

Boosting engagement with healthy food on social media

Healthy food

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Abstract

Purpose – Recent research has demonstrated that people are more likely to engage with fatty food content online. One way health advocates might facilitate engagement with healthier, calorie-light foods is to alter how people process food media. This research paper aims to investigate the moderating role of viewer mindset on consumer responses to digital food media.

Design/methodology/approach – Two experiments were conducted by manipulating the caloric density of food media content and/or one's mindset before viewing.

Findings – Results show that the relationship between nutrition and engagement is moderated by consumer mindset, where activating a more calculative mindset before exposure can elevate social media engagement for calorie-light food media content.

Research limitations/implications – These findings contribute to the domain of obesogenic digital environments and the role of nutrition in consuming food media. By examining how mindsets interact with affective evaluations, this work demonstrates that a default mindset based on instinct can be shifted and thus alter subsequent behavioral intentions.

Practical implications – This work provides insight into what can boost the visibility and engagement of healthy food content on social media. Marketers can help promote healthier food media by cueing consumers to think more deliberately before exposure.

Originality/value – This research builds on recent work by demonstrating how to boost engagement with healthy foods on social media by cueing a more thoughtful mindset.

Keywords Calculative mindset, Calories, Engagement, Facebook, Fat, Food, Healthy food, Social media, Consumer behavior, Affect, Mindset

Paper type Research paper

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Obesity is a chronic disease afflicting almost two billion people globally in which excess body fat impairs health, increases the risk of long-term medical issues and shortens life span (Prospective Studies Collaboration, 2009; Wharton *et al.*, 2020). While multiple genetic, behavioral and environmental factors influence obesity, the fundamental cause is an imbalance of calories consumed and calories expended (World Health Organization, 2021). In most cases, obesity arises from living in an environment that encourages and glorifies the plentiful consumption of food, especially food rich in energy (calorie-dense; e.g. in the form of fats, oils, sugars and starches), alongside low levels of physical activity – these are known as “obesogenic” environments (World Obesity Federation, 2021). In such environments, it is challenging to resist weight gain as humans are naturally programmed to minimize effort and store excess food as body fat (Drewnowski, 1997). As global diets have changed in recent decades, there has been an increase in the consumption of energy-dense foods high in fat and sugars (World Health Organization, 2021). This makes sense given that humans evolved to pursue caloric density, where finding and eating fatty and energy-dense foods was a default “good” choice for survival in food-scarce environments. Unfortunately, in obesogenic environments, this default “eat-what-makes-you-feel-good” heuristic is misfiring.

One of the most effective tools for the long-term management and prevention of obesity in obesogenic environments is appetite regulation through the consumption of calorie-light foods – i.e. decreased food energy intake (van Bloemendaal *et al.*, 2015). Consumers seem to be on board with the idea of eating better (Severson, 2020). Indeed, one of the most commonly held beliefs among food bloggers, trend watchers and culinary prognosticators is that consumers are craving more health-conscious content. There are now over 250-million posts on #eatclean, #diet, #healthyfood or #cleaneating on Instagram alone to meet this demand. Moreover, BuzzFeed’s *Tasty* – the world’s largest food network – now features a “Healthy Eating” section dedicated to recipes made from healthy ingredients and even recently launched *Goodful*, a brand extension centered on nourishment and well-being. *Forbes* wrote to “expect to see more plant based and plant forward foods” in 2021 (Lempert, 2020), and the *New York Times* wrote that “health and immunity will continue to be major concerns” (Severson, 2020). From consumers to content producers, a broad array of stakeholders on social media are banking on consumers engaging more with health-conscious food content.

Unfortunately, recent research on social media engagement suggests that the opposite might be true: people are more likely to like, comment and share *unhealthier, calorie-dense foods* on social media (Pancer *et al.*, 2022). This is consistent with work in evolutionary psychology on the adaptive pursuit of calorie-dense foods where people feel happy when they simply see fatty foods (Harrar *et al.*, 2011; Toepel *et al.*, 2009) and thus engage with it more (Pancer *et al.*, 2022). Based on the operating principles of social media and social influences over food consumption, this finding has several undesirable implications. First, social media rank-order algorithms promote content that receives more engagement (Gillespie, 2016; Hogan, 2015; Zulli, 2018). Therefore, it is likely that such unhealthy content is also having its reach amplified, while healthy food might struggle getting the views and engagement necessary to survive in the marketplace. Second, with higher engagement and reach metrics for unhealthy foods, content producers may gradually shift their content to be unhealthier to stay competitive. And third, with more exposure to unhealthy foods, consumer perceptions of what is considered normal eating habits may skew to be unhealthier. This concern is amplified based on prior work on the normalization of food consumption, where social influence can skew actual eating habits (McFerran *et al.*, 2010; Taylor and Noseworthy, 2021). Given that 70% of people in the USA use social media (Pew Research Center, 2021), that food-related content pages are some of the most popular on

social media (Tubular, 2021) and that food choices are influenced by social cues (McFerran *et al.*, 2010; Taylor *et al.*, 2019; Taylor and Noseworthy, 2021), helping boost health-conscious content can ensure that people are exposed to healthier food alternatives online. In an effort to respond to these potential challenges, the current work investigates whether shifting the viewer's mindset prior to exposure could boost engagement with healthy foods.

Prior work has identified the role of affect as a central driver of engagement with food media online (Pancer *et al.*, 2022). This research finds that people instinctively feel better when they are exposed to unhealthy (i.e. calorie-dense) foods rather than healthier (i.e. calorie-light) foods. This logic implicitly suggests that felt affect differs based on caloric density, whereby healthier calorie-light foods produce either a negative affective drive (e.g. seeing salads make people feel bad) or no affective drive at all (e.g. seeing salads does not change how people feel). Unfortunately, marketers simply cannot overwrite this fundamental drive and make people respond more positively to calorie-light foods.

Given that visual exposure to calorie-dense foods is evolutionarily hardwired to affect, it would be prudent to inhibit consumers from using affect-as-information when looking at calorie-light foods. The affect-as-information model (Schwarz and Bohner, 1996; Pham, 1998; Wang *et al.*, 2020) argues that emotions can provide information related to a consumer's cognitions, and in doing so, their emotional information colors judgments that influence subsequent attitudes and behaviors. For instance, emotions induced by the weather have been shown to predict people's assessments of their life satisfaction (Schwarz and Clore, 1983). When people feel that emotions are related to evaluations and judgments, they then rely on emotions to make judgments (Pham, 1998). In a sense, if a viewer feels good after exposure to calorie-dense food media, this emotional information will likely be factored into their future consumption behaviors, like making an unhealthy food choice.

This raises the intriguing possibility that it may not be necessary to create affective lift to bolster engagement with calorie-light foods, but rather marketers could reframe the consumer's mindset away from the default affective pursuit. Indeed, people generally have to "work" to maintain a healthy diet – it requires deliberate thought and action (Bublitz *et al.*, 2010). This is indicative of a calculative mindset (Hsee and Rottenstreich, 2004; Pham, 1998, 2004; Schwarz and Clore, 1996) and consistent with the dual process models in social psychology (Wilson and Brekke, 1994; Chaiken and Trope, 1999), which outlines how consumers can inhibit their use of affect-as-information heuristics in their evaluations. Thus, thinking more consciously and deliberately in a food media context should make the benefits of healthy foods more salient (e.g. feel better about the self, longevity and service of lifestyle goals), which should also elevate engagement. We expect that presenting social media consumers with an intervention that gets them thinking more deliberately (i.e. inducing a calculative mindset) prior to exposure to food media will change the way the content is processed, inhibiting their use of affect-as-information and subsequently boosting engagement with calorie-light foods.

This work makes several contributions to psychological perspectives on obesity in theory and practice. First, it conceptually replicates and extends recent work linking caloric density and social media engagement, demonstrating the robustness of this relationship across multiple types of food media content that was actually posted online. Second, from a theory perspective, this research demonstrates how prior work linking nutrition and social media engagement (Pancer *et al.*, 2022) was primarily driven by a seemingly implicit evolutionary drive that is non-conscious and, more importantly, such a drive can be shut down by altering the consumer mindset. This advances our understanding of the automaticity of poor eating behavior in digital obesogenic environments and flags that interventions are needed to overcome years of evolution. Third, this work has implications for practice, where a better understanding of the viewer's mindset can help marketers promote healthier foods online by

making the audience more receptive to healthy food content. Health-conscious content producers, policymakers and food brands can subsequently increase social media engagement with their healthy food content, which may then amplify its reach.

The remainder of this paper proceeds as follows. It begins by reviewing recent work on food marketing on social media followed by a discussion on how affect drives social media engagement. Next, it highlights how people by default, from an evolutionary perspective, process food through an affective lens. It is then suggested that one way to assist in the engagement with healthier, calorie-light, food media content is to change this default process by inducing a calculative mindset. Results of two experiments are then presented before concluding with a summary of our contributions and implications.

Literature review and conceptual development

Food marketing on social media

One of the major challenges for health advocates fighting obesity is food advertising that targets youth, selling offerings that are almost exclusively calorie-dense like snacks, candy and fast food (Frazier and Harris, 2018). While much of the extant literature on food marketing has classically examined television advertising (Kearney *et al.*, 2021; von Nordheim *et al.*, 2022), the way that young people consume media has shifted over the past decade to be online through social media (Pew Research Center, 2021). This has only been exacerbated further as life shifted online to cope with the COVID-19 pandemic. Over four billion people now use social media around the world with the average user spending approximately 2.5 h on social media every day (Hootsuite, 2022).

With this change in viewing habits online, it is no surprise that food marketers have shifted their channel mix online as well, placing their messages where their consumers are. Unfortunately, there is generally a mismatch between the goals of the food industry and the goals of the individual consumer, who is often looking for healthy experiences that enhance their well-being with food (Bataf and Addis, 2021). Yet, food and beverage manufacturers spend billions on advertisements on Facebook and YouTube annually, the majority of which still appear to market unhealthy, calorie-dense offerings (Fleming-Milici and Harris, 2020). This is concerning given these ads are often positioned as entertainment content (e.g. 1-min meal prep of a mouth-watering dish) and can be readily shared across the network (Pancer *et al.*, 2022).

Marketing food content on social media encourages users to engage in a myriad of ways, including liking and sharing content with their friends (Dhaoui and Webster, 2021; Dolan *et al.*, 2019; Drummond *et al.*, 2020; Flaherty *et al.*, 2021; Philp *et al.*, 2022; Taheri *et al.*, 2021). Recent work has demonstrated that social media ads for unhealthy food typically evoke more positive responses than healthy food – they are more likely to be recalled, recognized, viewed longer and shared (Murphy *et al.*, 2020). They also find that users were more likely to evaluate a fellow user more positively when they had unhealthy food posts in their recent history. This speaks to the social influence of food media, where unlike the passive consumption of television, users participate and facilitate social media content going viral.

For groups that are particularly vulnerable to peer influence, exposure to widely shared and viewed food media content can change their perceptions of what is normal with respect to eating choices. For instance, consumer perceptions about how other Facebook users eat snacks and sugar-sweetened beverages predict their own consumption of those foods (Hawkins *et al.*, 2020). Online engagement metrics have been shown to influence attitudes toward energy drinks (Buchanan *et al.*, 2017) and influencer marketing can boost children's eating of unhealthy snacks (Coates *et al.*, 2019). While there are clearly deleterious consequences of food marketing and social media engagement on consumer perceptions of normal eating habits, the mechanisms through which this happens have received less

empirical attention. Such insight can assist those interested in marketing healthier foods to amplify their engagement on these platforms.

Affect and social media engagement

Social media engagement (e.g. likes, comments, shares) is intertwined with affect (Eigenraam *et al.*, 2018; Moore and Lafreniere, 2020). Put simply, positive content and experiences, the kind that make a consumer feel good in general, are more likely to be shared (Berger, 2011; De Angelis *et al.*, 2012), receive engagement (Pancer *et al.*, 2019; McShane *et al.*, 2021) and go viral (Berger, 2014; Berger and Milkman, 2012). This makes sense given the fast-paced nature of how consumers scroll through content on social media platforms, which can make the act of “liking” a post an implicit affective response (Kim and Yang, 2017).

In the context of food media, recent empirical evidence demonstrates that unhealthy, calorie-dense meals receive more social media engagement than healthier, calorie-light, meals (Pancer *et al.*, 2022). Consistent with prior social media research, these authors provide initial evidence that affect underscores engagement with calorie-dense food media. Similarly, we suggest that seeing calorie-dense food media makes people feel happy which increases engagement with that content. Stated formally:

- H1. Food media calories positively influences social media engagement intentions (i.e. liking, commenting and sharing).
- H2. The effect of food media calories on social media engagement intentions are mediated by the user’s affective state, such that viewing calorie-dense (vs calorie-light) food media elevates the user’s affective state, which in turn, leads to higher social media engagement intentions.

Evolutionary roots of affective processing of food

Research in evolutionary psychology supports that people have evolved to feel good when seeing calorie-dense foods (Harrar *et al.*, 2011; Toepel *et al.*, 2009). Evolving from hunter-gatherers, where reliable and readily available food were not as abundant as they are today, people became visually attuned to not only what is and is not edible, but also what is more valuable to eat (i.e. caloric-density) (Allman and Martin, 1999; Drewnowski and Almiron-Roig, 2009; Gehring, 2014). Consistent with this evolutionary perspective, finding and eating calorie-dense foods can make people feel good (Drewnowski, 1997; Moss, 2013; Volkow *et al.*, 2011), as this response was once beneficial for survival. Thus, people have evolved to affectively process food, using an “eat-what-makes-you-feel-good” affective heuristic.

However, just as seeing calorie-dense foods may increase positive feelings, exposure to calorie-light foods may have the opposite effect (Berthoud and Morrison, 2008). Visually, people infer healthier foods to be less tasty, less enjoyable, less satiable and are subsequently less preferred (Turnwald *et al.*, 2019; Raghunathan *et al.*, 2006; Suher *et al.*, 2016). Visual exposure to calorie-light foods can also cue people to physical hunger (Finkelstein and Fishbach, 2010), a sensation intertwined with the negative affective state of feeling “hangry” (MacCormack and Lindquist, 2019). Additionally, the notion that people respond differently to food based on caloric density is supported by brain imaging studies (Killgore and Yurgelun-Todd, 2006; Killgore *et al.*, 2003). In particular, visual exposure to calorie-light foods activates multiple areas of the brain associated with integrating affective, visceral and primary sensory information, taking more time to process than compared to calorie-dense foods (Price, 1999).

Overall, it appears that enjoying calorie-dense food media comes easily, but enjoying calorie-light food media, despite all its benefits on health, is instinctively more difficult.

Similar to why it is challenging to eat well and maintain a healthy lifestyle, people do not naturally get an affective boost from viewing healthy food media. Evolutionarily, feeling positively when seeing calorie-light foods goes against our default affective process. It does not make people as happy as seeing calorie-dense foods would, underscoring why the caloric density of food media content is positively related to social media engagement (Pancer *et al.*, 2022). Therefore, in effort to increase engagement toward healthier, calorie-light, food media, consumers likely need to find a way to move beyond their default affective process.

Shifting to calculative mindset

One possible way to overcome an affective process is to induce a calculative mindset (Belmi and Schroeder, 2021; Kim *et al.*, 2021; Shi *et al.*, 2021; Siddiqui *et al.*, 2018). Building on prior dual-processing models (Chaiken and Trope, 1999; Epstein, 1994; Kahneman and Frederick, 2002; Sloman, 1996), Hsee and Rottenstreich (2004) suggest that people come to assess targets by both calculation and feeling. When assessing an experience for its hedonic rewards, decision-makers rely less on careful calculations and more on how the experience makes them feel (Hsee and Rottenstreich, 2004; Pham, 1998, 2004; Schwarz and Clore, 1996). Inducing a calculative mindset, however, can reduce reliance on these affective heuristics, where target stimuli are then assessed in a more deliberate and thoughtful way (Siddiqui *et al.*, 2018).

A calculative mindset has been shown to attenuate affect-as-information biases across multiple contexts, from the sensitivity of scope on product valuations (Hsee and Rottenstreich, 2004), numerosity in promotional rewards (Siddiqui *et al.*, 2018), the “zero” bias in retirement planning (Kalra *et al.*, 2020) and even racial biases in hiring decisions (Reynolds *et al.*, 2020). The notion of altering one’s mindset is emerging in recent scholarly work in a food consumption context, particularly in how they value hedonic consumption. For example, changing one’s construal level (i.e. thinking abstractly or concretely) has been shown to inhibit indulgent consumption (Chang *et al.*, 2020), shift people away from sensory gratification (Zarantonello *et al.*, 2021) and make them more interested in knowing the ingredients in their food (Ozcan *et al.*, 2018). Taken together, these works demonstrate that shifting one’s mindset can be an effective intervention to overcome affect-as-information biases.

Therefore, given that social media engagement decisions are biased by an affect-as-information heuristic (Pancer *et al.*, 2019) and that this extends to food media (Pancer *et al.*, 2022), it is expected that inducing a calculative mindset can change this default process and help make the value of healthier, calorie-light foods more salient to viewers. This is consistent with the broad notion that eating healthy necessitates conscious thought and effort (Bublitz *et al.*, 2010) and that healthier foods require more deliberate thought to see their value and appeal (Killgore *et al.*, 2003). With the inherent value of healthier, calorie-light foods, being more accessible under a calculative mindset, engagement toward such healthy foods should increase. Formally:

- H3. A calculative mindset moderates the impact of food media calories on engagement intentions, such that engagement intentions with calorie-light foods will increase under a calculative mindset.
- H4. A calculative mindset moderates the indirect effect of food media calories on engagement intentions through affect (mediated moderation).

In other words, we anticipate that the *a* path (calories → affect) is positive, the *b* path is positive (affect → engagement) and the *c* path (calories → engagement) is positive (H1 and H2). This is consistent with recent findings from the field (Pancer *et al.*, 2022). The focal

contribution of the current work is in showing that the moderator (calculative mindset) changes the a path. This means that there is a conditional indirect effect: When the calculative mindset prime is absent, there is a *positive* relationship of calories on engagement through affect. When the mindset prime is activated, there is *not* ($H3$ and $H4$).

Overview of the studies

Study 1 conceptually replicates prior work linking the caloric density of food media with social media engagement with novel food media stimuli. Indeed, healthy dishes elicit lower levels of engagement relative to less healthy meals, a process which is mediated by affect. Study 2 demonstrates how inducing a calculative mindset can moderate this relationship, elevating engagement intentions for calorie-light food media. Taken together, the findings demonstrate that while exposure to healthier foods may not naturally elevate people's feelings, shifting the consumer's mindset can help motivate them to engage with this content on social media.

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Study 1

The purpose of Study 1 was to conceptually replicate the findings from prior work before introducing the mindset moderator. This study investigates the relationship between the healthiness of food media and engagement intentions as well as the mediating role of affect. Although there is precedent in the literature (Pancer *et al.*, 2022), it was important to establish these baseline effects for different food videos to mitigate concerns of stimuli dependence prior to moderation through mindset in a subsequent study. Actual food preparation videos were selected from *Tasty*, the world's most popular digital food network, based on the calories per serving of each meal, randomly selecting videos as stimuli from the top (calorie-dense) and bottom (calorie-light) quartiles. Here, the focus was to demonstrate that people are less willing to engage with food-related media content when it is calorie-light than compared to calorie-dense. It was expected that this effect would be mediated by differences in affect after viewing, such that exposure to calorie-dense meals would generate increased affect, which would translate into higher engagement intentions. Exposure to calorie-light meals would not generate an affective boost, thereby leading to lower engagement intentions.

Method. The study used a three-level single-factor between-participants design (no-video control, calorie-light video, calorie-dense video). Two-hundred sixty-three MTurk participants (47.5% females, $M_{\text{age}} = 39.8$, $SD = 11.07$) were exposed at random to either no video (control), a calorie-light video or a calorie-dense video. Four 30-s food preparation videos were selected from *Tasty* (Appendix), a popular food-centric Facebook page where they post time-lapse food preparation videos of meals. The videos were chosen from a corpus of every video posted by the *Tasty* Facebook page over a five-year period (July 31, 2015–October 10, 2020), which displayed the dish's calories per serving. All videos were ranked based on calories per serving, and two videos were randomly chosen from the bottom quartile (calorie-light) and two from the top quartile (calorie-dense). The calorie-light videos were either a cloud bread (153 calories per serving) or vegan butternut tacos (158 calories per serving), while the calorie-dense videos were either a stuffed hashed brown omelet (1,037 calories per serving) or a meatball sub boat (1,400 calories per serving). Assigning participants at random to one of two videos reduced the possibility that the results were stimuli dependent. Each video was edited to be the same length and play the same background audio track.

Participants in the video conditions rated their engagement intentions after video exposure (Pancer *et al.*, 2022) (anchored: 1 = extremely unlikely; 7 = extremely likely – “Click

the thumbs up ‘like’ button”; “Comment on this post”; “Share this on your own Facebook feed”; “Share this with specific friends on Facebook”; and “Follow this Facebook page”). These items were averaged to create an index of engagement likelihood ($\alpha = 0.90$). While participants in the control condition skipped these measures (as they did not watch any video), all participants then filled out a survey about their affective state (Noseworthy *et al.*, 2014), which consisted of four bipolar items on a nine-point scale, completing the phrase, “I currently feel [...]” unpleasant/pleasant; negative/positive, sick/fine, sad/happy on nine-point scales ($\alpha = 0.94$).

Results and discussion. A one-way analysis of variance showed that engagement intentions were higher after watching a calorie-dense video ($M = 4.03, SD = 1.80$) relative to a calorie-light video ($M = 3.37, SD = 1.59$), $F_{2,260} = 7.59, p = 0.006, \eta^2 = 0.04$ (Table 1). This supported *H1* and is consistent with prior work linking caloric density with engagement intentions (Pancer *et al.*, 2022).

Results also revealed a significant omnibus effect on positive affect, $F_{2,260} = 8.11, p < 0.001, \eta^2 = 0.06$. Pairwise comparisons confirmed that affect was more positive after watching a calorie-dense video ($M = 7.84, SD = 1.15$) relative to both a calorie-light ($M = 7.38, SD = 1.29$), $t_{260} = 2.36, p = 0.019, d = 0.33$ and the no-video control ($M = 6.97, SD = 1.84$), $t_{260} = 3.94, p < 0.001, d = 0.63$. A calorie-light video had only a marginally effect on affect relative to the no-video control, $p = 0.069$. This suggests that positive affect was being elevated higher after watching a calorie-dense food preparation video.

For the mediation analysis, the indirect effect of food video type (0 = calorie-light, 1 = calorie-dense) on the likelihood to engage with the video over social media through affect was assessed in a PROCESS model (Model 4, 10,000 draws; Hayes, 2017). The indirect effect of calorie density on engagement intentions through affect was significant, $\beta = 0.23, SE = 0.09, 95\% CI = [0.068, 0.419]$, supporting *H2* (Figure 1).

These results replicate existing work using new video stimuli, whereby the caloric density of food media increased engagement intentions through affect. Indeed, it appears that consumers are more likely to engage with less-healthy, calorie-dense food media than

Table 1.
Study 1 – means,
standard deviations
and cell counts

Condition	No-video control	Calorie-dense video	Calorie-light video
Engagement	–	4.03 (1.80)	3.37 (1.59)
Affect	6.97 (1.84)	7.84 (1.15)	7.38 (1.29)
Cell size	60	109	94

Note: Standard deviations are reported in parentheses

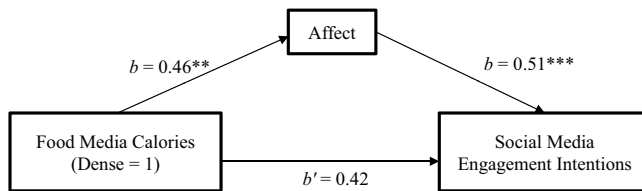


Figure 1.
Study 1 – mediation
analysis

Notes: Unstandardized betas are reported with superscripts:
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

healthier, calorie-light meals. These findings help set the stage for testing how to override this effect and boost engagement with healthier, calorie-light food media.

Study 2

The primary objective of Study 2 was to test the core hypothesis (*H3*), whether inducing a calculative mindset prior to food media exposure would increase engagement intentions for calorie-light meals. One of the current model's underlying assumptions is that the link between caloric density and engagement is driven by an affective heuristic process. When it comes to food, the sensory experience of taste, smell, texture and visual appearance is inherently intertwined with people's feelings (Papies and Veling, 2013). Affect-driven consumption often relies less on deliberative thought or careful calculation (Hsee and Rottenstreich, 2004; Pham, 1998, 2004; Schwarz and Clore, 1996). Given that calorie-light food, which is typically healthier, requires more calculative thought to assess its inherent reward value (Killgore *et al.*, 2003), it is expected that consumers will engage with it less because an affective heuristic does not recognize the immediate reward value associated with such foods. However, a more deliberate and calculative mindset should make the inherent value of calorie-light foods more accessible, subsequently elevating engagement intentions for calorie-light dishes.

Method. Participants and design. Through Amazon's Mechanical Turk, 203 participants (44.4% female; $M_{\text{age}} = 39.7$) were recruited. Participants were assigned at random to one of four conditions in a 2 (caloric density: low vs high) \times 2 (mindset: control vs calculative) between-subjects factorial design.

Procedure. Participants were informed that they were participating in a consumer survey designed to explore consumers' attitudes toward food. To induce a calculative mindset, we used a validated paradigm commonly used in cognitive psychology (Hsee and Rottenstreich, 2004; Siddiqui *et al.*, 2018; Small *et al.*, 2007). Consistent with the procedures from this prior research, those randomly assigned to the calculative mindset conditions first answered five questions that required performing mathematical calculations to solve simple problems. Participants who were randomly assigned to the control condition did not complete this task. The five items were as follows:

- (1) If an object travels at five feet per minute, then by your calculations how many feet will it travel in 360 s?
- (2) If a consumer bought 30 books for \$540, then, by your calculations, on average, how much did the consumer pay for each book?
- (3) If a person has 5 h of free time available, and he plans to watch a movie which is 180 min long, then, by your calculations, how many hours will he have left after watching the movie?
- (4) If a consumer has a budget of \$315, and he spends all of that money on 15 dinners, then, by your calculations, on average, how much did he spend on each dinner?
- (5) If a typist is able to type 5 pages in 10 min, then, by your calculations, how many hours will it take the typist to type 60 pages?

All participants then moved onto the food media task. Consistent with prior work, all participants were then exposed at random to a 30-s food preparation video of either a burger or a salad selected from *Tasty* (Pancer *et al.*, 2022). Past experimental work on assessing the consequences of a food's caloric density has often compared a burger (high caloric density) with a salad (low caloric density) (Chernev and Gal, 2010; Chernev, 2011; Romero and Biswas, 2016; Wilcox *et al.*, 2009). The calorie-dense video was of a chicken parmesan slider

(320 calories per serving), and the calorie-light video was a smashed cucumber salad (56 calories per serving). Both videos had similar filming styles, preparation speeds and video lengths, but varied in the healthiness of the meal.

Following the video, participants filled out the same five-item measure on their likelihood of engaging with the content over social media (Pancer *et al.*, 2022; $\alpha = 0.91$) and the four-item affective state scale (Noseworthy *et al.*, 2014; $\alpha = 0.94$) as Study 1. To control for rival explanations on the visual appearance of food, this study also included a battery of scales on food perception (Hagen, 2021), where participants rated the perceived healthiness, amount, visual presentation, tastiness and price of the meal (Appendix). To conclude, participants responded to a seven-point scale (1 = strongly disagree; 7 = strongly agree) on whether they perceived the dish was high in calories before completing a demographic questionnaire.

Results and discussion. Caloric density. Manipulation checks verified that participants perceived that the calorie-dense meal would be higher in calories ($M_{Light} = 1.92$ vs $M_{Dense} = 5.57$), $F_{1,199} = 470.88$, $p < 0.001$, $\eta^2 = 0.70$ and less healthy ($\alpha = 0.96$) than the calorie-light condition ($M_{Light} = 5.95$ vs $M_{Dense} = 3.47$), $F_{1,199} = 171.44$, $p < 0.001$, $\eta^2 = 0.46$. The mindset manipulation had no main effect on perceptions of calories ($p = 0.924$) and did not interact with calorie density manipulation ($p = 0.716$). The manipulation also did not have an effect on perceptions of healthiness ($p = 0.514$) or interact with the calorie density manipulation ($p = 0.549$).

Engagement intentions. Consistent with Study 1, there was a significant main effect of food media such that calorie-dense meals had greater engagement intentions than calorie-light meals ($M_{Light} = 2.73$ vs $M_{Dense} = 3.22$), $F_{1,199} = 4.50$, $p = 0.035$, $\eta^2 = 0.02$), supporting *H1*. There was also a main effect of Mindset such that a calculative mindset increased engagement relative to the control ($M_{Control} = 2.72$ vs $M_{Calculative} = 3.23$), $F_{1,199} = 4.87$, $p = 0.029$, $\eta^2 = 0.02$). These main effects were qualified by a significant caloric density \times mindset interaction, $F_{1,203} = 4.85$, $p = 0.029$, $\eta^2 = 0.02$ (Figure 2). As expected, the nature of this interaction was such that participants in the control condition were more likely to engage with the calorie-dense video ($M = 3.22$) relative to the calorie-light video ($M = 2.21$), $F_{1,199} = 8.88$, $p = 0.003$, $\eta^2 = 0.04$. This effect, however, was attenuated in the calculative mindset condition ($M_{Dense} = 3.22$; $M_{Light} = 3.24$), $F < 1$. This pattern of results supports *H3*. These effects also held after controlling for the perceived amount, visual presentation, tastiness and price (Appendix).

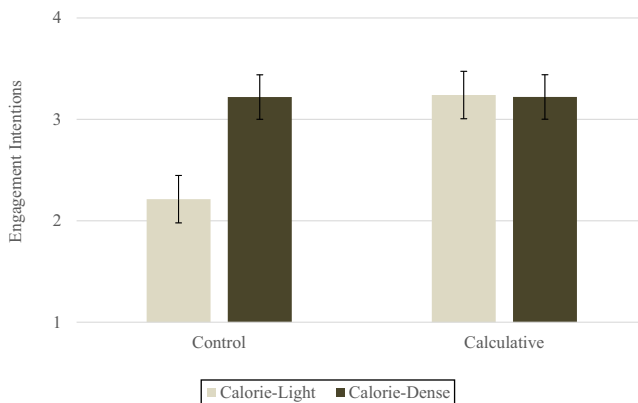


Figure 2.
Study 2 – the impact
of caloric density on
social media
engagement
intentions as a
function of mindset

Affect. There was no significant effect of caloric density ($p = 0.12$) or mindset ($p = 0.29$) on affect. However, there was a significant caloric density \times mindset interaction, $F_{1,199} = 4.09$, $p = 0.04$, $\eta^2 = 0.02$ (Table 2). As expected, the results show that in the control condition, affect was significantly higher after watching the calorie-dense video ($M = 7.51$) relative to the calorie-light video ($M = 6.60$), $F_{1,199} = 6.11$, $p = 0.014$, $\eta^2 = 0.03$. Much like the influence on engagement, the effect of calories on affect did not manifest in the calculative mindset condition ($M_{Dense} = 6.72$; $M_{Light} = 6.84$), $F < 1$.

Mediated moderation. A test of the indirect effect of caloric density (0 = calorie-light, 1 = calorie-dense) on engagement through affect and whether this effect is conditional on the consumer’s mindset was also conducted (Model 8; 10,000 draws; Hayes, 2017). The index of mediated moderation was significant ($CI_{95\%} = -0.78$ to -0.03 ; Figure 3), supporting H4. As expected, the indirect effect of caloric density on engagement through affect was conditional on mindset. Specifically, the indirect effect of caloric density on engagement through affect was significant in the control condition ($CI_{95\%} = 0.09$; 0.62), which was consistent with Study 1 and offered further support of H2, but not in the calculative mindset condition ($CI_{95\%} = -0.30$; 0.21).

The results of this study replicate Study 1 by demonstrating how caloric density influences social media engagement in an experimental setting. Evidence is also provided to show that variations in affect could be partially responsible for this effect. Because assessing the value of calorie-light foods requires more integrative and calculative thought than that of calorie-dense food, the affect-as-information heuristic typically suppresses engagement intentions for healthier, calorie-light food. However, adopting a calculative mindset can attenuate this effect, elevating social media engagement intentions for calorie-light meals.

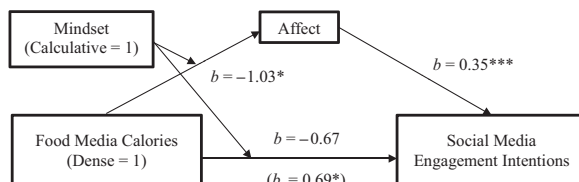
General discussion

The current work investigated how to boost engagement with healthier food content on social media. Building from recent findings on how consumers are more likely to engage

Mindset	Control		Calculative	
	Dense	Light	Dense	Light
Engagement	3.22 (1.91)	2.21 (1.07)	3.23 (1.72)	3.24 (1.76)
Affect	7.51 (1.64)	6.60 (1.77)	6.72 (1.91)	6.84 (1.85)
Cell size	49	47	57	50

Table 2. Study 2 – means, standard deviations and cell counts

Note: Standard deviations are reported in parentheses



Notes: Unstandardized betas are reported with superscripts: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Figure 3. Study 2 – mediated moderation analysis

with less-healthy, calorie-dense, fatty food media (Pancer *et al.*, 2022), the current findings demonstrated that inducing a calculative mindset can increase engagement with healthier food media. Consistent with prior research, people's default engagement behaviors on digital platforms are driven by affect, where consumers are more inclined to like, comment and share content that makes them feel good (Pancer *et al.*, 2019). This is consistent with how humans behave in obesogenic environments offline, where people are too often guided by an "eat-what-makes-you-feel-good" heuristic. The current findings first conceptually replicated recent work (Pancer *et al.*, 2022) using novel stimuli from different food categories, demonstrating that people were more likely to engage with less-healthy, calorie-dense food media than healthier, calorie-light meals (Study 1). Rather than attempting to make calorie-light foods affectively lifting, the current work showed how inducing a more deliberate and conscious mindset prior to exposure could overcome the default affective pursuit. Consistent with the dual processing paradigm in social psychology, the findings demonstrated that a calculative mindset could attenuate the use of affect-as-information, elevating engagement for healthier meals (Study 2). These results were validated through a mediated moderation model and were robust to perceptions based on visual presentation, tastiness and price.

Implications for theory

The current work advances theory with respect to the automaticity of poor eating behavior, and perhaps more importantly, how mindset interventions can help circumvent years of evolutionary adaptation. Based on the current findings, prior work linking nutrition and social media engagement (Pancer *et al.*, 2022) was primarily driven by a seemingly implicit evolutionary drive that is non-conscious. It appears that these human responses to food stimuli, even in a digital environment, are innate whereby people instinctively feel better when they are exposed to unhealthy (i.e. calorie-dense) foods rather than healthier (i.e. calorie-light) foods. This speaks to why digital platforms have morphed into obesogenic environments, which tacitly encourages and glorifies the preparation and consumption of unhealthy, calorie-dense, foods. This research highlights that unhealthy, calorie-dense foods do not only impact individual consumer well-being (e.g. personal food choice), but also shapes social behavior (e.g. content sharing online), documenting a more complex systemic impact of unhealthy food media consumption.

The current work advances theory in this domain by demonstrating that the evolutionary drive that prioritizes affect-as-information in a food context can be overridden by shifting the consumer mindset. This experimental evidence demonstrates that manipulating a calculative mindset attenuates any effect that caloric density has on a viewer's affect and that this then attenuates the positive caloric density-engagement relationship. Extant research in neuroimaging supports this underlying rationale. It has been shown that visual exposure to calorie-light foods activate multiple areas of the brain associated with integrating affective, visceral and primary sensory information (Killgore *et al.*, 2003; Price, 1999). While calorie-dense foods are heuristically recognized as palatable and satiating, it seems as though consumers cannot use such simple heuristics to see the value of calorie-light foods, which require more deliberate, integrative and calculative thought to assess their value (Killgore *et al.*, 2003). While the calculative mindset manipulation helped theoretically demonstrate the role of affect in driving this effect, it may be helping people more accurately assess the value of healthy foods.

This research also contributes to the existing literature pertaining to how people visually process food. Prior work has extensively looked at how the visual appearance of food influences consumer inferences. Such factors include visibility (Barkeling *et al.*, 2003), plating (Deroy *et al.*, 2014), variety (Haws and Redden, 2013), color (Hoegg and Alba, 2007),

contrast (Piqueras-Fiszman *et al.*, 2012), portion size (Zlatevska *et al.*, 2014) and orderliness (Zellner *et al.*, 2010; see also Wadhera and Capaldi-Phillips, 2014; Van der Laan *et al.*, 2012 for reviews). For example, enhancing the prettiness of a meal can increase perceptions of healthiness (Hagen, 2021). While this work has advanced in terms of how to visually present foods to inspire various inferences, it is unclear whether this would influence engagement in a social media context. The current study builds on prior work on visual cues, which typically rely on simple heuristics, to demonstrate that it may be the depth of processing that functions as a lens through which these visual cues are interpreted.

Implications for practice

Food consumption research has emphasized that what people eat is influenced by their social environment. For example, seeing others eat unhealthy food (McFerran *et al.*, 2010) and sharing food (Taylor and Noseworthy, 2021) can inadvertently increase people's caloric intake, eating more than they would otherwise. Thus, given recent research demonstrating that people engage more with unhealthy food media content (Pancer *et al.*, 2022) and that social media algorithms promote content that receives more engagement (Gillespie, 2016; Hogan, 2015; Zulli, 2018), people are likely exposed to more unhealthy food content online. Because of this, the social media food landscape has become a digital obesogenic environment, promoting and glorifying the preparation and consumption of unhealthy foods. This may, unwittingly, alter what people believe is considered normal eating habits and subsequently alter what meals they prepare and consume in their day-to-day lives. In efforts to correct this, the current research highlights how inducing a calculative mindset can amplify engagement toward healthier, calorie-light, food media.

Given that this is a visual phenomenon, food content producers might be inclined to simply make healthy foods look more like unhealthy foods (i.e. calorie-dense). It is not surprising that marketers have gone to great lengths to offer reformulated products that are calorie-wise or "light" versions, which are virtually indistinguishable from their unhealthy alternatives (Moss, 2021). Most times, these diet versions of food are sold on shelves directly beside their calorie-dense counterparts. Indeed, the lack of visual differentiation helps close the gap with respect to appeal and claims to support consumers making better choices. However, this may be a problem, for when consumers lack the willpower to choose the healthier version, the full-calorie version is often right beside it. As Moss (2021, p. 180) puts it:

[. . .] the genius of placing diet foods next to the regular ones is when we get inspired to start a new diet, and then get discouraged and quit, we can move back and forth between the products with just the slightest move of our hand.

So, while it may seem that food marketers presenting "healthier" versions of the same beloved products on social media is the way forward, it may not be in the best interest of the consumer's food well-being (Pancer and Handelman, 2012).

Instead, our findings suggest that tools that help shift mindsets can assist healthy diet advocates and content creators experience greater success with the food media content they post online, amplifying engagement and swinging the pendulum of what is considered normal eating habits away from a digital obesogenic environment. While the current studies focused on activating a specific mindset known to override the affect-as-information bias (i.e. calculative) and test the causal chain, this is by no means the only way to get consumers to think in a more careful and deliberative manner. One potential avenue to nudge people out of a default affect-driven mindset is through disclaimers or warning messages. There is also evidence that suggests warning labels can shift people from their default mindset to help

change food choices. A recent meta-analysis demonstrated that sugar sweetened beverage warning labels are effective at dissuading consumers from buying them (An *et al.*, 2021). In a similar vein, health star ratings (Thomas *et al.*, 2021) and traffic-light interventions (e.g. green = healthy, red = unhealthy; Thorndike *et al.*, 2014) can result in sustained healthier choices, which suggests that food environment interventions can promote changes in eating behaviors.

There is reason to believe that warning labels might also be effective in a social media context, where prior work has demonstrated that warning labels concerning fake news on social media can decrease people's willingness to share (Pennycook *et al.*, 2020; Mena, 2020). Appending a warning message prior to food media exposure that highlights that consuming calorie-dense food media can influence what you eat and may be hazardous to your health could make the user more mindful and help curb the virality of unhealthy foods. It can also slow content consumption down, which allows our brain the opportunity to catch up and snap out of its default processing mode. Future research should examine the efficacy of different warning interventions online, testing how disclaimers might shift the consumer mindset when consuming food media.

Even though the very nature of social media consumption is voracious, where users can consume hundreds of posts in a single session (Luckerson, 2015; Stewart, 2016), there may be other simple and promising interventions that may trigger more deliberativeness. For instance, Weight Watchers recently partnered with Headspace (WW × Headspace), a global leader in mindset and mindfulness, where both parties state that "it is how you *think* that drives the things you do." With incredibly brief (i.e. 1-min) mindfulness exercise, this collaboration promotes getting consumers to slow down and nourish the mind to help consumers reach their goals. Using similar tactics, health food marketers can place simple mindfulness cues as advertisements before videos or even embedded within the video itself may be enough to raise consciousness. These interventions can range from visually depicting explicit numerical nutritional information to including caveats and footnotes to help users easily modify their recipes to be healthier. Other companies are following similar strategies. *Noom*, a new digital weight loss app, claims to use scientific findings from psychology to help people "learn to eat mindfully" (noom.com). Other opportunities to shift the user mindset may not even be calculative in nature, but are able to help consumers put the brake on unhealthy content consumption. For instance, "grayscale," which turns one's screen black and white, makes apps and content less engaging (Zimmermann, 2021) and could be a viable digital well-being tool once unhealthy food content is flagged.

Overall, practitioners need to consider that the success of healthy food content on social media is biased by consumer's natural affective drive. Dieticians, health food advocates, policymakers and health content creators, when marketing their products, services and content through social media can aim to induce a calculative mindset in their target audience. As these current findings indicate, such tactics can increase the likelihood people will engage with the healthy food content, which will amplify the success and reach of these posts and campaigns.

Limitations and future research

The current research used a previously validated and standard paradigm for inducing a calculative mindset (Hsee and Rottenstreich, 2004) to test how such a mindset can increase engagement with healthy food media. While this method helped provide theoretical evidence for the affect-as-information bias that hinders engagement toward healthy food media, future research should aim to test more substantive interventions. Although it is possible to induce such a mindset in a practical way, as such companies like *noom.com* and *Weight*

Watchers are currently doing, this may not easily translate to a social media content context. Are there visual elements to a social media post that can be included that may induce a more calculative mindset? It is possible that including numbers (e.g. nutritional information) may spur users to think in a more calculative way, but such information is often not visually appealing, which may hinder social media engagement. Therefore, future research should aim to test various methods that healthy food media content creators can easily include in their posts to induce a calculative mindset, thus improving engagement.

Future research should also look beyond the induction of specific mindsets that shape how food stimuli is processed to understand the other elements of digital food media that impact social behaviors. An interesting avenue for future work would be to help pinpoint the visual elements of calorie-light food that typically make it less appealing to consumers. What is it about visualizing caloric density and unhealthy foods that boost affect and engagement? Similarly, what is it about visualizing calorie-light foods that do not boost affect and engagement? In other words, if there are contexts where it is difficult to shift the viewers' mindset, perhaps it is possible to add or alter visual elements to healthy foods to make them appear healthier. While this may seem counter-intuitive, it could be a means to leverage the rather dominant preference for energy-rich foods to drive engagement with healthy foods. It would be intriguing to test whether visual depictions of healthy foods, like vegetables, might be perceived as more appealing by imbuing them with certain visual characteristics associated with energy-rich foods (i.e. coating them with a sheen that implies the inclusion of fats and oils)? Indeed, a trade secret of food photographers is misting foods with water or other substances prior to taking a photo to enhance visual appeal. Is this appealing because it makes the food look more calorie-dense? Identifying these visual characteristics of nutrients could be another promising avenue to boost engagement with more health-conscious food media content. Furthermore, it is known that visual symmetry and orderliness can make meals appear prettier which subsequently increase perceptions of healthiness (Hagen, 2021). Therefore, would preparing healthier meals in a way that makes them appear less subjectively pretty, and thus be perceived less healthy, subsequently increase engagement? It is clear that future research is needed in this area.

Additionally, although the stimuli from the current studies were derived from actual posts off of a popular food media site, one limitation is the measurement of engagement intentions rather than actual engagement behaviors. We strongly encourage future research to examine actual engagement in a real-world setting. This would not only bolster the ecological validity of the current findings, but would also provide a richer understanding of online social dynamics that influence actual eating behaviors. Certainly, more work is needed in this area.

Another area of interest for future research is investigating who is particularly vulnerable to consuming unhealthy quantities of calorie-dense food media. For example, the ability to activate a calculative mindset has been demonstrated to have trait differences (Hsee and Rottenstreich, 2004; Kim *et al.*, 2021). In this vein, there is a burgeoning domain in the transformative consumer research movement that is keen on developing consumer wisdom – the mindful pursuit of well-being while balancing short and long-term consumption goals (Luchs and Mick, 2018), particularly for those who are most vulnerable to marketing efforts. For instance, adolescents, who are typically very active on social media (Pew Research Center, 2021), tend to have an undeveloped brain with which to weigh the consequences of their actions in a food choice context (Moss, 2021). Here, mindfulness is considered a process that can boost consumers' capacity to self-regulate (Hölzel *et al.*, 2011) and pertains to a “moment-to-moment awareness.” This suggests that other mindfulness interventions, beyond specifically activating a calculative mindset, might help consumers

make conscious, goal-oriented food choices. Testing other mindfulness interventions in the context of food media consumption (e.g. meditation) has the potential to nudge consumers to engage in mindful eating and override the default “eat-what-feels-good” heuristic. We advocate for future research to pursue these mindful interventions to bolster a healthier food environment online.

Finally, in the current studies, the default heuristic was that calorie-dense foods motivated affect and engagement. While this suggests these depictions can provide advertisers with another tool to target content that is likely to resonate with mainstream viewers, this work did not investigate the nuance of consumers with specialized diets. For example, caloric density is typically associated with greater meat and fat content, therefore this content is likely to resonate more with high-fat keto diet prescribers (Kianpour, 2021), but not for vegans that would dissociate from the featured food (Wen and Guo, 2020). Social networks feature a breadth of food communities to explore that center around specific diets and food features, including being vegan, eating homemade and clean eating (Pilař *et al.*, 2021). Future research examining the nutritional factors that shape affect and engagement from specific diets and consumer segments would be crucial in better understanding how to satisfy users with more granular detail.

Conclusion

As consumers are drawn toward unhealthier food media based on primitive instincts (Moss, 2013), content depicting calorie-light meals that support appetite regulation often loses out. Elevated engagement with calorie-dense foods incentivizes platforms to generate more of the same, propagating an obesogenic environment online that can trickle down to actual eating habits. The popularity of food content on social media rises (Tubular, 2021) along with obesity rates worldwide (Roberto *et al.*, 2015). Many promising interventions are being tested that promote healthier eating including traffic lights and health stars (Thomas *et al.*, 2021; Thorndike *et al.*, 2014), nutrition labeling (Roberto *et al.*, 2021) and reformulating products (Moss, 2021), but we advocate for more work to be done that focuses on stifling digital obesogenic environments. The transformative consumer research movement is keen on developing consumer wisdom – the mindful pursuit of well-being while balancing short- and long-term consumption goals (Luchs and Mick, 2018), particularly for those who are most vulnerable to marketing efforts. This current research takes an initial step by demonstrating that engagement toward healthier, calorie-light food media content is elevated when a calculative mindset is induced. Future research should continue to explore ways to promote healthy food content on social media, helping empower consumers to overcome their more primitive drives for energy-dense foods.

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Further reading

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Appendix

Study 1 – Supplementary information

Stimuli. Participants were randomly exposed to one of the calorie-light or calorie-dense videos.

Calorie Light Stimuli	Calorie Dense Stimuli
 <p data-bbox="281 666 510 720">Cloud Bread 153 calories per serving https://tasty.co/recipe/cloud-bread</p>	 <p data-bbox="610 666 948 720">Stuffed Hash Brown Omelette 1,037 calories per serving https://tasty.co/recipe/stuffed-hash-brown-omelette</p>
 <p data-bbox="234 1035 557 1108">Vegan Butternut Squash Al Pastor Tacos 158 calories per serving https://tasty.co/recipe/vegan-butternut-squash-al-pastor-tacos</p>	 <p data-bbox="642 1035 915 1108">Meatball Sub Boat 1,400 calories per serving https://tasty.co/recipe/meatball-sub-boats</p>

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*Measures**Engagement intentions.* Pancer *et al.*, 2021

Participants rated their likelihood (anchored: 1 = Extremely unlikely; 7 = Extremely likely) to “Click the thumbs up ‘like’ button”; “Comment on this post”; “Share this on your own Facebook feed”; “Share this with specific friends on Facebook”; and “Follow this Facebook page”. These items were averaged to create an index of engagement likelihood ($\alpha = 0.90$).

In the no-video control, participants advanced directly to the affective state measure.

Affective state. Noseworthy *et al.* (2014)

Participants then filled out a survey about their affective state which consisted of four bipolar items on a 9-point scale, completing the phrase, “I currently feel...” unpleasant/pleasant; negative/positive, sick/fine, sad/happy on nine-point scales ($\alpha = 0.94$).

Demographic questionnaire

What gender do you identify with?


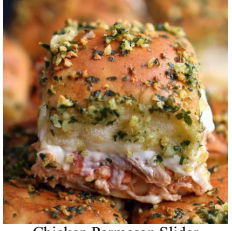
What is your age?

What language do you speak at home?

Participant screening

The data of participants who could not appropriately view the video based on resolution, responded that they did not complete watching the video, and/or who failed an attention test question that was embedded in the questionnaire were not recorded (Oppenheimer *et al.*, 2009).

*Study 2 – Supplementary information**Food video stimuli*

Calorie Light Stimuli	Calorie Dense Stimuli
 <p data-bbox="418 706 650 757">Smashed Cucumber Salad 56 calories per serving https://tasty.co/recipe/smashed-cucumber-salad</p>	 <p data-bbox="804 706 1035 757">Chicken Parmesan Slider 320 calories per serving https://tasty.co/recipe/chicken-parmesan-sliders</p>

Calculation mindset condition

Hsee and Rottenstreich (2004), Siddiqui *et al.* (2018), Small *et al.* (2007)

“Problem Solving Task. We are interested in your problem-solving abilities. Please solve each of the problems below:

- If an object travels at five feet per minute, then by your calculations how many feet will it travel in 360 seconds?
- If a consumer bought 30 books for \$540, then, by your calculations, on average, how much did the consumer pay for each book?
- If a person has 5 hours of free time available, and he plans to watch a movie which is 180 minutes long, then, by your calculations, how many hours will he have left after watching the movie?
- If a consumer has a budget of \$315, and he spends all of that money on 15 dinners, then, by your calculations, on average, how much did he spend on each dinner?
- If a typist is able to type 5 pages in 10 minutes, then, by your calculations, how many hours will it take the typist to type 60 pages?”

Control condition. Participants did not do any task in this condition.

Measures

Participants responded to the same measure of engagement intentions ($\alpha = 0.91$) and affect ($\alpha = 0.94$) as in Study 1 as well as the same demographic questionnaire.

As a manipulation check, they were asked if they perceived the dish as “high in calories” (1 = strongly disagree; 7 = strongly agree). We also asked them to rate the dish’s healthiness (three items; $\alpha = 0.96$): healthy; good for me; nutritious.

To control for rival explanations on the visual appearance of food, we also included a battery of scales on food perception (Hagen, 2020): “I believe the food looked. . .” (1 = strongly disagree; 7 = strongly agree).

Amount (four items; $\alpha = 0.85$): filling; satiating; large; substantial.

Visual presentation (three items; $\alpha = 0.86$): symmetrical; orderly; balanced.

Tastiness (three items; $\alpha = 0.93$): tasty; flavorful; delicious.

Price (two items; $r = 0.86$): pricey, expensive.

Supplementary analysis

Even when controlling for amount, visual presentation, tastiness and price, an analysis of covariance revealed a significant calorie density \times mindset interaction on engagement intentions, $F_{1,236} = 4.38$, $p = 0.038$, $\eta^2 = 0.02$. Thus, the effect held even when accounting for the rival explanations of visual food perception.

Participant screening

The data of participants who could not appropriately recall whether they responded to math questions, responded that they did not complete watching the video, could not appropriately view the video based on resolution, and/or who failed an attention test question that was embedded in the questionnaire were not recorded (Oppenheimer *et al.*, 2009).

Supplementary references

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