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# From Mentally Doing to Actually Doing: A Meta-Analysis of Induced Positive Consumption Simulations

**Gizem Ceylan, Kristin Diehl, and Wendy Wood**

**Abstract**

Mental simulation is an important tool for managers who want consumers to imagine what life would be like if they engaged in positive consumption behaviors. However, research has found mixed effects of mental simulation on behavior. To understand this inconsistency, the authors conduct a meta-analysis to quantify the effect of different mental simulation prompts. This multivariate three-level meta-analysis of 237 effect sizes spanning four decades (1980–2020) and representing 40,705 respondents yields a positive but small effect of mental simulation on behavioral responses. Managers and researchers can amplify this effect by using dynamic visual inductions (e.g., augmented reality), inductions involving both visuals and verbal instructions, and repeated inductions spaced over time (e.g., weekly, akin to real-world marketing campaigns). Inducing simulations repeatedly but massed (e.g., using the same message at the same time across different platforms or retargeting ads) actually reduces subsequent behavioral performance. The authors explain the implications of these findings for theory and practice and identify novel avenues for research.

**Keywords**

mental simulation, future, behavior, purchase, advertisement, meta-analysis

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Mental simulation, imagining behavioral episodes that have not (yet) taken place, has been widely used in marketing and communication. For example, a commercial for EasyJet, a leading European airline, asks people to "Imagine Where We Can Take You," with visuals of flying over clouds to different holiday locations, from beaches to cities. In a Facebook ad, Pillsbury prompts consumers to "imagine the memories" they will make with their cookie dough. Similarly, the Moraine Park Technical College radio ad asks listeners to "imagine what's next." In addition to explicit calls to imagine, managers employ strong visuals to implicitly prompt consumers to simulate a future scenario. For example, to enable consumers to simulate how new furniture would fit into their existing environment, furniture companies such as West Elm and Pottery Barn now offer augmented reality– (AR-)based room planners. Similarly, realtors have turned to 360-degree videos to showcase homes and apartments and ignite the imaginations of potential buyers.

Mental simulation has been shown to improve action readiness (Van Boven and Ashworth 2007) and thus is used in advertisements and other communication to facilitate and ultimately elicit purchase and consumption. However, research has revealed divergent effects of simulation on behavior. For example, although some studies have noted positive influences on behavioral intentions and behavior (e.g., Elder and Krishna 2012; Shiv and Huber 2000; Zhao, Hoeffler, and Zauberman 2007), others have found minimal or even negative effects (e.g., Pecher and Van Dantzig 2016; Rajagopal and Montgomery 2011). It is difficult to interpret these findings given that the modality of simulation techniques, frequency of induction, type of consumption experience, and target populations vary widely in research as well as in practice. In addition, over 25 years have passed since the highly influential review of simulation effects by MacInnis and Price (1987), and the

Gizem Ceylan is a postdoctoral researcher in Marketing, Yale School of Management, Yale University, USA (email: gceylan@gmail.com). Kristin Diehl is Professor of Marketing, Marshall School of Business, University of Southern California, USA (email: kdiehl@marshall.usc.edu). Wendy Wood is Provost Professor Emerita of Psychology and Business, Department of Psychology and Marshall School of Business, University of Southern California, USA (email: wendy.wood@usc.edu).

literature has grown considerably since that time. For these reasons, a quantitative synthesis of mental simulation on behavioral outcomes is timely and important.

We systematically review the literature in a meta-analysis and integrate the extensive empirical research in this multidisciplinary literature that spans marketing, advertising, psychology, and health. We connect and compare these results to the ways simulation has been used by managers and policy makers. Hence, our results can directly inform their decisions on simulation-based communication. Through this meta-analysis, we integrate 237 effect sizes and capture mental simulation's overall impact on behavior. We further contribute a comprehensive and empirically grounded account of the conditions under which mental simulation is effective in eliciting consumption and purchase. We thereby provide researchers and practitioners with a benchmark and strong foundation for understanding how to use this important technique.

Our research makes several important contributions. First, we find that, across studies, mental simulation increases behavioral responses. However, the average effect is small, suggesting that, while mental simulation works on average, marketers and researchers must identify ways to strengthen its impact. Second, we identify more powerful mental simulation prompts, such as dynamic visuals (AR, 360-degree video) and the combination of verbal instructions along with pictures, and we guide marketers to use such interactive, rich media. Third, we show that the frequency and spacing of mental simulation determine its effect on behavior, and we offer direct guidance to managers for effective ad planning and delivery. Fourth, we demonstrate that simulation has limited impact on behavior in online samples in which participants may not be sufficiently motivated to engage in mental simulation.

## Theoretical Development

### *Mental Simulation Readies for Behavior*

Mental simulation is the process of projecting oneself and one's action into alternate temporal, spatial, social, or hypothetical realities (Kosslyn 1980; Taylor and Schneider 1989). When people simulate future events, they think about their potential behaviors, creating a mental representation in which they are engaging in the target behavior and experiencing its consequences. The mental events involved in simulation are closely aligned with those of performing the behavior. In a classic analysis, James (1890) argued that "every mental representation of a movement awakens to some degree the actual movement which is its object." Echoing this idea, mental representations of future events have been termed "action plans" (Gilbert and Wilson 2007) and "organizers of activity" (Steels 2003). In support of a close connection between simulation and action, neuroimaging research reveals that simulating a behavior and engaging in the actual behavior take similar amounts of time (Parsons 1994) and activate similar neural mechanisms (Decety 1996; Guillot et al. 2009). This link between thinking and doing suggests a common neural coding of action or shared action schemas for simulated and actual behavior (Chartrand and Lakin 2013).

Given that mental simulation is essentially mentally performing a behavior, simulating a future behavior should increase the likelihood of action and improve actual performance. For instance, mental simulations improve athletes' performance by increasing their preparation for and motivation to act (Conroy and Hagger 2018; Driskell, Copper, and Moran 1994; Pham and Taylor 1999). Other skills, like playing the piano, can be learned effectively through mental practice in addition to actual physical practice (Pascual-Leone et al. 1995). In addition, simulating future consumption enables people to evaluate the emotional and cognitive consequences of that consumption, and imagining positive consequences increases people's willingness to engage in the imagined experience (Frijda, Bower, and Hamilton 1988; Higgins 2006). Furthermore, imagining events in concrete and specific form often makes those events seem true (Taylor et al. 1998). For example, imagining an idyllic vacation of lying on a beach, swimming, sailing, and snorkeling may increase the likelihood that consumers will turn these episodes into reality and book a vacation. Overall, mental simulation aims to facilitate and elicit the imagined behavior directly.

### *Mental Simulation and Its Mixed Effects on Behavior*

While ample research supports the idea that mental simulation increases readiness for behavior, research on the effectiveness of mental simulation on inducing actual behavior has yielded mixed outcomes. As we have noted, some studies found a positive effect of simulation prompts on behavioral intentions and behavior (e.g., Elder and Krishna 2012; Shiv and Huber 2000; Zhao, Hoeffler, and Zauberman 2007), while others failed to find such an effect (e.g., Pecher and Van Dantzig 2016; Rajagopal and Montgomery 2011). Note that this was the case even though both research and practice predominantly focus on simulating pleasurable consumption experiences such as driving a new car (Burns, Biswas, and Babin 1993) or staying at a nice hotel (Petrova and Cialdini 2005). Similarly, we focus our meta-analytic investigation on the mental simulation of positive consumption experiences.

To understand these inconsistent findings, researchers have recently begun to identify factors that may inhibit the effect of mental simulation on eliciting the simulated behavior. For instance, Cornil and Chandon (2016) found that mentally simulating the consumption of an unhealthy food option (e.g., a slice of chocolate cake) using all five senses simultaneously reduced the amount of food people consumed. In addition, Powell and Barasch (2019) found that exposure to photos limited the extent to which consumers mentally simulated an experience (vs. no photos), and limited simulation reduced purchase intentions. Given positive, null, and negative findings in the literature, a meta-analysis is particularly well suited to quantify mental simulation's overall effect and to identify possible reasons for varying results.

In line with marketing practice that uses verbal and visual inductions in different media (e.g., verbal on the radio, visual in print), researchers have used both explicit verbal and more implicit visual methods to activate mental simulation. Yet, researchers have rarely compared these different induction methods in a single study. Instead, they used different approaches but treated them as equivalent in activating mental simulation. Furthermore, researchers used different simulation targets (i.e., focal purchases) and respondent samples (e.g., in person, online) seemingly based on convenience without examining the potential effects of these decisions. We examine potential conditions that could alter the effectiveness of mental simulation, including how simulation was induced, its frequency, consumers' familiarity with the simulation target, and the nature of target (e.g., material products, experiential purchases, healthy behavior).

## *Does Mental Simulation Also Affect Attitudes?*

Mental simulation involves imagining behavioral episodes that have not (yet) taken place, such as driving a new car, putting on sneakers, or eating an apple. Neuroimaging research suggests a common neural coding of action or shared action schemas for simulated and actual behavior (D'Argembeau and Van Der Linden 2004). Collectively, the literature suggests that mental simulation should be able to affect behavior *directly* by increasing action readiness and realism of the experience, as indicated, for example, by feelings of greater narrative transportation (Escalas 2004).

Further, attitudes and behaviors may be related, as people often infer attitudes from their behavior and accessible thoughts (e.g., Kiesler, Nisbett, and Zanna 1969). It is possible that mental simulations of future behavior also influence attitudes. Mental simulation can bring to mind past experiences with the simulation target and related thoughts. These thoughts and feelings might then be updated based on the simulated behavior. For instance, a mental simulation of going to the gym might increase the likelihood of performing this behavior, thus also yielding more favorable attitudes toward going to the gym.

This effect of mental simulation on attitudes via behavior augments other well-established relationships between attitudes and behavior. A large body of work in research and practice examines persuasive communication that attempts to change behavior by first changing attitudes and intentions (i.e., an *indirect* effect of mental simulations on behavior). For example, the Theory of Reasoned Action (Fishbein and Ajzen 2011) provides a comprehensive framework, supported by copious empirical evidence, demonstrating that changing attitudes can lead to changes in behavior. Further, some work implies that mental simulation would influence attitudes first by creating feelings of fluency (e.g., Petrova and Cialdini 2005), and this change could carry over to behavior.

Given the importance of understanding the antecedents of behavioral responses to marketing practice and theory, in this meta-analysis, we purposefully focus on the causal effect of mental simulation on behavioral outcomes. Still, researchers may wonder whether and when mental simulations influence attitudes (e.g., Petrova and Cialdini 2005). Per our inclusion criteria, studies included in the meta-analysis must have assessed a behavioral response. Expanding the scope to include attitudinal outcomes independently was not feasible. To answer whether mental simulation influences attitudes, we use the studies included in the meta-analysis that also measured attitudes. Within the limits of this meta-analysis, we treat attitudes and behavior as separate outcomes and examine whether mental simulations would yield a positive effect on attitudes without disentangling the relationship between behavior and attitudes.

## *When Does Mental Simulation Affect Behavior?*

To understand when mental simulations affect behavior, we examine different ways in which mental simulation can be induced, focusing specifically on induction modality and simulation frequency. Empirically, we also explore other moderators as shown in Figure 1.

*Induction modality.* Researchers have activated simulations through verbal inductions, comparable to radio and podcast advertising, and visual instructions, comparable to print ads and 360 video presentations. Verbal inductions explicitly encourage individuals to simulate a future event or action related to a target behavior (e.g., Burns, Biswas, and Babin 1993; Silvera et al. 2014; Zhao, Hoeffler, and Zauberman 2007). Visual inductions provide photos, logos, drawings, and illustrations of the target to activate simulation (e.g., Krishna, Morrin, and Sayin 2014; Petrova and Cialdini 2005). A common assumption in the literature is that verbal and visual inductions similarly activate mental representations of the simulation target (Lutz and Lutz 1978). Hence, researchers have used them interchangeably. However, to the extent that pictures and words are processed and encoded differently, these two modalities may have different effects on behavior.

Pictures might provide a basis for more impactful simulations, given that they depict a specific representation of the referent object (Amit, Algom, and Trope 2009) and are processed faster than words (Nelson, Reed, and McEvoy 1977; Paivio 1969). Visuals that provide extensive detail may also evoke more intense emotional reactions (Rossiter and Percy 1980). For these reasons, visual simulation prompts could produce stronger effects on behavior than verbal ones.

Alternatively, verbal simulation prompts (i.e., instructions to imagine) may be more effective in activating detailed (Johnson et al. 1988) and self-relevant mental simulations (Anderson 1983; Escalas 2007). A verbal simulation prompt that denotes a broad set of referent objects (e.g., imagine yourself driving a sedan) allows consumers to simulate the features (e.g., color) that are most relevant and appealing to them. Thus, the personal relevance of verbal prompts might increase individuals' likelihood of engaging in the target behavior. The present meta-analysis compares the effectiveness of verbal versus visual inductions, even though prior research did not systematically study this question.

We also compare the effect of either visual or verbal simulation prompts to cases when both modalities are used in combination. Activating a simulation in two different modalities may

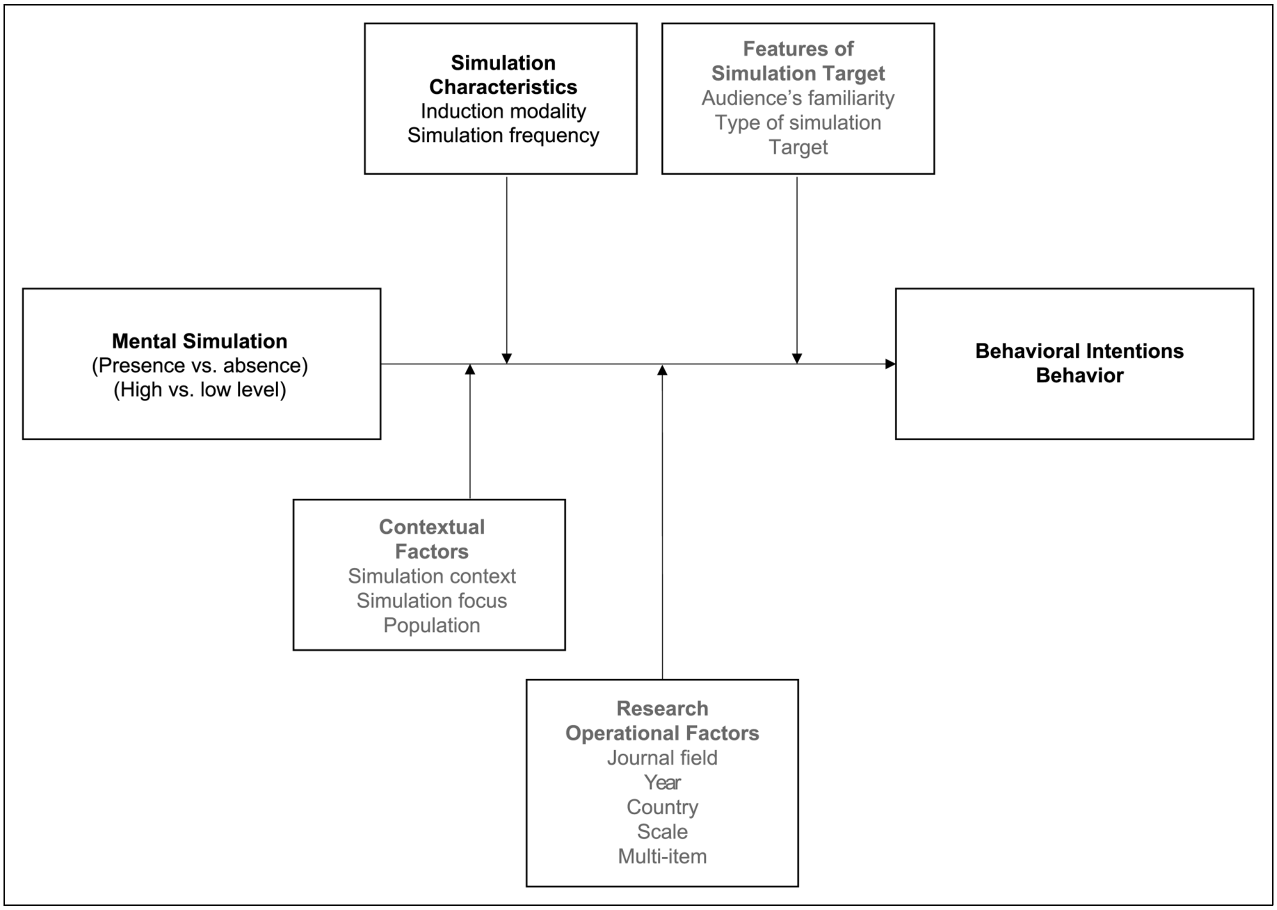


**Figure 1.** Model Tested in Meta-Analysis.
*Notes:* Gray text indicates moderators we tested but did not have a specific prediction about.

enhance the likelihood and elaboration of the simulation compared with using a single modality. Hence, combined inductions may have a stronger effect on behavior than single-modality inductions. However, it is also possible that simulations in two modalities have no additional effect, or that the combination may even have a negative effect through habituation.

To further understand the effects of different simulation inductions, we also compare the effect of standard static visual prompts with those involving dynamic visuals. Using emerging dynamic technologies, marketers and researchers potentially create more interactive, engaging consumer experiences. Studies with dynamic visuals used 3D images aided by interactive features, such as zooming in, moving, and rotating, or through AR. Control conditions in this work involve 2D images or static product pictures taken from the front, back, and side angles. Given the ability of dynamic visual prompts to evoke realistic and elaborate simulations of the target (Schlosser 2003), we expect dynamic simulation prompts to have a stronger effect on behavior than verbal and static (i.e., photos) visual inductions.

> **$H_1$:** Dynamic visual simulation inductions have a stronger effect on behavioral outcomes than verbal or static visual simulation inductions.

*Simulation frequency.* Prior research in advertising has identified the benefits of frequent exposure (also called "repetition effects" by Pechmann and Stewart 1988), largely due to more frequently advertised brands being recalled better at the point of purchase (Tellis 2003). In simulation-based ads, simulating behavior more (vs. less) frequently may increase action readiness, suggesting that greater simulation frequency leads to greater likelihood of engaging in the simulated behavior. However, simulation frequency may also lead to adaptation, such that greater simulation frequency reduces one's likelihood of engaging in the simulated behavior and eventually diminishes performance. Given these opposing mechanisms, it may not just be the frequency of mental simulation but also the spacing of mental simulation that influences behavioral outcomes.

Our review compares three approaches that researchers and practitioners have used to vary exposure frequency and spacing in mental simulation–based ads. The majority of studies in marketing evoke mental simulation of the target consumption experience only once in a single session, akin to a single exposure. Single exposures are likely in today's fragmented, cluttered media landscape, despite advertisers' efforts for greater exposure (Moorman, Ryan, and Tavassoli 2022). Furthermore, proponents of the minimalist (vs. frequentist) perspective on advertising have argued for and shown effects even after a single exposure (Gibson 1996; Jones 1995). Indeed, managers and researchers typically rely on a single exposure to assess ad effectiveness in A/B tests, a common industry practice. In addition, marketing practice stresses the importance of the first impression brands create on consumers (e.g., when visiting a brand's web page; Ghimire 2022). Finally, for consumable products, such as choosing what to eat for lunch from menus or apps, a single induction mimics the decision context, whereby marketers use vivid pictures to simulate the consumption experience and induce ordering (Pierce 2022). As such, single-simulation studies speak to an important aspect of marketing reality. Since mentally simulating a positive behavior (e.g., eating a cookie) is very close to actually performing the behavior and involves the same cognitive and neural circuitry, we expect it to increase the likelihood of engaging in the target behavior (e.g., purchasing or consuming the cookie).

Spaced simulations prompt participants to simulate the target consumption experience multiple times across temporally spaced sessions. Marketers use this strategy when delivering the same message to consumers on a daily or weekly basis. Across repetitions, individuals can bring different aspects of the simulation target to mind, eventually creating a more detailed and vivid mental model of the target. Given that consistency of mental simulation practice helps increase and maintain behavior performance (Janiszewski et al. 2003), we expect repeated simulations in temporally spaced sessions over time to have a stronger positive effect on behavior than a single simulation.

Massed simulations prompt participants to engage in simulation multiple times without temporal spacing. Marketers may (inadvertently) expose consumers to the same ad content in a massed way when reaching them across different platforms (e.g., Instagram, Twitter), when the inventory of nonskippable ads on online platforms is limited (a frequent complaint on YouTube), or with retargeting ads that follow consumers across different websites. For example, Li et al. (2021) speculated that consumer annoyance might explain why exposure to retargeting ads within a short period (30–60 minutes) negatively affects purchases. Relatedly, in a sports setting, Cooley et al. (2013) found a directionally negative relationship between the number of repetitions of a single image in one session and performance. In the context of simulation-based ads, we expect that repeatedly simulating the same target behavior in a short time frame leads to habituation and reduced behavioral responses. As a result, we expect massed simulations to reduce the likelihood of engaging in the target behavior compared with single simulation inductions.

**$H_{2a}$:** Spaced, repeated simulation inductions increase behavioral responses compared with single simulation inductions.

**$H_{2b}$:** Massed, repeated simulation inductions reduce behavioral responses compared with single simulation inductions.

We tested these a priori, theoretical predictions in our meta-analysis. Further, in line with meta-analytic practice, we also tested several other potential factors that arose during the review and differed between studies (see Figure 1) as well as operational factors (e.g., journal field). Given that we did not have a priori predictions about these factors, we introduce them in the following section and report the results only when they yield significant findings.

## Method

### Literature Search

We searched PsycINFO, PubMed, Web of Science, Google Scholar, Oxford Scholarship Online, ProQuest—Multiple Databases, and ProQuest Digital Dissertations for papers published or authored between 1980 and 2020. In line with the focus of this meta-analysis, the search used mental simulation–related terms in conjunction with outcome-related terms. Specifically, we used the following search string: the independent variable of interest ("simulation OR mental simulation OR imagery OR mental imagery OR mental practice OR visuali*") in conjunction with another independent variable or a dependent variable ("simulation OR mental simulation OR mental simulation OR mental simulation OR mental practice OR visuali*") and ("purchase intent[ion] OR behavioral intent[ion] OR persuasion OR behavior OR intervention OR program"). For searches conducted on PubMed, we added a third string ("randomized trial") to correctly identify studies with an experimental design. The term "persuasion" was included because it was sometimes used as an umbrella term to refer to outcomes of interest such as consumption behavior. The terms "intervention" and "program" were especially relevant to studies found in PubMed. Descendancy searches were conducted with Google Scholar on papers that cited foundational articles (Bone and Ellen 1992; Burns, Biswas, and Babin 1993; Rossiter and Percy 1980). Ancestry searches were conducted on the reference sections of foundational articles and review papers (Babin and Burns 1997; Blondé and Girandola 2016; Burns, Biswas, and Babin 1993; Conroy and Hagger 2018; MacInnis and Price 1987).

We also conducted a search for unpublished data (Rothstein and Bushman 2012). Searching ProQuest Digital Dissertations returned 13 documents that were a potential fit. Among them, four dissertations fit our criteria and were included in the analysis (Babin 1992; Ross-Stewart 2009; Thompson 2006; Walters 2007). Only one dissertation was later published (Babin and Burns 1997). In this case, studies from both the published article and the unpublished dissertation were included. We further searched ProQuest—Multiple Databases for conference proceedings. None of the reports we located fit our inclusion criteria (described subsequently).

In addition, we included two presentations from the 2019 Society for Consumer Psychology Conference in our analysis. Finally, we sent requests through the listservs of the Society for Personality and Social Psychology, the Society for Judgment and Decision Making, and the Association for Consumer Research. We received 16 papers (both published and unpublished work). Among these, two unpublished manuscripts met our inclusion criteria, and we included them in the meta-analysis. In addition, studies from an unpublished working paper by the authors of this manuscript were included in the analysis (see Web Appendix A for the graphical display of literature search).

### Inclusion Criteria

In line with the focus of this meta-analysis on the causal effect of mental simulation on behavioral outcomes, we included research reports that met the following criteria:

1. Studies must have had an experimental manipulation in which participants were randomly assigned to mental simulation conditions.
2. Mental simulation must be induced using verbal or visual prompts. As such, we included papers that induced participants' mental simulation using static pictures (e.g., Krishna, Morrin, and Sayin 2014), dynamic pictures (e.g., interactive pictures [Schlosser 2003], augmented reality [Fritz, Hadi, and Stephen 2022]), or verbal instructions (e.g., Adaval and Wyer 1998). Using this criterion, we excluded only three studies that activated mental simulation as a function of the number of claims (e.g., many vs. few claims; Spears, Ketron, and Ngamsiriudom 2016) or text type (e.g., dialogue vs. narration; Avramova, De Pelsmacker, and Dens 2017).
3. Eligible experiments must have had a control condition. We identified two types of control conditions in the literature: (1) one that used no simulation prompts (e.g., Adaval and Wyer 1998; Krishna, Morrin, and Sayin 2014) and (2) one that used prompts to induce a relatively lower level of simulation (e.g., Elder and Krishna 2012; Kim and Lennon 2008). Four studies that compared two different types of simulation conditions (e.g., process- vs. outcome-focused mental simulation manipulations) without a specific control were excluded from the analysis (Cian, Longoni, and Krishna 2020; Rennie et al. 2014).
4. Studies must have focused on simulating positive future consumption behaviors or positive sensory experiences derived from these behaviors (eating fruits [Knäuper et al. 2011], vacationing in Europe [Petrova and Cialdini 2005]) with the intention to increase simulated behavior. We did not include studies (a total of 17 studies) that instructed participants specifically to simulate *reducing* their future consumption behavior (e.g., reducing alcohol consumption; Conroy, Sparks, and De Visser 2015) or that instructed participants to simulate risks, problems, and negative sensory experiences (e.g., consequences of not screening for skin cancer [Block and Keller 1997], potential problems buying really new products [Dahl and Hoeffler 2004], disgust from neglecting gum health [Dillard and Shen 2018]).
5. Studies must have assessed a behavioral response in the form of (1) intentions, (2) choice between two alternatives, (3) actual consumption, or (4) amount of behavior (e.g., exercise). Given that mental simulation affects behavior directly, we did not include studies that *solely* assessed attitudes toward the brand or the company (e.g., DeRosia and McQuarrie 2019), attitudes toward the advertisement through which mental simulation was encouraged (e.g., Bolls and Muehling 2007), or memory recall (e.g., Klepacz et al. 2016). However, we computed attitude effects in studies that assessed attitudes in addition to behavioral responses to test for any evidence of an inference process.
6. Studies needed to have sufficient information (means, standard deviations, F-ratios, t-tests, etc.) to calculate effect sizes. We contacted authors for additional information whenever the necessary information was not available, and we used this information when provided (which recovered a total of 12 effect sizes).

### Meta-Analytic Strategy

We calculated the effect size, Hedges's g (Rosenthal 1991), using means and standard deviations, t-tests, F-ratios, and log-odds ratios using standard formulas (Borenstein et al. 2009; Johnson and Eagly 2014) and Comprehensive Meta-Analysis software (Borenstein et al. 2009). We used the bias-corrected Hedges's g (similar to Cohen's d but with a small sample correction) as our main measure of effect size (Rosenthal 1991). To estimate heterogeneity, we computed $I^2$ (Borenstein et al. 2009), which reflects the heterogeneity present in a sample as a percentage of the total variation that is not random sampling variation. We also estimated $\tau^2$ as a measure of absolute heterogeneity.

In all, our meta-analysis synthesized 237 published and unpublished effect sizes (including all induction methods and all dependent variables), obtained from research conducted in the United States and internationally. To account for the hierarchical structure of our data (i.e., multiple effect sizes derived from one paper), we estimated the overall effect size using a three-level model, reflecting the set of experiments nested in a given paper (level 3), individual effect sizes nested within experiments (level 2), and subjects nested in each experiment (level 1; Cheung 2014). The analysis used robust variance estimation (Hedges, Tipton, and Johnson 2010) with hierarchical weights and small sample corrections (Tipton, Pustejovsky, and Ahmadi 2019). When sufficient data were available ($k > 4$), we tested for the influence of moderating variables. All analyses were conducted using the R packages metafor (Viechtbauer 2010) and robumeta (Fisher, Tipton, and Zhipeng 2017).

Finally, to better communicate the substantive importance of a given finding, we translated Hedges's g into an improvement index, based on Cohen's U3 index, which converts an effect into a percentile gain shown by the treatment group compared with the control group (Durlak 2009). For example, an effect size of $g = .2$ moves the treatment group from the median of a normal distribution to its 60th percentile and represents a 10% change in the focal outcome (in standardized terms) between the treatment group and the control group.

## Publication Bias

Publication bias is a threat to the validity of any meta-analysis. The published literature documents only a proportion of all research carried out, and the unpublished proportion may be systematically different from the published because selectivity may exist in what gets published (Sutton 2009). To address these concerns and investigate bias, we assessed potential bias using three methods: Egger's tests, trim-and-fill analyses (Duval and Tweedie 2000a), and *p*-curve (Simonsohn, Nelson, and Simmons 2014).

First, we used Egger's test to examine publication bias. Egger's test estimates the association between the observed treatment effects and their standard errors; a strong association implies publication bias (Egger, Smith, and Phillips 1997). Second, we employed trim-and-fill on funnel plots with contours to verify the extent to which the effect size would change when accounting for unpublished results (Duval and Tweedie 2000b; Palmer et al. 2008; Peters et al. 2008). Third, we created a *p*-curve from all published studies in our final data set to test whether the underlying studies had evidential value, meaning that effects were not due to selective reporting (Simonsohn, Nelson, and Simmons 2014).

Jointly, these analyses suggest that the effect of mental simulation has a small but robust true effect on behavioral responses despite some evidence for publication bias (detailed analyses can be found in Web Appendix B). Separately, we conducted a publication bias analysis for studies with attitudes toward the simulation target as the dependent variable (see Web Appendix C). Similar to the average effect size from studies with behavioral outcomes, the average effect size from studies with attitudes reduced slightly but remained significantly different from zero after controlling for publication bias.

## Dependent Variables

*Behavioral responses.* Behavioral responses included purchase intentions, choice, actual (food) consumption, and actual behavior (e.g., exercise). Purchase intention measures included single- or multi-item measures of intentions to buy (e.g., Jeong and Jang 2016), willingness to obtain information (e.g., Gregory, Cialdini, and Carpenter 1982), and willingness to recommend an item to others (Silvera et al. 2014). We also included studies that combined purchase intentions with brand attitudes (e.g., Hartmann and Apaolaza-Ibáñez 2009). Some studies measured consumers' choice as a preference between two alternatives in hypothetical settings (e.g., Shiv and Huber 2000). In addition, several studies measured actual behavior, including actual food or drink consumption (either in grams or in units of the food and drink item; e.g., Cornil and Chandon 2016) and physical activity in terms of exercise in minutes or frequency in a week (Kim et al. 2011). We report all as behavioral responses.

*Attitudes toward the simulation target.* Some studies in our sample also reported attitudes toward the focal target and, thus, allow us to test whether mental simulation also affects attitudes. We calculated a separate effect size reflecting attitudes toward the simulation target. These studies typically measured attitudes using multiple items (good/bad, favorable/unfavorable, pleasant/unpleasant, etc.) and reported these as a composite score. Note that, in the reporting, prior research treated attitudes and behavior as separate outcomes and did not report the relationship between them. Hence, we cannot assess the indirect effect of mental simulation on attitudes via behavior as implied by a self-perception mechanism. However, we can assess the direct effect of mental simulation on attitudes. Such a finding may still be of practical importance because attitudes can be measured more easily than behavior.

## Effects and Moderator Coding

The first author and a research assistant, who held a master's degree in psychology and was trained by the first author, calculated all effect sizes and coded moderator variables as discussed next (interclass correlation = .90). The two coders resolved any disagreement by discussion. To capture prior experience with the target behavior, we used text analysis (discussed subsequently).

*Induction modality.* In studies with verbal inductions, the treatment group was instructed to mentally simulate a future behavior (e.g., driving a sedan car, vacationing at a beach resort). These studies compared the effect of mental simulation prompts in the treatment group with a control group that entailed (1) a list of product attributes (e.g., Escalas 2004) or (2) a different scenario without instructions to engage in mental simulation (e.g., Zhao, Hoeffler, and Zauberman 2007).

Studies with visual inductions activated mental simulation in the treatment condition by showing a high-quality picture of the intended future behavior (e.g., colorful and clear [Petrova and Cialdini 2005], larger visuals [Rossiter and Percy 1980]). In the control condition, these studies employed two operationalizations: (1) no picture: participants in this control did not receive a visual at all, or (2) less vivid picture: participants in this control received either a picture that was unrelated to the intended behavior or a lower-quality, less vivid picture of the intended behavior (e.g., black and white, fuzzy, smaller visuals).

We also coded studies that combined visual and verbal inductions in the same experimental condition. We compared the combined treatment condition with the available control conditions (which constituted the single-modality treatment conditions): (1) verbal induction alone: this control used instructions, or (2) visual induction alone: this control used static visuals to mentally simulate a behavior. We conducted a publication bias analysis for this separate set of studies that used combined inductions (see Web Appendix D) and did not find any evidence of publication bias.

We further coded studies in which the treatment condition involved dynamic visual simulation inductions or technologically enhanced visuals. Dynamic simulation inductions were images rendered in augmented reality (e.g., an image of a food item on a table; Fritz, Hadi, and Stephen 2022), rotating images (e.g., an image of a jacket that participants can zoom, move, or rotate; Choi and Taylor 2014), or a 360-degree video (e.g., of a digital camera; Schlosser 2003). The control group involved static visuals (e.g., pictures of the product from front, back, and side angles). Note that in this comparison the control condition constituted the treatment condition discussed previously (i.e., high-quality pictures). Hence, we analyzed studies with dynamic visuals separately. We also conducted a publication bias analysis for this separate set of studies that used dynamic visuals (see Web Appendix E) and did not find any evidence of publication bias. We present the four simulation induction methods and respective control conditions in Table 1.

*Simulation frequency.* Studies in our review that involved either verbal or visual inductions used three distinct presentation frequencies and spacings to activate mental simulation: single, spaced, and massed. In single simulations, participants simulated the target behavior once ($k = 116$). For instance, participants mentally simulated consuming popcorn (e.g., Hildebrand, Harding, and Hadi 2019) or using a notebook computer (e.g., Shiv and Huber 2000). In spaced simulations ($k = 10$), participants repeatedly simulated the target behavior in multiple sessions distributed over time (e.g., weekly). For instance, participants mentally simulated engaging in physical activity (Kim et al. 2011) or eating healthy snacks (Rennie et al. 2014) once a week for four weeks. These studies measured the outcome at the end of the final intervention session. Finally, in massed presentations ($k = 22$), participants simulated the same target behavior repeatedly within a short period (generally in the same session). In a single experimental session, respondents mentally simulated performing the behavior multiple times (e.g., eating 30 M&Ms; Morewedge, Huh, and Vosgerau 2010) or using all five sensory modalities (e.g., focusing on the sound, the smell, taste, look, and sensation of eating cake; Cornil and Chandon 2016).

*Familiarity with the simulated target.* The reviewed studies used simulation targets that may have differed in participants' prior familiarity. To estimate the familiarity of each target at the time of publication, we tracked mentions of the simulation targets in the news with Dow Jones Interactive, an online news database that records the frequency of use of a topic, word, or phrase (now known as Factiva.com [https://global.factiva.com/]). Following Fast, Heath, and Wu's (2009) demonstration that the prevalence of words or names in news media is an indicator of familiarity, we counted the number of times a simulation target appeared in publications in the country where the research was conducted and in the year the paper was published. We created an index of this word or phrase versus four commonly used words (news, land, buy, and market) that may have appeared in publications frequently to control for any increase in word appearances over time. We then created a composite index by averaging these four indexes. We used the composite index as a continuous moderator that reflects the relative prevalence of a stimulus target at the time of publication (see Web Appendix G for further details).

*Type of simulation target.* Simulation targets were typically not manipulated within a given study but rather varied across studies. We coded four distinct simulation targets that would be relevant to managers and researchers: (1) material, which included tangible products (e.g., car, laptop, jacket); (2) experiential, which included ephemeral experiences (e.g., vacationing at a resort, visiting a park); (3) food, which included items to be consumed (e.g., hamburgers, cookies, M&Ms, orange juice); and (4) health, which included engaging in beneficial activities (e.g., exercising).

*Simulation focus.* Only two studies in our review explicitly manipulated whether instructions focused on the outcome versus the process of consumption (vs. a separate control condition; Marszał-Wiśniewska and Jarczewska-Gerc 2016; Zhao, Hoeffler, and Zauberman 2007). For these papers, we compared process and outcome simulation conditions separately with the control. For all other studies, we coded simulation prompts as focusing on the outcome or process in line with the definition from Taylor et al. (1998).

*Simulation context.* We also coded whether manipulations were embedded in an explicit persuasive context (i.e., advertising context) or not. In some studies (e.g., Elder and Krishna 2012; Escalas 2004), prompts were embedded within an advertisement, which we coded as an advertising context. In other studies (Duncan et al. 2012; Meslot et al. 2016), prompts were presented without a specific persuasive context.

*Population.* Some studies recruited participants online, through Amazon Mechanical Turk (MTurk). Other studies were conducted in person at a college/university with student participants, and the remaining studies were conducted in person using general population samples.

**Table 1.** Induction Modality in Treatment and Control Conditions.

| Modality | k | Treatment | Control |
|---|---|---|---|
| Verbal | 60 | Instructions | No instructions |
| Visual | 88 | High-quality picture (static) | No picture or low-quality picture |
| Combined | 22 | Instructions + high-quality picture (static) | Instructions or high-quality picture (static) |
| Visual | 20 | Dynamic visuals (360-degree pictures or augmented reality) | High-quality picture (static) |

**Table 2.** Moderators.

| Moderator | Coding Scheme |
|---|---|
| Induction modality | 1 = visual, 0 = verbal<br>We also tested combined (visual + verbal) and dynamic inductions. |
| Simulation frequency | 1 = spaced, 0 = otherwise<br>1 = massed, 0 = otherwise<br>Reference category if both variables are 0 is single simulation |
| Prior experience with simulated target | Familiarity index based on Factiva mentions |
| Type of simulation target | 1 = material, 0 = otherwise<br>1 = food, 0 = otherwise<br>1 = health, 0 = otherwise<br>Reference category if all variables are 0 is experiential |
| Simulation focus | 1 = process-focused, 0 = outcome-focused |
| Simulation context | 1 = in advertising context, 0 = no advertising context |
| Population | 1 = general population, 0 = otherwise<br>1 = students, 0 = otherwise<br>Reference category if both variables are 0 is MTurk |
| Journal field | 1 = marketing, 0 = outside of marketing |
| Year | Year of publication (1980 to 2020) |
| Published | 1 = published, 0 = unpublished data (working paper, dissertation, or conference proceedings) |
| Country | 1 = United States, 0 = otherwise |
| Dependent variable is a scale | 1 = continuous, 0 = otherwise (binary, count) |
| Dependent variable is a scale composed of multiple items | 1 = multiple items, 0 = single item |

**Table 3.** The Influence of Mental Simulation Inductions (vs. No Simulation Control).

| Dependent Variables | Number of Effects | Total Sample Size | Hedges's g [95% CI] | % Change[a] | $I^2$ (%) |
|---|---|---|---|---|---|
| Behavioral Responses | 148 | 40,705 | .19***[b] [.11, .27] | 7.5 | 83.0 |
| Behavioral Intentions | 116 | 36,868 | .18***[b] [.11, .25] | 7.1 | 76.2 |
| Behavior | 32 | 3,837 | .13[b] [−.20, .45] | 5.1 | 91.2 |
| Attitudes Toward Simulation Target | 47 | 23,828 | .15***[b] [.07, .24] | 6.1 | 63.0 |

***$p < .001$.
[a]Standardized percentage change in the outcome as indicated by Cohen's improvement index.
[b]Identical letters indicate no significant difference between effect sizes.

*Journal field.* Some studies appeared in marketing journals (e.g., *Journal of Marketing*, *Journal of Consumer Research*) and others in nonmarketing ones (e.g., *Appetite*, *Frontiers in Psychology*). For working papers, dissertations, or conference presentations, we based coding on the primary appointment of the authors or the domain of the conference. Of all effect sizes included in this paper, 79% were based on a paper in the field of marketing.

A summary of all moderators tested can be found in Table 2.

## Results

### Does Mental Simulation Affect Behavior?

Across induction methods and dependent variables, the meta-analysis included 237 total effect sizes nested in 126 studies from 55 different manuscripts. In aggregate, these reflected responses of 40,705 participants. Of these, combined (i.e., visual + verbal) simulation inductions (22 effect sizes), dynamic stimulation inductions (20 effect sizes), and studies with attitudes as the dependent variable (47 effect sizes) were analyzed separately, leaving the largest number of effect sizes (148) for analyses of static inductions on behavior.

Table 3 shows the results from the best fitting three-level hierarchical linear model (see Web Appendix H for alternative models). Overall, mental simulation created a small positive increase in consumers' behavioral responses. On average, simulation inductions increased behavior by 7.5% expressed in Cohen's improvement index. When the effect size was broken down to intentions and behavior, the effect size was significant for intentions but not for behavior, possibly due to the smaller sample size assessing actual behavior. Figure 2 depicts the effect sizes of all 148 studies, grouped by induction modality, as well as the overall effect size. The nonrandom variability ($I^2$), or dispersion attributable to true heterogeneity and not sampling error (Higgins and Thompson 2002; Huedo-Medina et al. 2006), was sizable, suggesting that outcomes were influenced by simulation frequency and other study features.

### Does Mental Simulation Affect Attitudes?

Our review included 47 attitude effect sizes from 18 papers that reported both attitude toward the simulation target and behavioral responses in 35 separate studies (Table 3). All studies induced mental simulation using the single stimulation paradigm. Echoing the overall findings, simulation in this smaller sample increased behavior by 5% and attitudes by 6% (compared with the control), expressed in Cohen's improvement index. Simulations had comparable effects on behavior and attitudes.

### How to Amplify Mental Simulation's Effect on Behavior?

*Use modalities interchangeably as modality of simulations has no differential effect.* Table 4 reports all effect sizes by subgroup and the hierarchical linear model results for the impact of other examined factors on behavioral responses. Verbal instructions and visual photos had statistically comparable effects on behavior. Specifically, expressed in Cohen's improvement index, simulations that used a verbal induction or a static visual increased behavioral responses by 9.1% and 6.1%, respectively.

*Combine multiple modalities.* We further analyzed whether combining both modalities had a stronger effect compared with each modality alone (Table 4). Indeed, both modalities in combination increased behavioral responses by 9.8% compared with using either modality alone.

*Use dynamic simulations.* Studies that activated mental simulation using dynamic visual inductions (e.g., 360-degree videos, AR) increased behavioral responses by 15.5% compared with the static visual control, revealing a medium-sized effect (Table 4). To test $H_1$, we compared the effect size from studies that used dynamic visuals to visual inductions. In support of $H_1$, studies that used dynamic visuals produced a significantly larger behavioral response than studies that used static visuals ($z = -2.66$, 95% CI: [−.43, −.06], $p = .008$), and a marginally larger response than studies that used instructions ($z = -1.94$, 95% CI: [−.37, .001], $p = .052$).

*Space repeated simulations to increase behavior, mass simulations to decrease behavior.* Recall that single-simulation studies produced a small effect, increasing consumers' behavioral responses by 5.7% compared with the control. Spaced simulations, which were presented multiple times with breaks in-between, produced a large positive effect and increased behavioral responses by 33.8% compared with single simulations. Finally, massed simulations, which repeated mental simulations without a break, decreased consumers' behavioral responses by 12.6% compared with single simulations. In support of $H_{2a}$, spaced simulations had a larger positive effect than single simulations. Furthermore, in support of $H_{2b}$, the effect of single simulations was positive and hence larger than the effect of massed simulations, which was negative.

*Use more in-person and, if possible, general population samples.* Mental simulation increased behavioral responses in studies conducted in person with general population samples by 18.1% and with student samples by 5.1%. However, simulation had no significant effect in studies conducted with MTurk samples (note that only single and massed simulation studies were conducted online). When we compared the general population and student samples, simulation had a stronger influence on the general population than on students ($QM(1) = 8.89$, $p < .001$).

## General Discussion

Mental simulation had a small and robust effect of increasing behavioral responses in our data set of 237 effect sizes spanning four decades of research and representing 40,705 respondents. At the same time, the studies revealed several ways to strengthen this effect. Most important and relevant to both managers and researchers, the type of prompt used to stimulate mental simulation was a major influence on simulation effectiveness. When consumers simulated the target behavior using either a combination of verbal and static visual prompts or a dynamic visual prompt (such as AR or 360-degree videos), the behavioral impact far exceeded that of verbal or static visual prompts alone. Thus, simulation-based communication can benefit from multiple modalities or technological developments facilitating easier, more vivid, and realistic mental simulation.

The frequency of the simulation also provides a way to increase simulation effects. Prior advertising research has highlighted the advantages of frequent presentation because it can improve encoding and memory, as reflected in brand recall. However, repeated presentations did not always enhance the effectiveness of mental simulation. Single simulation inductions, often used in academic research and A/B testing in industry, produced a positive but small increase in behavioral response. When the simulation was repeated and spaced over time, the simulation's effect was, on average, five times larger than that of single inductions. In contrast, massed simulations actually reduced behavior. Small time intervals between exposures likely lead consumers to habituate and ultimately disengage from the simulated behavior.

It is also worth noting that studies conducted online (e.g., MTurk samples) yielded nonsignificant results. Studies conducted with in-person samples, however, produced significant effects. These findings suggest that in-person samples offer a more robust context for researchers to examine mental simulation and its consequences.

### Managerial Implications

An important finding for practitioners is that more interactive and engaging simulation prompts, such as 360-videos and AR tools, are especially effective in increasing behaviors. Fritz, Hadi, and Stephen (2022) find that, by superimposing objects into a consumer's real-time environment, AR increases the

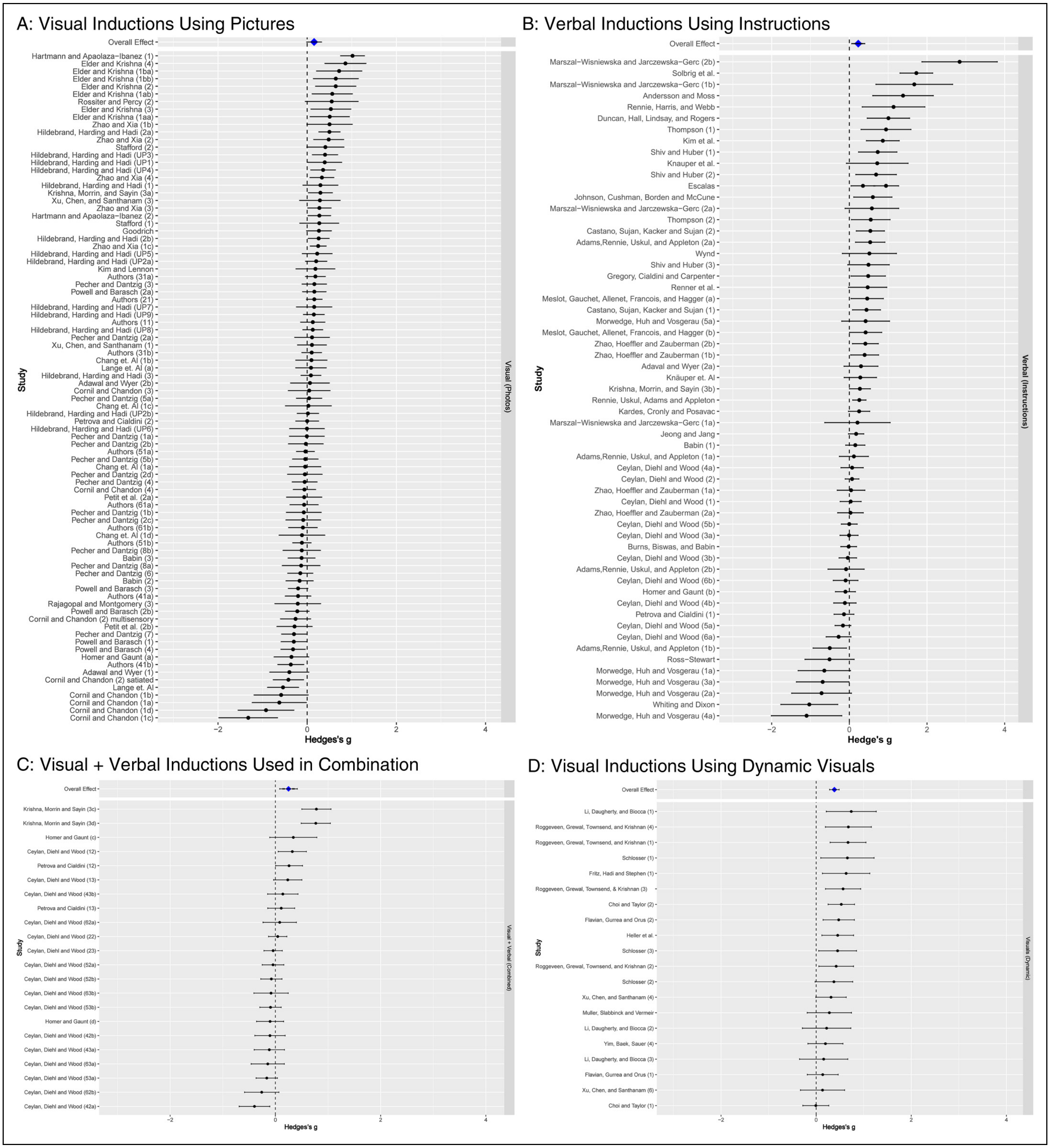


**Figure 2.** Forest Plot of All Effect Sizes with Behavioral Outcomes Grouped by Induction Modality.

ease with which consumers can mentally simulate behavior. This ease of simulation can, in turn, increase their desire, purchase likelihood, and consumption enjoyment. Beyond the initial attraction of novel technologies, investing in such technologies and approaches may be particularly important for companies that rely on consumers simulating a future experience or outcome. Further, certain existing technologies and channels can be leveraged for simulation-based communications. For instance, animated graphics play an increasingly important role in digital advertising and email marketing for product reveals and demonstrations (White 2021). Further, 1.5 million beauty videos are uploaded each month on YouTube, accounting for 4.6 billion views stimulating simulation (Hudson, Kim, and Moulton 2018). In addition, many luxury brands, from shoes to watches, employ unboxing videos on TikTok and Instagram to stimulate viewers' imagination and influence their future brand purchases.

Even if practitioners rely on traditional prompts to activate mental simulation, they can achieve double the effect size by combining visual and verbal prompts. This is in line with research on visual and verbal communication in consumer-generated content. For instance, in the context of online reviews, Ceylan, Diehl, and Proserpio (2023) find that when review photo and review text convey similar aspects of one's experience consumers find the review easier to process which, in turn, increases that review's perceived helpfulness. Similarly, in simulation-based ads, practitioners can more easily activate mental simulation and reap the benefits when they use both modalities in combination.

Although researchers and managers have previously stressed the importance of frequency when planning campaigns, they were generally concerned about ensuring brand recall. Our findings suggest that frequency and spacing are uniquely important for campaigns involving mental simulation. Ads prompting mental simulation are most effective when consumers are exposed to an ad multiple times. However, in today's age of viewers fragmented across platforms, some consumers may be reached only once, while others may be exposed to the same ad multiple times in brief succession. Both types of exposures are particularly problematic for simulation-based ads. Our findings show that simulating a consumption experience only once has a much smaller effect on behavior than repeated and spaced simulations. Worse, we find that repeated simulation prompts without spacing *inhibit* behavior. Hence, for marketers employing mental simulation in their campaigns, controlling, especially limiting, daily exposure is particularly important. Hulu, for example, has taken steps to ensure that its viewers encounter the same commercial *only* twice per hour, four times per day, or 25 times per week. Other platforms such as Facebook and Instagram now allow marketers to place limits on daily or weekly exposure, which, given our findings, should be set even lower than those employed by Hulu. Yet, with the practice of retargeting, exposure across venues may still be substantial (Smith 2021). Thus, simulation-based ads may particularly benefit from technological advances that allow marketers to place frequency limits *across* platforms, such as Google's Display & Video 360 (Bulbul 2022).

Furthermore, we found that mental simulation prompts were ineffective for online respondents, possibly because they were not sufficiently involved or engaged in the simulation process. This finding may be particularly alarming for managers because a large chunk of advertising spending is on TV and digital channels that may be consumed along with distracting activities and may involve active disengagement from ads. Ads that include mental simulation may better fit into channels in which consumers initiate the marketing activity (Wiesel, Pauwels, and Arts 2011), such as search ads that ensure greater consumer attention and engagement based on their declared interests (Shankar and Malthouse 2007). For other channels, it may be particularly important to target mental simulation messaging well to ensure that consumers are sufficiently motivated to engage in the effortful simulation process. Implications of our findings for managers and researchers are summarized in Table 5.

### *Future Research*

Our extensive analyses and broad survey of the available literature allowed us to test novel questions that were not addressed in the original research, such as the impact of repeated versus single simulation prompts. However, the majority of studies we identified focused on a limited range of visuals (e.g., static, 360-degree, AR) and thus were less informative about other types of visuals, such as videos or virtual reality (VR), which offer great promise for both academics and managers. For instance, Kristofferson, Daniels, and Morales (2021) found that VR (vs. 360-degree visuals) increased donations through greater immersion in the experience, suggesting that VR is a promising platform for simulation-based campaigns. Future research into the effects of new visual technologies on consumers' mental simulation and behavior will be important. Furthermore, future investigation might address whether these more engaging simulation methods can improve the effectiveness of mental simulation for targets about which consumers have little knowledge on which to base their simulation (e.g., low-familiarity targets) or for contexts in which people are not highly motivated to engage in simulation (e.g., online samples, low-involvement contexts).

Although our analysis did not identify familiarity with the simulation target as a significant predictor, familiarity may still play a role in both theory and practice. In the literature that we analyzed, researchers generally chose products and services with which participants had moderate to high familiarity (cf. Dahl and Hoeffler 2004; Jiang and Wyer 2009). However, brands also use simulation-based ads to introduce novel products. For example, Mercedes's print ads promote new models as coming from the "Dream Factory" and aim to activate the audience's mental simulation. In line with initial findings by Dahl and Hoeffler (2004) that simulation did not benefit really new products, Mercedes's campaign may be differentially effective when launching major innovations or radically new cars (e.g., autonomous cars) because consumers may not have a solid mental model of the behavior (i.e., driving an autonomous car). How consumers respond to simulation-based ads of different modalities in these instances and whether consumers need greater handholding using vivid visual prompts or easy-to-understand simulation starters can be the focus of future research.

Furthermore, simulation prompts in the reviewed literature were often associated with a company and an explicit persuasion attempt (i.e., advertising). Although persuasive context did not influence simulation effectiveness, future research might examine whether simulation prompts by third parties

**Table 4.** Results of Moderator Analyses.

| | k Studies | M Effect Size (SE) | Fully Nested (Three-Level) Model Without Research Operational Variables |
|---|---|---|---|
| Moderators | | | |
| Induction modality | | | |
| Visual (+1) | 88 | .16 (.04) | .03 (.03) |
| Verbal (0) | 60 | .23 (.05) | |
| Simulation frequency | | | |
| Massed (+1) | 22 | −.32 (.09) | −.31* (.13) |
| Spaced (+1) | 10 | .99 (.13) | .85*** (.21) |
| Single (0) | 116 | .18 (.03) | |
| Familiarity | 148 | | .001 (.01) |
| Simulation target | | | |
| Material (+1) | 51 | .21 (.06) | .09 (.08) |
| Food (+1) | 60 | .07 (.06) | .08 (.06) |
| Health (+1) | 14 | .74 (.13) | .17 (.19) |
| Experiential (0) | 23 | .13 (.08) | |
| Context | | | |
| In advertising (+1) | 67 | .18 (.06) | −.03 (.07) |
| No advertising (0) | 81 | .18 (.06) | |
| Focus | | | |
| Outcome (+1) | 32 | .31 (.07) | .03 (.07) |
| Process (0) | 116 | .14 (.04) | |
| Population | | | |
| General population (+1) | 25 | .47 (.09) | .21* (.09) |
| Students (+1) | 65 | .13 (.05) | .05 (.07) |
| MTurk (0) | 58 | .07 (.06) | |
| Akaike information criterion | | | 63.96 |
| Bayesian information criterion | | | 114.32 |
| d.f. | | | 16 |
| **Analyzed Separately** | | | **[95% CI]** |
| Combined inductions | 22 | .25 (.05) | [.14, .36] |
| Dynamic inductions | 20 | .40 (.09) | [.23, .56] |

*$p < .05$.
**$p < .01$.
***$p < .001$.

(e.g., to eat more vegetables by the American Diabetes Association) would be more effective than prompts by entities with a financial interest in the simulated behavior.

The literature we reviewed focused on engaging in a particular behavior (e.g., eating a cookie). However, particularly in the context of health and well-being, policy makers often employ simulation-based ads to *not* engage in a particular behavior (e.g., reducing consumption of unhealthy foods). The effect of mental simulation may be more complex when reducing an existing behavior via simulation than encouraging new behavior. Further factors such as familiarity may also play a role. For example, Hagger, Lonsdale, and Chatzisarantis (2012) found that mental simulation prompts to reduce alcohol consumption were more effective for those with higher baseline consumption. Future research may systematically examine the effect of simulating not to engage in certain behaviors and may even contrast these with massed simulations that effectively reduced behavior via habituation.

Given that most current research tested positive consumption experiences and that positive consumption behavior is highly relevant to marketing practice, we focused solely on such experiences. However, managers and policy makers sometimes leverage negative mental simulations to raise awareness for certain causes (e.g., the U.K. Alzheimer's Society asked viewers to imagine what it would be like to go through COVID lockdown while experiencing Alzheimer's) or to demarket products (e.g., vivid photos of mouth lesions on cigarette packs to reduce smoking). Simulating negative events involves different psychological processes than simulating positive events and may thus affect behavior differently (Barsics, Van der Linden, and D'Argembeau 2016). On the one hand, negative simulation prompts may be more effective because people weigh negative (vs. positive) information more heavily in their decision processes (Skowronski and Carlston 1989). On the other hand, counterarguing, motivated reasoning, or focusing on emotional responses

**Table 5.** Managerial and Research Implications.

| Key Findings | Managerial and Research Implications |
|---|---|
| On average, mental simulation inductions have a small effect on consumption and purchase behavior. | Both managers and researchers should carefully select simulation paradigms that heighten effectiveness. |
| Simulation inductions are more effective when they combine visual and verbal modalities than simulations that use either modality alone. | Multimodality can enhance the ease with which consumers can process simulation-based ads, which managers and researchers alike can utilize in their communication and research, respectively. |
| Dynamic visual inductions (rotating pictures or AR tools) are more effective than verbal and static visual inductions. | Engaging techniques such as rotating pictures and AR tools are more effective in increasing behaviors and can be used more often by managers and researchers. |
| Simulations are more effective when repeated over time with breaks (e.g., across weeks) | Both researchers and managers may refrain from relying solely on single-simulation interventions, such as investing in a simulation-based commercial that is shown only once to consumers (e.g., Scarlett Johansson imagining life with a mind-reading Alexa during Super Bowl 2022; Rawlings 2022). Marketing communication largely strives for repeated exposures. However, ensuring frequency is not sufficient to amplify the effectiveness of simulation-based communication. It is also critical that simulation prompts are appropriately spaced. Researchers may benefit from repeating simulation inductions to strengthen the effect of their manipulations. |
| Repeating the same simulation in a short period of time (i.e., massed simulations) reduces behavior. | While focusing on frequency, managers should be mindful that repeated simulations without spacing (i.e., massed) can dampen behavior. Hence, presenting the exact same message and visuals repeatedly within a short period of time should be avoided (e.g., by platforms allowing limits on exposure). |
| Simulation inductions are least effective in online studies (such as MTurk) and more effective for in-person samples (students or general population) | Managers should employ simulation-based ads when consumers are motivated to engage in the simulation (e.g., when they actively search for them). When studying mental simulation with online samples (e.g., MTurk), researchers must find ways to keep participants sufficiently motivated and engaged to induce simulation. |

(such as fear) may reduce the effectiveness of negative simulation prompts. For example, the graphicness of negative visuals did not affect quitting thoughts for heavy smokers (Andrews et al. 2014), and extensive elaboration on harmful consequences interfered with processing recommended changes in behavior (Keller and Block 1996). Given these conflicting possibilities, future research could examine the effect of negative simulation prompts on behavior more closely.

Our investigation focused on purchases and consumption due to their direct link with mental simulations as well as their importance to researchers and managers. However, other simulation-induced outcomes may also be important. For example, prior research found that savoring an upcoming consumption experience heightened enjoyment of the experience (Chun, Diehl, and MacInnis 2017). Similarly, it is possible that mental simulation increases readiness to *enjoy* the experience beyond mere readiness to act, a potentially critical yet unexplored effect. Given the importance of the actual consumption experience for both satisfaction and repeat purchases, future research should examine mental simulation outcomes that extend beyond purchase or use.

In summary, with our quantitative review, we contribute to the important literature on mental simulation by offering novel insights to inform academic research and marketing practice. Using these insights, researchers can pursue novel avenues of inquiry and practitioners can more effectively use mental simulation in their marketing strategies and communication plans.

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## ORCID iD

Gizem Ceylan https://orcid.org/0000-0002-3876-9312

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