – 111.18
Partly	8.97***	5.29 – 15.20
Unsure	14.31***	4.09 – 50.09
Activity	Reference = Without activity	
With activity	1.04	0.69 – 1.57
Time	Reference = Morning	
Noon	1.56	0.96 – 2.53
Evening	1.94**	1.21 – 3.11
Random effects		
ICC	.23	
Person-level variance	1.01	

Note. In this supplementary analysis, we aimed to explore the association between meat consumption and the eating behavior of other people present in the situation. To achieve this, we conducted a two-level logistic model on a subset of meals where participants ate with other people, hence the reduced number of meals and participants. Instead of the situational factors social setting (measuring whether other person(s) were present or not), we included the feature of whether the other person(s) ate meat. All situational factors were included uncentered. The results indicate that meat consumption was more likely when others ate meat compared to when others did not eat meat. This was true irrespective of whether all or some people present ate meat and even when the participants were unsure if others ate meat. OR = Odds ratios, CI = Confidence Intervals, ICC = Intraclass Correlation Coefficient, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

7. Literatur

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General Discussion

The overarching aim of this dissertation is to gain a better understanding of eating situations and their relationship with dietary behavior by answering the following two research questions: *What are eating situations? And how do they relate to dietary behavior?* In this chapter, I present my answers to these research questions by highlighting the contributions made by this dissertation in pursuing five corresponding research aims (see Figure 1). To address existing knowledge gaps and identify avenues for future research, I integrate the findings from the empirical studies into the broader research context. I further discuss the practical implications stemming from this research, with a particular focus on how the findings can inform the design of behavior change interventions. Finally, I address the limitations of this dissertation.

Contributions and Future Recommendations

Contributions to Research on (Eating) Situations

The first area of contributions is centered around the concept of (eating) situations. This dissertation contributes to research by enhancing our theoretical understanding of situations, offering a clear definition of eating situations, a comprehensive conceptualization, and a taxonomy-based approach for measuring these situations (RA1). In addition to these foundational aspects, this dissertation also contributes to research by adopting a holistic perspective on the study of eating situations, describing them as combinations of multiple dimensions (RA2). As a final key contribution in this area, this dissertation explores the concept of situational stability, offering both theoretical and empirical insights (RA3).

Research Aim 1: Definition, Conceptualization and Measurement of (Eating) Situations

Definition. In Article I, I synthesize the latest advancements in situation research to elaborate a definition of situations that integrates these insights (Rauthmann, 2015; Rauthmann et al., 2015) and is suitable for the field of nutrition research (Goldschmidt et al., 2017; Schneider-Worthington et al., 2022; Schüz et al., 2015). Thus, I define situations as combinations of various cues within multiple dimensions, with cues being the stimuli that individuals encounter, such as “being at home” or “being with friends”. Cues can be grouped into different situational dimensions like “location” or “social setting”. For example, the situational dimension “location” denotes the physical space and encompasses all related cues, such as “at home”, “at the office” or “at a restaurant”. This cue-focused approach was chosen to provide a descriptive basis for understanding situations, which is a prerequisite for interpreting situations or analyzing the impact of situations on behavior.

In defining the situational dimensions that make up situations, I make the case for including both internal and external dimensions, since both types of dimensions constitute the background against which behavior unfolds (Finnigan, 2020; Saucier, 2017). Reflecting current consensus in situation research, I argue for including only those situational dimensions that can be characterized as concrete, brief, and dynamic (Rauthmann et al., 2015). With this, I contribute to the field by providing a clear definition of situations that enhances effective communication within the research community, thereby improving the quality of research outputs.

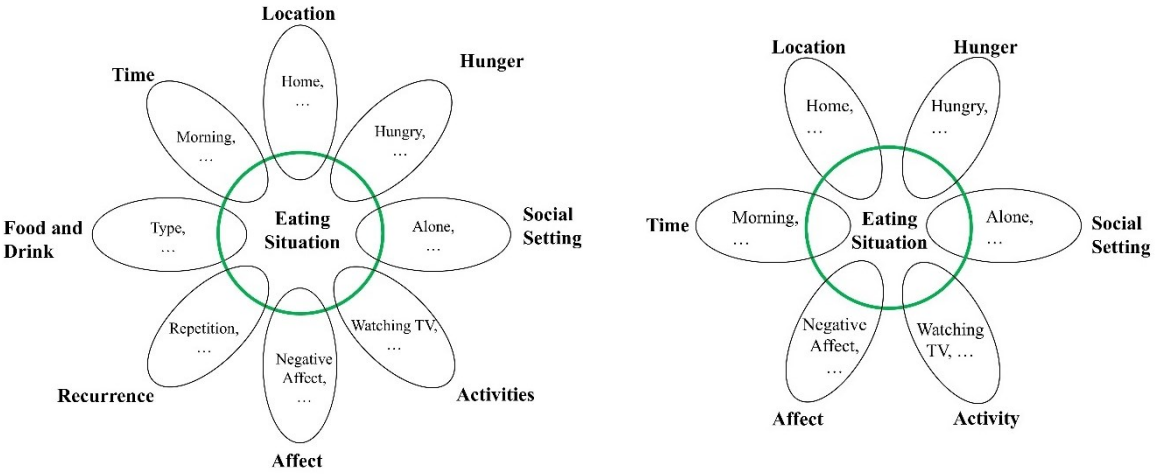
Conceptualization. Another contribution of this dissertation is its conceptualization of eating situations based on adapting the taxonomy of situational dimensions developed by Bisogni et al. (2007). This taxonomy serves to identify a comprehensive set of situational dimensions that are subsequently applied in the empirical work of this dissertation. This approach sets this dissertation apart from previous research that has mostly focused on a limited number of dimensions selected without a guiding taxonomy and based solely on prior research or reasoning (e.g., Elliston et al., 2017; Goldschmidt et al., 2017).

In this dissertation, I revised two areas of Bisogni et al.'s taxonomy (2007) to align it more closely with my theoretical understanding of eating situations. Whereas the original taxonomy describes eight dimensions (i.e., food and drink, time, location, physical condition, social setting, activities, mental processes, and recurrence), I exclude "recurrence" and "food and drink". Below, I elaborate on the rationale for these two revisions. To illustrate the adaptation, Figure 2 provides a visual comparison of Bisogni et al.'s original taxonomy in Panel (a) and the revised version elaborated in this dissertation in Panel (b).

Figure 2

Comparison between the original and revised version of the taxonomy of situational dimensions

(a) Original taxonomy by Bisogni et al. (2007) (b) Revised version of the taxonomy



Note. Panel (a) depicts the original taxonomy by Bisogni et al., (2007) with eight dimensions. Panel (b) depicts the revised version, omitting the two dimensions "food and drink" and "recurrence".

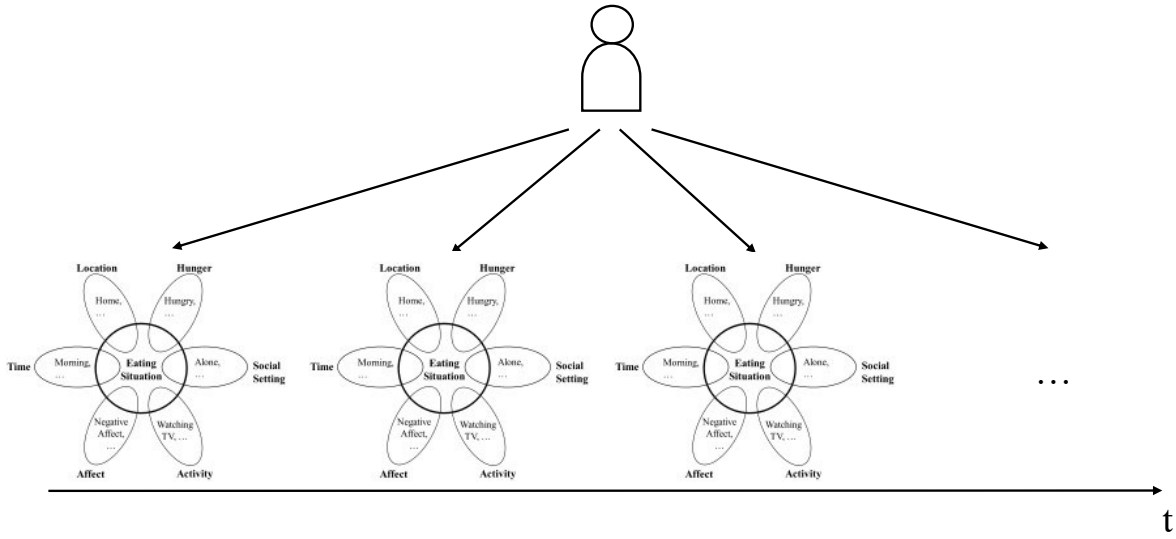
Food & Drink: Bisogni et al. (2007) included the dimension "food and drink" in their taxonomy on the basis that eating situations can vary depending on what type of food is eaten and whether the situation revolves around the nutritional aspect of eating (e.g., eating breakfast) or other aspects, such as social (e.g., family dinner) or mental (e.g., comfort food). While I can understand this reasoning, my research aims required a different approach. I intentionally separated "food and drink" from situational dimensions, drawing a clear line between dietary behaviors and eating situations. This distinction is crucial because it allows for a more focused analysis of eating situations and enables researchers to predefine the dietary behaviors of interest before investigating the related situations. This approach was applied in the empirical studies of this dissertation, with Article II focused on eating situations during meals and Article III focused on eating situations related to meat consumption. Reflecting my understanding of eating situations, my revised version of the taxonomy is depicted in Panel (b) of Figure 3.

Situational Stability (or Recurrence): In Bisogni et al.'s original taxonomy (2007), "recurrence" is included as a situational dimension. However, I argue that recurrence – or what I term "situational stability" – should be considered distinct and studied separately from other situational dimensions. Rather than a dimension specific to a situation, recurrence or situational stability represents an aggregation of an individual's eating situations over time, and I propose

that it is more aptly categorized as an individual-level variable. This conceptual distinction is crucial for researchers, as it separates the momentary cues of a situation from individual-level variables, such as how often individuals eat in the same situations over time. (For a more in-depth discussion, refer to Article I.) Consequently, I have excluded situational stability from the revised taxonomy and instead illustrate it separately in Figure 3. In this figure, situational stability is portrayed as an individual-level variable characterized by the repetition of eating situations over time.

Figure 3

Situational Stability



Note. This figure illustrates the concept of "situational stability", which indicates how regularly individuals eat in the same situations. Situational stability serves as an individual-level variable representing the aggregation of eating situations over time. The figure has been adapted from Wowra et al. (2023).

Measurement. My dissertation also contributes to the measurement of situations by combining a taxonomy-based measurement tool with quantitative survey methods and a repeated-measures research design. The adoption of a taxonomy-based measurement has two advantages: it addresses the lack of a standardized tool to measure situations and enables researchers to capture eating situations in more detail and temporally closer to their occurrence than cross-sectional designs. The key strengths of this approach include reduced recall bias, the ability to engage a broad and diverse group of participants, and ease of administration, making it an exemplary guide for future research.

Notwithstanding these advantages, future research could benefit from applying methods, such as Ecological Momentary Assessment, that have higher resolution, assess situations concurrently, and encompass multiple measurements throughout the day. By facilitating real-time data collection, Ecological Momentary Assessment captures the complexity of everyday life more precisely (Wrzus & Mehl, 2017). Applying objective methods, e.g., by using cameras and sensors, could improve the depth and accuracy of situation measurement (Harari et al., 2017) and move beyond the limitations of survey-based data (Brown et al., 2017). For example, GPS mapping on smartphones could provide precise location data, thereby reducing recall bias from retrospective survey methods. By combining higher-resolution methodologies with newer technological advances, future research could bring data collection even closer to everyday experience.

Research Aim 2: A Holistic Perspective on Eating Situations

Another contribution of this dissertation is that, rather than focusing on single dimensions, it elaborates and adopts a holistic perspective to describe eating situations, applying this perspective consistently throughout both the theoretical and empirical phases of the research. In the theoretical phase, I define situations as combinations of various cues within multiple situational dimensions rather than as single situational dimensions. This approach recognizes that individuals encounter a number of cues simultaneously in their everyday lives. I further revised Bisogni et al.'s taxonomy (2007) of situational dimensions as a theoretical foundation for conceptualizing eating situations. The revised taxonomy offers a comprehensive set of multiple situational dimensions to describe eating situations.

In the empirical phase, I applied this approach in Article II to identify the most common eating situations for each meal type. This was accomplished through analyzing the diary data via cluster analyses aimed at categorizing eating situations as combinations of multiple dimensions. The findings indicated that the most common situations for breakfast were characterized by a combination of the dimensions "social", "affect", and "hunger". And for lunch and dinner, the most common situations were characterized by varying combinations of the dimensions "social", "affect", and "activity".

The need to adopt a holistic perspective is supported by findings from prior research that demonstrate dietary behaviors are influenced not only by single situational dimensions but by the *entirety* of eating situations, which cannot be captured or understood when considering single dimensions in isolation (Goldman et al., 1991; King et al., 2004; Vartanian et al., 2017). These findings underscore that situations are more than the sum of their individual situational dimensions and thus need to be investigated as a whole.

Future research could build on this approach to examine the relationship between whole eating situations and dietary behaviors. This line of research remains largely unexplored, with the exception of a few recent studies (Maugeri et al., 2022; Neves, Fontes, Nogueira, Melo, et al., 2022; Neves, Fontes, Nogueira, Pereira, et al., 2022; Onita et al., 2021; Rauber et al., 2022). The need for a more comprehensive approach is exemplified by the Ecological Momentary Assessment study conducted among Italian college students (Maugeri et al., 2022). The findings of this study showed that different eating situations were associated with the consumption of different food groups. For instance, the situation "eating away from home and with others" was associated with the consumption of red and processed meat and sugar-sweetened beverages. However, these recent studies had two notable shortcomings: (a) they did not apply a theoretical taxonomy to identify situational dimensions; and (b) their findings might be bound by the specifics of the sample and the context in which this research was conducted, limiting their generalizability. Future research can advance this line of research by establishing a more robust theoretical foundation through the use of a taxonomy to conceptualize eating situations. Furthermore, researchers are encouraged to adapt and apply the methods outlined in this dissertation and previous studies to identify eating situations relevant to their unique samples and contexts.

Research Aim 3: Situational Stability

This dissertation extends research on situations by including a specific focus on the stability of eating situations. Situational stability has been largely unexplored in previous research, likely due to the tendency of most psychological research – including situation research – to focus on static structures without considering the dynamic nature of situations in everyday life (Rauthmann & Sherman, 2015; Sherman et al., 2015). This gap in research leaves the question unanswered of whether individuals repeatedly encounter the same situation (high situational stability) or whether they experience a variety of situations (low situational stability) over time. To address this question, my dissertation explores the concept of situational stability. In doing so, it makes two contributions to previous research: as a contribution to methodology, it introduces a new tool to describe situational stability; and as a contribution to empirical evidence, it reveals new insights into the situational stability of dietary behavior.

Methodological Contribution. The first contribution consists of the development of a situational stability index as a novel tool designed to quantify the stability of eating situations over time. This index is calculated as a function of the number of different eating situations in relation to the total number of meals eaten, as detailed in (1). It ranges from 0 (low situational stability) to 1 (high situational stability).

$$Situational\ Stability\ Index = 1 - \frac{(N_{situations} - 0.5)}{N_{meals}} \quad (1)$$

The index represents a significant advancement in assessing situational stability, both in being a new and unique way of assessing the stability of whole situations and in being derived from objective data. By contrast, previous approaches have predominantly focused on the stability of individual situational dimensions (e.g., the stability of locations) and relied on subjective self-reports in cross-sectional studies (e.g., "To what degree is the location similar each time the behavior is carried out?") (Danner et al., 2008; Kilb & Labudek, 2022; Pimm et al., 2016). Limited research has been conducted using objective measurements of situational stability (Maher et al., 2021). The stability index developed here thus fills a critical gap by offering an *objective* tool for assessing the stability of *whole situations*, enhancing the objectivity and accuracy of measurement.

Future research will need to validate the stability index to ensure it accurately captures situational stability. This validation can be approached in several ways. One method would be to compare the index with subjective approaches adopted in previous studies (e.g., Danner et al., 2008). Alternatively, the index could be validated via other objective approaches and modern analytical methods. For example, neural networks could detect and extract cues from streams of smartphone photos to serve as an indicator of situational stability (Bolanos et al., 2015; Rauthmann & Sherman, 2015). In summary, the validation of situational stability would benefit from using both subjective and objective data.

Empirical Contribution. We used the stability index to assess whether individuals repeatedly encounter the same situation (high situational stability) or experience a variety of situations over time (low situational stability). Our findings reveal a moderately high level of situational stability regardless of meal type, though considerable variation in situational stability was observed between participants. This aligns with previous research that has reported a high degree of stability in dinner situations overall with substantial inter-individual differences (Kilb & Labudek, 2022). These findings highlight the nuanced nature of situational stability in dietary behaviors, underscoring the significant variability between individuals even when some aspects of eating are routine and stable.

An important possible avenue for future research would be to explore the relationship between situational stability and behavioral consistency, grounded in the premise that stable situations lead to consistent behavior (Sherman et al., 2010). This is supported by previous research on various non-dietary behaviors (e.g., activity or sedentary behavior - Maher et al.,

2021; and physical activity - Rand et al., 2020). In the context of dietary behaviors, Kilb and Labudek (2022) have demonstrated that situational stability serves as a predictor of habit strength for eating dinner. However, future research is needed to investigate the extent to which eating in recurring situations predicts consistent behavior and the extent to which a certain behavior can be "locked in" through situational stability. Understanding these dynamics is crucial for developing effective strategies for behavior change interventions.

Another avenue for future research could be to investigate the factors that contribute to situational stability. Our investigation in Article II of the relationship between situational stability and sociodemographic characteristics reveals associations with factors such as age and household composition. Future studies could expand on this line of research, investigating how situational stability relates to personality traits such as openness to experience (Weston et al., 2020), or to significant life transitions such as moving houses (Kurz et al., 2015).

In summary, this dissertation contributes to research on situations by developing a new tool for assessing situational stability and by providing empirical insights into the degree of stability in eating meals. The situational stability index equips future researchers with a new tool for exploring the relationship between situational stability and behavioral consistency, and the factors that contribute to situational stability.

Contributions to Research on Eating Situations and Dietary Behaviors

The second major area of contributions of this dissertation centers around the relationship between eating situations and dietary behaviors, with meat consumption used as an example of such behavior due to its health and sustainability implications. In this section, I discuss these contributions in relation to two research aims: RA4, investigating which situational dimensions are associated with meat consumption; and RA5, providing deeper insights into the level of this association.

Research Aim 4: The Association Between Eating Situations and Meat Consumption

This dissertation enhances our understanding of the situational nature of meat consumption. It extends recent research on the link between eating situations and meat consumption conducted in the UK (Horgan et al., 2019) and across France, the Netherlands, and Switzerland (Laffan, 2021) to the German context. In this section, I briefly revisit our findings in relation to previous research, showing that they largely align with previous research but also introduce new insights. (For a more detailed analysis, see Article III.)

In line with previous research, our study found that meat consumption was associated with time, social setting, and hunger (Horgan et al., 2019; Laffan, 2021; Laffan et al., 2023). Specifically, we found that when all dimensions were considered simultaneously, meat

consumption was more likely (a) during lunch and dinner than at breakfast, (b) when eating with others compared to when alone, and (c) when individuals were hungry compared to when they were satiated. Notably, our study diverged from previous research in that we did not find an association between meat consumption and location (Horgan et al., 2019; Laffan, 2021; Laffan et al., 2023). This discrepancy is very likely to be related to the circumstances of the COVID-19 pandemic that prevailed during our study, with many eating locations restricted due to government-imposed closures of dine-out places.

This dissertation stands out by exploring "activity" and "affect" as two situational dimensions that are underexplored in previous research. In our study, we found that when all dimensions were considered simultaneously, meat consumption was more likely when engaged in another activity, while no association was detected between meat consumption and affect. Our decision to explore these two situational dimensions was the result of adopting a theoretical taxonomy, which is an approach rarely employed in previous research. Adopting this taxonomy enabled a systematic examination of the dimensions associated with meat consumption and can thus be considered a strength of this dissertation.

A promising direction for future research would be to combine an investigation of eating situations with an investigation of psychological characteristics. This is advisable since previous research has found that situations can modify the influence of psychological characteristics on dietary behavior, meaning both need to be investigated in unison (Bauer et al., 2022; Laffan et al., 2023). Integrating both situational dimensions and psychological characteristics can improve our understanding and prediction of dietary behaviors (Bouwman et al., 2022; Verain, Bouwman, et al., 2022). For example, in a study exploring how situational dimensions interact with the intention to reduce meat consumption, Laffan et al. (2023) found that hedonic situations (e.g., eating with others) are more likely to result in an intention-behavior gap. Similarly, Keller et al. (2021) compared the effectiveness of different situational dimensions, such as time and activity, in establishing new dietary habits, finding these two dimensions equally influential. Future research could further explore the interactions of situational dimensions and psychological characteristics to unravel the factors influencing dietary behaviors.

Research Aim 5: Level of Association Between Eating Situations and Meat Consumption

Building on the insights above, this dissertation dives deeper into the association between situational dimensions and meat consumption, exploring whether variation in this association is at within-person or between-person level. Our findings reveal that the three situational dimensions of "time", "hunger", and "social setting" were associated with meat

consumption due to variation at within-person level. This implies these associations are attributable to the specific situation (e.g., momentary hunger) rather than differences in situations between persons (e.g., different average hunger levels among individuals). Only the situational dimension "social setting" was also associated with meat consumption due to variation at between-person level, revealing an association due to both the specific situation (e.g., the momentary presence of other people) *and* differences in situations between persons (e.g., some individuals typically eat meals with others while others typically eat alone). (For more details, see Article III.) Based on these findings, this dissertation underscores the significance of investigating eating situations at the level where they occur, i.e., as momentary influences. Investigating how situations and dietary behavior are associated is an interesting avenue for research that remains largely unexplored (Elliston et al., 2017; Laffan et al., 2023; Shimizu et al., 2010). Moving forward, future research could prioritize collecting descriptive and exploratory data about the situational aspects of eating (Harari et al., 2017). Such data are needed to understand how situations relate to behavior and will be crucial for developing theories to explain this relationship. For example, examining whether situations are associated with behavior due to variation at within-person and between-person level can inform theory-building about the mechanisms behind this association.

The approach developed in this dissertation for measuring situations constitutes another contribution with implications for future research. Specifically, I make the case that situational dimensions cannot be equated with or replaced by proximate factors. The grounds for this argument are exemplified in our investigation of social influences, which we explored in three distinct ways:

a) The influence of social setting at within-person level (i.e., whether a meal is eaten alone or with others)
b) The influence of social setting at between-person level (i.e., whether an individual typically eats meals with others or typically eats alone)
c) The influence of household composition (i.e., whether an individual lives with others or alone)

Our findings reveal that these three variables cannot be equated. While social setting was associated with meat consumption due to variation both at within-person and between-person level, household composition, which could be considered a proximate factor for social settings, showed no such association. This highlights the importance of clearly defining what is being researched and of directly assessing situational variables. This is vital because relying

solely on proximate variables such as household composition may not be sufficient to capture all the subtleties of situational influences.

Practical Implications: "Mind the Situation"

This chapter serves as a bridge between the theoretical insights of this dissertation and their practical application, particularly in regards to designing interventions to change dietary behavior. Throughout this dissertation, I emphasize the need to "mind the situation" when designing interventions. This is especially important since research and practice have traditionally predominantly focused on individual-level interventions abstracted from the situations in which the targeted behaviors occur (Elliston et al., 2017; Kelly & Barker, 2016). I advocate for moving beyond this approach to one that accounts for the different situations in which behavior is embedded. My case for adopting this perspective is supported by the empirical findings of this dissertation. Specifically, the findings of Article III indicate that dietary behavior is associated with a number of situational dimensions, predominantly due to variation at the within-person level, suggesting that behavior is dependent on the momentary situation rather than on differences in situations between individuals. This is further underscored by the limited power of sociodemographic variables to explain dietary behavior (see Article III). These findings challenge the conventional focus of behavior interventions on individuals, reinforcing my argument that interventions should always consider situations.

Situations can be incorporated in intervention design in multiple ways. First, researchers and practitioners can identify the specific situations in which to conduct interventions (Laffan et al., 2023). This can be done by pinpointing situations in which individuals engage in a particular behavior and selecting the most important ones (Taufik et al., 2022). For example, the findings presented in Article II emphasize that for the sample, dinner is predominantly eaten at home with others. This eating situation presents a promising context to be targeted in behavior change interventions, e.g., by providing dinner-cooking kits for families with healthy and sustainable meal options. Alternatively, researchers and practitioners could identify situations in which individuals are most in need of support or are most likely to be receptive to behavior change (Nahum-Shani et al., 2018; Spruijt-Metz et al., 2015). This may entail identifying situations where it is known that people are prone to not following through with their intentions or situations in which people exhibit greater openness to alternative behaviors (Laffan et al., 2023; Verain, Bouwman, et al., 2022). By strategically targeting such situations, interventions can be optimally timed and tailored to ensure they effectively encourage healthy and sustainable behavior.

Second, researchers and practitioners can directly address situations in order to change behavior. This can be achieved either by altering the situation itself or by targeting the underlying mechanism responsible for the situation-behavior relationship (Papies, 2016). The first approach involves addressing the specific cues within a situation that drive a particular behavior (Wood & Neal, 2016). By altering these cues, interventions can decrease undesirable behaviors and increase desirable behaviors (Terzimehić et al., 2018). For instance, if the cue "hunger" acts as a driver for meat consumption, interventions could focus on reducing hunger levels through strategies like providing healthy snacks before meals or encouraging people to schedule dinner at an earlier time. The second approach is rooted in the understanding that behavior is only influenced once a specific mechanism has been activated, i.e., once a situation has first been perceived and processed by an individual. For instance, the cue "eating with others" may activate the mechanism "social norm", which in turn influences the behavior "to choose a dish with meat". To change the underlying mechanisms and thereby increase the likelihood of people making vegetarian choices, interventions could apply social norm feedback highlighting the popularity of vegetarian choices in the general population to encourage others to do likewise (Sparkman & Walton, 2017).

Lastly, examining the situation in which interventions are implemented can help when it comes to adapting and generalizing interventions to apply in other situations (Moore et al., 2021). Interventions are typically tested in one specific situation, and little is known about whether an intervention that has proven effective in one situation is also effective in another. I argue that researchers and practitioners can learn more about the conditions under which interventions succeed or fail by focusing on the situational factors influencing their success or failure (Mielke et al., 2022). In this way, a robust body of evidence about how situations affect the effectiveness of interventions can be established, ultimately enhancing our ability to adapt and generalize interventions across various situations.

In summary, these three approaches all represent different ways in which situations can inform the design of interventions to develop more effective strategies for promoting healthier and more sustainable dietary behaviors.

While advocating for a more situational approach in designing interventions, it is also crucial to underscore the need for a broader transformation at the societal level (Eker et al., 2019). This is essential because situations do not exist in isolation but instead are embedded in broader cultural, economic, and political contexts (Hofmann, 2024). The extent of such embeddedness is evident if we consider the example of the situation of eating out with others. This situation is heavily shaped by cultural context, including whether communal dining outside

the home is a customary social practice within a given society. Economic context also plays a pivotal role in the accessibility and affordability of dining establishments outside of one's home, while political context can exert influence by regulating the availability of healthy versus unhealthy dining options in out-of-home settings.

Given the multiplicity of contextual factors influencing eating situations and dietary behaviors, any interventional efforts to foster healthy and sustainable dietary behaviors will only be transformative if undertaken simultaneously by multiple actors at different levels (Chater & Loewenstein, 2023; Creutzig et al., 2018). At the policy level, policymakers can enact structural changes within the food environment through measures such as offering subsidies for the production of plant-based foods (Biesbroek et al., 2023). In the realm of food retail, businesses can play a pivotal role in shaping the food environment by influencing product selection, placement, pricing, and promotional strategies (Martinez et al., 2018). Within the workplace, companies can ensure the availability of healthy and sustainable food options for their employees. Within society, professionals like chefs and gourmet experts can act as public advocates to raise public awareness of healthy and sustainable diets (Eat Forum, 2018). Social media influencers can also play a crucial role in shaping societal norms through their platforms (Sina et al., 2022). In short, collaborative efforts from various actors at different levels are necessary for a transformation towards healthy and sustainable dietary practices.

Limitations

Below I acknowledge several overarching limitations of this dissertation, including both methodological and conceptual limitations. Since the articles already present their own respective limitations, I will focus on the general limitations of this dissertation and suggest promising avenues for future research, including research to address these limitations.

Methodological Limitations

Correlational Nature. The first methodological limitation of this dissertation is the correlational nature of its results. While correlational results are common in behavioral research, they limit the type of conclusions that can be drawn. This limitation is particularly relevant when examining the relationship between situations and behavior, as it hinders our ability to establish causality. Future research could address this by including complementary evidence from experimental designs and/or intervention studies. Applying such methods would allow for the investigation of causal relationships and serve as a basis for improving the design of behavior change interventions.

Psychometric Validation. The second methodological limitation relates to the psychometric validation of the tool applied in this dissertation for measuring situations.

Research in this field has traditionally assigned low priority to the need for developing psychometrically sound tools (Rauthmann et al., 2014), and this limitation persists within this dissertation. Although I designed a questionnaire to measure situations, it was not validated within the context of this dissertation. Future research should address this limitation and prioritize validating situation measurement tools. This effort should result in the creation of robust tools that not only enhance our understanding of situational influences but also improve the overall reliability of research in this field.

Non-representativeness of Findings. A third limitation of this dissertation relates to the non-representativeness of our findings, which are constrained by factors such as the specific sample used and the circumstances surrounding the COVID-19 pandemic. First, the findings are bound by the sample used and can only be generalized with caution. Since the sample was not representative of the wider German population, the findings should not be extrapolated as such. Furthermore, the sample was recruited via online panels, which may have introduced a sampling bias, limiting the extent to which these findings can be generalized to other sociodemographic groups in Germany. Second, the non-representativeness of the findings is severely constrained due to the extraordinary circumstances of the COVID-19 pandemic. These circumstances included government-imposed restrictions such as lockdowns and restaurant closures that led to changes in daily life, inducing different dietary behaviors and different situations (Kilb & Labudek, 2022; Kuper et al., 2021). It is important to interpret the findings within the context of these unique global circumstances, recognizing that they may not fully reflect typical behavior or situations. Future research should aim to replicate the findings in the post-pandemic "new normal".

Conceptual Limitations

Situations. The first conceptual limitation concerns the scope of dimensions and cues considered. Thus, although we analyzed situations via six situational dimensions identified in the taxonomy developed by Bisogni et al. (2007), it is important to acknowledge that this selection may not have encompassed all relevant dimensions. Examples of possible additional dimensions include "Event" (e.g., birthday party) or "Role" (e.g., host) (Noftle & Gust, 2015). (See Article I for an overview of taxonomies.) The diversity of dimensions proposed by other taxonomies underscores the need for future research to evaluate and possibly expand upon the dimensions considered when investigating situations. Similarly, our investigation focused on a limited number of cues, omitting numerous other potential cues. For example, the dimension "social setting" could encompass not only the presence of people but also the number of

individuals present and their dietary preferences. Future research could investigate multiple cues per dimension to provide a more comprehensive picture of the eating situations.

Generalization to Other Eating Contexts and Dietary Behaviors. Although this dissertation provides valuable insights into the situational aspects of eating, it is important to note that these findings are primarily applicable to the specific eating context of meals and the dietary behavior of meat consumption. They should not be directly extrapolated to other eating contexts such as snacking or other dietary behaviors like the consumption of ultra-processed foods, as these behaviors may be associated with different eating situations. For instance, snacking has been linked to the situational dimension of mood (Cleobury & Tapper, 2014; Elliston et al., 2017; Grenard et al., 2013), while the consumption of ultra-processed foods has been associated with activities like watching TV (Onita et al., 2021). The findings presented in this dissertation should thus be applied with caution and primarily to the context and behavior directly studied. Nevertheless, the methodology used to investigate eating situations could still be adapted to other dietary contexts and behaviors, paving the way for future research to explore situational aspects across a broader spectrum of dietary contexts and behaviors.

Dietary Behaviors and Their Impacts. Another limitation of this dissertation concerns the measurement of dietary behaviors, as meat consumption was assessed in a binary response format (i.e., whether or not meat was eaten during the meal). Framed within the context of a dual crisis of health and environmental sustainability, this dissertation responds to the pressing need for major changes in dietary behaviors to foster human and planetary health. To address these changes, a more comprehensive approach is needed for measuring dietary behavior and its impacts. A logical next step would be to consider not only the frequency of meat consumption (i.e., whether or not meat is eaten), but also the quantity (i.e., how much meat is eaten) and type of meat consumed (i.e., red or white). Future research could thus aim to measure behavior in more detail to determine its impacts on human and planetary health (see for example, Stewart et al., 2021).

Mechanism. The final limitation of this dissertation, and in my opinion one that indicates the most fruitful avenue for future research, relates to the mechanism linking situations and dietary behavior. This dissertation addresses the association between eating situations and dietary behavior without delving into the causal mechanism behind this association. This decision was made for two reasons. First, there are many different theoretical assumptions about how eating situations influence dietary behaviors, with each situational dimension potentially acting through a unique mechanism. For example, social setting might influence dietary behavior through social norms, whereas location might influence dietary behavior through the

availability of dishes. Given this complexity, a detailed examination of each mechanism would be beyond the scope of this dissertation. Second, the research methodology employed in this dissertation relies on correlational data, meaning it is not adequate to explore every mechanism. Investigating these different mechanisms would require different methodologies such as experimental designs and intervention studies that exceed the resources of this dissertation.

This does not mean that considerations about these mechanisms are absent from this dissertation. In particular, the empirical articles include preliminary considerations of the potential mechanisms linking eating situations and meat consumption. Although these considerations are not definitive, they indicate avenues for future research into the nature of the relationship between eating situations and dietary behavior.

Identifying and understanding the mechanisms that underlie the relationship between situations and behavior is of great relevance for both future research and practical applications. Such understanding would afford valuable insights into the "hows" and "whys" of this relationship, enriching our understanding of the situational aspects of eating. This in turn would enable us to develop theories that shed light on the relationship, paving the way for the design of more effective intervention strategies and ultimately contributing to the promotion of healthier and more sustainable diets.

Concluding Remarks

The overarching goal of this dissertation is to deepen our theoretical and empirical understanding of eating situations and their relationship with dietary behaviors. This goal is achieved through insights generated in three articles.

The first article establishes the theoretical foundation, synthesizing insights from previous research on the concept of "situations" and proposing an approach for incorporating these insights into research on dietary behavior. This approach is then applied to the empirical investigation of eating situations via two empirical articles. Both of these articles adopt a holistic perspective of eating situations. Article II approaches and describes eating situations as a combination of various cues within multiple dimensions, identifying common eating situations for different meal types and exploring how often people eat in the same situations (situational stability). Article III focuses on a comprehensive set of situational dimensions and links different situational dimensions to meat consumption, underscoring the importance of situations when explaining dietary behavior.

The principal argument advanced in this dissertation is that adopting a situational perspective can significantly benefit research and practice on dietary behavior. This is

especially relevant in the context of a dual crisis of health and sustainability. Situations are salient in this context because they are at the intersection between individual agency and broader contextual influences. On the one hand, situations are to some extent within an individual's control, allowing for personal decisions to impact dietary behaviors. For instance, individuals can choose not to make food decisions when experiencing hunger (as hunger was associated with meat consumption, see Article III) or can opt to dine at a location that offers healthy or sustainable meals (Bauer et al., 2022). On the other hand, situations are shaped by broader contextual influences beyond the direct control of individuals. For example, cultural norms could dictate the type of foods typically eaten during specific meals (as lunch and dinner were associated with meat consumption, see Article III), while the availability of healthy and sustainable food outlets in a neighborhood can restrict or increase the options for grabbing a healthy lunch (Hofmann, 2024).

To change dietary behavior through a situational approach, therefore, it is crucial both to empower individuals to make informed choices regarding their eating situations and to advocate for systemic changes that remove structural barriers to healthy and sustainable situations (Chater & Loewenstein, 2023). Efforts to empower individuals can include personal dietary changes on an individual level, advocating for healthier and more sustainable food options within organizational settings, altering dietary guidelines to reshape cultural norms, and engaging in civic activities such as voting on laws that affect the broader food environment. Through these diverse approaches, individuals can transform their situation and contribute to broader societal changes.

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Appendix

Diary Study – Day 1

Studie zum Ernährungsverhalten im Alltag

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Introduction

Herzlich willkommen!

Liebe(r) Teilnehmer(in),
vielen Dank für Ihr Interesse an unserer Tagebuch-Studie zum Ernährungsverhalten von Konsumentinnen und Konsumenten.
Die Studie wird durch das Institut für Verbraucherforschung, Kommunikation und Ernährungssoziologie an der Justus-Liebig-Universität Gießen durchgeführt.

Aufbau der Studie:
Die Studie besteht aus einer Eingangsbefragung, an der Sie gerade teilnehmen, sowie kurzen täglichen Fragebögen, welche auf Ihr Ernährungsverhalten am jeweiligen Tag eingehen.

Eingangsfragebogen

- Dieser Fragebogen soll nach Ihrer letzten Mahlzeit des Tages ausgefüllt werden.
- Füllen Sie den Fragebogen nur aus, wenn Sie heute bereits Ihre letzte Mahlzeit zu sich genommen haben. Sollte das noch nicht der Fall sein, können Sie den Link einfach später aufrufen, um wieder auf den Fragebogen zuzugreifen.
- Dauer des heutigen Eingangsfragebogen: ca. 15 min

Tägliche Fragebögen

- Sie erhalten an weiteren vier aufeinanderfolgenden Abenden unter der Woche einen Link zu einem Fragebogen über Ihr Ernährungsverhalten
- Die täglichen Fragebögen sollen jeden Abend nach Ihrer letzten Mahlzeit des Tages ausgefüllt werden
- Dauer der täglichen Fragebögen: weniger als 10 min
- Sie erhalten einen Link um **19 Uhr**

Voraussetzungen:
Sie können an der Studie teilnehmen, wenn Sie **mindestens 18 Jahre alt** sind.
Ausgeschlossen von dieser Studie sind **Vegetarier/innen oder Veganer/innen**.

Datenschutz:
Alle Daten werden vollkommen anonym erhoben, streng vertraulich behandelt und nur zur Untersuchung von Ernährungsverhalten verwendet. Ein Rückschluss auf Ihre Person ist somit zu keiner Zeit möglich.

Bei weiteren Fragen können Sie mich gerne unter folgender Adresse kontaktieren:
patricia.wowra@ernaehrung.uni-giessen.de.

Ich bin mit der im Rahmen dieser Studie erfolgenden Aufzeichnung von Daten und ihrer Verwendung in anonymisierter Form für wissenschaftliche Zwecke einverstanden. Ich habe das 18. Lebensjahr vollendet.
Ich stimme hiermit zu an allen täglichen Fragebögen teilzunehmen.

- ○ Ich stimme zu.
- ○ Ich stimme nicht zu.

Sociodemographics

Bitte beantworten Sie zunächst einige Fragen zu Ihrer Person.

Was ist Ihr Geschlecht?

- ○ Weiblich
- ○ Männlich
- ○ Divers

Wie alt sind Sie?

☐ Jahre

Welche Beschreibung aus der Liste trifft am ehesten auf Sie zu?

- ○ Vollzeiterwerbstätig
- ○ Teilzeiterwerbstätig
- ○ Geringfügig erwerbstätig, 450-Euro-Job , Minijob oder „Ein-Euro-Job" (bei Bezug von Arbeitslosengeld II)
- ○ In einer beruflichen Ausbildung/Lehre oder in Umschulung
- ○ Freiwilliger Wehrdienst, Bundesfreiwilligendienst oder Freiwilliges Soziales Jahr
- ○ Mutterschafts-, Erziehungsurlaub, Elternzeit oder sonstige Beurlaubung
- ○ Schüler/-innen oder Studierende
- ○ Nicht erwerbstätig (einschließlich: Arbeitslose, Vorruheständler/-innen, Rentner/-innen ohne Nebenverdienst)

Bitte geben Sie an, wie viele Personen (**außer Ihnen**) in Ihrem Haushalt leben?

Erwachsene (14 Jahre oder älter) ☐

Kinder unter 14 Jahren ☐

Wie hoch ist das durchschnittliche monatliche Nettoeinkommen Ihres Haushaltes?

Hinweis: Netto-Einkommen = Unter durchschnittlichem monatlichem Nettoeinkommen ist die Summe zu verstehen, die sich aus Lohn, Gehalt, Einkommen aus selbstständiger Tätigkeit, Rente oder Pension ergibt. Rechnen Sie bitte auch die Einkünfte aus öffentlichen Beihilfen, Einkommen aus Vermietung und Verpachtung, Vermögen, Wohngeld, Kindergeld und sonstige Einkünfte hinzu und ziehen sie dann Steuern und Sozialversicherungsbeiträge (Renten-, Arbeitslosen- und Krankenversicherung) ab.

- unter 150 Euro
- 150 bis unter 450 Euro
- 450 bis unter 850 Euro
- 850 bis unter 1 000 Euro
- 1 000 bis unter 1 250 Euro
- 1 250 bis unter 1 500 Euro
- 1 500 bis unter 1 750 Euro
- 1 750 bis unter 2 000 Euro
- 2 000 bis unter 2 250 Euro
- 2 250 bis unter 2 500 Euro

Folgen Sie aktuell einer speziellen Ernährungsweise?

- ○ Nein
- ○ Ja

Welcher Ernährungsweise folgen Sie?

- ☐ Vegan
- ☐ Vegetarisch
- ☐ Kosher
- ☐ Halal
- ☐ Atkins
- ☐ Paleo
- ☐ Ketogene Diät
- ☐ Low Carb Diät
- ☐ [ ] Andere Ernährungsweise:

Aufgrund der erhöhten Fallzahlen an Corona-Erkrankten gibt es vielerorts zustätzliche Maßnahmen zur Eindämmung des Virus. Mit welchen Einschränkungen sind Sie aktuell konfrontiert? (Mehrfachauswahl erlaubt)

- ☐ Kontaktbeschränkungen im öffentlichen Raum
- ☐ Kontaktbeschränkungen im privaten Raum
- ☐ Home-office
- ☐ Eingestellter Sportbetrieb (Fitnessstudio, etc.)
- ☐ Schließung von Gastronomiebetrieben sowie Bars, Clubs, Diskotheken, Kneipen und ähnlichen Einrichtungen
- ☐ Schließung von Theater, Opern- und Konzerthäuser
- ☐ Maskenpflicht an öffentlichen Plätzen
- ☐ Einschränkung des Bewegungsradius
- ☐ Ausgangssperre
- ☐ [ ] sonstige Einschränkungen:

Die Corona-Krise hat einen großen Einfluss auf unseren Alltag. Im Folgenden möchten wir gerne von Ihnen wissen, wie sich die Krise auf Ihr Essverhalten auswirkt.

Wie sehr hat sich Ihr Essverhalten durch die Corona-Krise verändert?

Gar nicht verändert Sehr verändert

Im Vergleich zur Zeit vor der Corona-Krise esse ich...

mengenmäßig weniger.	☐
weniger Selbstgekochtes.	☐
weniger Fertiggerichte.	☐
weniger Gerichte zum Mitnehmen oder Liefern.	☐
ungesünder.	☐
mehr auswärts.	☐
häufiger alleine.	☐
unregelmäßiger.	☐
eher zu unterschiedlichen Zeiten.	☐
seltener am Tag.	☐
eintöniger.	☐
weniger geplante Gerichte.	☐

Daily Questionaire

Nun wollen wir uns Ihrem heutigen Essverhalten widmen.

Zum Einstieg würden wir gerne erfahren, ob der Tag heute einem für Sie typischen Wochentag entspricht.
(Beispiel für untypische Tage: erkrankt, im Urlaub, Quarantäne etc.)

Ja, es war ein typischer Tag.			mehr oder weniger			Nein, der Tag war untypisch.
○	○	○	○	○	○	○

Inwiefern?

- ☐ Quarantäne (freiwillig oder verpflichtend)
- ☐ Urlaub
- ☐ erkrankt (selbst oder Kinder)
- ☐ ☐ Sonstiges:

Im Folgenden soll der Fokus auf Ihre Hauptmahlzeiten gelegt werden. Snacks, d.h. kleine Zwischenmahlzeiten, werden im Weiteren **nicht** erfragt.

Wie viele Hauptmahlzeiten haben Sie heute eingenommen?

☐

Hauptmahlzeit

Die folgenden Fragen beziehen sich auf Ihre **${lm://Field/2}** heute.

Wenn Sie Ihrer ${lm://Field/3} eine Beschreibung zuordnen würden, welche würde am ehesten zutreffen.

- Frühstück
- Mittagessen
- Abendessen

Um wie viel Uhr haben Sie Ihre ${lm://Field/2} gegessen?

Wo haben Sie Ihre ${lm://Field/2} zu sich genommen?

- Zu Hause
- Bei jemand anderem zu Hause (z.B. bei Freunden oder Familienangehörigen)
- In einer Kantine, einer Mensa, einer Cafetaria, einer Fast-Food Kette, einem Restaurant, Imbiss oder ähnlichem
- Am Arbeitsplatz
- Unterwegs (z.B. im Bus, in der Bahn, im Auto, ...)
- Draußen in der Natur (z.B. im Park)
- An einem anderen Ort, und zwar

Wie hungrig haben Sie sich vor dem Essen gefühlt?

Überhaupt nicht hungrig — Extrem hungrig

Geben Sie bitte an, wie Sie sich in dem Moment gefühlt haben.

	gar nicht			einigermaßen			äußerst
traurig							
ängstlich							
ärgerlich							
glücklich							
energiegeladen							
entspannt							

Haben Sie neben dem Essen noch etwas Anderes gemacht?
Beispiele: Fernsehen, Arbeiten, im Internet surfen etc.
(Ausgenommen ist ein Gespräch während des Essens, sollten Sie mit einer oder mehreren Personen gegessen haben.)

- Ja
- Nein

Haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} Fleisch gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- Ja
- Nein

Welche der folgenden Lebensmittelkategorien haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- ☐ Schweinefleisch
- ☐ Rindfleisch
- ☐ Geflügel
- ☐ Fisch
- ☐ Anderes Fleisch (Lamm, etc.)
- ☐ Weiß ich nicht.

Waren andere Personen anwesend, während Sie gegessen haben?

- ○ Nein, ich war alleine.
- ○ Ja, ich habe in Gesellschaft gegessen.

Hat die andere anwesende Person oder haben die anderen Personen ein Gericht mit Fleisch gegessen?

- ○ Ja
- ○ Teils-teils
- ○ Nein
- ○ Weiß ich nicht

Inwiefern stimmen Sie den folgenden Aussagen zu.

Dieses Gericht zum ${q://QID17/ChoiceGroup/SelectedChoices} zu essen ist etwas, ...

	Ich stimme gar nicht zu						Ich stimme voll und ganz zu
für das ich mich automatisch entschieden habe.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne mich bewusst daran erinnern zu müssen.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne groß nachzudenken.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne es zu bemerken.	○	○	○	○	○	○	○

Verabschiedung täglich

Vielen Dank für das Ausfüllen des heutigen Fragebogens!

Haben Sie sonstige Anmerkungen oder Kommentare zur Studie?

Bei weiteren Fragen oder Problemen können Sie mich gerne unter folgender Adresse kontaktieren: patricia.wowra@ernaehrung.uni-giessen.de

Sie erhalten morgen wieder um dieselbe Uhrzeit einen Link zum Fragebogen.

Diary Study – Day 2

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Studie zum Essverhalten im Alltag

Daily Questionaire

Herzlich willkommen!

Heute erhalten Sie den zweiten von fünf Fragebögen.

Füllen Sie den Fragebogen nur aus, wenn Sie heute bereits Ihre letzte Mahlzeit zu sich genommen haben. Sollte das noch nicht der Fall sein, können Sie den Link einfach später aufrufen, um wieder auf den Fragebogen zuzugreifen.

Die Dauer des Fragebogens beträgt weniger als 10 min.

Auch wenn Ihnen im Laufe der Studie die Fragen bekannt vorkommen, ist es für die Qualität der Studie wichtig, dass Sie alle Fragen beantworten.

Danke für Ihre Unterstützung!

Datenschutz:
Alle Daten werden vollkommen anonym erhoben, streng vertraulich behandelt und nur zur Untersuchung von Ernährungsverhalten verwendet. Ein Rückschluss auf Ihre Person ist somit zu keiner Zeit möglich.

Bei weiteren Fragen können Sie mich gerne unter folgender Adresse kontaktieren:
patricia.wowra@ernaehrung.uni-giessen.de.

Zum Einstieg würden wir gerne erfahren, ob der Tag heute einem für Sie typischen Wochentag entspricht.
(Beispiel für untypische Tage: erkrankt, im Urlaub, Quarantäne etc.)

Ja, es war ein typischer Tag.			mehr oder weniger			Nein, der Tag war untypisch.
○	○	○	○	○	○	○

Inwiefern?

- ☐ Quarantäne (freiwillig oder verpflichtend)
- ☐ Urlaub
- ☐ erkrankt (selbst oder Kinder)
- ☐ [ ] Sonstiges:

Im Folgenden soll der Fokus auf Ihre Hauptmahlzeiten gelegt werden. Snacks, d.h. kleine Zwischenmahlzeiten, werden im Weiteren **nicht** erfragt.

Wie viele Hauptmahlzeiten haben Sie heute eingenommen?

[ ]

Hauptmahlzeit

Die folgenden Fragen beziehen sich auf Ihre **${lm://Field/2}** heute.

Wenn Sie Ihrer ${lm://Field/3} eine Beschreibung zuordnen würden, welche würde am ehesten zutreffen.

- Frühstück
- Mittagessen
- Abendessen

Um wie viel Uhr haben Sie Ihre ${lm://Field/2} gegessen?

Wo haben Sie Ihre ${lm://Field/2} zu sich genommen?

- Zu Hause
- Bei jemand anderem zu Hause (z.B. bei Freunden oder Familienangehörigen)
- In einer Kantine, einer Mensa, einer Cafetaria, einer Fast-Food Kette, einem Restaurant, Imbiss oder ähnlichem
- Am Arbeitsplatz
- Unterwegs (z.B. im Bus, in der Bahn, im Auto, ...)
- Draußen in der Natur (z.B. im Park)
- An einem anderen Ort, und zwar

Wie hungrig haben Sie sich vor dem Essen gefühlt?

Überhaupt nicht hungrig — Extrem hungrig

Geben Sie bitte an, wie Sie sich in dem Moment gefühlt haben.

	gar nicht			einigermaßen			äußerst
glücklich							
traurig							
entspannt							
energiegeladen							
ärgerlich							
ängstlich							

Haben Sie neben dem Essen noch etwas Anderes gemacht?
Beispiele: Fernsehen, Arbeiten, im Internet surfen etc.
(Ausgenommen ist ein Gespräch während des Essens, sollten Sie mit einer oder mehreren Personen gegessen haben.)

- Ja
- Nein

Haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} Fleisch gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- Ja
- Nein

Welche der folgenden Lebensmittelkategorien haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- ☐ Schweinefleisch
- ☐ Rindfleisch
- ☐ Geflügel
- ☐ Fisch
- ☐ Anderes Fleisch (Lamm, etc.)
- ☐ Weiß ich nicht.

Waren andere Personen anwesend, während Sie gegessen haben?

- ○ Nein, ich war alleine.
- ○ Ja, ich habe in Gesellschaft gegessen.

Hat die andere anwesende Person oder haben die anderen Personen ein Gericht mit Fleisch gegessen?

- ○ Ja
- ○ Teils-teils
- ○ Nein
- ○ Weiß ich nicht

Inwiefern stimmen Sie den folgenden Aussagen zu.

Dieses Gericht zum ${q://QID17/ChoiceGroup/SelectedChoices} zu essen ist etwas, ...

	Ich stimme gar nicht zu						Ich stimme voll und ganz zu
für das ich mich automatisch entschieden habe.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne mich bewusst daran erinnern zu müssen.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne groß nachzudenken.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne es zu bemerken.	○	○	○	○	○	○	○

Verabschiedung täglich

Vielen Dank für das Ausfüllen des heutigen Fragebogens!

Haben Sie sonstige Anmerkungen oder Kommentare zur Studie?

Bei weiteren Fragen oder Problemen können Sie mich gerne unter folgender Adresse kontaktieren: patricia.wowra@ernaehrung.uni-giessen.de

Sie erhalten morgen wieder um dieselbe Uhrzeit einen Link zum Fragebogen.

Diary Study – Day 3

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Studie zum Essverhalten im Alltag

Daily Questionaire

Herzlich willkommen!

Heute erhalten Sie den dritten von fünf Fragebögen.

Die Fragen dieses Fragebogens beziehen sich auf Ihre Mahlzeiten von **heute (Mittwoch, den 13.01.2021**).

Füllen Sie den Fragebogen nur aus, wenn Sie heute (13.01.2021) bereits Ihre letzte Mahlzeit zu sich genommen haben. Sollte das noch nicht der Fall sein, können Sie den Link einfach später aufrufen, um wieder auf den Fragebogen zuzugreifen.
Sollten Sie den Fragebogen erst am Donnerstag, den 14.01.2021, ausfüllen, beziehen Sie Ihre Antworten bitte weiterhin auf Mittwoch, den 13.01.2021.

Die Dauer des Fragebogens beträgt weniger als 10 min.

Auch wenn Ihnen im Laufe der Studie die Fragen bekannt vorkommen, ist es für die Qualität der Studie wichtig, dass Sie alle Fragen beantworten.

Danke für Ihre Unterstützung!

Datenschutz:
Alle Daten werden vollkommen anonym erhoben, streng vertraulich behandelt und nur zur Untersuchung von Ernährungsverhalten verwendet. Ein Rückschluss auf Ihre Person ist somit zu keiner Zeit möglich.

Bei weiteren Fragen können Sie mich gerne unter folgender Adresse kontaktieren:
patricia.wowra@ernaehrung.uni-giessen.de.

Zum Einstieg würden wir gerne erfahren, ob der Tag heute einem für Sie typischen Wochentag entspricht.
(Beispiel für untypische Tage: erkrankt, im Urlaub, Quarantäne etc.)

Ja, es war ein typischer Tag.			mehr oder weniger			Nein, der Tag war untypisch.
○	○	○	○	○	○	○

Inwiefern?

- ☐ Quarantäne (freiwillig oder verpflichtend)
- ☐ Urlaub
- ☐ erkrankt (selbst oder Kinder)
- ☐ ☐ Sonstiges:

Im Folgenden soll der Fokus auf Ihre Hauptmahlzeiten gelegt werden. Snacks, d.h. kleine Zwischenmahlzeiten, werden im Weiteren **nicht** erfragt.

Wie viele Hauptmahlzeiten haben Sie heute (**Mittwoch, den 13.01.2021**) eingenommen?

☐

Hauptmahlzeit

Die folgenden Fragen beziehen sich auf Ihre **${lm://Field/2}** heute (**Mittwoch, den 13.01.2021)**.

Wenn Sie Ihrer ${lm://Field/3} eine Beschreibung zuordnen würden, welche würde am ehesten zutreffen.

- Frühstück
- Mittagessen
- Abendessen

Um wie viel Uhr haben Sie Ihre ${lm://Field/2} gegessen?

Wo haben Sie Ihre ${lm://Field/2} zu sich genommen?

- Zu Hause
- Bei jemand anderem zu Hause (z.B. bei Freunden oder Familienangehörigen)
- In einer Kantine, einer Mensa, einer Cafetaria, einer Fast-Food Kette, einem Restaurant, Imbiss oder ähnlichem
- Am Arbeitsplatz
- Unterwegs (z.B. im Bus, in der Bahn, im Auto, ...)
- Draußen in der Natur (z.B. im Park)
- An einem anderen Ort, und zwar

Wie hungrig haben Sie sich vor dem Essen gefühlt?

Überhaupt nicht hungrig — Extrem hungrig

Geben Sie bitte an, wie Sie sich in dem Moment gefühlt haben.

	gar nicht			einigermaßen			äußerst
entspannt	○	○	○	○	○	○	○
glücklich	○	○	○	○	○	○	○
ärgerlich	○	○	○	○	○	○	○
ängstlich	○	○	○	○	○	○	○
traurig	○	○	○	○	○	○	○
energiegeladen	○	○	○	○	○	○	○

Haben Sie neben dem Essen noch etwas Anderes gemacht?
Beispiele: Fernsehen, Arbeiten, im Internet surfen etc.
(Ausgenommen ist ein Gespräch während des Essens, sollten Sie mit einer oder mehreren Personen gegessen haben.)

- Ja
- Nein

Haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} Fleisch gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- Ja
- Nein

Welche der folgenden Lebensmittelkategorien haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- ☐ Schweinefleisch
- ☐ Rindfleisch
- ☐ Geflügel
- ☐ Fisch
- ☐ Anderes Fleisch (Lamm, etc.)
- ☐ Weiß ich nicht.

Waren andere Personen anwesend, während Sie gegessen haben?

- ○ Nein, ich war alleine.
- ○ Ja, ich habe in Gesellschaft gegessen.

Hat die andere anwesende Person oder haben die anderen Personen ein Gericht mit Fleisch gegessen?

- ○ Ja
- ○ Teils-teils
- ○ Nein
- ○ Weiß ich nicht

Inwiefern stimmen Sie den folgenden Aussagen zu.

Dieses Gericht zum ${q://QID17/ChoiceGroup/SelectedChoices} zu essen ist etwas, ...

	Ich stimme gar nicht zu						Ich stimme voll und ganz zu
für das ich mich automatisch entschieden habe.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne mich bewusst daran erinnern zu müssen.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne groß nachzudenken.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne es zu bemerken.	○	○	○	○	○	○	○

Verabschiedung täglich

Vielen Dank für das Ausfüllen des heutigen Fragebogens!

Haben Sie sonstige Anmerkungen oder Kommentare zur Studie?

Bei weiteren Fragen oder Problemen können Sie mich gerne unter folgender Adresse kontaktieren: patricia.wowra@ernaehrung.uni-giessen.de

Sie erhalten morgen wieder um dieselbe Uhrzeit einen Link zum Fragebogen.

Diary Study – Day 4

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Studie zum Essverhalten im Alltag

Daily Questionaire

Herzlich willkommen!

Heute erhalten Sie den vierten von fünf Fragebögen.

Die Fragen dieses Fragebogens beziehen sich auf Ihre Mahlzeiten von **heute (Donnerstag, den 14.01.2021)**.

Füllen Sie den Fragebogen nur aus, wenn Sie heute (14.01.2021) bereits Ihre letzte Mahlzeit zu sich genommen haben. Sollte das noch nicht der Fall sein, können Sie den Link einfach später aufrufen, um wieder auf den Fragebogen zuzugreifen.
Sollten Sie den Fragebogen erst am Freitag, den 15.01.2021, ausfüllen, beziehen Sie Ihre Antworten bitte weiterhin auf Donnerstag, den 14.01.2021.

Die Dauer des Fragebogens beträgt weniger als 10 min.

Auch wenn Ihnen im Laufe der Studie die Fragen bekannt vorkommen, ist es für die Qualität der Studie wichtig, dass Sie alle Fragen beantworten.

Danke für Ihre Unterstützung!

Datenschutz:
Alle Daten werden vollkommen anonym erhoben, streng vertraulich behandelt und nur zur Untersuchung von Ernährungsverhalten verwendet. Ein Rückschluss auf Ihre Person ist somit zu keiner Zeit möglich.

Bei weiteren Fragen können Sie mich gerne unter folgender Adresse kontaktieren:
patricia.wowra@ernaehrung.uni-giessen.de.

Zum Einstieg würden wir gerne erfahren, ob der Tag heute einem für Sie typischen Wochentag entspricht.
(Beispiel für untypische Tage: erkrankt, im Urlaub, Quarantäne etc.)

Ja, es war ein typischer Tag.			mehr oder weniger			Nein, der Tag war untypisch.
○	○	○	○	○	○	○

Inwiefern?

- ☐ Quarantäne (freiwillig oder verpflichtend)
- ☐ Urlaub
- ☐ erkrankt (selbst oder Kinder)
- ☐ [ ] Sonstiges:

Im Folgenden soll der Fokus auf Ihre Hauptmahlzeiten gelegt werden. Snacks, d.h. kleine Zwischenmahlzeiten, werden im Weiteren **nicht** erfragt.

Wie viele Hauptmahlzeiten haben Sie heute (**Donnerstag, den 14.01.2021**) eingenommen?

[ ]

Hauptmahlzeit

Die folgenden Fragen beziehen sich auf Ihre **${lm://Field/2}** heute (**Donnerstag, den 14.01.2021**).

Wenn Sie Ihrer ${lm://Field/3} eine Beschreibung zuordnen würden, welche würde am ehesten zutreffen.

- Frühstück
- Mittagessen
- Abendessen

Um wie viel Uhr haben Sie Ihre ${lm://Field/2} gegessen?

Wo haben Sie Ihre ${lm://Field/2} zu sich genommen?

- Zu Hause
- Bei jemand anderem zu Hause (z.B. bei Freunden oder Familienangehörigen)
- In einer Kantine, einer Mensa, einer Cafetaria, einer Fast-Food Kette, einem Restaurant, Imbiss oder ähnlichem
- Am Arbeitsplatz
- Unterwegs (z.B. im Bus, in der Bahn, im Auto, ...)
- Draußen in der Natur (z.B. im Park)
- An einem anderen Ort, und zwar

Wie hungrig haben Sie sich vor dem Essen gefühlt?

Überhaupt nicht hungrig — Extrem hungrig

Geben Sie bitte an, wie Sie sich in dem Moment gefühlt haben.

	gar nicht			einigermaßen			äußerst
ärgerlich	○	○	○	○	○	○	○
glücklich	○	○	○	○	○	○	○
entspannt	○	○	○	○	○	○	○
energiegeladen	○	○	○	○	○	○	○
ängstlich	○	○	○	○	○	○	○
traurig	○	○	○	○	○	○	○

Haben Sie neben dem Essen noch etwas Anderes gemacht?
Beispiele: Fernsehen, Arbeiten, im Internet surfen etc.
(Ausgenommen ist ein Gespräch während des Essens, sollten Sie mit einer oder mehreren Personen gegessen haben.)

- Ja
- Nein

Haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} Fleisch gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- Ja
- Nein

Welche der folgenden Lebensmittelkategorien haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- ☐ Schweinefleisch
- ☐ Rindfleisch
- ☐ Geflügel
- ☐ Fisch
- ☐ Anderes Fleisch (Lamm, etc.)
- ☐ Weiß ich nicht.

Waren andere Personen anwesend, während Sie gegessen haben?

- ○ Nein, ich war alleine.
- ○ Ja, ich habe in Gesellschaft gegessen.

Hat die andere anwesende Person oder haben die anderen Personen ein Gericht mit Fleisch gegessen?

- ○ Ja
- ○ Teils-teils
- ○ Nein
- ○ Weiß ich nicht

Inwiefern stimmen Sie den folgenden Aussagen zu.

Dieses Gericht zum ${q://QID17/ChoiceGroup/SelectedChoices} zu essen ist etwas, ...

	Ich stimme gar nicht zu						Ich stimme voll und ganz zu
für das ich mich automatisch entschieden habe.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne mich bewusst daran erinnern zu müssen.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne groß nachzudenken.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne es zu bemerken.	○	○	○	○	○	○	○

Verabschiedung täglich

Vielen Dank für das Ausfüllen des heutigen Fragebogens!

Haben Sie sonstige Anmerkungen oder Kommentare zur Studie?

Bei weiteren Fragen oder Problemen können Sie mich gerne unter folgender Adresse kontaktieren: patricia.wowra@ernaehrung.uni-giessen.de

Sie erhalten morgen wieder um dieselbe Uhrzeit einen Link zum Fragebogen.

Diary Study – Day 5

JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Studie zum Essverhalten im Alltag

Daily Questionaire

Herzlich willkommen!

Heute erhalten Sie den **letzten Fragebogen der Studie**.

Die Fragen dieses Fragebogens beziehen sich auf Ihre Mahlzeiten von **heute (Freitag, den 15.01.2021)**.

Füllen Sie den Fragebogen nur aus, wenn Sie heute (15.01.2021) bereits Ihre letzte Mahlzeit zu sich genommen haben. Sollte das noch nicht der Fall sein, können Sie den Link einfach später aufrufen, um wieder auf den Fragebogen zuzugreifen.
Sollten Sie den Fragebogen erst am Samstag, den 16.01.2021, ausfüllen, beziehen Sie Ihre Antworten bitte weiterhin auf Freitag, den 15.01.2021.

Die Dauer des Fragebogens beträgt weniger als 10 min.

Auch wenn Ihnen im Laufe der Studie die Fragen bekannt vorkommen, ist es für die Qualität der Studie wichtig, dass Sie alle Fragen beantworten.

Danke für Ihre Unterstützung!

Datenschutz:
Alle Daten werden vollkommen anonym erhoben, streng vertraulich behandelt und nur zur Untersuchung von Ernährungsverhalten verwendet. Ein Rückschluss auf Ihre Person ist somit zu keiner Zeit möglich.

Bei weiteren Fragen können Sie mich gerne unter folgender Adresse kontaktieren:
patricia.wowra@ernaehrung.uni-giessen.de.

Zum Einstieg würden wir gerne erfahren, ob der Tag heute einem für Sie typischen Wochentag entspricht.
(Beispiel für untypische Tage: erkrankt, im Urlaub, Quarantäne etc.)

Ja, es war ein typischer Tag.			mehr oder weniger			Nein, der Tag war untypisch.
○	○	○	○	○	○	○

Inwiefern?

- ☐ Quarantäne (freiwillig oder verpflichtend)
- ☐ Urlaub
- ☐ erkrankt (selbst oder Kinder)
- ☐ [ ] Sonstiges:

Im Folgenden soll der Fokus auf Ihre Hauptmahlzeiten gelegt werden. Snacks, d.h. kleine Zwischenmahlzeiten, werden im Weiteren **nicht** erfragt.

Wie viele Hauptmahlzeiten haben Sie heute (**Freitag, den 15.01.2021**) eingenommen?

[ ]

Hauptmahlzeit

Die folgenden Fragen beziehen sich auf Ihre **${lm://Field/2}** heute (**Freitag, den 15.01.2021**).

Wenn Sie Ihrer ${lm://Field/3} eine Beschreibung zuordnen würden, welche würde am ehesten zutreffen.

- ○ Frühstück
- ○ Mittagessen
- ○ Abendessen

Um wie viel Uhr haben Sie Ihre ${lm://Field/2} gegessen?

[▾]

Wo haben Sie Ihre ${lm://Field/2} zu sich genommen?

- ○ Zu Hause
- ○ Bei jemand anderem zu Hause (z.B. bei Freunden oder Familienangehörigen)
- ○ In einer Kantine, einer Mensa, einer Cafetaria, einer Fast-Food Kette, einem Restaurant, Imbiss oder ähnlichem
- ○ Am Arbeitsplatz
- ○ Unterwegs (z.B. im Bus, in der Bahn, im Auto, ...)
- ○ Draußen in der Natur (z.B. im Park)
- ○ [ ] An einem anderen Ort, und zwar

Wie hungrig haben Sie sich vor dem Essen gefühlt?

Überhaupt nicht hungrig — Extrem hungrig

[ ]

Geben Sie bitte an, wie Sie sich in dem Moment gefühlt haben.

	gar nicht			einigermaßen			äußerst
entspannt	○	○	○	○	○	○	○
ängstlich	○	○	○	○	○	○	○
glücklich	○	○	○	○	○	○	○
energiegeladen	○	○	○	○	○	○	○
traurig	○	○	○	○	○	○	○
ärgerlich	○	○	○	○	○	○	○

Haben Sie neben dem Essen noch etwas Anderes gemacht?
Beispiele: Fernsehen, Arbeiten, im Internet surfen etc.
(Ausgenommen ist ein Gespräch während des Essens, sollten Sie mit einer oder mehreren Personen gegessen haben.)

- ○ Ja
- ○ Nein

Haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} Fleisch gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- ○ Ja
- ○ Nein

Welche der folgenden Lebensmittelkategorien haben Sie zum ${q://QID17/ChoiceGroup/SelectedChoices} gegessen?

(Denken Sie auch an verarbeitete Lebensmittel, wie Aufschnitt, Bolognese-Soße mit Hackfleisch, etc.)

- ☐ Schweinefleisch
- ☐ Rindfleisch
- ☐ Geflügel
- ☐ Fisch
- ☐ Anderes Fleisch (Lamm, etc.)
- ☐ Weiß ich nicht.

Waren andere Personen anwesend, während Sie gegessen haben?

- ○ Nein, ich war alleine.
- ○ Ja, ich habe in Gesellschaft gegessen.

Hat die andere anwesende Person oder haben die anderen Personen ein Gericht mit Fleisch gegessen?

- ○ Ja
- ○ Teils-teils
- ○ Nein
- ○ Weiß ich nicht

Inwiefern stimmen Sie den folgenden Aussagen zu.

Dieses Gericht zum ${q://QID17/ChoiceGroup/SelectedChoices} zu essen ist etwas, ...

	Ich stimme gar nicht zu						Ich stimme voll und ganz zu
für das ich mich automatisch entschieden habe.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne mich bewusst daran erinnern zu müssen.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne groß nachzudenken.	○	○	○	○	○	○	○
für das ich mich entschieden habe, ohne es zu bemerken.	○	○	○	○	○	○	○

SRBAI

Die folgenden Aussagen beziehen sich nun nicht mehr auf Ihre heutigen Mahlzeiten, sondern auf **Ihr Essverhalten im Allgemeinen**.
Inwiefern stimmen Sie den folgenden Aussagen zu.

Ein Gericht mit Fleisch zu essen ist etwas, ...

	Ich stimme gar nicht zu.						Ich stimme voll und ganz zu.
für das ich mich automatisch entscheide.	O	O	O	O	O	O	O
für das ich mich entscheide, ohne mich bewusst daran erinnern zu müssen.	O	O	O	O	O	O	O
für das ich mich entscheide, ohne groß nachzudenken.	O	O	O	O	O	O	O
für das ich mich entscheide, ohne es zu bemerken.	O	O	O	O	O	O	O

Verabschiedung täglich

Das war der letzte Teil der Studie. Vielen Dank für Ihre Teilnahme!

Haben Sie sonstige Anmerkungen oder Kommentare zur Studie?

Bei weiteren Fragen oder Problemen können Sie mich gerne unter folgender Adresse kontaktieren: patricia.wowra@ernaehrung.uni-giessen.de