Examining Eating: Bridging the Gap between "Lab Eating" and "Free-Living Eating"

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ABSTRACT Food consumption and its physiological, psychological, and social antecedents and outcomes have received considerable attention in research across many disciplines, including consumer research. Although researchers use various methods to examine food decision making, many insights generated stem from observing eating choices in tightly controlled lab settings. Although much insight can be gained through such studies (or "lab eating"), it is apparent that many factors differ between such settings and everyday consumption (or "free-living eating"). This article highlights key differences between lab eating and free-living eating, discusses ways in which such differences matter, and provides recommendations for researchers regarding how and when to narrow the gap between them, including by enriching lab studies in ways inspired by free-living eating. Besides suggesting how researchers can conduct studies offering a deeper understanding of eating patterns, we also highlight practical implications for improving food consumption for consumers, marketers, and policy makers.

Food is one of the most widely studied consumer research topics. Indeed, although obesity's causes are multifaceted and complex, food choices play a key role in weight gain (Livingston and Zylke 2012). Moreover, issues such as sustainability (Block et al. 2016) and general well-being (Block et al. 2011) are also important food-related outcomes. Therefore, understanding people's food selections and consumption and their responses to various interventions shaping these choices is important, and consumer research has made considerable progress in this regard (Cadario and Chandon 2020). At the same time, researchers often use laboratory studies to make recommendations for real-world interventions, despite not having evidence that they are effective beyond lab settings.

Like many areas of consumer research, researchers have differing aims when conducting food research, which should guide their methodological choices and trade-offs between external and internal validity (Lynch 1982, 1983, 1999; Calder, Phillips, and Tybout 1983). Theory testing, for example, warrants controlled "lab eating" studies. Conversely, applying a theoretical prediction to a specific context, say, to estimate the effects of a local soda tax on children's convenience store purchases (Seiler, Tuchman, and Yao 2021) warrants a study closely mirroring the context and population of interest and capturing people's eating behaviors unconstrained by researchers—which is known as "free-living eating" in nutrition research (e.g., Petty, Melanson, and Greene 2013).

We propose that although lab eating, as it is often conducted, is suitable for some research goals, there is considerable opportunity to better bridge the gap between lab eating and free-living eating by enriching lab-eating studies to account for background factors that exist within free-living eating and/or by using more multi-method approaches. Indeed, researchers often fail to capture, or even acknowledge, the many background factors that exist within free-living eating environments when reporting their lab eating research studies. This compromises attempts to translate lab findings into other contexts, including the real world (Lynch 1982). We

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contend that researchers should consider these factors in developing "enriched" lab studies, enhanced in ecological validity and realism (Morales, Amir, and Lee 2017; Van Heerde et al. 2021), and we provide recommendations for doing so. Moreover, we argue that researchers should consider incorporating these factors as moderators in their theories and studies, thereby illuminating boundary conditions or enhancing external validity by showing robustness to variations in these background factors (Lynch 1983). Although we focus on recommendations drawing from free-living eating to improve lab eating, field studies themselves are also specific to particular settings. Conducting studies in the field increases ecological validity (i.e., mapping onto a situation that occurs in real life) but does not automatically increase external validity (i.e., the ability of the results to hold across different settings or background factors than those studied, characterized as "conceptual replicability or robustness" by Lynch [1982]). As such, some of our recommendations for considering background factors that exist within free-living eating also extend to field studies.

We next offer three illustrations of the potential disconnect between lab eating and free-living eating. First, estimates of the magnitude of the effect of four front-of-pack nutrition labels on the nutritional quality of the basket of foods purchased were 17 times smaller in a large randomized controlled trial conducted in supermarkets (Dubois et al. 2021) than in a high-quality incentive-compatible lab study using the same dependent variable (Crosetto et al. 2020). Second, meta-analyses of lab studies support the effectiveness of using smaller plates as a means of reducing consumption when people serve themselves (Hollands et al. 2015; Holden, Zlatevska, and Dubelaar 2016). However, a recent study using procedures more closely mapping onto free-living eating found no effect of smaller plates on how much people serve themselves and how much they eat (Kosīte et al. 2019). Third, effect sizes can also be larger in free-living eating than in lab eating: Gough et al. (2021) found that giving people larger portions of popcorn increased consumption more when the study was conducted in people's homes than when it was conducted in a lab. These examples highlight different consequences of not fully considering gaps between lab eating and free-living eating.

This article has two main goals: (1) to introduce and explicate key differences varying along a continuum from lab eating to free-living eating using a classic who, what, where, when, why, and how framework; and (2) to suggest ways to adapt research approaches to bridge the gap between lab eating and free-living eating in ways appropriate to the research's objectives. We also echo recent calls for multimethod approaches (Inman et al. 2018), particularly when researchers have both theoretical and practical objectives. Accordingly, we offer a sampling of different researcher objectives in the eating domain and how various methods may best match those objectives.

LAB EATING VERSUS FREE-LIVING EATING

We begin by introducing and explicating key differences between lab eating and free-living eating using a classic who, what, where, when, why, and how framework (see table 1 for a summary of key differences and recommendations about how to bridge the gap). Although we discuss them as two distinct categories, lab eating and free-living eating are at two ends of a continuum ranging from very tightly controlled and somewhat sparse laboratory studies to everyday eating choices with no interference from researchers, and therefore a range of other research methods (several mentioned later; see table 2) fall between these extremes. We also note that although not all who, what, where, when, why, and how factors will be relevant to every research question or aim, they are worth consideration as potential background factors to assess and report.

Who?

The first critical aspect of "who" is whose eating we measure. Much lab eating is conducted using undergraduate students. The notion that undergraduate samples are WEIRD (Western, educated, industrialized, rich, democratic) is well documented (Henrich, Heine, and Norenzayan 2010), and so are the age (Rolland-Cachera et al. 1991) and socioeconomic (Claassen et al. 2019) gradients of obesity. Yet demographic characteristics are not extensively considered or even reported in consumer research publications as they often are in nutrition, medical or public health research, contributing to the potential for overlooking important differences in effects based on underlying demographic factors (Lynch 1982). For example, consumer research articles commonly report the average age and gender of their samples but nutrition, medical, and public health publications also report information on race, ethnicity, income, and education. These publications (e.g., *Appetite*) go further and instruct authors to report the results separately for each of these groups. We contend it is important to focus more on sample details to assess generalizability over time and place. For example, although many consumer researchers motivate their eating studies by the need to understand the obesity epidemic, lab-eating studies typically recruit participants with normal weight. Yet normal-weight participants sometimes respond

Table 1. Free-Living Eating versus Lab Eating

	Free-living eating	Lab eating	Incorporating free-living eating factors in lab-eating studies[a]
Who?	• People vary widely in demographic and other personal characteristics (e.g., BMI) and dietary preferences.	• Participants are typically young (mostly undergraduates 18–22 years old), in the normal BMI range, literate (often highly educated), from Western culture (with Western dietary preferences), and relatively high socioeconomic status.	• Consider recruiting more varied samples both within and across studies to include both normal weight and overweight/obese participants as well as a wider range of age, race/ethnicity, cultures, and socioeconomic status. Consider testing for main effects or boundary conditions using these factors.
	• People eat in isolation and total anonymity; are only "watched" by the server, cook, or chef who prepared the meal; or are watched by significant others (friends, partners, family members, caregivers).	• In terms of the influence of others, participants know that they, or at least their choices, are being "watched" by an authority figure (the experimenter) but often no one else.	• Consider varying whether others are present during eating decisions. Minimize the feeling of "being watched" by the experimenter when this is not the purpose of the study.
	• People (or their family members) typically dispose of their own food or wash their own dishes.	• Participants do not often dispose of their own food or wash their own dishes, and someone they don't know will do this for them (an experimenter).	• Consider using self-disposal within the lab setting.
	• With whom? Typically, when eating with others, these people include friends, family members, and/or coworkers, and one can see what the others are eating and talk to them. Other people, often strangers, may be eating in the same environment; and the individual can see what they are eating but often they don't directly interact.	• With whom? Typically, alone. Other people, typically strangers, are eating at the same time and in the same place as participants, although it is likely that participants can't see what they are doing or talk to them.	• Consider conducting studies with dyads/groups and make it clear in the reporting whether participants know with whom they are eating.
	• With whom? People often eat multiple foods from containers that they and other people (e.g., friends, family members) are also consuming from (i.e., shared plates or a shared pantry).	• With whom? Participants typically eat a portion of a single food from a container that only they can consume from.	• Consider conducting studies with dyads/groups and allow sharing of multiple foods or eating from a common serving dish or plate.
	• For whom? People choose for themselves as well as for other people at times.	• For whom? If choices about what to eat or how much are made, they are almost always for oneself.	• Consider varying whether choices differ when made for themselves versus for others.
	• By whom? The person or a family member likely paid for, and very likely shopped for and prepared what they are eating.	• By whom? Participants rarely pay for, and very unlikely shopped for or prepared what they are eating.	• Consider increasing the level of incentive-compatibility, such as by providing a budget from which food choices will be made.

Table 1. (*Continued*)

	Free-living eating	Lab eating	Incorporating free-living eating factors in lab-eating studies[a]
What?	• People can choose what they will eat from a wide range of options, including niche, culture, or individual-specific dishes or food flavors. They can choose more than one type of food, the condiments or other food or beverages they will eat with their food.	• Participants either do not have a choice about what they are eating, or they have a very small choice set, often two options which represent a binary choice (e.g., healthy vs. not healthy) of broad appeal food dishes and flavors.	• Consider broadening the number and range of options available to participants to better represent typical eating decisions. Consider customizing choice sets provided to specific tastes of the participant.
	• People typically have access to a beverage of their choice, simultaneously while eating.	• Participants typically do not have access to a beverage simultaneously while eating.	• Provide participants with easy access to water during lab eating or consider examining the interactions between eating and drinking behaviors (including with alcohol).
	• People generally have access to information on what they are eating, especially if the food was prepared at home, such as price, nutrition facts, ingredient list, health or nutrition claims but also brand name and description. For nutrition and regulated claims, this information is accurate.	• Participants have access to limited information on what they are eating (e.g., they are often not given the packaging, ingredient list, price, brand, etc.). At times this information might be purposely misleading.	• When possible, consider including the same level and type of information that participants are most likely to encounter in everyday environments, including branding and nutritional information.
	• The wider array of foods varies in preparation difficulty (e.g., including hot/cold foods).	• The limited set usually consists of easy to provide/prepare foods (e.g., room-temperature, nonrefrigerated snacks).	• Consider including options served hot or cold in research studies.
Where?	• People eat at the place of their choosing whether it be at home (or a table, at their desk, or on the couch), work, a restaurant, in their cars, or otherwise.	• Participants are asked to come to a specific location, typically a research lab of a research university, and eat at a computer or other workstation.	• Attempt to create as typical of an eating environment as possible and/or test effects in at least 2–3 different set-ups within the lab. Attempt to recreate public versus private consumption scenarios to the extent possible.
	• People eat in the presence of a wide range of ambient factors including the décor, lighting, noise level, views, and other atmospheric elements.	• Participants eat in a tightly controlled environment intended to hold atmospheric elements constant or manipulate specific atmospheric elements to represent levels of interest to the research question.	• When studying food decisions without an emphasis on specific atmospheric elements, considering demonstrating that effects hold both in sparse lab environments as well as more typical daily eating environments.
	• People are often eating in distracting environments (e.g., watching TV or phones, conversing with others, working on their computers, driving, etc.).	• Participants are typically eating either in a distraction-free environment or are asked to perform a specific distracting task (completing other studies; watching a film clip) while eating; distraction is low or held constant.	• Consider incorporating typical distractions while participants are eating.

Table 1. (*Continued*)

	Free-living eating	Lab eating	Incorporating free-living eating factors in lab-eating studies[a]
	• When eating occurs at home or in restaurants, it often occurs at a table setting with utensils and other typical table and serving items.	• Participants may not have utensils and other typical table or serving items or have, at best, disposable tableware.	• Provide disposable utensils (or reusable utensils with proper sanitation protocols) and other serving items that best reflect the eating decision environment in real life.
When?	• People are eating during and outside business hours (e.g., eating in the late evening, on weekends, on holidays, etc.)	• Participants are eating primarily during business hours or are otherwise constrained to the timing of the study.	• Consider intentionally conducting lab-eating studies at varying times of the day and on both weekdays and weekends.
	• People arrive at a situation often knowing (and planning) that they will be eating. They have often made a free choice to begin eating.	• Participants arrive at a situation unaware that and/or what they will be eating, or aware that they will be eating (and hungry) because they were asked to fast. They have rarely made a free choice to begin eating, having been asked by an authority figure (i.e., the experimenter) to do so.	• Unless the primary purpose of study is to determine responses to spontaneous opportunities to eat, inform participants in advance that the study will involve food consumption, and consider telling them what the food(s) will be.
	• People make eating choices for both immediate consumption (from pantry or refrigerator or restaurant menu) or for consumption at a later point (e.g., putting aside food for later consumption, cooking ahead of time).	• Participants make choices primarily for immediate consumption.	• Include choices about foods that will not be consumed until a future point in time.
	• People can choose not to eat in any given situation.	• Participants are often compelled to make choices or feel obligated to eat in research studies.	• Include no-choice options when possible.
	• People's choices or consumption in the current situation are affected by previous choices and/or subsequent choices.	• Participants' choices are rarely linked to any of their past choices. Future choices are rarely assessed.	• Collect information about potentially relevant previous or future consumption. Potentially follow-up to capture consumption later in the day following the lab-eating study.
Why?	• People are influenced by a wide range of physiological, psychological, social, emotional, and environmental motivations driving eating behaviors. In some cases, people may eat rather mindlessly, without paying attention to their eating behavior.	• Although hunger often plays a role, in many cases participants are eating because they are asked to do so or feel obligated to do so, which may influence their food choices. Self-presentation and ingratiation goals may be salient. People may eat more mindfully.	• At a minimum, assess current level of hunger during lab eating and ideally general attitudes towards eating (dieting status, restrained eating tendencies, food allergies, etc.). Strive to provide a safe space in which participants do not feel judged (e.g., choices are only measured at the aggregate level). Only conduct eating studies among participants who feel like eating.

Table 1. (*Continued*)

	Free-living eating	Lab eating	Incorporating free-living eating factors in lab-eating studies[a]
How much?	• People may eat from either a predefined and fairly small one-serving portion size or a very large and undefined portion size. • Leftovers are for people to decide how to deal with, and one can save them to eat for later, share them with someone else, or discard them.	• Participants typically have little choice in terms of the portion size to eat from unless portion size choice is a primary aim of the study. • Leftovers often remain at the study, and participants cannot hide them, save them to eat for later, or share them with someone else.	• When possible, participants should be provided with options in terms of the amount of the food(s) available to them. • Provide the opportunity for participants to save and consume food at a later point in time, ideally coupled with collecting information about subsequent consumption.

[a] The recommendations for free living factors into lab-eating contexts depend upon the main objectives of the researcher and would not necessarily apply across all studies.

differently to marketing tactics than do people with obesity (Cornil et al. 2022).

Another important "who" question is with whom people are eating. Food consumption is frequently social, and others' choices provide strong inputs into what to eat (Ariely and Levav 2000; Liu, McFerran, and Haws 2020), where to eat (Liu and Min 2020), when to eat (Higgs 2015), and how much to eat (McFerran et al. 2010; Liu et al. 2020). Eating is connected with social and cultural norms, as shared plates (Woolley and Fishbach 2019), family meals (Hammons and Fiese 2011), and the importance of food at celebrations attest. Yet in lab eating, participants are often in private cubicles; only rarely are there groups (see, for an exception, Lowe and Haws [2014]). Even then, others are often strangers—either fellow participants or research confederates. Consumers also have social identity and self-presentation goals germane to food, which should be more salient in public eating settings. For instance, choosing to eat meat (Gal and Wilkie 2010; Rozin et al. 2012) and unhealthy food (Vartanian, Herman, and Polivy 2007) are both viewed as more masculine. Furthermore, in free-living eating, norms such as eating to please the host, to leave a certain amount for others, or to finish one's food to avoid waste are likely stronger than in lab eating. Finally, meals in large groups tend to last longer and thus increase consumption (De Castro and Brewer 1992).

What?

Although multiple literatures (e.g., anthropology, culture, biology) address what people eat and how they develop taste preferences over time, most lab eating focuses on one-time choices. Typically, the choice set consists of two snack options (e.g., fruit salad vs. chocolate cake, almonds vs. M&Ms). In contrast, free-living eating commonly involves eating multiple foods simultaneously, especially in nonsnack meal consumption, which accounts for three-fourths of total caloric consumption by one estimate (Yoquinto 2011).

Furthermore, for convenience or liability issues, some foods and beverages are almost never studied in lab eating. For example, few studies involve hot food (for an exception, see Yamim, Mai, and Werle 2020). Although 70% of Americans drink alcohol at least once a year (NIAA 2021), and although food and alcohol choices influence one another (e.g., food-wine pairings; Harrington 2007), alcohol consumption is almost never studied in consumer research (for an exception, see Cornil, Chandon, and Krishna 2017). Relatedly, although beverages in general influence food choices (Kruger and Kruger 2015), increase fullness (Lappalainen et al. 1993), and are typically available when free-living eating, beverages other than plain water are often not available in lab eating. Additionally, in free-living eating, choice set options are often constructed by consumers either in advance through planning (e.g., shopping lists; Block and Morwitz 1999; Suher, Huang, and Lee 2019) or in the moment (e.g., searching the pantry; impulse shopping). In lab eating, choice sets are highly engineered and "gated" decisions influencing what one will eat. When free-living eating away from home, consumers may select among a large set of restaurants or among many menu items from a specific restaurant.

Even studies that introduce realism by making more than two food options available often constrain consumers to select only one option (e.g., Redden and Haws 2013; for exceptions, see Liu et al. [2015] and Haws, Davis, and Dholakia [2016]). Or when consumers are allowed to select multiple options (Bayuk, Janiszewski, and Leboeuf 2010), the food is often not actually consumed. Additionally, free-living eating also involves varying choice sets and foods consumed over time. Yet the limited lab eating that considers sequential food choices tends to focus on highly compressed time periods—typically two choices from similarly constrained choice sets within the same research participation session of an hour or less (Fishbach and Dhar 2005; Mukhopadhyay and Johar 2009).

Another factor driving eating differently in lab versus free-living settings is information provision, including of ingredient or nutrition content (Hawley et al. 2013; Liu et al. 2014; Nikolova and Inman 2015). Such information is often purposely inaccessible in lab eating. In some studies, food is presented already removed from its package and poured into a bowl or plate (Liu et al. 2015; Yang, Gu, and Galak 2017), whereas in others, food is presented in a sealed bag (sometimes in a clear bag that allows participants to see the contents clearly, without any brands or labels; Scott et al. 2008). In most cases, foods (even packaged snacks) are often presented without ingredient or nutrition information unless the research question is about this type of information. When presented, such information is provided "close up" with fewer distractions than in the grocery store or in a restaurant, biasing effect sizes upward (Dubois et al. 2021). Additionally, other constraints besides nutrition (e.g., cost, convenience) also affect what consumers choose when free-living eating, and yet these factors are typically held constant in lab eating (e.g., food is free and already prepared).

Where?

Lab settings are typically designed to be sparse, with neutral ambient characteristics. For instance, lab eating tends to use standard (disposable) plates, cups, and occasionally other eating utensils. In contrast, free-living eating generally involves more elaborate table settings with a wider array of nondisposable plates, cups, eating utensils, and serveware. Yet the nature of these elements can have a significant effect. For instance, plate size may influence how much people serve themselves, affecting amounts consumed in some lab settings (Holden et al. 2016), while plate material (disposable vs. reusable) affects how much is consumed or thrown away (Williamson, Block, and Keller 2016). Even utensil size influences how much people eat (Geier, Rozin, and Doros 2006; Hollands et al. 2015). Similarly, décor, lighting, noise, background music, temperature, or crowdedness all affect free-living eating (Stroebele and De Castro 2004), mostly through their effects on distraction and consumption monitoring (as reviewed by Wansink and Chandon 2014). For example, people eat more during and after watching television because it reduces attention to their food (Hetherington et al. 2006; Higgs and Woodward 2009). In short, many aspects of one's surroundings can influence food consumption.

When?

In lab eating, participants often (1) do not know they will be eating beforehand or what they will eat and (2) have limited choice regarding what time to participate; this participation time may not correspond to their natural eating times. Yet timing matters: food choices depend heavily on time of day (Gullo et al. 2019; Cadario and Morewedge 2022) and can differ for weekdays versus weekends or special holidays (Khare and Inman 2006; Hildebrand, Harding, and Hadi 2019). Yet lab eating research typically does not report the timing of the study and rarely examines food intake during weekends or holidays, and almost never in the early morning or late evening.

In free-living eating, consumers often exert some effort to obtain their food (even simply walking to the pantry); food accessibility thus affects when they eat, as more accessible food increases eating (Swinburn et al. 2011; Baskin et al. 2016). Consumers also make advance food decisions to accommodate later eating episodes, which may also account for prior consumption. In contrast, lab participants typically receive food without needing to exert effort, and eating decisions are mostly for the present. Overall, in the lab, participants have much less control over "when" to eat than in free-living eating.

Why?

Consumers possess wide-ranging motivations to eat. The Eating Motivation Survey (Renner et al. 2012) captures this breadth of motivations with varied statements, such as "because I'm hungry"; "because I usually eat it"; and "because it is inexpensive." However, this long list does not include "because I was asked by researchers." Although consumption in lab eating is rarely mandatory (due to ethical guidelines and dietary allergies/restrictions), participants likely feel compelled to eat unless they have dietary allergies/restrictions. Contributing to this implicit compulsion, participants have been asked to eat by an authority figure, assume other participants are also eating during the session (even if they cannot observe them eating), and the food is presented without

financial cost to them. Overall, most prior research suggests that all or most participants complied with instructions to start eating or are silent on the issue, suggesting that explicit or implicit "no-choice" options are not the norm. This matters because being compelled to eat leads to different food choices than choosing to eat. For example, Finkelstein and Fishbach (2010) found that imposed healthy eating leads to greater subsequent consumption.

Other common lab eating paradigms include purported "taste tests" (Brendl, Markman, and Messner 2003; Laran and Salerno 2013) or an offer of food "to enjoy while you [do something else]," such as watch a video (Liu et al. 2015; Duke and Amir 2019; Tangari et al. 2019). Another prevalent approach is to present food as study compensation or a bonus (Ferraro, Shiv, and Bettman 2005). Although these paradigms can identify causal effects on food intake (Robinson et al. 2017), such motivations may differ dramatically from motivations for free-living eating.

Intuitions about hunger's importance as a driver of eating lead researchers to design lab-eating studies that aim to account for hunger yet still differ from free-living eating in various ways, by (1) asking participants to fast beforehand (Chae and Zhu 2014), (2) assessing hunger levels prior to eating (Tangari et al. 2019), and (3) measuring the time since participants last ate (Duke and Amir 2019). Hunger has an obvious influence on eating behaviors but also on the effects of many of the interventions studied by researchers, and its effects are not necessarily linear. For example, lab-eating studies demonstrated that sensory imagery interventions are more likely to lead people to choose smaller portion sizes when they are moderately hungry than when satiated (Cornil and Chandon 2016). However, free-living eating research subsequently found that the effectiveness of sensory interventions diminishes when hunger is very high (Lange et al. 2020). This unanticipated ceiling effect was only discovered because the free-living eating study was conducted with 10-year-old school children at the time of their afternoon snack, when many were extremely hungry.

Beyond hunger, multiple other factors concurrently motivate eating behaviors, including liking, emotional states, visual appeal, convenience, social norms, and prices (Renner et al. 2012). We do not describe these in detail herein (and our coverage of "why" in table 1 is intentionally general), but we note that researchers generally attempt to streamline motivations (e.g., manipulate some motivation while controlling for others) or discount motivations to eat (e.g., ignore most known motivations) in lab eating. However, these motivations often interact with interventions studied, sometimes even reversing effects. For example, André, Chandon, and Haws (2019) found that people prefer "low-fat" breakfast cereals to those without artificial flavors when they have a dieting goal but have the opposite preference when their goal is to eat healthily. In short, the full "why" behind daily eating is nearly impossible to recreate in a lab eating setting, but measuring, recording, and controlling for some basic motivations may help address these gaps.

How Much?

We focus our "how" specifically on "how much," given its centrality to overall consumption. Food-specific "fullness," known as sensory-specific satiety (SSS; Rolls et al. 1981), leads consumers to stop eating a food because it is no longer enjoyable, even though they may not feel physiologically satiated (Cornil 2017). SSS is related to boredom and monotony (Rolls et al. 1981), and when consuming a single food, SSS can lead to ceasing consumption, particularly if a consumer is attending to their decreased enjoyment (Redden and Haws 2013).

However, sometimes decreasing hunger or increasing SSS are not sufficient cues to cease consumption. Some consumers may use cognitive resources to limit amounts immediately available prior to starting consumption—such as by making a deliberate portion size selection (Wertenbroch 1998). In free-living eating inside the home, such selections can be made and reversed easily. Deliberate advance portion size selection can be more difficult outside the home, where most restaurants offer entrees in one size, although beverages and snacks (e.g., movie theater popcorn) regularly come with some size options (Haws et al. 2020; Liu and Haws 2020). Within lab eating, consumers are often provided with a single portion size option—typically a snack—unless the topic under study is portion sizes.

When the topic is portion sizes selected or amount consumed, lab studies often provide more portion size choices than seen in the marketplace (e.g., in Cornil and Chandon [2016], six different cake slice sizes), both to enable more fine-tuned conclusions about factors influencing portion size choice and to identify nudges that could be employed in the real-world. Furthermore, and closely related to "when" considerations, there are often binding time restrictions (e.g., eating during a 5-minute movie clip; McFerran et al. 2010). Clearly, such restrictions may alter how much is eaten.

Finally, in free-living eating, consumers are typically responsible for disposing of (or saving) uneaten food portions, whereas this is rarely true in lab eating. The responsibility for managing uneaten food portions can also shape how much

people eat and how they spread food portions over time (Krishna and Hagen 2019).

RECOMMENDATIONS FOR FOOD RESEARCH

Food decision making is an area in which internal validity and realism are often difficult to achieve simultaneously. One solution is to consider multi-method approaches (Inman et al. 2018). Indeed, consumer research on food (and other topics) increasingly pairs a single field study with a much longer series of lab studies. This imbalanced approach is not necessarily misguided, but it does imply internal validity is more important than realism. Although we do not think an article with five field studies and a single lab study is the desired ratio either, we do think more articles adopting a balanced approach would be valuable (see Rozin et al.'s [2012] study of the genderization of foods as one example).

More pertinent to our current focus, simply adding a field study to a set of lab studies tends to treat external and internal validity as two polar ends of a continuum. Yet field studies are not intrinsically better than lab studies at ensuring that results hold across different contexts or populations (which is the definition of external validity). Rather, improving external validity requires considering whether and how "who," "what," "where," "when," "why," and "how much" background factors in table 1 fit with one's research, and then controlling, or (better) manipulating factors likely to moderate the effects studied. We contend that this can be done with only modest procedural alterations, leading to lab studies that increase both external validity (i.e., generalizability) and ecological validity (i.e., mapping to real-life settings).

Therefore, although we favor multi-method approaches when this approach is consistent with the researchers' objectives, we next focus on ideas for enriching lab-eating studies as an additional path to narrowing the gap between lab eating and free-living eating. We also note that, although we focused on research on healthy eating, the same considerations apply to a broader set of food decision-making topics, such as food well-being, safety, insecurity, and waste (Block et al. 2011, 2016).

Incorporating Free-Living Eating Factors in Lab-Eating Studies

Table 1's final column summarizes how our recommendations relate to the various questions discussed in the previous section. We next discuss three sets of recommendations: (1) broadening research samples, (2) improving relevance of stimuli, and (3) expanding outcome variables.

Broadening Research Samples. Studying a broader range of consumers is critical for external validity, particularly when making claims about generalizability of one's theoretical effects across background factors (Lynch 1982). Limited reporting of sample characteristics may limit insights or even lead to incorrect recommendations. Furthermore, established findings about Western (especially US American consumers') food decisions that we often think of as universal (e.g., the unhealthy = tasty intuition; Raghunathan, Naylor, and Hoyer 2006) do not always hold in other countries. For example, French people, unlike Americans, expect healthy food to be tasty (Werle, Trendel, and Ardito 2013). A reliance on university student samples for lab-eating studies also means a narrow age band of participants who are substantially thinner, healthier (in terms of obesity and comorbidities), and less food insecure than the wider population. Many also dine frequently in all-you-can-eat dining halls.

A focus on student samples means we also rarely study eating in other samples, such as children, in whom food preferences are more formative, or older consumers, who often have different eating goals and health concerns than young adults. For example, research is needed to find interventions that encourage older people to eat and drink more to compensate for the nutritional deficiency and appetite loss caused by aging (Hetherington 1998).

Furthermore, researchers should ask whether they are recruiting household food "decision makers" or people whose food decisions are often made for them (Liu, Dallas, and Fitzsimons 2019a). For instance, is a lab study on purchasing food conducted with food decision makers who do most of the grocery shopping? Providing supplemental information about one's sample (e.g., household food decision roles) would be a simple enhancement. Vosgerau, Scopelliti, and Huh (2020) also emphasized this point by coding food decision papers based on whether participants were recruited due to their food, health, or dietary goals, or whether food related goals were measured or manipulated.

Related motivations with an impact on health outcomes, such as those involving physical activity or sedentary behaviors (Okada 2019) or those involving weight loss goals (Haws et al. 2017), are also important to consider and when relevant, to measure and report. We suggest that collecting, reporting, and controlling for, or examining the moderating effects of not only demographic characteristics (e.g., age, gender, race/ethnicity, body mass index [BMI], socioeconomic status) but also motivational drivers (e.g., hunger, dieting status, physical activity, dietary restraint, food allergies/preferences) can improve our treatment both of the "who" and the

"why" aspects of eating behavior. Even if individual-level measures are not the focus, they should be collected when feasible and shared to facilitate subsequent meta-analyses.

Improving Relevance of Stimuli. Just as researchers should consider which aspects of a free-living environment's "what," "where," "when," "why," and "how much" are relevant to their study aims, they should also consider their stimuli's relevance to participants. Instead of a set of two food options, researchers could have participants make multiple food choices or provide snacks curated to match the preferences of individual participants (e.g., having participants first rank-order their liking of various foods and then design choice sets accordingly; see Haws and Liu [2016] and Steffel and Williams [2018]). Certainly, either larger or curated choice offerings will both pose additional costs, which ought to be assessed relative to potential benefits. Perhaps less expensively, increased stimulus pretesting with participants from the same population as the actual study could identify more relevant stimuli for a particular context and participant population (see also stimulus sampling; Wells and Windschitl 1999). Furthermore, simply including a liking measure for a particular food can clarify responses to different interventions (Larson, Redden, and Elder 2014), and reporting liking may help future researchers to design replications mapping more closely onto the original study's conditions or to reconcile differences in the case of failed replications. In free living eating, consumers are rarely forced to eat foods that they do not enjoy, making such foods much less relevant for generality.

Expanding Outcome Variables. It is important to expand outcome variables beyond the primary focus on "what" consumers eat. For instance, "how much" is especially important to overall health. Research could thus examine both "what" and "how much" within the same study—by having participants choose one snack or multiple snacks and measuring amounts consumed. For example, Cornil and Chandon (2013) provided football fans with four foods (tomatoes, grapes, chocolate candies, chips) and measured consumption of each food (in grams, total calories, and macronutrients). Other studies involving multiple foods include Winterich and Haws (2011), Liu et al. (2015), and Hock and Bagchi (2018). The compatibility of eating multiple foods together could also be measured (and reported, facilitating future reconciliation and replication) or manipulated, to shed light on whether these are multiple foods typically offered and eaten together in real life and if this compatibility matters.

Further, participants could be given the opportunity to choose quantities or even serve themselves (Hagen, Krishna, and McFerran 2017), increasing agency over "how much" even if they did not get to choose "what." We suggest that combining these methods by, for example, providing a set of relevant stimuli, customizing, and expanding the number of options, and then allowing participants to either choose or self-serve multiple foods will lead to a stronger mapping from lab eating to free-living eating. The burden on researchers would be relatively light, as lab studies would still be the research method, and not all studies in a paper need to employ these enhanced approaches.

Finally, we have focused on actual eating decisions and consumption, but much research focuses on other outcomes including attitudes and intentions with respect to food choices. We encourage researchers to further examine the relationships between these intervening variables and the full set of short- and long-term eating-related psychological outcomes.

Research Eating Going beyond the Lab

Thus far, we have underscored ways to address the gap between lab eating and free-living eating by enriching lab research. We next highlight four methods going beyond the traditional lab that have been increasingly used by researchers, often through a multi-method approach, summarized in table 2.

Recruiting Participants in Natural Eating Environments. In a field-based approach, recruiting and testing participants occurs in their natural eating environments. This approach provides participants with freedom, rather than constraining them to scheduled lab arrival times and preselected food choices. Such studies may use an industry partnership to vary aspects of an eating experience in a natural environment. For example, Sevilla, Isaac, and Bagchi (2018) varied the type of claim (numerical vs. percentage rank) and examined actual cheese sales at a farmer's market. Alternatively, researchers may recruit people immediately following freely chosen consumption at a restaurant and collect information about what they ordered (via receipts or self-report), the amount they consumed, and their perceptions of the experience. For instance, Hasford, Kidwell, and Lopez-Kidwell (2018) collected information about restaurant diners' orders to estimate calories after their meal. Although field studies naturally bridge many gaps between lab eating and free-living eating, the choice of the natural eating environment should not be based on convenience alone. Field studies are often conducted in schools, workplaces, or hospital cafeterias and less frequently homes or restaurants (but see Schwartz et al.

Table 2. Research Eating Methods That Go beyond the Lab

Method	Key examples[a]	Existing advantages and/or opportunities for improvement
Field studies or experiments	Sevilla et al. (2018); Dubois et al. (2021)	• Recruit consumers shortly after they have made real food decisions—captures real behavior although can be subject to recall biases • Record actual consumption • Use to confirm purchase effects of interventions or theories tested in lab or online • Design to balance realism and control of extraneous environmental factors • Examine real interventions using real consumers in real purchase decisions, over time
Purchase data, grocery stores	Nikolova and Inman (2015); Ailawadi et al. (2018)	• Capture actual purchases, sometimes across different retail outlets • Focus on household patterns • Utilize single-person households to focus on decisions for the self only • Examine patterns of behavior over time • Add follow-up surveys to track or estimate consumption
Purchase data, restaurants	VanEpps, Downs, and Loewenstein (2016); Hock and Bagchi (2018)	• Capture real choices of multiple foods in single time period, which could be enhanced by including consumption measurements • Utilize university or workplace cafeteria environments • Can track online ordering patterns
24-hour dietary recalls	Stanton and Tucci (1982); Haws et al. (2017)	• Include time and place of eating, generating enhanced understanding of "when to start" drivers • Extend the period under study, increase the number of days during period that are recorded • Couple with interventions to track effects
Food diaries, visual food diaries, or self-reports of actual consumption	Khare and Inman (2006, 2009); Emich and Pyone (2018)	• Include time and place of eating recorded by participant, subject to error and quantity biases • Use visual recording of food consumption to enhance accuracy of both food type and quantity (particularly using before and after pictures) • Add simplified version of food diary and recall to other studies to verify effect of any manipulations on subsequent consumption • Use technological devices for recording activity and food consumption
Hybrid field and lab studies	Gough et al. (2021)	• Field studies with remote experimental control: Send food to people's homes and control the procedure remotely via video conferencing tools like Zoom or ProctorU. • Living labs: Seminaturalistic laboratory settings furnished and designed to mimic the natural eating environment (e.g., home or restaurant).

[a] Denotes that this method was used in this article in at least one study, not that this was the only method used in the article.

2012). Consumers likely eat differently based on their location and choose different locations for distinct purposes.

Utilizing Purchase Data. The second approach we highlight is utilizing food purchase data. One example is Nikolova and Inman (2015), who used food purchase data over a 12-month period and found that a simplified point-of-sale nutritional information system improved the nutritional value of purchases in eight common categories. Ailawadi, Ma, and Grewal (2018) combined food purchase data from multiple retail chains to look at spending patterns of consumers across outlets, providing unique insights on nearly all grocery purchases for households over an extended period. Finally, Rishika, Feurer, and Haws (2022) used longitudinal loyalty program purchase data from a deli over 14 months to demonstrate differing patterns of strategic licensing and complement these findings using a lab-based approach to provide supportive process evidence.

Utilizing Dietary Intake Information. Third, we highlight unique insights possible from utilizing food diaries or dietary recalls (Stanton and Tucci 1982). Such investigations

Table 3. Sample Research Objectives and Recommended Methods

Sample research objectives[a]	Recommended method(s)	Considerations regarding mapping to free-living eating background factors
Causal aim: Understand if there is a causal effect of factor *X* on eating in isolation, holding all else constant without confounds	Lab eating	Record the "who," "what," and "why" and clearly acknowledge these gaps compared to free-living eating. Consider "how much" as another eating outcome. The gap between lab eating and free-living eating is less of a concern in this case, so long as claims are not overstated.
Theory aim: Testing a theory (food context is not central to the objective, but an appropriate realistic choice context)	Lab eating	Control and record the "who," "what," "when," "where," and "why," ensuring that the stimuli used are relevant to the theoretical research question through stimulus testing.
Pilot aim: Piloting potential effect size for a future more intensive field study, given practical constraints	Lab eating	Record the "who," "what," "when," "where," and "why" and consider measuring "how much." Try to map each of these characteristics onto the intended field setting as much as possible.
Real-world effect size aim: Determine if an effect exists in some real-world setting (i.e., ecological validity) and if so, its effect size (important for determining intervention effectiveness under specific circumstances of "who" and "where" especially)	Field setting	Record the "who," "what," "when," "where," and "why" and consider measuring "how much." Note that effect sizes likely also vary by field settings and thus recording and sharing the 5Ws and H is also important.
Convenience aim: Study something that is challenging to study in the lab, such as drinking alcohol	Field setting	Consider exploiting natural variations in a quasi-experiment (e.g., sample people before or after exiting a bar) or conducting studies in a safe and appropriate setting (e.g., university cafeterias serving reasonable quantities of alcohol). Record the "who," "what," "when," "where," and "why" and consider measuring "how much."
External validity aim and/or boundary condition aim: Attempt to establish the generalizability of an effect (or boundary conditions) through testing it in multiple situations.	Multi-methods	Measure or manipulate potential moderators in terms of "who," "what," "when," "where," and "why" in both tightly controlled lab experiments and free-living studies. Consider adding correlational data from observational or other secondary data sources.

[a] We acknowledge that these are but some examples of various objectives that researchers may have when conducting food decision-making studies, and that in many cases, there are multiple objectives for the same research project.

provide insights geared more toward understanding patterns of food decision making when free-living eating and often offer more agency in eating decisions. For example, Khare and Inman (2006), Khare and Inman (2009), and Haws et al. (2017) utilized longitudinal data collected from such approaches to examine the roles of habits, meal occasions, and dietary variety. Diary data can also be combined with exogenous shocks, such as the victory or defeat of one's favorite team, in a quasi-experiment (Cornil and Chandon 2013). Additionally, Emich and Pyone (2018) utilized a food diary approach as part of a field study, which compared students whose meals had been paid for (vs. not paid for) and measured their overall consumption through having them record consumption following a cafeteria meal. Finally, Liu et al. (2015, 2019) utilized a dietary recall approach to record free-living eating choices during the rest of the day following the lab study. These examples illustrate ways to add greater insight into free-living eating even though in many of these cases, participants knew that researchers were observing their eating decisions.

Other Novel Approaches. Finally, there is a role for novel hybrid methods that allow free-living eating while providing strong control. One option is enriched "living labs," furnished to mimic the eating environment (e.g., home or restaurant) while providing video and audio feeds to the researcher. Another option is to conduct a field study controlled remotely, wherein researchers send food and other stimuli (e.g., videos to watch while eating) to people's homes. For better control, researchers can guide participants and monitor their behaviors via video conference apps or remote monitoring apps. Recently, however, Gough et al. (2021) found a larger portion size effect size for popcorn eaten at home than in a traditional or living lab, suggesting that the living lab may not always provide a better proxy for free-living eating. Again, we emphasize the importance of the underlying objectives of the research in determining which method or combination of methods is the best fit. See table 3 for examples of research objectives and recommended methods for achieving these objectives.

CONCLUSION

Many important consumer insights have come from studies conducted in carefully controlled lab settings, and we expect most future eating studies to continue to be conducted in this way, especially if researchers' primary goal is theory testing or testing causal effects in highly controlled circumstances. In some cases, however, studies conducted in the lab have failed to account for the variety of background factors about who, what, where, when, why, and how much people eat in free-living conditions. This has limited the generalizability of lab findings to different contexts and everyday life. Future research, either within single papers or across papers, should strive to enrich lab studies by considering how people normally freely eat throughout their daily lives. More thorough recording, reporting, and sharing of such background factors (e.g., including them in the data accessible to other researchers) should enable other researchers to look across papers to begin identifying the most potentially impactful background factors (e.g., who, what, where, when, why, and how much) within a given area of food research, thus spurring future research. Researchers should also continue to test interventions in both lab and field settings whenever possible to understand what interventions work differently or have widely disparate effect sizes based on the study setting, further bridging the gap between lab eating and free-living eating.

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