European Journal of Marketing

159

Slow and steady or fast and furious: how movement speed in the digital medium impacts consumers' risk judgments

Nükhet Taylor and Sean T. Hingston
Department of Marketing, Ted Rogers School of Management, Toronto Metropolitan University, Toronto, Canada

Received 14 April 2023
Revised 9 February 2024
26 June 2024
Accepted 12 July 2024

Abstract

Purpose – Fueled by the soaring popularity of the digital medium, consumers are increasingly relying on dynamic images to inform their decisions. However, little is known about how changes in the presentation of movement impacts these decisions. The purpose of this paper is to document whether and how movement speed–a fundamental characteristic of dynamic images in the digital medium–influences consumers' risk judgments and subsequent decisions.

Design/methodology/approach – Three experimental studies investigate the impact of movement speed displayed in the digital medium, focusing on different risk-laden domains including health (pilot study), gambling (Study 1) and stock market decisions (Study 2).

Findings – The authors find that faster movement speed displayed in the digital medium elevates consumers' feelings of risk and elicits cautionary actions in response. The authors reveal a mechanism for this effect, showing that faster movement reduces feelings of control over outcomes, which predicts greater feelings of risk.

Research limitations/implications – Future work could expand upon these findings by systematically examining whether certain individuals are more susceptible to movement speed effects in the digital medium. Research could also investigate whether different ways of experiencing movement speed (e.g. physical movement) similarly influence risk judgments and whether movement speed can have positive connotations outside of risky domains.

Practical implications – The authors offer important insights to marketing practitioners and public policymakers seeking to guide consumers' judgments and decisions in risk-laden contexts through the digital medium.

Originality/value – By showing how movement speed alters judgments in risk-laden contexts, the authors contribute to literature on risk perception and the growing body of literature examining how moving images shape consumers' behaviors.

Keywords Digital medium, Movement, Speed, Risk, Judgments, Evolutionary psychology

Paper type Research paper

Funding: This work was partially funded by the Social Sciences and Humanities Research Council of Canada (SSHRC Insight Development Grant # 430-2023-00077), awarded to the first author.

European Journal of Marketing
Vol. 58 No. 13, 2024
pp. 159-183
Emerald Publishing Limited
0309-0566
DOI 10.1108/EJM-04-2023-0258

Movement is ever-present in the digital medium. According to recent estimates, more than 80% of the internet traffic is now composed of dynamic images (The Network for Global Media, 2020). As a result, consumers are increasingly using dynamic images to make important decisions. For example, consumers now rely on animated stock charts to make investment decisions (Kim and Lakshmanan, 2021); interact with dynamic product images to make purchase decisions (Jia *et al.*, 2020); and watch animations of diseases and treatment options to make medical decisions (Webb, 2020). The use of dynamic images has been touted by major digital platforms including Facebook (Meta for Business, 2018) and Twitter (2018) as an important way of improving consumer engagement with marketing elements.

While dynamic images are both common and important, how they are used can vary. One typical variation relates to movement speed. Marketers routinely alter the playback speed of dynamic images, making movements appear slower or faster (Jung and Dubois, 2023). Despite their widespread use in digital marketing, there is limited research on how movement speed effects can alter consumers' behavior. Existing work has predominantly focused on risk-free contexts, documenting how movement speed impacts perceptions of product size (Jia *et al.*, 2020), luxuriousness (Jung and Dubois, 2023), hedonic appeal (Stuppy *et al.*, 2023) and actors' perceived genuineness in product ads (Yin *et al.*, 2021).

However, the question of whether and how movement speed displayed in the digital medium can influence consumers' judgments and decisions regarding risks remains largely unexplored. For example, could a faster or slower moving stock chart animation change how consumers view investment risks? Similarly, could faster or slower animation speed affect perceptions of how risky bacteria are? The current article addresses this gap in the literature and systematically examines how movement speed displayed in the digital medium can shape consumers' judgments and decisions regarding risks.

Drawing from the principles of evolutionary psychology, we suggest that whether and how movement speed can alter consumers' risk judgments can be traced back to our ancestral roots. Scholars in evolutionary psychology have long theorized that our ancestral past was marked by a hostile environment, wherein fast-moving objects signaled a threat to survival (Riskind, 1997). For instance, predators often adopted fast movements during a hunt (Janosov *et al.*, 2017), and natural hazards such as quickly falling rocks or rushing water posed imminent threat to survival (Wägner, 1886). As a result, humans evolved to treat fast movement as a sign of danger and respond with caution (Riskind, 1997). Although these evolutionary adaptations served a critical function in the past, we suggest that they continue color consumers' judgments and decisions in the modern world. Importantly, our research addresses not the variations in movement speed seen in the physical world, but those observed in the digital medium. Specifically, we argue that altering the movement speed of digital visual elements can shape consumer risk judgments and subsequent behaviors.

This evolutionary lens dovetails existing research on feelings of risk, which suggests that consumers often judge risks on an instinctive level (Loewenstein *et al.*, 2001; Slovic and Peters, 2006). Therefore, when something *feels* dangerous, consumers often perceive it to be riskier, whether it relates to the financial risk of losing money (Grable and Roszkowski, 2008) or health risks of contracting diseases (Loewenstein *et al.*, 2001). Accordingly, we predict that faster movement displayed in digital marketing elements will heighten consumers' feelings of risk, prompting them to adopt cautious behaviors in response.

The current work makes several important contributions. First, we add to the scholarly discussion on the psychological impact of moving images, a topic of increasing importance given the growing relevance of digital platforms as marketing channels (e.g. Togawa and Sugitani, 2022; Yin *et al.*, 2021). Second, we extend the literature on risk perception (Fischhoff *et al.*, 1993; Loewenstein *et al.*, 2001; Slovic, 1996; Siegrist and Árvai, 2020),

which has thus far largely overlooked the influence of dynamic visuals on consumers' risk judgments. One notable exception is the recent work by Kim and Lakshmanan (2021), which revealed that dynamic images, as opposed to static ones, can enhance perceptions of risk. However, this investigation left a key question unanswered – whether specific characteristics of these dynamic images, such as movement speed, impact consumers' risk judgments. We address this possibility by showing that movement speed indeed plays a key role in shaping consumers' risk assessments.

Third, we extend research applying evolutionary psychology to consumer research, which has traditionally focused on static marketing elements (e.g. Griskevicius *et al.*, 2012; Meert *et al.*, 2014; Wang and Griskevicius, 2014). Our work adds to this research stream by showing how evolutionary instincts can color consumers' perceptions of dynamic images depending on movement speed. We also provide insights into why movement speed may intuitively relate to risks. Our argument centers on the notion that interactions with fast-moving objects can diminish consumers' feelings of control, particularly in terms of their ability to manage the outcomes of these interactions. Indeed, the risk judgment literature underscores the critical role that feelings of control over outcomes play in shaping consumers' risk assessments (Kim and McGill, 2011; Klein and Kunda, 1994; Langer, 1975). Correspondingly, we show that increased movement speed reduces consumers' feelings of control over outcomes, which coincides with heightened feelings of risk. This offers a deeper understanding of the evolutionary underpinnings of consumer behavior in dynamic digital environments.

These findings also offer important substantive insights, suggesting that marketing practitioners and policymakers can leverage movement speed effects in the digital medium to guide consumers' perceptions of potential risks. Specifically, our findings show that faster movement speed can effectively elicit greater feelings of risk and lead to more cautious behavior. Thus, considering dynamic visual characteristics, such as movement speed, in the design of marketing elements may help promote consumer safety and well-being in the digital medium.

Conceptual development

Movement speed effects in marketing

The growing use of movement speed effects in digital marketing (Jung and Dubois, 2023) has been garnering increasing scholarly interest (Table 1). The bulk of this research documents how altering the playback speed of objects, which are typically seen in motion in the real world, can impact consumers' perceptions. For example, Jung and Dubois (2023) illustrated that using slow-motion sequences in advertisements, such as an ice cube elegantly splashing into champagne in slow motion, can amplify the perceived luxuriousness of the featured product. Conversely, Yin *et al.* (2021) showed that actors portrayed in slow motion in product advertisements may appear less genuine, which diminishes the ad's effectiveness.

In a notable investigation, Jia *et al.* (2020) showed that the impact of movement speed on consumer perceptions is not limited to naturally occurring motions, extending even to simulated movements created specifically for digital communications. The authors found that digitally animating a static product (e.g. a table) to appear to move either quickly or slowly can change consumer perceptions of the product's size. This stems from consumers intuitively associating movement speed with an object's physical size, an association which is then applied to digitally animated objects (Jia *et al.*, 2020). These insights are noteworthy because they suggest that consumers might possess an understanding of movement speed and its implications for other object characteristics. Furthermore, this understanding appears to be applied broadly, regardless of whether the movement is inherently characteristic of the object in question.

Table 1. Literature on dynamic images and the current article

Article	IV: movement speed	DV: risk judgments	Focal target	Key results
Yin *et al.* (2021)	✓	×	Actors in dynamic ads	Slow (vs. regular) motion reduces the perceived genuineness of actors in product advertisements, which reduces the ad's persuasiveness
Jung and Dubois (2023)	✓	×	Products in dynamic ads	Slow (vs. regular) motion increases consumers' immersion with the featured product, which elevates the product's perceived luxuriousness
Stuppy *et al.* (2023)	✓	×	Products and activities in motion (e.g. sports)	Slow motion (vs. regular speed) videos increase consumers' processing fluency, which amplifies the hedonic qualities of the video
Jia *et al.* (2020)	✓	×	Products in dynamic ads	Consumers associate smaller (vs. larger) physical size with fast (vs. slow) motion. Therefore, seeing a product appear to move fast results in smaller size judgments
Kim and Lakshmanan (2021)	×	✓	Financial risks	Moving (vs. static) stock charts increase the salience of price transitions, which elevates risk judgments
Current article	✓	✓	Health risks and financial risks	Fast (vs. slow) movement elevates consumers' feelings of risk. This is underscored by fast (vs. slow) movement reducing consumers' feelings of control over outcomes related to the moving entity

Notes: The checkmark (✓) indicates the variable was featured as one of the two primary variables of focus (IV or DV) in the corresponding article, whereas the × indicates the variable was not the primary focus of the article
Source: Authors' own work

Our research builds on this foundation by investigating whether consumers innately link movement speed with risks. Specifically, we posit that consumers feel greater risk in response to faster movement and we further argue that this influences consumers' judgments and decisions in the digital medium. In so doing, we add to the literature on risk perceptions, which, aside from an article by Kim and Lakshmanan (2021) comparing static and moving images in the stock investment domain, has yet to examine how dynamic visual cues influence risk assessments. To address this gap, we integrate insights from evolutionary psychology and propose that the impact of movement speed displayed in the digital medium on consumers' risk judgments may be derived from our evolutionary past.

Evolutionary psychology and marketing

Evolutionary psychology is rooted in the idea that all living organisms evolved to behave in ways that provided a survival advantage to their ancestors. In particular, humans who exhibited behaviors that promoted survival and reproduction were more likely to pass on

their genes to subsequent generations (Durante and Griskevicius, 2016). As a result, evolutionary psychology states that modern humans have evolved to process information and make decisions in ways that would have helped our ancestors survive, thrive and replicate (Confer *et al.*, 2010; Griskevicius and Kenrick, 2013).

A growing body of work in marketing suggests that our evolutionary heritage has a significant role in shaping modern-day consumer preferences and behaviors (e.g. Saad, 2020; Saad and Gill, 2000). For instance, consumers are naturally attracted to products that are symmetrical, scarce, and aesthetically pleasant, mirroring ancestral tendencies to prioritize high-quality resources (Bigoin-Gagnan and Lacoste-Badie, 2018; Palmer *et al.*, 2013; Verhallen and Robben, 1994). In addition, consumers also tend to avoid items resembling ancestral threats, such as geometric shapes with sharp edges (e.g. a downward "V" shape; Larson *et al.*, 2012).

While this research suggests that evolutionary adaptations can inform consumers' behaviors, existing studies often focus on marketing elements that do not include dynamic components, such as brand preferences (Wang and Griskevicius, 2014), product attributes (Griskevicius *et al.*, 2012) and aesthetic preferences (Meert *et al.*, 2014). We add to this growing body of work by examining how consumers' evolutionary instincts may shape their perceptions of, and behavior toward, dynamic marketing elements in the digital medium.

Movement as an evolutionary cue

From an evolutionary perspective, movement is an important cue because it indicates a potentially important change in the environment that can provide adaptive value (Radden, 1996). Our ancestors' ability to detect motion allowed them to identify threats and opportunities, aiding their survival (Pratt *et al.*, 2010). Similarly, detecting the movements of conspecifics facilitated social interactions and alliances, which was crucial for survival and reproduction (Pratt *et al.*, 2010).

The human inclination toward movement prevails to this day, persisting even in contexts wherein movement is not necessarily relevant to survival. For example, using movement cues in digital marketing elements can be highly effective in eliciting consumer engagement (Cian *et al.*, 2014). Animated product displays, moving logos and dynamic marketing communications have all been shown to outperform their static counterparts, suggesting that motion cues continue to influence modern consumers' behaviors (Yu *et al.*, 2022).

While it is clear that movement can engage consumers, marketing scholars have paid limited attention to whether consumers have evolutionary instincts related to *how* an object moves, beyond simply *whether* it moves. In our ancestral past, quickly identifying whether an object posed risks or benefits was critical to survival, and the way an object moved provided a vital cue to draw upon (Osgood, 1969; Riskind, 1997; Riskind and Richards, 2018). Detecting the speed at which an object moves conferred important benefits to survival (Osgood, 1969), as fast-moving objects often posed greater potential for harm. Indeed, fast-moving objects would pose a significant threat to survival, as evading harm from these objects would be challenging. Similarly, in the case of predators, faster movement was often associated with moments wherein the predator would actively try to catch and harm its prey (Janosov *et al.*, 2017), suggesting that there was adaptive value in classifying them as dangerous based on their movement speed.

Thus, one reason for why movement serves as an evolutionary cue may relate to the adaptive benefits of quickly determining whether the object is potentially dangerous, with fast-moving objects being more likely to pose risks compared to slow-moving objects. We argue that this evolutionary background can shape modern consumers' perceptions, leading them to perceive greater risks in faster movement.

Movement speed and feelings of risk

The notion that ancestral threat cues can alter consumers' risk judgments aligns with existing research on feelings of risk. This research posits that consumers often assess risks based on their instinctive feelings, overriding even their understanding of objective risks (Slovic *et al.*, 2004). Thus, consumers might perceive something as dangerous or risky based on their gut feelings, even when these perceptions do not align with the actual likelihood of harmful outcomes (Loewenstein *et al.*, 2001; Slovic *et al.*, 2004). For example, the thought of catastrophic events, such as a nuclear power plant accident, can trigger intense feelings of risk even though the likelihood is remote (Slovic *et al.*, 2004). It is noteworthy that Slovic, who introduced the concept of feelings of risk, theorized that these feelings are "an important vestige of our evolutionary journey" (Slovic *et al.*, 2004; p. 311). In line with this, research on evolutionary psychology has shown that subtle reminders of ancestral threats, such as imagining being alone in the dark, can impact consumers' willingness to take risks even in unrelated modern-day domains (e.g. financial decisions; Li *et al.*, 2012).

Bringing together the notions of ancestral threats and the literature on feelings of risk, we propose that consumers may use movement speed as a cue to assess risks in dynamic marketing elements in the digital medium. Specifically, we argue that faster (vs. slower) movement speed will result in greater feelings of risk. This, in turn, should alter consumers' behaviors, with faster movement encouraging cautionary responses (i.e. elevated avoidance intentions).

Feelings of control

While movement speed serves as an important evolutionary cue, there is debate over the precise underlying mechanism. Following the notion that movement is inherently engaging (e.g. Pratt *et al.*, 2010; Cian *et al.*, 2014), some studies suggest a physiological impact, arguing that faster movement may further elevate consumers' arousal and attention (Duff and Sar, 2015; Sundar and Kalyanaraman, 2004; Yoo and Kim, 2005). However, evidence linking movement speed with physiological responses often incorporated potential confounds, such as using within-subjects designs (Sundar and Kalyanaraman, 2004) or using advertisements that presented both textual and visual information (Duff and Sar, 2015; Sundar and Kalyanaraman, 2004; Yoo and Kim, 2005). In such cases, faster presentation speed may require greater attention to adequately process the textual content, complicating the interpretation of whether movement speed alone affects physiological responses. Recent research addressing these methodological concerns found no consistent differences in consumers' physiological responses to objects moving at varying speeds (Jia *et al.*, 2020; Witt *et al.*, 2016). These findings imply that altering movement speed might not always provoke a direct physiological response, but rather influence consumer perceptions by generating specific inferences (e.g. Jia *et al.*, 2020).

We conjecture that one such inference may relate to consumers' feelings of control. Research indicates that a person's sense of control is multifaceted, involving factors such as the ability to influence one's environment and the ability to manage outcomes (Wallston *et al.*, 1987). In the context of movement speed and risk judgments, we believe that the ability to control outcomes is particularly pertinent. Historically, rapid movements, such as those of fast-moving predators in a hunt, would have limited ancestral humans' ability to respond effectively and control outcomes, thus putting their survival at greater risk. Consistent with this rationale, we argue that the relationship between movement speed and risk judgments may be underscored by feelings of control over outcomes.

This possibility also aligns with our theoretical framework on feelings of risk, which suggests that the degree to which individuals feel they can control outcomes is particularly

influential in shaping risk judgments (Slovic, 1996). For example, despite statistical evidence to the contrary, people tend to feel that flying is riskier than driving because they feel a lower sense of control over their fate while flying (Klein and Kunda, 1994). Research on illusion of control similarly supports the link between control over outcomes and risk perception. These studies show that people are more likely to engage in risky activities (e.g. gambling) when they feel they can control the outcomes associated with the activity (e.g. wins and losses; Kim and McGill, 2011; Langer, 1975; Taylor *et al.*, 2019). Our investigation expands upon this notion to document how movement speed alters consumers' feelings of risks. Specifically, we suggest that the effect of movement speed on risk judgments relates to consumers' feelings of control over outcomes. Therefore, we argue that higher speeds may result in lower feelings of control over outcomes, which corresponds with heightened risk judgments.

Overview of studies

Three studies explore whether and how the movement speed displayed in the digital medium alters risk judgments and subsequent behaviors. We investigate this by examining various risk-laden contexts wherein extensive work has documented consumers relying on their intuitive feelings of risk (Harris, 2014; Slovic *et al.*, 2004). Specifically, we focus on the health domain, wherein participants make judgments about bacteria (pilot study), and the financial domain, wherein participants engage in gambling (Study 1) and evaluate a stock market investment (Study 2). These studies show that faster movement increases feelings of risk, even when consumers' experienced outcomes remain constant (Study 1). This aligns with previous research on feelings of risk (Slovic *et al.*, 2004) and suggests that the impact of movement speed on risk judgments may bypass consumers' analytical reasoning about risks.

We also examine whether these feelings of risks can alter consumers' behaviors. Consistent with our prediction, we find that faster movement elicits greater avoidance intentions (Studies 1–2). Furthermore, we identify a mechanism for how faster movement enhances feelings of risk. Specifically, we show that faster movement reduces feelings of control over outcomes, which corresponds with heightened feelings of risks (Study 2). All studies show that consumers' arousal and attention levels remain consistent across different movement speed levels. Therefore, consistent with recent evidence in marketing (Jia *et al.*, 2020), we find that arousal and attention do not account for the effect of movement speed on feelings of risk. Rather, it is consumers' feelings of control over outcomes that is shaped by movement speed, in turn influencing risk assessments.

Across all studies, we confirmed that our findings reflected how altering speed perceptions – and not related factors – impacted consumers' judgments and decisions. Specifically, we ensured that the speed manipulation did not induce any extreme speed perceptions, such as imperceptibly slow movements that might escape detection (Cordo *et al.*, 2000). These analyses are presented in the Supplementary Material (pages 1–3). The Supplementary Material also details the exploratory measures collected across studies (pages 4–6). We return to these exploratory measures and their implications for future research in the General Discussion section.

Pilot study

The pilot study tested our core prediction that fast movement speed displayed in the digital medium elevates risk judgments. We focused on consumers' risk judgments of a form of bacteria, which was depicted as moving either fast or slow. This context was chosen for two reasons. First, consumers are increasingly using the digital medium to watch moving images of diseases and treatment options (Webb, 2020). For example, the COVID-19 pandemic

resulted in many consumers viewing animated videos about the virus on digital platforms, with some videos accumulating hundreds of millions of views (YouTube, 2020). Importantly, movement speed effects are widely used in medical videos (Kelly *et al.*, 2020). Practitioners create high-speed video illustrations of how viruses and bacteria spread to make efficient use of viewers' time (Bai, 2020). Similarly, consumers often view medical videos on platforms such as YouTube, which allows them to alter the video speed with the click of a button (Google, 2022).

Second, this context aligns with our theoretical focus on feelings of risk. Research finds that consumers often rely on their intuitive feelings when assessing health risks, such as the risks of disease contraction (Janssen *et al.*, 2013; Loewenstein *et al.*, 2001). This suggests that consumers may perceive a bacterium to be risky when it intuitively feels dangerous. Therefore, if faster movement speed elevates feelings of risk, consumers should be more likely judge bacteria to be risky when it appears to move faster. The current study examined this possibility.

Method

Participants and design. We recruited 250 undergraduate students who participated in the study in return for partial course credit. One participant who indicated not being able to view the visual was eliminated, leaving a final sample of 249 participants (M_{age} = 20.36, 63.9% female, 1.2% gender fluid/prefer not to say). Participants were assigned at random to one of two conditions in a 2 (speed: slow vs. fast) between-subjects design.

Procedures. Participants read that they would view a graphic interface format (GIF) of a form of bacteria and categorize it as either neutral or risky. Participants were subsequently provided the description of the two categories. Neutral bacteria were described as forms of bacteria that would have no impact on a person's health and physical well-being, whereas risky bacteria were described as forms of bacteria that could have negative impact on a person's health and physical well-being, including causing foodborne illnesses and hospitalization. These descriptions were taken from the Centers for Disease Control and Prevention (2020) website and adapted for the purposes of the study.

Participants then viewed the bacteria GIF (Appendix 1). The GIF was adapted from a royalty-free stock video of the salmonella bacteria (Shutterstock, 2022). We manipulated movement speed by altering the video playback speed. Consistent with prior research (Jia *et al.*, 2020), the playback speed of the fast GIF was four times faster than the slow GIF. Participants viewed either the fast or the slow GIF. To create a consistent viewing experience across conditions, we presented the GIF on an infinite loop wherein bacteria movements were displayed repeatedly and continually while participants remained on the page (e.g. Jia *et al.*, 2020).

After viewing the GIF, participants began the questionnaire. First, participants categorized the bacteria (neutral bacteria/risky bacteria). Second, participants rated their perceptions of how fast the bacteria moved across two questions, which served as the manipulation check (anchored: 1 = not quickly/fast at all, 7 = very quickly/fast). Finally, participants reported their arousal ("I felt alert/energized while viewing the bacteria image") and attention levels ("I paid attention to the bacteria image"; anchored: 1 = *completely disagree*, 7 = *completely agree*). These two variables were measured across all studies. Consistent with recent marketing studies (e.g. Jia *et al.*, 2020), the purpose was to ensure that any variations in consumers' judgments did not directly stem from their engagement with movement.

Results

We first examined perceptions of movement speed ($r = 0.81$). An independent samples *t*-test confirmed that participants indeed perceived the bacteria to move faster in the fast condition ($M = 4.35$, SD = 1.21) than in the slow condition ($M = 3.54$, SD = 1.18; $t(247) = 5.26$, $p < 0.001$, $d = 0.67$). Next, we explored participants' attention and arousal ratings. Consistent with recent work in marketing (Jia *et al.*, 2020), the speed manipulation did not alter arousal ($r = 0.30$; $M_{slow} = 4.23$, SD = 1.51 vs. $M_{fast} = 4.37$, SD = 1.20; $p = 0.41$) or attention toward the bacteria ($M_{slow} = 6.21$, SD = 1.21 vs $M_{fast} = 6.13$, SD = 1.08; $p = 0.55$). Therefore, the speed manipulation impacted perceptions of movement speed without changing attention or arousal levels.

Finally, we turned to risk judgments. A binary logistic regression confirmed that more participants categorized the bacteria as risky in the fast condition (71.5%) than in the slow condition (54%; Wald = 8.10, $\beta = 0.76$, SE = 0.27, $p = 0.004$). Thus, fast movement indeed elevated risk judgments.

Discussion

The pilot study provided evidence consistent with our core prediction. Specifically, more participants judged bacteria to be risky when the bacteria moved faster. In addition, our results also suggested that the difference in risk judgments did not relate to physiological variables that indicate engagement, including arousal and attention. This underscores the distinct role of movement speed displayed in the digital medium in shaping risk perceptions, separate from general engagement.

While these results lend support to our core prediction, one important question is whether these effects have broader applicability across different risk-laden contexts. Indeed, in cases involving living entities such as bacteria, one might argue that consumers perceive faster movement as a sign of greater vitality, which may intensify the impact of movement speed on risk judgments. Therefore, an important consideration is whether the link between movement speed and risk perception extends beyond living entities. If movement speed has an inherent link to risk judgments, as we suggest, then the impact of fast versus slow movement speed displayed in the digital medium should also be applicable to contexts that do not involve living entities.

To examine this possibility, our subsequent studies focused on nonliving risk-laden entities. To so do, we built upon existing work on feelings of risk, which posits that in addition to health risks, consumers also rely on their gut feelings to assess financial risks (Loewenstein *et al.*, 2001), including slot machine gambling (Kugler *et al.*, 2012) and stock investment decisions (Griffith *et al.*, 2020). These contexts are relevant as they involve inherently inanimate objects (i.e. slot machines and stock charts). Importantly, across these contexts, movement speed is also not objectively linked to potential risks. For instance, in slot machines, winning probabilities are fixed and not influenced by the spin speed. Similarly, stock outcomes are not tied to the movement speed imposed on stock charts. These contexts thus provided an opportunity to examine whether consumers link faster movements with heightened risk, even when the movement speed was not diagnostic of potential risks.

In addition, we sought to examine the role of feelings of risk on consumers' behaviors. Previous findings indicate that consumers' behaviors in risk-laden contexts are influenced more so by their intuitive feelings of risk than by the actual likelihood of negative outcomes (Slovic *et al.*, 2004). Thus, when an entity feels dangerous or risky, this can trigger a desire to avoid the entity, even when the odds of negative outcomes do not corroborate these feelings (Klein and Kunda, 1994). For instance, in gambling contexts, consumers might feel a heightened sense of risk based on contextual cues, leading to a reduced desire to gamble,

even when the actual odds of losing remain constant (Armstrong *et al.*, 2020). Building on this, study 1 elaborated on the role of feelings of risk in predicting consumers' behaviors. Specifically, we examined whether the feelings of risk induced by movement speed could predict consumers' behaviors regardless of the actual outcomes that they experienced.

Study 1

Study 1 aimed to conceptually replicate the core findings of the pilot study in a different risk domain. Specifically, we focused on the gambling context and examined whether faster movement speed displayed in a digital slot machine would elevate consumers' feelings of risk.

Consistent with the pilot study, the current context was chosen given its substantive and theoretical relevance. Substantively, the number of consumers playing online casino games through their smartphones and computers has been skyrocketing (Ipsos, 2022). This trend has led to a significant rise in the global online gambling market, which is currently generating more than $72bn in annual revenue (Research and Markets, 2023) and is projected to reach $100bn by 2026 (Rainwater, 2023). Importantly, movement speed variations are commonly used in online casino games. For example, digital slot machines used in online casinos often introduce variations in their reel spin speed (Wheeler, 2021). This underscores the substantive importance of understanding how variations in movement speed can affect gambling behavior.

This context was also relevant from a theoretical perspective. Extant work has shown that gambling is another important domain in which consumers rely on their intuitive feelings of risk (Kugler *et al.*, 2012). Thus, if movement speed displayed in the digital medium alters feelings of risk, then introducing variations to the movement speed of a gambling game should alter consumers' behaviors. Specifically, we predict that faster reel spin movement in a digital slot machine will elicit greater feelings of risk, reducing consumers' desire to interact with the machine.

In addition, we explored whether these subjective feelings of risk could predict consumers' behaviors more so than the actual game outcomes. To achieve this, we had participants play a digital slot machine ten times and kept the odds of wins and losses constant across the two movement speed conditions. As in prior research (Kim and McGill, 2011), we expected that playing ten spins would allow participants to gain an understanding of the possibility of winning and losing with the machine. We then examined whether the feelings of risk elicited by movement speed could alter consumers' gambling behaviors regardless of the gaming outcomes they experienced.

Method

Participants and design. In total, 200 consumers (M_{Age} = 20.79, 39% female) participated in the study in return for monetary compensation. Participants were randomly assigned to one of two conditions in a 2 (speed: slow vs. fast) between-subjects design. The study was preregistered (link: https://aspredicted.org/WHR_5Y1).

Procedures. We set up a slot machine booth in a North American business school. The booth consisted of two stations wherein consumers interacted with a digital slot machine and a private survey area. The stations contained two identical laptops hosting the digital slot machine.

The digital slot machine was created by a programmer for the current study (Appendix 2). Participants interacted with the digital slot machine by pressing the space bar of the laptop, which enabled the spin function. To familiarize participants with the odds of winning and losing with the slot machine, we asked each participant to play for ten spins. The bet per spin

was kept constant at one credit. To reduce potential differences in loss aversion, we provided each participant with 100 credits at the start of the study. Therefore, the lowest number of credits participants could have by the end of the game was 90 credits.

To manipulate movement speed, we varied the animated reel spin speed. Consistent with the pilot study, the movement speed in the fast condition four times faster than in the slow condition. Specifically, the speed of the reel spin was set at 2.5 symbols/second in the slow condition, whereas it was set at 10 symbols/second in the fast condition. The spin duration was kept constant at four seconds in both conditions. This meant that ten random slot symbols moved down each slot line over four seconds in the slow condition, whereas 40 random slot symbols moved down each slot line during the same period in the fast condition.

After completing the ten spins, participants were directed to the private survey area. Following previous research on likelihood measurements, we used 11-point scales to measure our primary variables. As in prior work, we expected this would allow participants to map their understanding of the game's outcomes on to the corresponding likelihood scales (Teigen and Brun, 2000; Teigen and Brun, 1999).

Participants began by rating their feelings of risk in relation to the slot machine (anchored: 1 = *not risky at all*, 11 = *very risky*). To gauge participants' assessment of the objective likelihood of winning with the machine, we asked them to rate the chances of winning with the machine in general (anchored: 1 = *very low chances*, 11 = *very high chances*) and the likelihood of winning in a next spin (anchored: 1 = *very unlikely*, 11 = *very likely*). Participants then indicated their behavioral intentions by rating their desire to continue playing (anchored: 1 = *not at all*, 11 = *very much*) and their likelihood of playing using real money (anchored: 1 = *not likely at all*, 11 = *very likely*). As in the pilot study, we measured speed perceptions, arousal and attention levels using seven-point scales.

Results

An independent samples *t*-test on speed perceptions ($r = 0.71$) confirmed that participants in the fast condition perceived the animated reel spin of the slot machine to be faster ($M = 4.27$, SD = 1.19) than those in the slow condition ($M = 3.31$, SD = 1.29; $t(198) = 5.46$, $p < 0.001$, $d = 0.77$). Furthermore, consistent with the results of the pilot study, we found that the speed manipulation did not significantly alter participants' arousal ($r = 0.64$; $M_{fast} = 3.98$ vs. $M_{slow} = 4.00$; $p = 0.93$) or attention levels ($M_{fast} = 4.75$ vs. $M_{slow} = 4.93$; $p = 0.49$).

We then probed the actual outcomes participants experienced with the slot machine. First, we examined the number of credits participants ended the game with after ten spins. An independent samples *t*-test showed no significant differences between the two conditions ($M_{fast} = 101.9$ vs. $M_{slow} = 102.6$; $p = 0.80$). Thus, participants experienced similar outcomes across the two conditions. We then sought to understand whether these experiences afforded similar assessments of likelihood of winning ($r = 0.53$). The results confirmed that participants across the two conditions believed they were equally likely to win ($M_{fast} = 3.15$ vs. $M_{slow} = 3.19$; $p = 0.93$). Taken together, participants had a consistent experience with, and assessments of, the outcomes associated with the slot machine. The question was whether they had different feelings of risk.

An independent samples *t*-test on feelings of risks showed a main effect of movement speed ($t(198) = 2.68$, $p = 0.008$, $d = 0.38$). As predicted, participants indicated greater feelings of risk toward the slot machine in the fast condition ($M = 6.52$, SD = 3.33) than in the slow condition ($M = 5.27$, SD = 3.27). We then examined whether this altered participants' behavioral intentions ($r = 0.38$). The results revealed a marginal effect ($t(198) = 1.88$, $p = 0.06$, $d = 0.27$), such that participants had lower behavioral intentions to continue interacting

with the slot machine in the fast condition (M = 4.06, SD = 2.47) than in the slow condition (M = 4.75, SD = 2.62).

A mediation analysis (Hayes, 2018; Model 4, bootstrapped 10,000 draws) confirmed an indirect effect of movement speed on behavior through feelings of risk (95%CI: = −0.45, −0.03). Thus, faster movement elevated feelings of risk, which negatively predicted the intention to continue interacting with the machine. In contrast, there was no indirect effect on behavior through participants' experiences with the slot machine, including their final credit counts (95%CI: −0.14, 0.08) and assessments of the objective likelihood of winning (95%CI: = −0.39, 0.40).

Discussion

Study 1 provided evidence consistent with our core prediction and identified a critical behavioral outcome. Focusing on interactions with a digital slot machine, we found that faster movement speed elevated participants' feelings of risk, which decreased their intention to further engage with the machine. These findings are particularly noteworthy in that they held true even though participants experienced consistent outcomes (i.e. wins and losses), and understood the odds of these outcomes similarly across the two conditions. These results align with previous research on feelings of risk, which suggests that intuitive feelings of risk can impact consumer behavior more so than the actual probability of outcomes (Klein and Kunda, 1994). Taken together, our findings suggest that movement speed can alter feelings of risk, which subsequently guides consumers' behaviors. Given this, our next study investigated why movement speed relates to feelings of risk.

Study 2

In Study 2, we explored the mechanism underlying the relationship between movement speed displayed in the digital medium and feelings of risk. We predicted that faster movement might lead consumers to feel a diminished sense of control over outcomes, corresponding with heightened feelings of risk. To test this, we focused on a different financial risk domain, examining consumers' responses to an animated stock chart adopting faster versus slower movement speed. Consistent with previous studies, this context was chosen given its theoretical and substantive relevance. From a theoretical perspective, research has shown that feelings of risk tend to significantly impact investors' stock decisions (Griffith *et al.*, 2020). From a substantive perspective, the use of animated stock charts is becoming increasingly prevalent, with 76% of major financial information providers now using animated charts to present real-time quotes and historical data (Kim and Lakshmanan, 2021). This underscores the growing need to understand how dynamic visual cues can alter investment decisions, as investors rely on quick and intuitive judgments to inform their investment strategies (Raghubir and Das, 1999).

To gauge how movement speed displayed in the digital medium alters feelings of control and risk, we asked participants to examine an animated stock chart of a company on the NASDAQ. We expected that a stock chart displaying faster movement speed would reduce feelings of control over outcomes associated with this stock, leading to higher feelings of risk. This, in turn, should be reflected in lower behavioral intentions to invest in the stock, aligning with our findings in Study 1. The following study explored these predictions.

Method

Participants and design. We recruited 200 participants (M_{age} = 38.45, 38.5% female, 1% gender fluid/prefer not to say) through Cloud Research, a recruitment platform for Amazon's Mechanical Turk. Participants were provided monetary compensation for taking part in the

study and were assigned at random to one of two conditions in a 2 (speed: slow vs. fast) between-subjects design. The study was preregistered (link: https://aspredicted.org/J2F_TRR).

Procedures. Participants read that they would view an animated stock chart for Letrup (stock ticker name: LTRP), a company whose stocks were traded on NASDAQ. Participants further read that the chart would display the stock's price variations over the past 29 months.

Participants then viewed the animated stock chart (Appendix 3). Movement speed was manipulated by varying the rate at which the price line, representing stock valuation changes, moved. In the fast condition, the price line moved five times faster than in the slow condition. Specifically, it took 21 s to depict the stock's valuation across 29 months in the slow condition (averaging 0.75 s per month), whereas this time was reduced to 4.2 s in the fast condition (averaging 0.15 s per month).

Importantly, we kept the stock valuation constant at the beginning and end points of the chart. Specifically, the stock valuation remained constant at $34 for the first and last months displayed. The purpose was to isolate the effect of movement speed without the confounding influence of changes in stock value between the initial and end points (e.g. Kim and Lakshmanan, 2021). Consistent with the procedures of the pilot study, the stock chart was presented as a continually looping GIF to provide participants a consistent viewing experience.

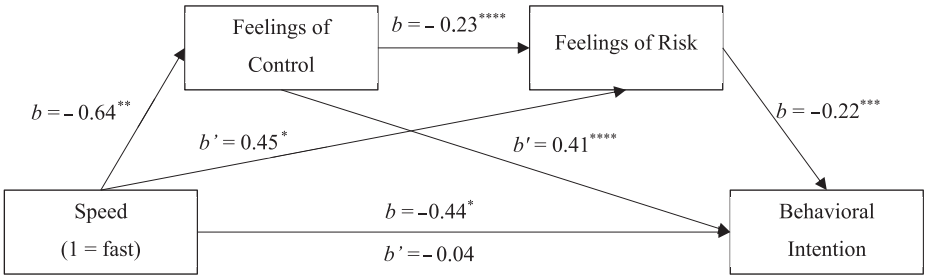
After viewing the chart, participants rated their feelings of risk across two questions (anchored: 1 = *not risky/volatile at all*, 9 = *very risky/volatile*; Kim and Lakshmanan, 2021). Participants then rated their likelihood of investing in this stock (anchored: 1 = *not likely at all*, 9 = *very likely*). We then measured participants' feelings of control over outcomes across two questions ("It would be easy for me to buy this stock at a low price and sell at a high price" and "I believe I can easily anticipate the changes in this stock's price", anchored: 1 = *completely disagree*; 9 = *completely agree*; adapted from Burger, 1986). Finally, participants responded to the same speed, arousal, and attention variables as previous studies, using nine-point scales.

Results

We first examined the movement speed manipulation. Consistent with previous studies, the movement speed manipulation successfully altered speed perceptions (r = 0.91; M_{fast} = 6.86, SD = 1.49 vs. M_{slow} = 5.23, SD = 1.85; $t(198) = 6.83$, $p < 0.001$) without impacting arousal (r = 0.48; M_{fast} = 5.68 vs. M_{slow} = 5.71; p = 0.83) or attention levels (M_{fast} = 6.77 vs. M_{slow} = 6.76; p = 0.89).

We then examined whether movement speed altered feelings of control (r = 0.75). As anticipated, participants reported lower feelings of control over stock outcomes in the fast condition (M = 4.00, SD = 1.93) than the slow condition (M = 4.64, SD = 2.01; $t(198) = 2.30$, p = 0.02). Correspondingly, participants also felt greater risk (r = 0.75) in the fast condition (M = 6.37, SD = 1.60) than the slow condition (M = 5.78, SD = 1.77; $t(198) = 2.70$, p = 0.01). Finally, participants' intention to purchase the stock was lower in the fast condition (M = 3.65, SD = 1.77) than the slow chart animation (M = 4.09, SD = 2.03), although this difference was marginally significant ($t(198) = 1.63$, p = 0.10).

Finally, we tested the relationship between feelings of control over outcomes, feelings of risk, and behavioral intentions with a serial mediation analysis (speed → feelings of control over outcomes → risk perception → behavioral intention; Model 6, Burger, 1986; bootstrapped 10,000 draws). As depicted in Figure 1, the analysis revealed a significant indirect effect (β = −0.49, SE = 0.15, 95%CI: = −0.71, −0.10). Therefore, consistent with our predictions, faster movement led to decreased feelings of control over outcomes, which



Notes: * Denotes $p \leq 0.10$; ** denotes $p < 0.05$; *** denotes $p < 0.005$; **** denotes $p < 0.001$
Source: Authors' own work

Figure 1. Serial mediation analysis in Study 2

corresponded with elevated feelings of risk. Furthermore, these elevated feelings of risk negatively predicted participants' intention to purchase the stock.

Discussion

Study 2 sought to identify an underlying mechanism for why people perceive greater risk in faster movement displayed in digital settings, revealing feelings of control over outcomes as a viable explanation. Specifically, we found that when participants viewed a fast (vs. slow) moving animated stock chart, they reported a diminished sense of control over the outcomes they may experience with the stock, which coincided with heightened feelings of risk. We also conceptually replicated the impact of movement speed on consumers' behaviors observed in study 1, with faster movement reducing the intention to invest in the stock. Finally, we showed a serial mediation effect for feelings of control over outcomes, feelings of risk, and subsequent behavioral intentions. These results are consistent with our prediction that feelings of control can serve as an underlying mechanism for why movement speed elevates feelings of risk.

General discussion

Over the past decade, technological advancements have significantly increased consumers' engagement with the digital medium. One key driver of this trend is the widespread adoption of smartphones, which have seen annual worldwide sales increase by approximately 1 billion units between 2011 and 2021 (Laricchia, 2022). This, coupled with the ubiquity of fast internet and the proliferation of online applications, has led to consumers relying upon animated visuals to make decisions more than ever before. Notably, many of these decisions involve some degree of risk. For example, investors are now using animated stock charts to make trade decisions (Adobe, 2022; Kim and Lakshmanan, 2021), and consumers are increasingly gambling online and interacting with animated games (Wheeler, 2021). Given this trend, understanding how dynamic visual cues displayed in the digital medium influence consumer decision-making is becoming increasingly important for both marketing practitioners and scholars.

Across three studies, the current article offered meaningful insights into how consumers respond to information conveyed through the digital medium, highlighting that subtle changes in dynamic movement cues can impact consumers' decisions. Specifically, we

demonstrated that movement speed effects used in the digital medium can alter consumers' feelings of risk, impacting subsequent behaviors. Our findings were consistent across two major domains of risk (financial and health) and with different participant samples (students, consumers, and online samples).

Our findings suggest that movement speed displayed in the digital medium influences risk judgments regardless of whether consumers were unaware of the objective outcomes associated with the entity (pilot study); whether they experienced consistent outcomes between conditions (Study 1); or whether outcome measures were constant between the initial and final observation points (Study 2). Importantly, we also identified an underlying mechanism, showing that faster movement reduces consumers' feelings of control over outcomes, which corresponds with greater feelings of risk (study 2). Collectively, these findings suggest that movement speed in dynamic images can shape consumers' risk judgments and highlight the importance of intuitive feelings of risk in guiding consumers' decisions in the digital medium.

Substantive and theoretical implications

In light of the dramatic increase in consumption activities taking place in the digital medium, the substantive insights offered by this research are particularly timely. By demonstrating how a fundamental visual characteristic (i.e. movement speed) alters risk judgments, we provide valuable insights on how to strategically present important information to consumers. Indeed, with the rise of online gambling, problematic gambling behavior has been skyrocketing (Davies, 2022), elevating the importance of public policy interventions (Cotte and Latour, 2009). Similarly, the COVID-19 pandemic has highlighted the importance of managing consumers' perceptions of health risks (Savadori and Lauriola, 2021), with public policymakers increasingly relying on animated videos across digital platforms (Centers for Disease Control and Prevention, 2020). The current work suggests that fast movement can be used to nudge consumers toward avoiding risky behaviors. Specifically, if the goal is to make consumers more mindful of risks, high-speed visuals may help them to better recognize these risks and, consequently, exhibit caution.

From a theoretical perspective, we make important contributions to the risk perception literature (Loewenstein *et al.*, 2001; Slovic, 1996). Researchers have investigated how static visual cues can convey risks, including colors (Gnambs *et al.*, 2015), anthropomorphic features (Kim and McGill, 2011), and instability in visual design elements (Rahinel and Nelson, 2016). However, less attention has been devoted to dynamic visuals. Kim and Lakshmanan (2021) represent a notable exception, exploring how the presence or absence of movement in marketing elements can affect risk judgments. Yet, with over 80% of online traffic now comprising dynamic images (The Network for Global Media, 2020), the question has arguably shifted from whether consumers encounter dynamic visuals to how consumers are influenced by the specific nature of these moving images. Our findings begin to address this question by uncovering speed of movement as a key factor in shaping how consumers assess risk in the digital medium.

By examining visual speed cues within the digital medium, our research also significantly broadens the theoretical understanding of the relationship between speed and risk perception. While evolutionary psychology has associated speed with physical threats, research on risk perception has largely overlooked the connection between visual cues of speed and feelings of risks. Beyond visual aspects, there is also limited work on whether consumers conceptually associate speed with risks. One exploration by Lench and Flores (2012) touched upon this, showing that consumers perceive lower risks in slow-paced risky events (e.g. bus accidents) than faster-paced ones (e.g. a sports car accident). While these findings suggest a connection

between speed and risk perception, the interpretation is constrained by the real physical dangers associated with high-speed events. For instance, a high-speed car crash typically poses greater survival risks than a slower paced one. This makes it difficult to determine whether it is the concept of speed, or the real possibility of more severe harm, that escalate consumers' risk perceptions. Our studies clarify this link by focusing on contexts where the speed of movement was not diagnostic of the likelihood or severity of negative outcomes. For instance, the spin speed of a slot machine does not dictate win or loss probabilities (study 1), and the animation speed of stock charts does not influence stock prices (study 2). This offers a clearer demonstration that consumers innately link faster speed with heightened risks.

Finally, our work extends the scope of existing research on the role of evolutionary instincts in modern consumers' behaviors. While previous studies have primarily focused on how these instincts influence reactions to static marketing elements (Griskevicius *et al.*, 2012; Meert *et al.*, 2014; Wang and Griskevicius, 2014), we show that evolutionary instincts can also shape consumers' perceptions of dynamic cues in the digital medium.

Exploration and future research

Our results lend several interesting avenues for future research. One intriguing area is to investigate whether certain individuals are more susceptible to movement speed effects in the digital medium. As an initial exploration, our two main studies gathered data on three factors that could differentiate participants: their liking of the activity, their previous experience levels, and their propensity for risk-taking (Supplementary Material, page 4). Our findings showed that individuals' background, namely, their prior experience, can influence how they respond to movement speed displayed in digital settings, but that this impact may also be context dependent. In the context of online gambling (Study 1), we found that the risk assessments of less experienced consumers were more swayed by the speed manipulation. However, in the context of online stock trading (Study 2), prior experience did not have a significant impact (see details in Supplementary Material, page 5).

These exploratory results point toward a nuanced relationship between the nature of the risk-laden context and consumers' prior experiences. We conjecture that prior experience may be more relevant in lower-risk settings, such as slot machine gambling wherein consumers often bet small monetary amounts per spin. However, in higher-stakes contexts such as stock trading, the impact of movement speed may be more universal, affecting risk judgments similarly regardless of the individual's level of experience. Future work could systematically examine these possibilities to understand how individual differences affect the way risk cues are interpreted.

Future research could also examine whether faster movement speed used in digital marketing elements could ever be a positive cue. Indeed, while fast movement can create negative inferences in risky contexts, it could be rather appealing in other circumstances. For example, when it comes to customer service, consumers value fast response times (Anania, 2023). Therefore, adopting faster (vs. slower) movement speed when depicting service interactions may elicit positive reactions. Future research could build on this possibility by examining whether visual depictions of speed in a virtual customer service interaction is judged positively.

Future work can also expand upon the mechanism behind the movement speed–risk relationship. Given our findings that movement speed displayed in the digital medium alters feelings of control, future work may examine whether situations offering greater control may diminish the link between speed and risk judgments. This could shed light on how the degree of control inherent in the digital context may interact with dynamic visual cues to influence risk judgments.

It would also be interesting to expand upon our theoretical framework on evolutionary-relevant risks by examining how other evolutionary factors may impact these risk assessments. For example, drawing upon prior work showing that risk recognition varies across the menstrual cycle (Boudesseul *et al.*, 2019), future research could investigate whether women respond to movement speed differently during different menstrual cycle stages. Research in evolutionary psychology has also shown that people's childhood environments impact their consumption behavior as adults (Whelan and Hingston, 2022), including their risk-taking tendencies (Griskevicius *et al.*, 2013). Researchers could expand upon our findings by examining whether childhood environment impacts how consumers respond to movement speed. This could help marketers identify how different segments might respond to dynamic visuals.

Finally, researchers may explore whether the association between speed and risk can be applied to another way in which consumers experience speed: physical movement. With the ubiquity of mobile technology, consumers are increasingly watching videos while on the move, such as while walking or while on public transport (Mourra *et al.*, 2020). Building on recent evidence that physical movement speed can alter consumers' decision making (Shani-Feinstein *et al.*, 2022), researchers may examine whether risk perceptions are also altered when consumers perceive their own movement to be faster. Certainly, more research is needed in this area.

Conclusion

Consumers' lives are now dominated by the digital medium, with dynamic visuals becoming a core element of the digital landscape (The Network for Global Media, 2020). This underscores the importance of understanding whether and how movement cues displayed in the digital medium can shape consumers' judgments and decisions. Our research focused on a fundamental, yet easily adjustable, aspect of dynamic images – movement speed. We revealed that the speed of movement can significantly influence consumers' judgments across various risk-laden contexts, from the health risks associated with bacteria to the financial risks linked to slot machines and animated stock charts.

As consumers increasingly make important decisions online, our findings highlight that the way in which dynamic visuals are presented in the digital medium can play a key role in tempering consumer risk-taking. By strategically using digital visuals, marketers and public policymakers have the opportunity to steer consumer behavior toward taking fewer risks, ultimately boosting consumer safety and well-being in the digital age.

References

Adobe (2022), "Use animated charts for business ", | *Adobe Stock tutorials*, available at: https://helpx.adobe.com/ca/stock/how-to/animated-charts.html (accessed 14 April 2023).

Anania, T. (2023), "What is customer service?", *Zendesk*, available at: www.zendesk.com/blog/customer-service-skills/(accessed 14 April 2023).

Armstrong, T., Rockloff, M., Browne, M. and Blaszczynski, A. (2020), "Training gamblers to re-think their gambling choices: how contextual analytical thinking may be useful in promoting safer gambling", *Journal of Behavioral Addictions*, Vol. 9 No. 3, pp. 766-784.

Bai, N. (2020), "Still confused about masks? Here's the science behind how face masks prevent coronavirus | ", *UC San Francisco*, available at: www.ucsf.edu/news/2020/06/417906/still-confused-about-masks-heres-science-behind-how-face-masks-prevent (accessed 14 April 2023).

Bigoin-Gagnan, A. and Lacoste-Badie, S. (2018), "Symmetry influences packaging aesthetic evaluation and purchase intention", *International Journal of Retail and Distribution Management*, Vol. 46 Nos 11/12, pp. 1026-1040.

Boudesseul, J., Gildersleeve, K.A., Haselton, M.G. and Bègue, L. (2019), "Do women expose themselves to more health-related risks in certain phases of the menstrual cycle? A meta-analytic review", *Neuroscience and Biobehavioral Reviews*, Vol. 107, pp. 505-524.

Burger, J.M. (1986), "Desire for control and the illusion of control: the effects of familiarity and sequence of outcomes", *Journal of Research in Personality*, Vol. 20 No. 1, pp. 66-76.

Centers for Disease Control and Prevention (2020), "Covid-19 videos ", | *Centers for Disease Control and Prevention*, available at: www.cdc.gov/coronavirus/2019-ncov/communication/videos.html (accessed 14 April 2023).

Cian, L., Krishna, A. and Elder, R.S. (2014), "This logo moves me: dynamic imagery from static images", *Journal of Marketing Research*, Vol. 51 No. 2, pp. 184-197.

Confer, J.C., Easton, J.A., Fleischman, D.S., Goetz, C.D., Lewis, D.M., Perilloux, C. and Buss, D.M. (2010), "Evolutionary psychology: controversies, questions, prospects, and limitations", *American Psychologist*, Vol. 65 No. 2, p. 110.

Cordo, P.J., Gurfinkel, V.S. and Levik, Y. (2000), "Position sense during imperceptibly slow movements", *Experimental Brain Research*, Vol. 132 No. 1, pp. 1-9.

Cotte, J. and Latour, K.A. (2009), "Blackjack in the kitchen: understanding online versus casino gambling", *Journal of Consumer Research*, Vol. 35 No. 5, pp. 742-758.

Davies, R. (2022), *Jackpot: How Gambling Conquered Britain*, Guardian Faber Publishing, London.

Duff, B.R.L. and Sar, S. (2015), "Seeing the big picture: multitasking and perceptual processing influences on ad recognition", *Journal of Advertising*, Vol. 44 No. 3, pp. 173-184.

Durante, K.M. and Griskevicius, V. (2016), "Evolution and consumer behavior", *Current Opinion in Psychology*, Vol. 10, pp. 27-32.

Fischhoff, B., Bostrom, A. and Quadrel, M.J. (1993), "Risk perception and communication", *Annual Review of Public Health*, Vol. 14 No. 1, pp. 183-203.

Gnambs, T., Appel, M. and Oeberst, A. (2015), "Red color and risk-taking behavior in online environments", *Plos One*, Vol. 10 No. 7, p. e0134033.

Google (2022), "YouTube playback speed control. Google", available at: https://chrome.google.com/webstore/detail/youtube-playback-speed-co/hdannnflhlmdablckfkjpleikpphncik (accessed 14 April 2023).

Grable, J.E. and Roszkowski, M.J. (2008), "The influence of mood on the willingness to take financial risks", *Journal of Risk Research*, Vol. 11 No. 7, pp. 905-923.

Griffith, J., Najand, M. and Shen, J. (2020), "Emotions in the stock market", *Journal of Behavioral Finance*, Vol. 21 No. 1, pp. 42-56.

Griskevicius, V. and Kenrick, D.T. (2013), "Fundamental motives: how evolutionary needs influence consumer behavior", *Journal of Consumer Psychology*, Vol. 23 No. 3, pp. 372-386.

Griskevicius, V., Cantú, S.M. and Van Vugt, M. (2012), "The evolutionary bases for sustainable behavior: implications for marketing, policy, and social entrepreneurship", *Journal of Public Policy and Marketing*, Vol. 31 No. 1, pp. 115-128.

Griskevicius, V., Ackerman, J.M., Cantú, S.M., Delton, A.W., Robertson, T.E., Simpson, J.A., Thompson, M.E. and Tybur, J.M. (2013), "When the economy falters, do people spend or save? Responses to resource scarcity depend on childhood environments", *Psychological Science*, Vol. 24 No. 2, pp. 197-205.

Harris, E. (2014), "Feel the risk: strategic investment decisions in an uncertain world", in Otley, D. and Soin, K. (Eds), *Management Control and Uncertainty*, Palgrave Macmillan, London.

Hayes, A.F. (2018), "Partial, conditional, and moderated moderated mediation: quantification, inference, and interpretation", *Communication Monographs*, Vol. 85 No. 1, pp. 4-40.

Ipsos (2022), "How much is too much? Nearly half of Canadians think gambling ads have gotten out of hand", available at: www.ipsos.com/en-ca/how-much-too-much-nearly-half-canadians-think-gambling-ads-have-gotten-out-hand (accessed 14 April 2023).

Janosov, M., Virágh, C., Vásárhelyi, G. and Vicsek, T. (2017), "Group chasing tactics: how to catch a faster prey", *New Journal of Physics*, Vol. 19 No. 5, p. 053003.

Janssen, E., van Osch, L., de Vries, H. and Lechner, L. (2013), "The influence of narrative risk communication on feelings of cancer risk", *British Journal of Health Psychology*, Vol. 18 No. 2, pp. 407-419.

Jia, H., Kim, B.K. and Ge, L. (2020), "Speed up, size down: how animated movement speed in product videos influences size assessment and product evaluation", *Journal of Marketing*, Vol. 84 No. 5, pp. 100-116.

Jung, S. and Dubois, D. (2023), "When and how slow motion makes products more luxurious", *Journal of Marketing Research*, Vol. 60 No. 6, pp. 1177-1196.

Kelly, J.D., Petersen, A., Lendvay, T.S. and Kowalewski, T.M. (2020), "The effect of video playback speed on surgeon technical skill perception", *International Journal of Computer Assisted Radiology and Surgery*, Vol. 15 No. 5, pp. 739-747.

Kim, J. and Lakshmanan, A. (2021), "Do animated line graphs increase risk inferences?", *Journal of Marketing Research*, Vol. 58 No. 3, pp. 595-613.

Kim, S. and McGill, A.L. (2011), "Gaming with Mr. Slot or gaming the slot machine? Power, anthropomorphism, and risk perception", *Journal of Consumer Research*, Vol. 38 No. 1, pp. 94-107.

Klein, W.M. and Kunda, Z. (1994), "Exaggerated self-assessments and the preference for controllable risks", *Organizational Behavior and Human Decision Processes*, Vol. 59 No. 3, pp. 410-427.

Kugler, T., Connolly, T. and Ordóñez, L.D. (2012), "Emotion, decision, and risk: betting on gambles versus betting on people", *Journal of Behavioral Decision Making*, Vol. 25 No. 2, pp. 123-134.

Langer, E.J. (1975), "The illusion of control", *Journal of Personality and Social Psychology*, Vol. 32 No. 2, p. 311.

Laricchia, F. (2022), "Smartphone sales worldwide 2007-2021", *Statista*, available at: www.statista.com/statistics/263437/global-smartphone-sales-to-end-users-since-2007/ (accessed 14 April 2023).

Larson, C.L., Aronoff, J. and Steuer, E.L. (2012), "Simple geometric shapes are implicitly associated with affective value", *Motivation and Emotion*, Vol. 36 No. 3, pp. 404-413.

Lench, H.C. and Flores, S.A. (2012), "The fast and the dangerous: the speed of events influences risk judgements", *British Journal of Social Psychology*, Vol. 51 No. 1, pp. 178-187.

Li, Y.J., Kenrick, D.T., Griskevicius, V. and Neuberg, S.L. (2012), "Economic decision biases and fundamental motivations: how mating and self-protection alter loss aversion", *Journal of Personality and Social Psychology*, Vol. 102 No. 3, p. 550.

Loewenstein, G.F., Weber, E.U., Hsee, C.K. and Welch, N. (2001), "Risk as feelings", *Psychological Bulletin*, Vol. 127 No. 2, p. 267.

Meert, K., Pandelaere, M. and Patrick, V.M. (2014), "Taking a shine to it: how the preference for glossy stems from an innate need for water", *Journal of Consumer Psychology*, Vol. 24 No. 2, pp. 195-206.

Meta for Business (2018), "4 Ways to turn still image ads into video ads", available at: www.facebook.com/business/news/4-ways-to-turn-still-image-ads-into-video-ads (accessed 14 April 2023).

Mourra, G.N., Senecal, S., Fredette, M., Lepore, F., Faubert, J., Bellavance, F., Cameron, A.F., Labonté-LeMoyne, E. and Léger, P.M. (2020), "Using a smartphone while walking: the cost of smartphone-addiction proneness", *Addictive Behaviors*, Vol. 106, p. 106346.

Osgood, C.E. (1969), "On the whys and wherefores of E, P, and A", *Journal of Personality and Social Psychology*, Vol. 12 No. 3, pp. 194-199.

Palmer, S.E., Schloss, K.B. and Sammartino, J. (2013), "Visual aesthetics and human preference", *Annual Review of Psychology*, Vol. 64 No. 1, pp. 77-107.

Pratt, J., Radulescu, P.V., Guo, R.M. and Abrams, R.A. (2010), "It's alive**!** Animate motion captures visual attention", *Psychological Science*, Vol. 21 No. 11, pp. 1724-1730.

Radden, G. (1996), "Motion metaphorized: the case of coming and going", *Cognitive Linguistics in The Redwoods: The Expansion of a New Paradigm in Linguistics*, Vol. 423, p. 458.

Raghubir, P. and Das, S.R. (1999), "A case for theory-driven experimental enquiry", *Financial Analysts Journal*, Vol. 55 No. 6, pp. 56-79.

Rahinel, R. and Nelson, N.M. (2016), "When brand logos describe the environment: design instability and the utility of safety-oriented products", *Journal of Consumer Research*, Vol. 43 No. 3, pp. 478-496.

Rainwater, A. (2023), "Online gambling statistics: a **$**100 billion industry by 2026, PlayToday.co", available at: https://playtoday.co/blog/online-gambling-statistics/#grow%20to%20$100%20billion%20in%202026 (accessed 14 April 2023).

Research and Markets (2023), "Online gambling global market report 2023", *Research and Markets*, available at: www.researchandmarkets.com/reports/5321374/online-gambling-global-market-report-2021-covid (accessed 14 April 2023).

Riskind, J.H. (1997), "Looming vulnerability to threat: a cognitive paradigm for anxiety", *Behaviour Research and Therapy*, Vol. 35 No. 8, pp. 685-702.

Riskind, J.H. and Richards, D.K. (2018), "The effect of germ movement on the construal of mental states in germs: the moderating role of contamination fear", *Cognitive Therapy and Research*, Vol. 42 No. 1, pp. 36-47.

Saad, G. (2020), "The marketing of evolutionary psychology", *Journal of Business Research*, Vol. 120, pp. 485-491.

Saad, G. and Gill, T. (2000), "Applications of evolutionary psychology in marketing", *Psychology and Marketing*, Vol. 17 No. 12, pp. 1005-1034.

Savadori, L. and Lauriola, M. (2021), "Risk perception and protective behaviors during the rise of the COVID-19 outbreak in Italy", *Frontiers in Psychology*, Vol. 11, p. 3822.

Shani-Feinstein, Y., Kyung, E.J. and Goldenberg, J. (2022), "Moving, fast or slow: how perceived speed influences mental representation and decision making", *Journal of Consumer Research*, Vol. 49 No. 3, pp. 520-542.

Shutterstock (2022), "3D render animation salmonella bacteria bacterial stock footage video (100**%** royalty-free)", available at: www.shutterstock.com/video/clip-1067635448-3d-render-animation-salmonella-bacteria-bacterial-disease (accessed 14 April 2023).

Siegrist, M. and Árvai, J. (2020), "Risk perception: reflections on 40 years of research", *Risk Analysis*, Vol. 40 No. S1, pp. 2191-2206.

Slovic, P. and Peters, E. (2006), "Risk perception and affect", *Current Directions in Psychological Science*, Vol. 15 No. 6, pp. 322-325.

Slovic, P. (1996), "Perception of risk from radiation", *Radiation Protection Dosimetry*, Vol. 68 No. 3, pp. 165-180.

Slovic, P., Finucane, M.L., Peters, E. and MacGregor, D.G. (2004), "Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality", *Risk Analysis*, Vol. 24 No. 2, pp. 311-322.

Stuppy, A., Landwehr, J.R. and McGraw, A.P. (2023), "The art of slowness: slow motion enhances consumer evaluations by increasing processing fluency", *Journal of Marketing Research*, p. 00222437231179187.

Sundar, S.S. and Kalyanaraman, S. (2004), "Arousal, memory, and impression-formation effects of animation speed in web advertising", *Journal of Advertising*, Vol. 33 No. 1, pp. 7-17.

Taylor, N., Noseworthy, T.J. and Pancer, E. (2019), "Supersize my chances: promotional lotteries impact product size choices", *Journal of Consumer Psychology*, Vol. 29 No. 1, pp. 79-88.

Teigen, K.H. and Brun, W. (1999), "The directionality of verbal probability expressions: effects on decisions, predictions, and probabilistic reasoning", *Organizational Behavior and Human Decision Processes*, Vol. 80 No. 2, pp. 155-190.

Teigen, K.H. and Brun, W. (2000), "Ambiguous probabilities: when does $p = 0.3$ reflect a possibility, and when does it express a doubt?", *Journal of Behavioral Decision Making*, Vol. 13 No. 3, pp. 345-362.

The Network for Global Media (2020), "Over 82% of internet traffic will be online videos by 2022 ", | *Digital Publishing News*, available at: https://whatsnewinpublishing.com/over-82-of-internet-traffic-will-be-online-videos-by-2022-how-publishers-can-scale-their-content-production/ (accessed 14 April 2023).

Togawa, T. and Sugitani, Y. (2022), "Looks far beyond my reach: the zoom effect in product videos influences luxury perception and purchase intention", *Journal of Consumer Psychology*, Vol. 32 No. 4, pp. 687-698.

Twitter (2018), "Fun fact: a study of 3.7 million accounts showed that tweets with a GIF gained 55% more engagement than those without. (source: Twitter internal data)", *Twitter*, available at: https://twitter.com/TwitterBusiness/status/1070423034467540992 (accessed 14 April 2023).

Verhallen, T.M. and Robben, H.S. (1994), "Scarcity and preference: an experiment on unavailability and product evaluation", *Journal of Economic Psychology*, Vol. 15 No. 2, pp. 315-331.

Wägner, W. (1886), *Asgard and the Gods: The Tales and Traditions of Our Northern Ancestors, Forming a Complete Manual of Norse Mythology*, S. Sonnenschein, Le Bas and Lowrey, London.

Wallston, K.A., Wallston, B.S., Smith, S. and Dobbins, C.J. (1987), "Perceived control and health", *Current Psychology*, Vol. 6 No. 1, pp. 5-25.

Wang, Y. and Griskevicius, V. (2014), "Conspicuous consumption, relationships, and rivals: women's luxury products as signals to other women", *Journal of Consumer Research*, Vol. 40 No. 5, pp. 834-854.

Webb, A. (2020), "Why every physician should be on YouTube", KevinMD.com, available at: www.kevinmd.com/2020/01/why-every-physician-should-be-on-youtube.html (accessed 14 April 2023).

Wheeler, L. (2021), "Velocity of slots – got the need for speed? Slots are spinning at a furious pace, how fast is fast? Slot machine game velocity explained |", *888casino New Jersey. 888*, available at: https://us.888casino.com/blog/slots-velocity (accessed 14 April 2023).

Whelan, J. and Hingston, S.T. (2022), "Pathogens, privilege, and purity: how pathogen threat and childhood socioeconomic status influence consumers' condemnation of purity violations", *Journal of Business Research*, Vol. 142, pp. 636-647.

Witt, J.K., Sugovic, M. and Dodd, M.D. (2016), "Action-specific perception of speed is independent of attention", *Attention, Perception, and Psychophysics*, Vol. 78 No. 3, pp. 880-890.

Yin, Y., Jia, J.S. and Zheng, W. (2021), "The effect of slow motion video on consumer inference", *Journal of Marketing Research*, Vol. 58 No. 5, pp. 1007-1024.

Yoo, C.Y. and Kim, K. (2005), "Processing of animation in online banner advertising: the roles of cognitive and emotional responses", *Journal of Interactive Marketing*, Vol. 19 No. 4, pp. 18-34.

YouTube (2020), "Covid-19 animation: what happens if you get coronavirus? ", YouTube, available at: www.youtube.com/watch?v=5DGwOJXSxqg (accessed 14 April 2023).

Yu, J., Droulers, O. and Lacoste-Badie, S. (2022), "Why display motion on packaging? The effect of implied motion on consumer behavior", *Journal of Retailing and Consumer Services*, Vol. 64, p. 102840.

Further reading

Hutson, M. (2017), "Self-taught artificial intelligence beats doctors at predicting heart attacks", *Science*, Vol. 14 No. 4.

Kruger, D.J. (2008), "Male financial consumption is associated with higher mating intentions and mating success", *Evolutionary Psychology*, Vol. 6 No. 4, p. 147470490800600407.

Longoni, C., Bonezzi, A. and Morewedge, C.K. (2019), "Resistance to medical artificial intelligence", *Journal of Consumer Research*, Vol. 46 No. 4, pp. 629-650.

Mittal, C. and Griskevicius, V. (2016), "Silver spoons and platinum plans: how childhood environment affects adult health care decisions", *Journal of Consumer Research*, Vol. 43 No. 4, pp. 636-656.

Science Daily (2020), "How moving slower allows groups of bacteria to spread across surfaces", available at: www.sciencedaily.com/releases/2020/11/201123112504.htm (accessed 14 April 2023).

Appendix 1

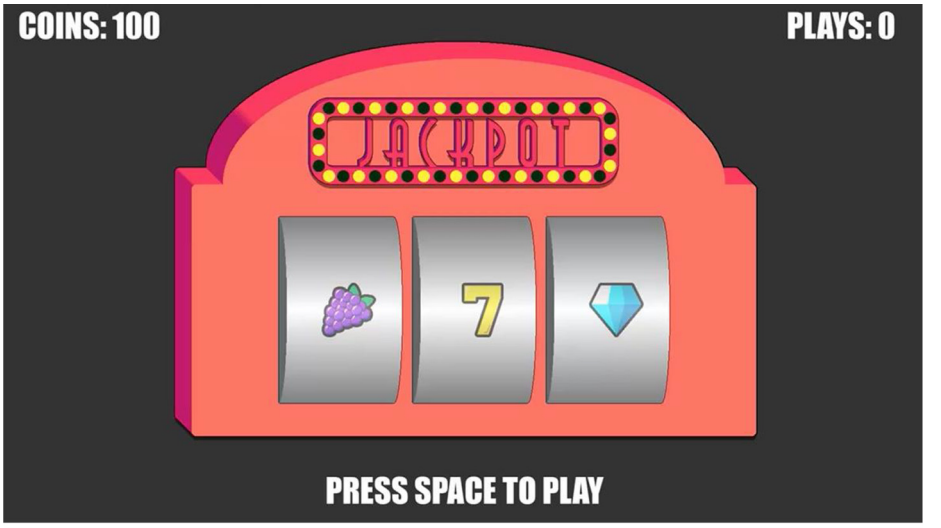
Source: "Shutterstock (standard license)"

Figure A1. Screenshot of stimulus used in pilot study

Links for GIFs used in pilot study

- Slow condition: https://researchbox.org/show_image.php?b=OGFWWk5FUEg3Wi80TS9MMW5QbzN4Zz09&f=TEZUZzhUd3JXM252ajh6Z01nSzBYdz09
- Fast condition: https://researchbox.org/show_image.php?b=OGFWWk5FUEg3Wi80TS9MMW5QbzN4Zz09&f=T2grNkFteHpGejY1aEhRa1dMQ0hLQT09

Appendix 2



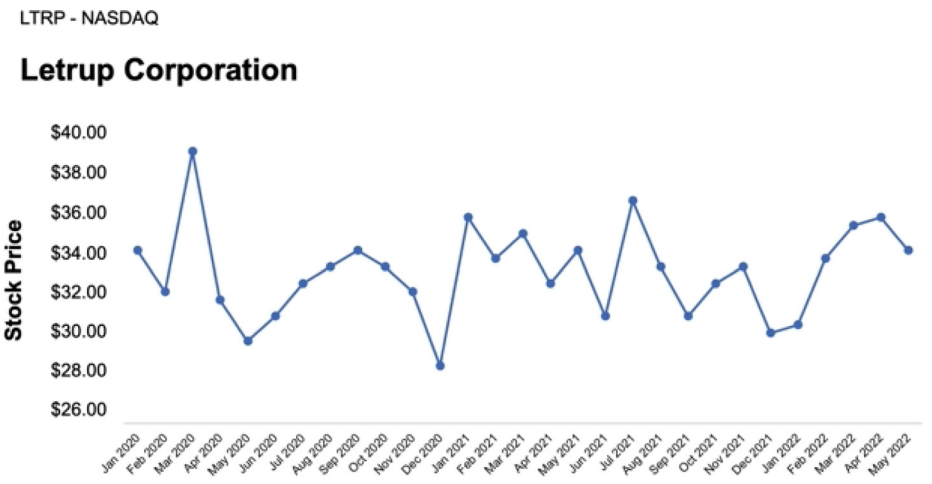
Source: Authors' own work

Figure A2. Screenshot of stimulus used in Study 1

Links for illustrative GIFs (i.e. illustration of consumers' experiences with spin speed)

- Slow condition: https://researchbox.org/show_image.php?b=OGFWWk5FUEg3Wi80TS9MMW5QbzN4Zz09&f=QlZwQkRXcFNaWlpUckxKc1hWa3dMQT09
- Fast condition: https://researchbox.org/show_image.php?b=OGFWWk5FUEg3Wi80TS9MMW5QbzN4Zz09&f=QVFPaS82cEM0QkhnbVJJK0JuWnVHUT09

Appendix 3



Source: Author's own work

Figure A3. Screenshot of stimulus used in Study 2

Links for animated stock charts used in Study 2

- Slow condition: https://researchbox.org/show_image.php?b=OGFWWk5FUEg3Wi80TS9MMW5QbzN4Zz09&f=eTFaQkNNUkF2SUcybFpDcDd4SkIvdz09
- Fast condition: https://researchbox.org/show_image.php?b=OGFWWk5FUEg3Wi80TS9MMW5QbzN4Zz09&f=YU1mWmx2THFzZjlBZFpZZytNTUowQT09

Supplementary material

The supplementary material for this article can be found online.

Corresponding author

Nükhet Taylor can be contacted at: nukhet.taylor@torontomu.ca