The Effect of Slow Motion Video on Consumer Inference

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ABSTRACT

Video advertisements often show actors and influence agents consuming and enjoying products in slow motion. By prolonging depictions of influence agents' consumption utility, slow motion cinematographic effects ostensibly enhance social proof and signal product qualities that are otherwise difficult to infer visually (e.g., pleasant tastes, smells, haptic sensations, etc.). Seven studies including an eye-tracking study, a Facebook Ads field experiment, and lab and online experiments—all using real ads across diverse contexts—demonstrate that slow motion (vs. natural speed) can backfire and undercut product appeal by making the influence agent's behavior seem more intentional and extrinsically motivated. The authors rule out several alternative explanations by showing that the effect attenuates for individuals with lower intentionality bias, is mitigated under cognitive load, and reverses when ads use non-human influence agents. The authors conclude by highlighting the potential for cross-pollination between visual information processing and social cognition research, particularly in contexts such as persuasion and trust, and discuss managerial implications for visual marketing, especially on digital and social platforms.

Keywords: visual marketing, slow motion video, audiovisual media, intentionality, eye-tracking

Video marketing is the dominant form of advertising; television aside, over 1.9 billion YouTube users watch 1 billion hours of ad-filled videos every day, while mobile video ad spend alone accounts for over 72% of digital ad spend (Biteable 2021). Despite being more engaging, memorable, and popular than other forms of content (Bowman 2017), video advertisements are fundamentally limited to visual (and audio) information. This makes it necessary to employ actors and influence agents to signal a product's non-visual attributes (e.g., taste of food, feel of using facial-cleanser, motion of riding a bicycle), often by demonstrating and reacting to consumption (e.g., smiling while chewing on food), and to provide social proof of its utility (Cialdini 2007).

In such marketing contexts, one of the most common and easy-to-implement cinematographic techniques is to portray consumption in slow motion. For example, food advertisements often show actors chewing and smiling in slow motion to signal palatability; similarly, face-wash and shampoo commercials often portray actors lathering and rinsing luxuriantly in slow motion to depict sensations of cleanliness and comfort (also see Web Appendix A for examples of real ads featuring slow motion cinematographic effects). Such effects are also pervasive on social media; indeed, most social media apps have built-in features for recording slow motion video, making it easy-to-implement for both influencers and ordinary consumers. Also reflecting its popularity, all top-five mobile phone manufacturers in 2019 (Apple, Samsung, Huawei, OPPO, and Vivo) have promoted the ability of their mobile phones to "record high-quality slow motion footage", with many review websites even including slow motion video making as a performance metric for mobile phones (Singh 2019).

Despite its ubiquity, do slow motion video effects necessarily make the advertised product more attractive? As a rough test of its prevalence and efficacy in the marketplace, we conducted a pilot study analyzing real ads on YouTube, the biggest online video platform

worldwide, with a market reach of 90% in the United States (Clement 2019). Specifically, we compiled the top one hundred hits under the keyword "food commercial" (search date: June 2020) and coded their usage of slow motion as both dichotomic and continuous measurements, i.e., whether the video uses slow motion effect (no/yes), and how often it uses slow motion (1= not at all, 9 = very often; rated by two independent coders, r = .98, $p < .001$; for details see Web Appendix B). To explore the marketing efficacy of slow motion, we collected several video performance metrics, including ranking under the keyword and number of views, likes, and comments. We found that although 57% of the ads employed slow motion cinematographic effects, the use of slow-motion did not predict the ranking of the video (Wilcox rank-sum test, z = -1.50, $p = .13$), which suggests that the use of slow motion is not specific to top-ranked (or low-ranked) videos. More importantly, contrary to the notion that slow motion makes ads are more aesthetically attractive, or that its widespread adoption is in itself evidence of marketing efficacy, we found that slow motion video ads have fewer views, likes, and comments (Table 1). These results remain robust when we use the continuous measurement of slow motion usage and after controlling for video rankings (ps < .01, Web Appendix B).

TABLE 1

Results of the Effect of Slow Motion On YouTube Video Ad Metrics

	Views	Likes	Comments
Slow-motion ads	1,177,015 (2,077,266)	17,790 (34,234)	1,234 (2,854)
Non-slow motion ads	3,638,711 (7,309,908)	49,914 (90,258)	2,525 (3,734)
P value	$p = .037$ (*$p = .028$)	$p = .031$ (*$p = .045$)	$p = .063$ (*$p = .019$)

Notes: Standard deviations are in parentheses. P values are computed using Student's t-test (p) and non-parametric Wilcox rank-sum test (*p) for between-condition comparisons.

The pilot study, which examines real ads in the marketplace, raises the possibility that despite being commonplace, slow motion video might create undesirable consequences. Indeed, previous social psychology research examining the impact of slow motion replays in adjudication contexts suggests that slowed video footage of human actions can unwittingly create unfavorable perceptions. For example, professional soccer referees perceive slow motion replays of fouls as more "willful, deliberate, and pre-meditated" (compared to live footage), and subsequently serve more severe penalties (Spitz et al. 2018). Similarly, simulated juries viewing actual surveillance footage of violent crimes will perceive the crime as more intentional and feel that perpetrators are more responsible for harm when the surveillance video is played at a relatively slower frame rate (Caruso et al. 2016).

Given the results of our pilot study, could analogous meta-inferences occur for slow motion in marketing contexts? Although watching commercials or social media is radically different from jury and refereeing decisions (which involve moral adjudication), meta-inferences arising from perceived intentionality can also occur during consumer information processing (Newman et al. 2014; Reich et al. 2017). Perceptions of intentionality are particularly relevant for advertisements that rely on behavioral cues from on-screen influence agents (i.e., actors or social media influencers) to signal product utility. In these contexts, whether the actions, reactions, and expressions of an influence agent are construed as intentional and willful as opposed to spontaneous and unplanned may directly affect consumer perceptions and ad efficacy. For example, a video of an influence agent joyfully eating chocolate may be perceived as a more or less reliable signal of the influence agent's consumption utility, and thus the predicted utility of the chocolate, depending on whether their behaviors and reactions are construed as intentional or unintentional. Even the most blissful post-chocolate smile may be discounted if consumers feel that extrinsic motivations (such as the intention to persuade) belie the influence agent's behavior.

Next, we outline the conceptual background for the proposed effect. By circumscribing the conditions under which slow motion video may hinder versus foster ad persuasiveness, our findings have direct practical implications for how marketing managers and social influencers design visual marketing involving dynamic cinematographic effects. In investigating this specific but commonplace effect, we also explore the general question of how consumers make social-cognitive inferences in dynamic visual marketing environments; a topic of growing importance given the rising importance of new media and social commerce, which are inherently video- and social-based platforms, as marketing channels.

CONCEPTUAL BACKGROUND

Slow Motion and Perception of Intentionality

Slow motion video refers to a cinematographic technique in which a video's framerate is slowed so that the objects appear to be moving more slowly than normal (Zettl 2011). Pioneered in early 20th century film to create dramatic effect, slow motion is now used across a variety of contexts outside of cinema (Zettl 2011). In video advertising, marketers have long used slow motion to signal enjoyment (Areni and Black 2015; Bryant and Veroff 2007), particularly for products featuring non-visual attributes, e.g., taste, smell, emotional stimulus, haptic sensations. Slow motion is also used to aid adjudication, for example for replays and refereeing in professional sports and video surveillance footage as legal evidence in court. Slow motion effects are also widely used in news footage in order to highlight or sensationalize events (Barnett and Grabe 2000; Wöllner et al. 2018). More recently, slow motion visual effects have become popular on social media, meme, and live streaming platforms, partly because slow motion video functions are accessible and built-in functions

on most social media apps (e.g., Instagram, TikTok); this allows users to slow down and highlight specific temporal sequences of a video with just a few clicks or finger taps.

Prior research on visual cognition has documented a range of different slow motion video effects (Table 2), many of which are aesthetic-emotional effects. For example, TV news stories that feature slow motion video are perceived as more sensational and emotional (e.g., more threatening, more aroused) but less informative, compared with the news stories that do not employ slow motion video (Barnett and Grabe 2000). Relatedly, the movie scenes played in slow motion (vs. natural speed film scenes) lead to "higher perceived emotional valence" of the video (Wöllner et al. 2018). Slow motion cinematography can also change viewers' psychophysiological reactions: When watching slow motion film scenes, viewers have relatively higher gaze dispersion and a smaller center bias, which suggests greater attention being paid to details (Hammerschmidt and Wöllner 2018).

Beyond aesthetic and psychophysiological effects, a small body of literature has found that slow motion video can engender social cognition inferences. In particular, human actions played out in slow motion look more deliberate and intentional; this in turn can create perceptions of intentionality and motivation, which can bias decision making during adjudication judgments. For example, people judge "helmet-to-helmet" tackles in American football, a move prohibited by the National Football League, as more intentional when viewing the same footage in slow motion rather than at regular speed (Caruso et al. 2016). Such "slow motion intentionality bias" can even occur for professional referees. In an official FIFA study, elite referees from five countries were asked to view real foul-play situations taken from international soccer matches and provide their professional judgment: Referees gave harsher penalties when video-replays of potential fouls were played in slow motion rather than in real-time (e.g., gave a red instead of a yellow card; Spitz et al. 2018). In

criminal justice contexts, simulated juries viewing video evidence in slow motion were more likely to presume criminal intentionality and guilt (Caruso et al. 2016).

TABLE 2

Literature Review on The Effect of Slow Motion on Human Perceptions

Study	Context/stimuli	Boundary conditions	Key findings
Barnett and Grabe (2000)	TV news stories	\	News stories using slow motion are evaluated as more sensational but less informative.
Caruso et al. (2016)	Footage of murder and violent contact in American football	Salient time reminder	Slow motion videos cause viewers to perceive actions as more intentional, resulting in harsher punishment.
Spitz et al. (2017)	Replays of foul play situations in soccer	Referee expertise; type of foul	Slow motion footage leads to higher decision accuracy for technical fouls only.
Hammerschmidt and Wöllner (2018)	Movies	\	Individuals attended to more details (more fixations/saccades) in slowed film scenes.
Wöllner et al. (2018)	Movie, ballet, and sports clips	\	Slow motion video leads to higher perceived emotional valence, lower respiration rates, and pupillary diameters.
Spitz et al. (2018)	Replays of foul play situations in soccer	\	Referees penalized players more severely when foul replay is played in slow motion
Present research	Real ads and live streaming clips	Intentionality bias; cognitive resource availability; entity of agents	Slow motion ads make advertised products less attractive and appealing.

Although such social cognition effects have only been documented in the narrow context of adjudications, we investigate whether a similar, but more general effect (and by extension, a process that is not particular to adjudications) may occur in marketing contexts and override the aesthetic and visual benefits of slow motion video. Although consumers do 'judge' commercials or social media videos to some extent, there are major contextual differences between information processing for visual marketing versus adjudication contexts. For example, while video commercials usually present emotionally positive-valance scenarios such as influence agents consuming and enjoying products, adjudication contexts are mostly concerned with moral transgressions or human conflict (e.g., criminal behavior,

physical violence, etc.). Furthermore, an influence agent's action-intentionality may be less salient in consumer contexts: Whereas intentionality is highly relevant in adjudications and moral decision making contexts (and a basic principle in legal judgments), intentionality is not necessarily first-to-mind in marketing contexts, where consumers are exposed to a variety of cognitive, social, and motivational forces (Macinnis et al. 2002; Petty and Cacioppo 1986).

Nevertheless, there are also several features of human social cognition that may trigger intentionality-judgment biases in response to slow motion advertisements. Firstly, humans have an inherent tendency to infer other people's intentions from their actions, and such tendency has a biological basis (Baldwin and Baird 2001; Blakemore and Decety 2001). For example, research using functional imaging has shown that the temporal and parietal lobe (i.e., temporoparietal junction; TPJ) is involved in reasoning about other people's beliefs, intentions, and desires (Saxe and Kanwisher 2003). Also, lesions to the left TPJ can impair cognitive processes specifically involved in reasoning about others' intentionality (Baldwin and Baird 2001). Secondly, humans also have an innate sense of normal temporal speed against which they compare events and behaviors, and thus are able to automatically detect when slow motion is occurring (Arstila 2012; Wöllner et al. 2018). Put together, social-cognitive inferences arising from temporal speed may be difficult to de-bias. For example, in jury contexts, even explicitly highlighting the objective passage of time passage (by allowing viewers to see both natural speed and slow motion videos or by prominently displaying a clock on the video that shows the actual passage of time) cannot eliminate the intentionality bias triggered by the slow motion video (Caruso et al. 2016).

Next, we discuss psychological processes that may cause slow motion effects to backfire and generate negative consumer inferences in marketing contexts. In particular, we consider whether slow motion effects make influence agents' behaviors seem more

intentional and willful, and make their reactions to products seem less spontaneous and genuine, and thus undermine the persuasiveness of video ads.

Intentionality and Consumer Inference

Perception of intentionality plays a significant role not only in shaping consumer evaluations of products (Newman et al. 2014; Reich et al. 2017) but also in making social cognition attributions in general (Gilbert and Malone 1995; Heider 1958; Rosset 2008). We postulate that stronger perceptions of intentionality of an influence agent's behavior in slow motion video will lead consumers to attribute the influence agent's consumption reaction (e.g., how much they smile) more to factors extrinsic (rather than intrinsic) to the product. This in turn can generate worse attitudes towards the advertised product relative to when the product is presented at natural speed.

We next draw on attribution theory literature, which explains how individuals arrive at causal explanations for specific events (Harvey and Weary 1984; Kelley and Michela 1980), to explain the impact of perceived intentionality on consumer evaluations. There are two main categories of causal attribution that consumers may generate in response to influence agents' behavior: 1) attributions to the intrinsic characteristics of a focal object; or 2) attributions to forces that are extrinsic to the focal object. Thus, when viewing a typical consumption skit in a video (e.g., a person eating pizza with a smile), viewers may attribute the observed behavioral outcome (i.e., eating with a smile) to two possible underlying causes: 1) intrinsic product-related factors, e.g., taste and quality, which reflect experienced pleasure and consumption utility, or 2) extrinsic factors unrelated to the product, e.g., hunger, intentional expression of certain reactions or emotions for social signaling purposes (Settle and Golden 1974; Sparkman and Locander 1980), which are less reflective of the product's consumption utility. As a result, when slow motion video enhances the perceived

intentionality of influence agents, we expect viewers to attribute the agent's (re)actions in the video (e.g., favorable reactions to consumption) more to extrinsic forces (e.g., agent's intention to signal quality) rather than intrinsic factors (e.g., how a pizza actually tastes). This in turn may undermine the relative efficacy of the advertisement (e.g., how persuaded consumers are by the ad), which may lead to relatively worse attitudes towards the advertised product or brand and lower purchase intentions (Newman et al. 2014; Reich et al. 2017).

In summary, we predict that slow motion can backfire and generate negative consumer inferences in marketing contexts by triggering perception of intentionality (Figure 1). We hypothesize that:

H1: A slow motion (vs. natural speed) ad depicting consumption leads to relatively more negative evaluations of the advertised product.

H2: The effect of slow motion on product evaluation is mediated by heightened perceptions of intentionality in the influence agent's observed behaviors.

Notably, our proposed mechanism based on perceived intentionality differs from the Persuasion Knowledge Model (PKM; Friestad and Wright 1994), a theory of how consumers use their knowledge of persuasion motives and tactics to interpret, evaluate and respond to influence and persuasion attempts. The PKM model posits that consumers may develop dynamic knowledge structures about persuasion and draw on this knowledge system to identify marketers' attempts to persuade them. In this framework, persuasion knowledge refers to a group of intuitive theories or beliefs about persuasion, e.g., identifying which persuasion tactics marketers use; how these marketing tactics may trigger psychological consequences; which tactics are effective or appropriate under different contexts; and what

firms' goals and motives are. These processes differ in important ways from our proposed mechanism and study context: We study viewers' perceptions of and attitudes toward the influence agent (i.e., the actor or social influencer) who engages in consumption behavior in a video, rather than the marketer or advertiser of the product (who is usually unseen behind the stage). Our proposed intentionality-based mechanism is thus a more direct and parsimonious explanation for the proposed effect as compared to the Persuasion Knowledge Model (which requires consumers to think about the unseen marketer, which is an additional level of inference beyond thinking about the influence agent). Furthermore, our mechanism, which relates to consumers' social-cognitions of a visible agent, is a better fit for new media contexts (e.g., influencer marketing, live-streaming, social commerce), where the distinction between influence agents and marketers can be blurred or non-existent (as compared to traditional TV advertising contexts).

Our proposed mechanism also has a visual perceptual element that the PKM model does not have. If the effect of slow motion video is indeed driven by the heightened perceptions of action intentionality, we also expect consumers to engage in greater visual social monitoring (of the influence agent). We predict that this effect can be captured by the degree to which viewers' visually attend to (i.e., gaze at) the influence agents' eyes in the slow motion condition (vs. natural speed condition). Indeed, eyes are often metaphorically referred to as the "windows of soul"; during face-to-face social interaction, eyes often serve as the most important source of information of another person's mental state (Emery 2000; Hamilton 2016; Khalid et al. 2016; Senju and Johnson 2009). In addition, humans intuitively and actively engage in eye contact and follow the gaze of another person when trying to detect their intentions and beliefs (Colombatto et al. 2020; Grossmann 2017; Kuhn et al. 2009). Based on these findings, we postulate that visual attention to influence agents' eyes

may serve as a proxy of perception of intentionality and mediate the effect of slow motion on consumer attitudes towards the advertised product.

Boundary Conditions

To provide more process insight on the proposed intentionality mechanism, we also explore the conditions under which slow motion video may hinder versus foster the ad's persuasiveness. If consumer inferences of intentionality indeed mediates the effect, the effect should be mitigated when the (cognitive) inference process is inhibited. One circumstance where this may occur is when mental resources are impaired, such as when consumers are cognitively busy when viewing the commercial (e.g., if the ad has an information-intensive soundtrack). Indeed, prior research has shown that inferring and construing others' intentionality and motives requires higher-order inferential processing, and that cognitive load can attenuate consumers' ability to infer others' motives and intentions across various contexts (Campbell and Kirmani 2000; Waytz et al. 2010; Williams et al. 2004). Consequently, we predict that when consumers view slowed commercials under cognitive load, they will be unable to counterargue the influence agents' behavior and are less likely to make inferences about intentions, which should mitigate the negative impact of slow motion on ad persuasiveness. We thus hypothesize that:

H3: the effect of slow motion on product evaluation attenuates when consumers are under cognitive load.

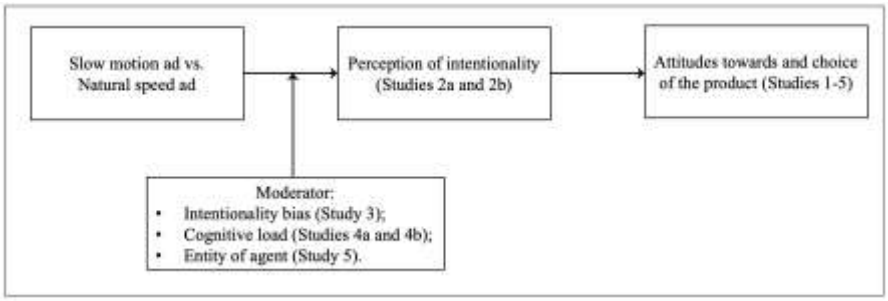
As a second qualification, we expect the effect to be contingent on whether influence agents are human. People are generally less likely to attribute intentionality and mental states to non-human entities which share less morphological similarity with real humans (Epley et

al. 2007). If the effect of slow motion video on product evaluation is driven by the way consumers perceive and interpret the motivation behind influence agents' consumption behavior, the effect may be diminished when ads employ non-human agents to demonstrate product utility (compared to when human influence agents are used). We thus postulate:

H4: the effect of slow motion on product evaluation attenuates when influence agents are non-human entities.

FIGURE 1

Conceptual Framework



Empirical Overview

Previewing briefly, we present seven studies (and two additional studies reported in the web appendix), including a field experiment and an eye-tracking study, to test these hypotheses. Using real commercials across multiple product categories (including both ads that were originally filmed in slow motion and ads that we slowed down from natural speed; Web Appendix A), we documented the impact of slow motion effects on visual attention, attitudes, preferences, and click-through's (of real online consumers). Study 1 provides initial evidence of the main effect in a field setting. Studies 2a and 2b explore the underlying process by examining the mediating role of perceived intentionality using eye-tracking as well as behavioral measurements. Studies 3-5 offer additional process insights by testing theoretically relevant moderators: The effect weakens among individuals with lower

intentionality bias (Study 3), and when consumers' cognitive capacity is constrained (Study 4); the effect can reverse when the ad uses non-human influence agents (Study 5). The moderators we tested have important managerial implications since they circumscribe conditions under which slow motion video advertisements can be effective (or at least less ineffective). Finally, we conducted a within-paper meta-analysis to demonstrate the robustness of our findings across experiments.

STUDY 1

Study 1 aims to provide initial evidence that applying slow motion to a video advertisement can affect its marketing efficacy. To enhance managerial relevance, we conducted a field study that measures actual consumer choice on Facebook. Moreover, we intentionally selected a product that was locally unfamiliar at the time of the study to mitigate the possibility that prior exposure to the product and its advertisements may drive the effect.

Procedure

We ran ads for Soylent, a beverage brand, on Facebook's advertising platform with the objective of increasing the target commercials' click-through rate (CTR), which is a function of clicks and a commonly-used ad performance metric. We utilized Facebook's split-test function, which randomly assigned users to one of two advertisement conditions (i.e., slow motion vs. natural speed), both of which used the same ad (but played at different speeds). The video commercial, once clicked by viewers, led to the official website of the beverage brand. Our campaign targeted users with an age of 18 or above who were currently living in Hong Kong and ran for 36 consecutive hours (Final N = 26,972, i.e., unique

impressions). At the time of the study, Soylent was only available in the North American market and had not officially launched (or been promoted) in the Hong Kong market.

We played the original commercial for Soylent, which was downloaded from the company's official website. The commercial, which showed different people consuming and enjoying Soylent, was originally in slow motion (approximately 0.5X natural speed, rated by two independent judges). We sped the video's frame-rate up 2X in the natural speed condition. This also preempts the possibility that the effect is caused by our manipulation of slow motion negatively affecting the advertisement's intended design and aesthetics. As Facebook recommends advertisers to keep video length up to around 15 seconds, we edited the original commercial in order to meet with the video length requirement. The videos are in high-resolution (720p or above) throughout all studies (see Web Appendix A). Finally, to isolate the pure visual-processing effect and sidestep potential audiovisual mismatch problems, we muted the sound of the commercial. This should not have been perceived as unusual since video ads on Facebook (and Instagram) are by default played on mute. We used Apple's iMovie software for video editing and playback speed adjustments.

Pretest. One hundred and six undergraduate students from a major Hong Kong university (45 females, M_{age} = 20.62) viewed the commercial in either slow motion or natural speed and indicated (1) "To what extent do you think the person in the video was expressing her emotional reaction in slow motion?" (2) "To what extent do you think the person in the video was moving in slow motion?" (3) "To what extent did the video feel like it was playing in slow motion?" on 1 (not at all) to 9 (to a great extent) scales. Responses to these items were aggregated to create a slow motion index (α = .88). As expected, the slowed ad scored higher on the slow motion index ($p < .001$; also see Web Appendix C for pretests of slow motion video across studies).

Results and Discussion

Altogether, five hundred and sixty-five Facebook users clicked on the video, yielding 2.09% total click-through rate (as a benchmark, the average CTR in Facebook is 0.90%; Irvine 2019). More importantly, the CTR in the slow motion condition (1.77%) was significantly lower than in the natural speed condition (2.17%; $\chi^2(1) = 4.69$, $p = .03$, odds ratio = 1.23). Overall, Study 1 provides initial evidence, from a field study, that applying slow motion in commercials for a new product can backfire by making the product less attractive and appealing. It is worth noting that product unfamiliarity or novelty did not impede the effect, nor did the fact that the commercial was originally in slow motion. The latter point shows the effect was not merely the result of us creating a sub-part advertisement (indeed, the video we created performed better in terms of real consumer response). In the following studies, we extend the study paradigm to a range of real ads that varied in visual properties, product categories, original speed, and country of origin in order to enhance external validity and establish robustness.

STUDY 2

Study 2 explores the process underlying the effect by using both eye-tracking and scale-based measurements. Prior research on the effects of slow motion video on adjudication judgments suggests that human actions viewed in slow motion are associated with greater perceived intentionality (Caruso et al. 2016; Spitz et al. 2018). We therefore theorize that slowing a video advertisement is more likely to lead consumers to perceive that influence agents in commercials are purposely signaling consumption enjoyment (and that influence agents are intentionally behaving in a manner due to exogenous motivations, e.g., the intention to persuade). This in turn may reduce the degree to which viewers attribute the

influence agents' positive reactions to intrinsic product features such as product quality (as opposed to extrinsic factors like motivation to persuade) and lead to relatively worse attitudes towards the product.

Study 2a

Study 2a offers initial process evidence by measuring consumer eye movement as a behavioral mediator. Past literature has shown that during face-to-face social interactions, people often gaze at the eyes of their interaction partner in order to discern their psychological state (e.g., emotional state, focus of visual attention) or infer their intentions (Birmingham et al. 2008; Grossmann 2017). Conversely, insufficient fixation on partners' eyes may lead to difficulties in recognizing, or even distort perceptions of, their emotional and cognitive states. Indeed, persistent avoidance of eye contact is also a behavioral maker of social interaction and communication difficulties and disorders such as autism (Baron-Cohen et al. 1995; Guillon et al. 2014). Moreover, humans have an innate tendency to actively follow the gaze of interactive partners when trying to figure out their intentions and beliefs (Colombatto et al. 2020; Kuhn et al. 2009). Thus, if slow motion video does indeed heighten perceptions of intentionality of the agent's consumption behavior, we should expect consumers' visual attention to focus relatively more on influence agents' eyes when a commercial is played in slow motion (vs. in natural speed). Furthermore, if greater visual attention to the influence agent's eyes does indeed reflect consumers' attempts to discern intentionality, we also expect visual attention to mediate the impact of slow motion video on product evaluation. For robustness, we tested the effect on two new real video advertisements varying in product category, video length, agent, and consumption behavior.

Method

Procedure. One hundred and ninety-nine undergraduate students (128 females, M_{age} = 20.72) from a major university in Hong Kong participated in this in-lab study for HK$80 (~US$10). All participants had normal or corrected-to-normal vision. Participants were randomly assigned to one of two conditions (slow motion vs. natural speed) and viewed two advertisement videos (all from the same condition, in random order). The stimuli were real video commercials for a Sanyo instant noodle and Neutrogena facial cleanser. We edited the videos in the same manner as described in Study 1 (Web Appendix A). After viewing each video, participants were asked to report their attitudes on an 11-point scale (i.e., "how much do you like the product in the video?", 1 = not at all, 11 = very much).

Eye-tracking measures. Participants' eye movements were recorded using the Xinsight Gazelab system (http://www.xinsight.cn/html/EN/) at a sampling rate of 30 Hz with a spatial resolution of 0.1° of visual angle. All stimuli were presented on a 15-inch LCD screen with a resolution of 1680x1050 in full-color bitmaps. To analyze the gaze pattern during commercial-viewing and test the proposed hypotheses, two areas on the video clips were drawn as areas of interest (AOIs); the influence agents' eyes and nose regions (Web Appendix E). The latter served as the control area to rule out the possibility that slow motion may invite general attention to the face rather than to the eyes in particular (Auyeung et al. 2015; Yu et al. 2017). We selected the nose area as a control because it has a similar surface area, is an important facial component, and is also close to the eyes, which makes for a fair comparison. Our analysis focuses on fixation duration, a common eye-tracking measurement defined as the duration of all the fixations made within an AOI during the whole video-viewing period. To facilitate between condition and across commercial comparisons, we created a normalized measure of fixation duration by dividing the fixation duration by the length of each video clip (Auyeung et al. 2015; Yu et al. 2017).

Results

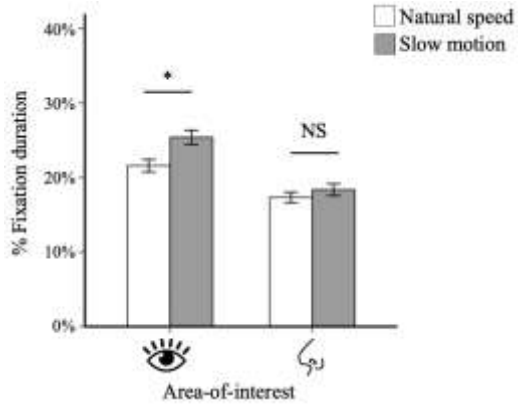
Behavioral results. We first tested for the previously documented (negative) main effect of slow motion cinematography. Since each participant viewed two commercials (and thus evaluated two products) and there were two conditions for each commercial (i.e., slow motion vs. natural speed), we conducted a hierarchical linear mixed-effects (HLM regression) model to control for the subject- and video-level random effects (Fisher et al. 2018; Spiller and Belogolova 2016). Specifically, we ran the HLM regression using the "lme4" (Bates et al. 2014) and lmerTest (Kuznetsova et al. 2017) packages in R, with slow motion condition (1 = slow motion, 0 = natural speed) as a fixed effect, and random effect on intercepts for subjects and commercials. Significant levels of the effect were obtained using likelihood ratio tests of the full model with the fixed effect against the null model without the fixed effect. As expected, the HLM regression replicated the effect of slow motion (Likelihood ratio test, $\chi^2(1) = 6.01$, $p = .014$): Participants in the slow motion condition, compared with those viewed the same commercials in natural speed, reported worse attitudes towards the advertised product (b = -.56, SE = .23, t = -2.45, $p = .015$).

Eye-tracking results. We next explored whether slow motion shifted gaze pattern during commercial-viewing as measured by the percentage of fixation duration on the area of interest. As shown in Figure 2, the HLM analysis with video speed (natural speed = -1, slow motion = 1), area-of-interest (eye = 1, nose = -1), and their interaction as fixed effects yielded a significant main effect in area-of-interest ($\chi^2(1) = 88.21$, $p < .001$), which was qualified by a significant area-of-interest × video speed interaction ($\chi^2(1) = 5.33$, $p = .021$). In particular, participants in the slow motion condition paid relatively more attention to the influence agents' eyes than participants in the natural speed condition did (b = .04, SE = .02, t = 2.39, $p = .018$; see Web Appendix F for raw values of fixations for each condition and video).

Since people may generally pay more attention to details in slowed videos (Hammerschmidt and Wöllner 2018), one may wonder if slow motion video invites more visual attention to influence agents and their facial reactions as a whole (as opposed to only the eyes). To explore this possibility, we next tested if slow motion video affects gaze on the control AOI, i.e., nose area, which is still a prominent facial area. However, we observed no differences in fixation duration on the nose AOI between conditions (b = .01, SE = .01, t = .80, NS), suggesting that slow motion specifically increase consumers' visual attention to agents' eye region rather than agents' entire face. Finally, we tested for the possibility of gender or age differences in gaze patterns (Mercer Moss et al. 2012; Vassallo et al. 2009) or visual interest and attention (for example the stimuli we used was more appealing to one demographic) by including demographic variables (i.e., gender and age) as statistical controls to the HLM regression. We obtained consistent results and did not find evidence of differences across demographics. The HLM regression including age and gender as covariates yielded a similar main effect of slow motion, and these control variables did not predict product rating or participants' eye movement (*p*s > .1; Web Appendix G).

FIGURE 2

Slow Motion Video Moderates Consumers' Gaze Pattern (Study 2a)

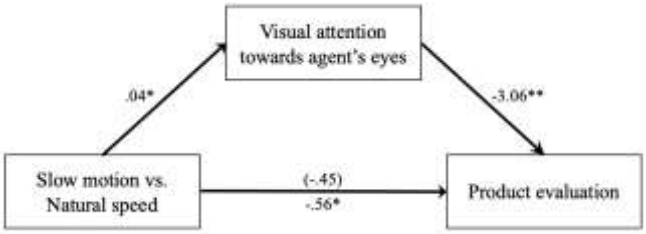


Notes: Error bar indicates ±1 SE. * $p < .05$ based on HLM regression model.

Mediation results. As a test for the proposed mechanism, we next tested whether visual attention to influence agents' eyes can explain and mediate the effect of slow motion video on product evaluation. Since each participant viewed two commercials and rated two different products (visual attention: r = .56, $p < .001$; product rating: r = .20, $p = .005$), we first averaged responses for each participant before running a mediation analysis with 5,000 bootstrapping samples (PROCESS model 4; Hayes 2013). Results confirmed that the effect of slow motion on product liking could be explained by greater attention towards agents' eyes as measured by fixation duration (95% CI: [-.281, -.022], excluding zero; Figure 3).

FIGURE 3

Gaze Pattern Mediates the Effect of Slow Motion Video on Product Evaluation (Study 2a)



Notes: Value in parentheses indicates the effect of slow motion video on the dependent variable after controlling for the mediator. *$p < .05$; **$p < .01$.

Discussion

Study 2a provides a preliminary theory test by showing that consumers' gaze patterns and visual attention to influence agents' eyes mediate the effect. Besides offering mechanism evidence, Study 2a also demonstrates that slow motion ads may elicit a different cognitive and behavioral response from the consumer compared to natural speed ads, i.e., by generating greater cognition of action intentions and subsequently greater visual attention to influence agents' eyes.

Nonetheless, the results of Study 2a also raise several alternative possibilities. Firstly, prior literature suggests that there are cultural differences in human eye movements. For example, people in cultures where emotional subduction is the norm (e.g., the East Asian sample in this study) may focus relatively more on the eyes when interpreting others' emotion (Yuki et al. 2007). Thus, it might be possible that the mediating effect of visual focus on influence agents' eyes is specific for East Asian cultures. Secondly, one may wonder whether other factors such as perceived attention-grabbing, perceived engagement, or even boredom may drive the effect of slow motion on ad persuasiveness (and eye movements). We test these alternative explanations and provide more evidence of an intentionality-based process in the following studies.

Study 2b

The goal of Study 2b is two-fold. First, we aim to provide additional process evidence by measuring and testing the mediating role of perception of intentionality. Second, we evaluate whether slowing videos change the visual aesthetic characteristics of the commercials or how participants perceived the viewing experience, which might be alternative explanations for the effect.

Method

Procedure. Three hundred and thirteen United States residents (165 female, M_{age} = 37.38) recruited from Amazon Mechanical Turk (MTurk) participated in the online study in exchange for a small amount of monetary compensation. By random assignment, they viewed a commercial for Sanyo instant noodles (from Study 2a) in either slow motion or natural speed. After viewing the video, participants were shown an image of the product and rated

their willingness-to-pay for the advertised product on an 8-point scale with price options increasing in $1 increments from $1 to $8: “Please indicate the most amount of money you would be willing to pay for the product advertised in the video, if it is available locally?”

Next, participants saw a screenshot of the influence agent consuming the noodles and responded to two questions measuring perceived intentionality: (1) “To what extent was this person’s consumption behavior willful?” (2) “To what extent do you think this person’s consumption behavior was intentional?” on scales from 1 (not at all) to 9 (to a great extent; adapted from Caruso et al. 2016). We averaged the two items to create a perceived intentionality index ($r = .72$, $p < .001$). To rule out other visual processes, we also measured (1) ease of visual processing: “How difficult was it to visually follow what was happening in the video? (2) engagement: “How engaging was it to view this video?”, and (3) attention-grabbing: “To what extent was this commercial video attention-grabbing?” We also considered the possibility that viewers felt that human behavior in slow motion looked abnormal: “To what extent was this person’s consumption behavior weird?” (all on 9-point scales, 1 = not at all, 9 = extremely). In addition, we also conducted a post-study test to ensure that participants can understand the two-item intentionality measurement in the current study (Web Appendix H).

Results

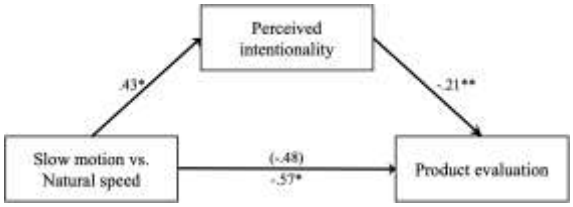
As hypothesized, we found that slow motion video reduced self-reported willingness-to-pay ($M_{\text{natural speed}} = 3.58$, $SD = 1.96$ vs. $M_{\text{slow motion}} = 3.01$, $SD = 1.79$; $t(311) = 2.67$, $p = .008$, $d = .30$). In addition, the slowed commercial (vs. commercial in natural speed) is associated with greater perceived intentionality behind the influence agents’ behavior ($M_{\text{natural speed}} = 7.06$, $SD = 1.71$ vs. $M_{\text{slow motion}} = 7.49$, $SD = 1.38$; $t(311) = 2.45$, $p = .015$, $d = .28$). Furthermore, there was no corresponding effect on the visual and aesthetic properties of the

video (i.e., visual difficulty, engagement, perceived attention-grabbing, and perceived weirdness; *p*s >.1).

Our conceptualization posits that slow motion video undermines consumer evaluations of advertised product because of heightened perception of intentionality (e.g., the overt intention and motivation to signal or persuade) underlying influence agents' consumption behavior. We conducted a bootstrapping mediation analysis using 5,000 bootstrap samples (PROCESS Model 4; Hayes 2013; Figure 4) to test this proposed mechanism and found that perceived intentionality significantly mediated the effect of slow motion on WTP for the advertised product (95% CI: [-.239, -.011], excluding zero).

FIGURE 4

Intentionality Mediates the Effect of Slow Motion Video on Product Evaluation (Study 2b)



Notes: Value in parentheses indicates the effect of slow motion video on the dependent variable after controlling for the mediator. *$p < .05$; **$p < .01$.

Discussion

Using measures of perceived intentionality, we replicated the basic effect and provided support for the proposed mechanism. We also did not find evidence that slow motion affects ease of visual processing, perceived engagement, and perceived weirdness. This suggests that the effect is not driven merely by changes in video aesthetic (and how consumers responded to that), but rather by the way that consumers perceive and interpret the slowed consumption behavior depicted by a human influence agent in the advertisements.

STUDY 3

The purpose of Study 3 is two-fold. First, we explore the moderating role of individual-differences in intentionality bias in the observed effect, which serves as process evidence. As a corollary of the proposed mechanism, we expect the effect to be moderated by the viewer's intentionality bias (Baldwin and Baird 2001; Rosset 2008; Slavny and Moore 2018), which indicates the extent to which individuals spontaneously tend to judge others' action to be intentional. If the effect of slow motion on product evaluation is driven by viewers inferring influence agents' consumption behavior and reactions as motivated by extrinsic intentions, then the effect should be weaker among viewers with relatively lower intentionality bias. Second, instead of using traditional commercials as in previous studies, we played video clips of professional live-streamers. Live-streaming, which occupies the space between social and commercial media, is a major growing form of new media that is available globally on most major social and video platforms including Facebook, Tik Tok, WeChat, and YouTube; for example, there are 425 million users of dedicated live-streaming platforms in China alone by July 2018 (Zhou and Xiao 2019). Extending the effect into new social media domains, where influence agents' behaviors are less-scripted, helps reduce concerns that the effect is limited to contexts involving professional actors and enhances the ecological validity of our research.

Method

Procedure. Three hundred and forty-eight United States residents (169 female, M_{age} = 40.30) recruited from MTurk participated in the experiments in exchange for monetary compensation. Participants were randomly assigned to one of two conditions (i.e., slow

motion vs. natural speed) and viewed one real video steaming clip which showed streamers consuming and enjoying food (Web Appendix A). We edited the video clip in the same manner as in the previous studies. After viewing the video clip, participants were presented with an image of the product and reported their willingness-to-pay for the advertised food on a drop-down list with price options increasing in $2 increments from $2 to $16.

Next, participants completed an ostensibly unrelated task that measured their individual differences in intentionality bias. The intentionality bias task was modified from Rosset (2008) and consisted of short sentences describing ambiguous human actions that could be deemed as either intentional or unintentional (Table 3)[1]. For each test sentence, participants need to rate whether the action described in the sentence was done "on purpose" (i.e., intentionally) or "by accident" (i.e., unintentionally) and evaluate 22 sentences (in randomized order) in total. Specifically, we instructed participants: "In this part, you will be asked to answer a few questions about everyday consumer behavior. For each question, you will read a short sentence, which describes a simple action (for example, "He deleted the email", and you will need to decide whether you think this action was generally done "on purpose" or ''by accident". For some actions, you may feel that both words are applicable but please select just one option which you consider to be most suitable. You will need to evaluate 22 short sentences in total, and you will not be timed and please take your time to read each short sentence." To calculate the intentionality bias score, the total number of intentional judgements was divided by the total number of sentences and multiplied by 100 to create a percentage score.

TABLE 3

Test Sentences of Individual Intentionality Bias Task (Study 3)

He hit the man with his car.	He gave her the wrong change.
She burnt the meal.	She broke the vase.
He tracked mud inside.	He forgot his homework.

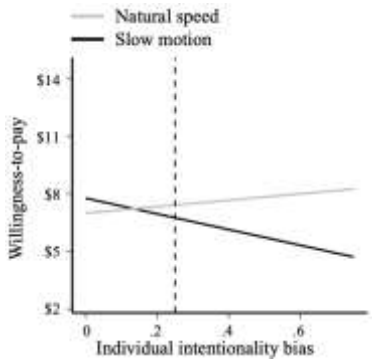
He arrived 5 min late for class.	He bumped into a classmate in the hall.
He broke the window.	The painter inhaled the fumes.
He drank the spoiled milk.	She woke the baby up.
He stepped in the puddle.	He set off the alarm.
He jumped when the bell rang.	He dripped paint on the canvas.
She kicked her dog.	She left the water running.
He set the house on fire.	He ate the bruised part of the apple.
She told the same joke twice.	The girl popped the balloon.

Results

To explore the impact of slow motion video on product evaluation, we ran a linear regression predicting participants' WTP for the advertised product, with video speed condition (natural speed = -1, slow motion = 1), intentionality bias score (mean-centered for regression analysis), and the interaction between two factors as independent variables. As hypothesized, the regression analysis yielded a significant main effect for video speed (b = -.41, SE = .17, t = -2.44, p = .015), which was qualified by a significant video speed × intentionality bias interaction (b = -2.96, SE = 1.30, t = -2.27, p = .024; Figure 5). To decompose this interaction, we utilized the Johnson–Neyman technique (Johnson and Fay 1950) to identify the range of intentionality bias for which the simple effect of the slow motion video was significant at a significance level of $p < .05$ (Spiller et al. 2013). This analysis revealed a significant negative effect of slow motion video on WTP for any individual with an intentionality bias score higher than .25 (55.7%, or .19 SD below of mean of .27), but not for those with an intentionality bias score less than .25.

FIGURE 5

Willingness-To-Pay as a Function of Video Speed and Intentionality Bias (Study 3)



Note: Johnson-Neyman region of significance when intentionality bias is greater than .25.

Discussion

Study 3 replicates the basic effect and provides further support for the intentionality account of the effect. In particular, the moderation effect suggests that perceived intentionality can explain the impact of slow motion on ad efficacy; whether consumers perceive intentionality is moderated by the degree of their own individual intentionality bias. Besides showing that the effect of slow motion can be explained by the way consumers perceive and interpret the influence agent's intentionality, Study 3 also shows that intentionality bias is an important individual-level trait that may limit the effectiveness of the advertising across mediums. On the flip side, individual differences in intentionality may also be a key factor for consumers to be cognizant and aware of social influence attempts by monitoring influence agents in video ads or social media. Finally, Study 3 extends the effect to the domain of live-streaming, which suggests the effect may extend to other video-based social media contexts, which are now dominant contexts for marketing and advertising.

STUDY 4

Studies 4a and 4b explore an important boundary condition of the effect. Extant literature suggests that inferring others' intentionality and motives requires sufficient mental resources (Campbell and Kirmani 2000; Waytz et al. 2010; Williams et al. 2004). As such, without adequate cognitive resources, consumers may be less able to infer agents' underlying motives in the first place. We thus expect that hampering consumers' overall cognitive capacity will impede their ability to perceive influence agent's intentionality, and thus mitigate the effect negative effect of slow motion on consumer evaluations of video ads.

Study 4a

Method

Procedure. Five hundred and one United States residents (253 female, M_{age} = 39.52) recruited from MTurk watched a commercial for Sony Bluetooth earbuds (Web Appendix A) by random assignment in a 2 (video condition: slow motion vs. natural speed) by 2 (cognitive load: low-load soundtrack vs. high-load soundtrack) design. To mimic real-world marketing practices, we manipulated cognitive load by embedding auditory information into the ad soundtrack, which we expected viewers to find distracting (Horvath and Burgyan 2011; Rees et al. 2001). In the low-load soundtrack condition, a soft-music clip played in the background; while in the high-load soundtrack condition, a voice-over narration of product features (overlaid on rhythmic music) was added into the background soundtrack. To keep verbal information constant across conditions, the voice-over narration was placed at the center of the soundtrack and played only once in both conditions. After viewing the video, participants rated their willingness-to-pay for the earbuds on a drop-down list with price options increasing in $25 increments from $50 to $255.

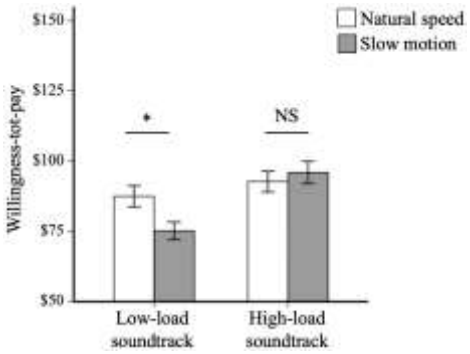
Pretest. Two hundred and seventy-one participants recruited from MTurk (135 females, M_{age} = 41.55) participated in the pretest which featured a 2 (slow motion vs. natural speed) by 2 (low-load soundtrack vs. high-load soundtrack) between-subjects design. After viewing the video, participants rated on a 9-point scale (e.g., "To what extent do you think the background sound used in the ads is distracting", 1 = not at all, 9 = very). An ANOVA test confirmed that the soundtrack in the high-load condition (vs. low-load condition) was indeed perceived as more distracting ($M_{low\text{-}load}$= 2.39, SD = 1.88 vs. $M_{high\text{-}load}$ = 3.08, SD = 1.98; F(1, 267) = 8.42, p = .004, η^2_p = .03). Perceived distraction did not differ between two video speed conditions (F(1, 267) = .12, NS; interaction effect: F(1, 267) = .10, NS).

Results

A 2 (video condition: slow motion vs. natural speed) by 2 (cognitive load: low-load soundtrack vs. high-load soundtrack) ANOVA with willingness-to-pay as dependent variables revealed a significant main effect of cognitive load (F(1, 497) = 12.64, p < .001, η^2_p = .02), which was qualified by a significant interaction effect (F(1, 497) = 4.54, p = .034, η^2_p = .01; Figure 6). When the ad had a low cognitive load soundtrack, we observed the same effect as previous studies: The slowed commercial (vs. natural speed commercial) yielded lower product WTP ratings ($M_{natural\ speed}$ = 87.50, SD = 41.87 vs. $M_{slow\ motion}$ = 75.20, SD = 35.28; t(497) = 2.38, p = .018, d = .32). When the ads had a cognitive load soundtrack, however, there was no significant difference in WTP ratings between the two conditions ($M_{natural\ speed}$ = 92.72, SD = 41.56 vs. $M_{slow\ motion}$ = 95.97, SD = 44.22; t(497) = -.63, NS).

FIGURE 6

Willingness-Tot-Pay as a Function of Video Speed and Background Soundtrack (Study 4a)



Notes: Error bar indicates ±1 SE. * $p < .05$.

Discussion

Study 4a provides an additional theory test and shows that the effect weakens when consumers lack the cognitive resources to think carefully about influence agents' intentionality. This study also has direct marketing implications: Under conditions of cognitive busyness, which is commonplace in real-world physical environments and online social environments such as live streaming (where viewers are constantly typing comments that other viewers can see), the negative effect of slow motion video can be weakened by the distractor. Indeed, taken one step further, the moderation by cognitive load suggests that marketers can actively mitigate the negative impact of slow motion video by inducing cognitive load. Examples of unobtrusive forms of cognitive load in video ads include playing background music, additional audio information (from a narrator or commentator), or even displaying bullet-screen comments (a comment-video integration technique popular on live-streaming platforms, especially in East Asia).

Study 4b: Manipulating cognitive resource using alternative approach

One may wonder whether it was induced emotion, or other idiosyncratic psychological or physiological factors triggered by the audio content, rather than cognitive load per se, that mitigated the effect (Allan 2006; Gorn 1982; Kellaris et al. 1993). To address this concern, we conducted an additional study in which we manipulated cognitive load by asking participants to memorize an alphanumeric string. Although lower in ecological validity, this manipulation does not create the aforementioned spillover effects and is well established in marketing research (Cian et al. 2020; Kwan et al. 2017; Trendel et al. 2018). We obtained analogous results using this alternative manipulation of cognitive load. In the low-load condition, the slow motion condition (vs. natural speed) yielded lower consumer interest ($t(503) = 2.77$, $p = .006$, $d = .35$), while the effect was weakened in the high-load condition ($t(503) = -.26$, NS). Overall, this supports our hypothesis that constraining consumers' cognitive resources can prevent intentionality from being perceived and subsequently mitigate the effect of slow motion. The details of Study 4b (method, results, and discussions) are presented in Web Appendix I.

STUDY 5

Study 5 serves two purposes. First, we provide additional process insight by exploring whether the effect diminishes when the ad uses non-human agents (e.g., an animated object, animal, brand mascot, etc., which are commonplace in the video). We postulate that the perceived intentionality mechanism does not apply for non-human agents because social heuristics relating to theory-of-mind are no longer relevant, particularly when non-human agents have no anthropomorphized features, such as a face or limbs (Epley et al. 2007), as is the case for this study. Second, in previous experiments, the commercials in the slow motion condition had a longer temporal duration (and thus potentially more visual information),

which also gave consumers more time to analyze and react to the advertising information in the advertisement. The current study rules out this possibility by holding viewing time and amount of information constant across conditions.

Method

Procedure. Five hundred and six United States residents (274 female, M_{age} = 41.09) recruited from MTurk participated in the experiment in exchange for monetary compensation. The study adopted a 2 (video condition: slow motion vs. natural speed) by 2 (influence agent: animated agent vs. human agent) between-subjects design. Participants were randomly assigned to one of four conditions and viewed one food commercial in which the product qualities are either demonstrated by an animated character or a human influence agent in the video (Web appendix A). The videos are both food commercials; Oreo chocolate cookies or Sanyo instant noodles (same as Studies 2a). The former commercial was an ad for Cadbury chocolate flavored Oreos, where an animated Oreo cookie and Cadbury chocolate hop around and travel together; both entities resembled the physical product and were not anthropomorphized with a face or limbs, etc. To equalize deliberation time and amount of information across video conditions, participants in the natural speed were asked to watch the ad video twice (as the slow motion ad plays at half of speed of the ad in the natural speed condition). After watching the commercial, participants rated their interest in trying the advertised product on a 9-point scale ("How interested are you in trying the product you just saw in the video, if it is available locally?" 1 = not at all, 9 = very).

Results

In the human influence agent conditions, we observed the same effect as in previous studies: Slow motion (vs. natural speed) decreased consumers' interest in trying the

advertised product ($M_{natural\ speed}$ = 5.78, SD = 2.41 vs. $M_{slow\ motion}$ = 5.07, SD = 2.58; t(502) = -2.32, p = .021, d = .28). However, slow motion actually yielded a positive effect on product evaluation (vs. natural speed) when the ad used non-human animated figures as influence agents ($M_{natural\ speed}$ = 6.33, SD = 2.57 vs. $M_{slow\ motion}$ = 6.97, SD = 2.10; t(502) = 2.12, p = .035, d = .27). Although we caution that an interaction analysis may not be a fair comparison (since the subject of the ads were different), a 2 (video condition: slow motion vs. natural speed) by 2 (influence agent: human vs. animated figure) ANOVA with consumer interest towards advertised product as dependent variables nonetheless yields a significant main effect of influence agent (F(1, 502) = 31.50, $p < .001$, η^2_p = .06), which was qualified by a significant interaction effect (F(1, 502) = 9.83, p = .002, η^2_p = .02).

Discussion

The replication of the effect in the human influence agent conditions helps rule out longer viewing time, which was equal across conditions, as an alternative explanation of the effect. Study 5 also provides a theory test for the proposed process and shows that the effect reverses for an ad with no human agents; a context where perceiving an influence agent's intentionality is not relevant. Of note, slow motion cinematography actually leads to greater interest in the product for the non-human agent ad. Here, the positive impact of slow motion might be due to increased attention elicited by the slow motion cinematographic effect or aesthetic appreciation for the advertised product portrayed in slow motion. Of managerial relevance, this suggests that the effect can be reversed, and that slow motion may abet the persuasiveness of ads when advertisers avoid using human influence agents.

This study is a first step in showing how entity of influence agent may moderate the detrimental effect of slow motion. However, more research is needed to explore the precise boundaries and moderating role of anthropomorphism; these questions are beyond the scope

of this research. Although both ads in Study 5 had the same product category (food commercials), the ads differed in many aspects (e.g., precise consumption behavior, video length, etc.), which makes it unfair to interpret the interaction effect. Thus, to address this issue and rigorously test how entity of influence may moderate the slow motion effect, future studies could use Computer-Generated-Imagery to manipulate the extent to which a non-human agent is humanized while holding other factors (e.g., video property and agent actions) constant.

Additionally, the non-human characters in Study 5 had minimal anthropomorphic features and were simply inanimate objects (i.e., a cookie and a piece of chocolate) engaging in human-like behaviors (such as going to the beach or taking selfies). It remains an open question whether slow motion cinematography would yield a similar effect if a more humanized character were used: Do people make social inferences and gauge intentionality for life-like animations of humans, highly anthropomorphized non-human characters (e.g., Mickey Mouse), or quasi-anthropomorphized characters (e.g., a cookie with a smiley face)? These boundary conditions remain questions for future research, but are of managerial importance given the widespread use of non-human or animated brand mascots, particularly for grocery products, children's products, and digital products such as video games (Kim et al. 2016).

GENERAL DISCUSSION

The common use of slow motion effects in video advertising suggests that marketers generally assume this tactic nets positive benefits, such as greater visual attention or stronger aesthetic appreciation for the advertised product. However, we find that using slow motion to depict consumption can backfire and make video marketing less persuasive and advertised

products less attractive. The effect is robust across a variety of real commercials, including live streaming videos, for a wide range of products of different countries of origin, and among participants from student to general population pools in both East Asia and North America. Study 1 shows that the effect persists for online consumers' responses to real advertising. Studies 2a-b demonstrate that the negative impact of slow motion video is driven by consumers' attempts to infer influence agents' underlying intentionality, which is also reflected by greater visual attention to influence agents' eyes (Study 2a). In further support, the pattern of results in the moderation conditions is consistent with previous research on how people infer intentionality; namely that the backlash of slow motion attenuates for individuals with lower intentionality bias (Study 3), is mitigated under cognitive load (Study 4), and reverses when ads use non-human influence agents (Study 5). We also show that the effect cannot be explained by changes in ease of visual processing, perceived engagement, and deliberation time (Studies 2b, 5). Finally, we conducted a within-paper meta-analysis on the effects of experiments reported in current research (Grewal et al. 2018), which shows that our effect sizes across studies are both homogenous ($Q(6) = .66$, $p = .995$) and significant ($\eta = .32$, $p < .001$), and demonstrates the robustness of our findings (Web Appendix J).

Theoretical Contribution

Although the slow motion effect is visual in nature, our conceptual contribution is primarily to the literature on visual-based social inference. We reveal a novel antecedent (i.e., slow motion) that may trigger the perception of intentionality in consumer inferences, and identify a process by which slow motion nudges consumer preference. Previous literature has shown that slow motion may highlight intentionality underlying human actions in very specific decision-making domains, particularly in legal adjudication contexts that involve legal or moral infractions, e.g., referee's judgment of violent fouls, jury's perceptions of

criminal behavior (Caruso et al. 2016; Spitz et al. 2018). Our research makes a first step in showing that a similar slow motion intentionality bias can extend to more general social contexts, and visual marketing involving influence agents in particular. In these contexts, consumers may use their internal speed-comparison mechanisms to compare "ideal" action against observed action to conduct an intentionality test. Contrary to the intuition that slowed ad video should present more visual details and thus lead to greater trustworthiness (DePaulo et al., 2003; Hartwig and Bond, 2011), our research shows that slow motion effects can backfire. We document the specific conditions under which intentionality inferences can override any aesthetic and visual benefits to the detriment of the advertisement's appeal and persuasiveness. In doing so, we also explore how (dynamic) visual marketing design aesthetics can have a significant and unintended impact on consumers' social cognition which directly affects marketing efficacy.

Our work also sheds light on visual attentional processes (and eye movement) that occur when consumers make social-cognitive inferences about influence agents (and brand representatives). Indeed, our eye-tracking study showed that consumers' gaze patterns and visual attentional strategies changed in response to the relatively subtle cue of slow motion behavior. We make a methodological contribution by demonstrating that visual attention, eye movement, and active tracking of influence agents' eyes can serve as proxy measures of consumer attributional inference and suspicions (of intentionality) in marketing contexts. We directly link such visual behavioral patterns to perceptions of agent's intentionality and also attitude change towards the advertised product. As marketing becomes increasingly 'indirect' and subtle, particularly in new media contexts, measurements of when consumers 'actively monitor' for marketing and persuasion attempts are important marketing efficacy measures in their own right.

This work also adds to the growing research on how time perception affects consumer judgment (Rudd et al. 2018; Tonietto et al. 2019). We study how a common manipulation of time perception in media and advertising, namely slow motion, affects social inferences, and ultimately changes consumer attitudes and preferences. We concurrently contribute to an emerging stream of visual marketing research that examines how aesthetic strategies influence the evaluation and perception of products (Argo and Dahl 2017; Buechel and Townsend 2018; Cian et al. 2014; Hagtvedt and Patrick 2008). Whereas prior research focused on static visual cues, here we investigate how a unique dynamic visual cue that affects how consumers construe influence agents in marketing. Finally, we propose one specific trait — intentionality bias — as a critical social cognition qualification that modulates the efficacy of how visual-based persuasive messages are delivered. This trait can be readily extended to the many marketing contexts where social cognition is required to process persuasive information coming from a marketing or influence agent (e.g., face-to-face sales, online social media platforms, and live-streaming, as shown in Study 3).

We also contribute to literature on consumer response to persuasion and advertising by considering how visual effects and persuasion intersect in new media contexts (e.g., live-streaming, reality TV Shows, social influencers, etc.) where there advertising is more 'hidden' and less explicit than in legacy marketing mediums. Such contexts do not fit precisely into traditional Persuasion Knowledge Model, which were developed for mid-to-late 20th century media and communication contexts, and posit that consumers need recognition and awareness of advertising in order to cope and defend against persuasive messages (Evans and Park 2015; Friestad and Wright 1994; Obermiller and Spangenberg 1998). Our findings suggest that how much consumers are able to resist persuasion in new media contexts, where there is less-scripted behavior by social agents and no blatant signs of advertising (e.g., live-streaming context in Study 3), may depend on their ability to muster

social cognition heuristics. Once active, these heuristics can devalue the credibility of influence agents' behaviors. Of course, these findings are still applicable in traditional advertising contexts, where here are overt advertising signals (Friestad and Wright 1994; Obermiller and Spangenberg 1998); in these contexts, heightened perceived intentionality may directly trigger persuasion knowledge and skepticism towards advertisers.

Managerial Implications

Our research has numerous applications for visual marketing, particularly for video, TV, mobile advertising, and emerging social media contexts, where behavioral social-proof by influence agents (e.g., testing or reacting to a product) is a common persuasion strategy. Our findings highlight the need for more programmatic studies of how visual marketing strategies and social-cognition interact. This question is particularly relevant for visual portrayals of active consumption, where visual and cinematographic effects can potentially trigger a minefield of visual and cognitive heuristics. These questions have received little attention in the marketing research despite their wide-ranging implications for both theory and practice. However, it is equally likely that such heuristics can be easily de-biased: For example, our findings suggest that the slow motion effect can be de-biased by the cognitive load (e.g., background sound) or if the consumption decision seems more incidental rather than intentional. Moreover, results of our eye-tracking study also imply that marketers can potentially dodge the slow motion inference bias by using tools to nudge consumers' visual attention away from the influence agent (e.g., captions, narrative preceding the ads, visual markers) in order to prevent the establishment of action intentionality.

In addition, our research provides a starting point for understanding how visual marketing affects consumer trust. A trustworthiness alarm has been raised in advertising recently, especially for digital advertising: According to Nelson's report on Global trust in

advertising (Nielsen 2015), less than half (48%) of respondents report they entirely or partially trust online video ads, while mobile ads had an even lower trustworthiness rating (43%). Our studies suggest that marketers should be even more mindful of how the delivery and execution of advertisements (including the interaction effect between video/visual aesthetics and choice of influence agent) affect perceived trustworthiness, particularly as more and more advertising spending migrates towards emerging new media platforms such as (mobile) short-form videos, live-streaming, and virtual reality. Our conceptualization suggests that resistance to overt intentionality can be lowered when ads are endorsed by real consumers rather than professional actors (or celebrities), look more real-life-like (e.g., consumption in natural speed), and present natural contexts rather than exaggerated caricatures (e.g., prolonged savoring in slow motion).

Limitations and Directions for Future Research

This research is intended to be a first step in exploring the general question of how social cognition effects mediate the efficacy of visual marketing strategies. In investigating how one particular (but common) visual marketing technique generates unintended social cognition effects, we have by necessity left many questions unanswered and open even more new questions. Below we discuss questions that are beyond the scope of this research, but may nonetheless be important limitations and potential moderators for our findings.

While our research focuses on a particular cinematographic effect (i.e., slow motion) and its undesirable marketing consequences, one may wonder whether analogous effects occur for other cinematographic effects (e.g., speeding up, color filtering, etc.), and whether consumers have a negative reaction to video editing in general. Initial evidence reported in Web Appendix K suggests this is not the case, and that the negative main effect and perceived intentionality-driven mechanism does not occur for two other major

cinematographic techniques (e.g., fast speed, color filtering in black-and-white). Furthermore, we find no evidence that the process underlying the slow motion effect is due to some other visual aesthetic characteristics (e.g., perceived information quantity and boredom). This suggests that the negative impact of slow motion cinematography is not merely due to a general preference for 'natural' speed. Of course, our tests were not exhaustive: We hope that future research can systematically test the marketing efficacy of all known cinematographic techniques, which are usually evaluated from an aesthetic or psychological rather than marketing perspective (Argo and Dahl 2017; Buechel and Townsend 2018; Cian et al. 2014; Hagtvedt and Patrick 2008). Doing so will deepen our understanding of the mechanism behind consumer visual processing of dynamic visual stimuli and also have direct managerial implications for how commercials are designed, calibrated, edited, and played.

Although we tested the effect using numerous real ads that varied in product category and cinematographic features (length, sound, original speed), and ruled out several obvious alternative explanations (e.g., ease of visual processing, boredom, engagement, boredom, etc.), the slow motion effect, as with most marketing phenomenon, is likely to be multiply determined. Consequently, these and other factors may co-occur and help drive the effect in the real world. For example, affective factors may override (or at least interplay with) the intentionality-driven mechanism when videos are immersed in strong emotions (e.g., charity ads using slow motion to amplify a touching story). Indeed, since we found that information-intensive background sounds can mitigate the backlash against slow motion (Study 4), one may wonder whether sound effects can interact with slow motion effects in other ways. For example, prior studies find that background music can shape ad processing through attention-gain and music-message congruency (Allan 2006; Gorn 1982; Kellaris et al. 1993). Thus, future research can manipulate nuances of background sound, which may interact with slow motion video and product category to determine an ad's efficacy. Such research can help

draw a more complete and multimodal understanding of how consumers respond to visual cues in the real (multimodal) world.

For consistency, we used real commercials that employ influence agents reacting positively to consumption (e.g., smiling while chewing on food) to serve as social proof for the advertised product. Although most real-world slow motion commercials fall within this category, there are also product categories where social proof is weighted less; for instance, advertisements for products that require close scrutiny (e.g., medications, tools) typically emphasize product performance qualities. Future research may investigate the impact of slow motion effects in contexts where social proof is less relevant or informative. Related to this question, one might also wonder if our effect extends to contexts where there are no influence agents at all, for example, a car commercial depicting a car travelling in slow motion. Indeed, we found that slow motion can be beneficial to ad persuasiveness when influence agents are animated non-human objects (Study 5). When no influence agents are present, we predict that slow motion should only have visual aesthetic effects and no social cognition effects. However, the characteristics of such effects are beyond the scope of our research and conceptual framework, which focus on contexts where influence agents are present and social cognition effects are possible.

Finally, future investigations may consider the impact of slow motion on downstream effects such as memory. This research studied how slow motion video affects persuasion by measuring consumer evaluations immediately after commercial viewing. However, could slow motion videos affect, and possibly improve, how well consumers recall the information presented in the commercial? These are but a few examples of the multitudinous directions that future research can take to build on our opening endeavors. These questions will become increasingly important as marketing and daily consumer behavior migrate into new media domains, particularly live-video-enabled social platforms and AI-assisted visual search

platforms such as TikTok. More generally, we hope that a stream of future research can help create a comprehensive understanding of how visual presentation and social cognition effects interact to influence perceptions, persuasion, and trust across a variety of marketing contexts.

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FOOTNOTE:

[1] For simplicity, we did not include reading-comprehension filler questions from the original task (Rosset 2008) because they primarily serve as attention-checks.