

The Role of Blurry Backgrounds as Nudges Towards Riskier Options

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In this research, the authors propose that the use of blurry backgrounds on web pages could increase consumers' risky decisions, independent of their visual attractiveness. Drawing on several research streams, the authors suggest that a blurry background works as a greater spatial distance cue than a sharp background. Since construal level broadens with spatial distance, the authors hypothesize and show that blurry backgrounds, as opposed to sharp backgrounds, induce a high-level construal. As a result, exposure to blurry backgrounds heightens consumers' risky decisions, since a high-level construal promotes risk propensity by increasing focus on payoff. Across a series of studies, the authors provide empirical evidence for their theorizing and the impact of blurriness on consequential judgments and actual behavior. By being the first to show that background blurriness can elevate levels of construal and, thereby, facilitate consumers' risky decisions, and proposing boundary conditions, the present research makes theoretical contributions to construal level theory, depth perception, risk-taking, and aesthetics literatures. It also provides practical guidelines for online marketers, and food for thought for regulators.

Abstract: 173 words

Keywords: visual perception, risk-taking, construal level theory, aesthetics, online consumption

Statement of Intended Contribution

The use of blurry backgrounds as an aesthetic element has been gaining popularity in the design of commercial webpages, as blurry backgrounds are perceived by web designers as cool and awesome. However, whether and how blurry webpage backgrounds influence consumer decision making has received little research attention. We are the first to theorize and show that the blurriness of a web page background influences risky decisions in consumption decisions, independent of any effects due to aesthetic preference.

Drawing on depth perception theories and construal level theory we argue that blurry backgrounds influence distance perception, which in turn elicits a higher-level construal, that in turn leads to a greater focus on payoff rather than probability of winning, leading to riskier decision making. We report five experiments and a mini meta-analysis of the studies reported in this manuscript as well as additional studies conducted as a part of this project, but not reported here. Collectively, they test our theorizing using a range of stimuli and both hypothetical and consequential choices.

Our findings make several theoretical contributions: We add to research on construal level theory by proposing visual blurriness as a new determinant of construal level. We contribute to depth perception theories by empirically confirming the strong effect of blurriness as a depth cue; an important gap in the literature. We further make a contribution by showing that blurry backgrounds could exert a lasting influence on consumers' lives. We also contribute by showing that the effect is preventable by means of an ex-ante inoculation. We add to risk-taking research by establishing the causal relationship between visual perception and risky decisions. Finally, we contribute to aesthetics research by accentuating the positive role of blurriness as, hitherto, blurriness was deemed to be a negative aesthetic element.

Our research also contributes to practice. Given that marketing practitioners are currently not cognizant of the 'unintended' potential impact of blurry backgrounds, by offering guidelines as to when and why to use blurry elements in their webpage design, our research provides guidance to web designers and marketing practitioners. Given that consumers make both functional and dysfunctional risky decisions (e.g., entrepreneurship vs. overinvestment in bitcoins), policy makers may benefit from our work, as it suggests when and how to regulate the usage of blurry backgrounds.

Blurry backgrounds, defined as backgrounds that are hazy, indistinct, and fuzzy in outline (dictionary.com), are now ubiquitous in advertisements, the design of mobile apps, operating systems, and websites (Gosha 2012; Jaoudi 2014). For example, in 2012, Apple Inc., a leader in product design (Blake, Nazarian, and Castel 2015), introduced the use of blurry backgrounds in Mac's OS X El Capitan (Bakir 2014) (see Figure 1). Various online businesses, including financial services (e.g., Angel Investment Network.com), education programs (e.g., Wharton EMBA Program), and even gambling sites (e.g., majesticslotsclub.com), have also adopted blurry backgrounds in designing their web pages, with blurry backgrounds perceived by web designers as cool and awesome (e.g., Kamps 2013; Patterson 2013). The 2015 Creative Trends Report, released by Shutterstock, underlines the wide use of blur by noting that blurred backgrounds were one of three 'truly universal' global trends for advertising and design in 2014, with searches for "blur" increasing by 144 % over the previous year (www.shutterstock.com/blog/trends/2015-creative-trends).

Notwithstanding the popularity of blurry backgrounds in websites, to our knowledge, there is no research that examines whether such backgrounds influence consumer decision making beyond the potential impact of the attractiveness of blurry backgrounds. The goal of our research is to fill this gap. Specifically, we ask: is the use of blurriness simply a matter of aesthetic consideration, i.e., web designers and consumers find them pleasing, cool, and sexy, or is it possible that blurred backgrounds impact consumer decisions in other ways? Specifically, we examine if blurry backgrounds nudge consumers towards riskier decision options in consumption decisions, for example, when making a financial investment decision or choosing which university to go to.

[Insert Figure 1 about here]

Drawing on several research streams, spanning perceptual psychology to photography theories, we hypothesize that objects that are blurry appear farther than objects with sharp images (e.g., Israelson 2014; O'Shea, Govan, and Sekuler 1997; Palmer and Brooks 2008). Further, drawing on construal level theory (CLT; Trope and Liberman 2010), which suggests that greater spatial distance activates a high-level construal (Liberman and Förster 2009) and thus promotes an increased focus on payoff (Sagristano, Trope, and Liberman 2002), we argue that the use of a blurry background could nudge consumers towards riskier options, independent of the background's perceived coolness or attractiveness.

Given that risk is inherent in many areas of daily consumption (e.g., financial, social, and medical domains) (Mandel 2003; Shimp and Bearden 1982), and that many industries dealing with risk rely heavily on sensory cues (e.g., visual design) to attract consumers (e.g., Bettencourt 2018; La Fleur 2018), this would be an important question for research to address, to the degree our prediction above is not known or is a common intuition. To this end, we surveyed 52 senior executives enrolled in an advanced management program.

Eighteen of the 52 executives (34%) surveyed said they were involved in the aesthetic design of their company's webpage. Probing these 18 participants further, we found that 11 (61%) answered "no" to the question of whether they think blurry/sharp backgrounds could potentially influence consumers' decision making, while 7 participants (39%) said "yes". When we asked those 7 respondents to specify how blurry/sharp backgrounds would influence consumers, four participants merely mentioned the broad influence of design (e.g., "because everything in design matters"), two noted they recommended a sharp background because it fostered certainty and inspired confidence, and one did not provide a response. It is noteworthy that, the rationale

reported by these two respondents suggests that sharp backgrounds should augment the likelihood of risky decisions, due to feelings of greater confidence such backgrounds, they believe, would elicit. This is the opposite of what we theorize. These data suggest that practitioners do not have clear insight on how the blurriness of their website background could impact consumer decisions.

The present research, thus, makes a contribution to practice in two ways: it sheds light on the important ‘unintended’ consequence of using blurry backgrounds and provides guidance to practitioners involved in decisions regarding online business communications, as to when to use blurry backgrounds to influence message recipients appropriately. It also provides guidance to regulators, as to when to intervene, as the use of blurriness can unwittingly result in consumers making overly risky decisions.

The present research also makes a number of important theoretical contributions. First, it adds to CLT by proposing blurriness as a novel antecedent of construal level, thereby extending the scanty knowledge about how visual perception impacts CLT. Second, by providing evidence that blurriness is a strong distance cue, even in a context where distance judgment is not the focal task and participants are not explicitly made aware of the blurriness/sharpness of the background, the current research contributes to the depth perception literature where there has been a debate over the strength of blurriness as a depth cue (e.g., Banks, Burge, and Held 2011; Held, Cooper and Banks; 2012; Marshall et al. 1996). Third, by including retirement investment and post-graduate education as experimental settings, our work contributes by suggesting that blurriness could potentially impact consumers’ preference for riskier options even in significant life decisions with long term consequences. Fourth, our research contributes by showing that this risk-facilitating effect of a background is preventable by using an appropriate ex-ante inoculation. Fifth, since little research has examined how visual perception affects risk appetite (Gnambs,

Appel, and Oeberst [2015] is an exception), this paper strengthens the growing literature on consumer risk-taking. Last, but not least, by showing that blurry backgrounds result in positive outcomes in business, this research contributes to the aesthetics literature which has hitherto perceived blurriness as a negative aesthetic element (e.g., Berlyne and Normore 1972).

Conceptual Development

Ample research suggests that peripheral or environmental cues affect consumers' information processing and decision making (Bagchi and Cheema 2012; Mandel and Johnson 2002; Mehta, Zhu, and Cheema 2012). Building on this literature, in the present research, we focus on an environmental cue that has not been studied to date: blurry backgrounds that are frequently employed in on-line consumption settings.

Blurriness as a Depth Cue

One of the vital functions that our vision performs relates to depth perception (i.e., the ability to see the environment and estimate the spatial distances of objects). Evolutionarily, this is crucial for our survival, as it enables us to see how far we need to move in order to reach or avoid certain objects (Buss 2015; Haviland et al. 2013, Howard 2012).

Three streams of evidence suggest that blurriness is a visual cue that signals greater spatial distance. Aerial perspective theory (e.g., Palmer and Brooks 2008) suggests that the outline of objects further away tend to appear paler, less detailed, and importantly, blurrier (Hoffman and Preetham 2002), due to the interplay between light and the atmosphere, in which light is scattered or absorbed over longer distances by particles in the atmosphere (i.e., water vapor and dust). Indeed, to mimic the effect that the atmosphere has on the appearance of a faraway object, many

prominent artists (e.g., Leonardo Da Vinci) adopted the aerial perspective and blurred outlines and contours in their paintings (Foley and Matlin 1997) to create three-dimensional depth, on an otherwise two-dimensional surface.

A second stream of evidence linking blurriness and spatial distance is visibility and distance perception. Consistent with a learned ecological association that distant objects are more difficult to see (e.g., Alter and Oppenheimer 2008), research has shown that objects that are less visible tend to be perceived as more distantly located, as illustrated by less visible buildings being rated as spatially farther (Nasar et al. 1985). Notably, blurry-looking objects are commonly deemed significantly less visible (e.g., Bushberg and Boone 2011; Nobre and Kastner 2014). Thus, this line of evidence also supports the claim that blurriness is likely to act as a spatial distance cue.

A third stream of evidence causally linking blurriness with spatial distance comes from photography and optics. Depth-of-field (DoF), a central concept in photography (Kingslake 1992; Taheri, Feldman, and Yentzer 2013), refers to the distance between the nearest and the farthest objects that are in sharp focus in a photo, whereby photos taken with a shallower DoF tend to have focal objects that appear sharp, with backgrounds that look less sharp or blurred. Importantly, for any given DoF, the further away the background is from the subject, the more blurred the background is going to be (Israelson 2014). This property is used by photographers to create an illusion of depth (Rosen and DeVries 1993), such that photo viewers perceive blurred backgrounds as more distantly located. In sum, three distinct streams of evidence, art theory, visibility research, and photography theories, collectively suggest a connection between visual blurriness and spatial distance. They suggest that blurry backgrounds are likely to be perceived as more spatially distant.

Consistent with our theorizing, a number of perception studies have empirically shown that blurriness may lead to perceptions of greater distance (e.g., Mather 1997; O'Shea, Govan, and Sekuler 1997; Palmer and Brooks 2008; Read 2012). Yet, despite the agreement that blurriness could work as a spatial distance cue, research to date has yielded somewhat mixed empirical results about the actual 'strength' of blurriness as a spatial distance cue. Some studies concluded that blurriness is at best a weak and unreliable visual cue for distance perception, providing only relative depth-ordering information between sharp and blurred textures 'simultaneously' displayed on an image (i.e., $D_{\text{blurred}} > D_{\text{sharp}}$) (e.g., Mather 1997; Mather and Smith 2000; Mather and Smith 2002). However, other studies suggest that blurriness is a stronger distance cue than previously claimed, capable of providing substantially precise and absolute distance information (e.g., Banks, Burge, and Held 2011; Burge and Geisler 2011; Held, Cooper, and Banks 2012).

Not only is there a debate in the literature about the strength of blurriness as a depth cue, which makes generalizing those results directly to the marketing context fraught, but the experimental approach used in that research makes it even more difficult and dubious to generalize the findings in that literature to the marketing context. A key aspect of previous research is that the focal task is ordinal distance judgment (e.g., Mather and Smith 2000; Mather and Smith 2002). Participants are typically provided with blurry and sharp regions simultaneously juxtaposed and explicitly asked which of the two regions appears farther.

In our research, and in business contexts at large, the focal task is not distance judgment and consumer attention is not drawn to the blurriness/sharpness of the stimuli. Rather, the focal task is to nudge consumers to choose a product/service offering or form a purchase intent towards it, while subtly exposing them to messages with blurry or sharp backgrounds. As such, it

is important to assess whether backgrounds, subtly manipulated to be blurry or sharp, influence decisions, and do so through elicited perceptions of spatial distance, when such judgments are not the focal task. Thus, we hypothesize and in our empirical work assess whether:

H1: Exposure to a blurry (vs. sharp) background is likely to make consumers perceive the objects in the images as being at a greater distance.

To the degree we find support for our hypothesis above, it would contribute to the ongoing debate in the literature by providing evidence in support for the strong role of blurriness as a distance cue.

Blurriness and Construal Level

Construal level theory (CLT; Trope and Liberman 2010) suggests that psychological distance, defined on dimensions such as temporal, social, hypothetical, and spatial distance (Fujita et al. 2006; Trope, Liberman, and Wakslak 2007), from a target source, affects information processing (Trope and Liberman 2010). When events or objects are psychologically proximal, people engage in low-level construal and form concrete representations of the target events or objects. When events or objects are psychologically distant, by contrast, CLT proposes that people engage in high-level construal and create abstract representations.

Psychological distance and construal level are conceptually not the same. The former refers to the perception of *when*, *where*, to *whom*, or *whether* an event occurs, while the latter relates to the perception of *what* will occur, i.e., the processes resulting in the representation of an event itself (Trope and Liberman 2010). The key premise of CLT is that there exists a reciprocally causal relationship between the two because they are conceptually highly related, such that distant

objects *cause* high-level construal and vice versa (Trope and Liberman 2010). One intuitive example is that, as we get further, we tend to observe not trees but a whole forest, and we need to step forward and get closer to be able to observe particular trees.

Spatial distance qualifies as a dimension of psychological distance (Fujita et al. 2006; Trope, Liberman, and Wakslak 2007; Kerckhove, Geuens, and Vermeir 2015). As illustrated by the trees/forest example, the information we get from a spatially distant object becomes less detailed and accurate (Liberman, Trope, and Stephan 2007). This leads individuals to mentally construe distant objects in a more global and abstract fashion, i.e., at a higher level (e.g., Bryant and Tversky 1999; Henderson et al. 2007; Tversky 2003). Consistent with the logic, past CLT research has consistently shown that people tend to form more abstract representations of an object when it is said to be located in a distant location (e.g., Fujita et al. 2006), and that even some ‘embodied’ spatial distance cues (e.g., vertical eye and/or head movements) significantly affect levels of construal. Specifically, as looking up (vs. looking down) tends to yield physically distant (vs. near) stimuli, research has shown that upward eye or head movements induce a high-level construal, whereas downward movements induce a low-level construal (Kerckhove, Geuens, and Vermeir 2015).

Connecting the key premise of the CLT literature with the preceding depth perception literature enables us to generate a novel hypothesis: when the background of a webpage is blurry, consumers exposed to it are likely to see the objects on the webpage as being at a greater distance, and thereby engage in high-level construal. Formally we hypothesize:

H2A: Consumers exposed to a blurry (vs. sharp) background are likely to engage in high-level (vs. low-level) construal.

H2B: The effect of a blurry background on high-level construal is likely to be mediated by greater perceived spatial distance.

Construal Level and Sensitivity to Desirability

According to Vroom (1964), the two fundamental factors underlying human decision-making are the attractiveness of the outcome and the probability of achieving it. The former and the latter have been formally conceptualized as an action's 'desirability' and 'feasibility', respectively (Gollwitzer 1986; Steel and Konig 2006), in which desirability denotes the valence of an action's end state, and feasibility denotes the difficulty of reaching the end state (Liberman and Trope 1998). Particularly, when making risky decisions (e.g., managing a financial portfolio or gambling), desirability is captured by the value of the potential payoff of the decision, whereas feasibility is captured by the probability of winning. Given that we focus on risky decisions in the present research, we use the terms payoff and probability, in lieu of desirability and feasibility.

According to CLT, *why* aspects of an action are more abstract compared to *how* aspects (Vallacher and Kaufman 1996). Thus, a high-level construal leads consumers to focus more on *why* (vs. *how*) aspects of an action (Trope and Liberman 2010). Given this, a high-level construal is likely to enhance the decision maker's focus on the likely payoff, the "why" of any risky decision, nudging them towards the riskier option. A low-level construal, however, is likely to promote a focus on "how" to deal with the uncertainty (probability) of the outcome, nudging them towards the less risky option.

Consistent with the above, research has shown that when construal level was manipulated through temporal distance (e.g., two months vs. today), in distant-future gambles, people were more sensitive to payoff but less to winning probabilities, and thus more risk-taking (Sagristano,

Trope, and Liberman 2002). When people adopted an abstract mindset through construal-level priming (e.g., why/how task), they also exhibited higher propensity on risk-taking measures such as the Balloon Analog Risk Task (BART) or Angling Risk Task (ART) (Lerner et al. 2015).

H3A: Consumers exposed to a blurry background are more likely to choose a risky option than those exposed to a sharp background.

H3B: Consumers exposed to a blurry background are likely to focus more on payoff of a risky consumption, compared to those exposed to a sharp background.

H3C: The effect of a blurry background on preference for a riskier option is likely to be mediated by increased focus on payoff, induced by a high-level construal.

Our conceptualization suggests that our hypothesized effect of blurry backgrounds on decision making occurs in the presence of risk, because in its presence, there is a need to think about and address risk and to balance risk against the payoff (Kim, Schnall, and White 2013; Raue et al. 2016). When a decision is riskless, thinking about how to mitigate risk or to balance it against payoff, becomes irrelevant, thus, shifting focus as a function of construal level, should not lead to differences in processing and thus attenuate the effect, as compared to when risk is present. Formally:

H4: In the absence of risk, the effect of a blurry background on decision making is likely to be attenuated

The flow chart below summarizes the five causal steps in our conceptualization. We next

report five experiments that test our hypotheses. We also present a meta-analysis in the Web Appendix that examines the robustness of our findings when considering the reported studies as well as three additional studies that include risky decisions as the main dependent variable and were conducted as part of this research project, but for ease of exposition are not reported here.

[Insert Figure 2 about here]

Study 1: Effect of Blurry vs. Sharp Backgrounds on Risky Decision

The goal of Study 1 is to provide initial evidence that exposure to a blurry background increases perceived spatial distance and induces a high-level construal, which in turn facilitates consumers' preference for riskier options. Study 1 also intends to show that the hypothesized effects are limited to risky contexts, such that the effects are dampened in the absence of uncertainty. For the experimental context, we opted for a fictitious retirement investment website with either blurry or sharp backgrounds.

Method

Stimuli. We first downloaded a high-definition (HD) picture of a ski resort from the web that could potentially be used as a website background. By applying the Gaussian Blur filter (filter values: 3%) in Adobe Photoshop CS6, we created two versions of the same visual background (sharp vs. 3% blurred). We then combined these two versions of the ski resort background with the website format adopted from the main page of an investment website called AVARTIS, on which an ad for a retirement investment plan was displayed. In addition to background blurriness,

by editing its wording, we also manipulated uncertainty of this investment plan and created two different levels of risk (risky vs. riskless). Thus, we had four versions of the stimulus website. In the riskless version, we included the sentence “projected annual returns: \$800 guaranteed.” In the risky version, that sentence was replaced by “projected annual returns: 90% chance of earning \$1,000 and 10% chance of losing \$1,000 in any given year,” thus indicating that the investment involved risk, while keeping the expected return the same as in the riskless condition. We based our choice of projected annual returns and risk on information gleaned from actual retirement investment ads. A pretest ($N=201$) confirmed that the stimuli significantly differed in blurriness and perceived riskiness (all $ps < .001$) but matched on other measures, i.e., arousal, familiarity, and preference (all $Fs < .1$) (See Web Appendix for details).

Participants and Procedure. We referred to a prospective power analysis using G*power (Version 3.1; Faul, Erdfelder, Lang, and Buchner 2007) when determining the sample size. The analysis indicated that at least 401 participants would be required for the study to have 85% power to detect an effect, if an effect size is conservatively assumed with Cohen’s $f = 0.15$. We thus recruited 460 Mturk participants to ensure that we would end up with at least the required number of participants. From the sample of 460, we excluded eight respondents, as they did not follow the study instructions properly (e.g., In response to the question “have you taken a similar survey before?”, one participant responded, “Trump is not my president.”). Thus, we ended up with a final sample of 452 participants (43% female, median age 33, aged 18–81).

Upon entering the study, participants randomly assigned to one of the four conditions (blurriness: blurry vs. sharp) x (risk: risky vs. riskless) first saw the following instruction about a retirement investment scenario: “Imagine you're deciding on what investments to make this year

towards your retirement plan. While searching for investment options, you've come across a retirement investment company AVANTIS WEALTH's website, which introduces their signature retirement investment product for Sky Ski Resort". The instruction was then followed by different information depending on the condition. Participants in the risky condition read the following text: "According to the company's website, if you make an investment of \$10,000 in this resort, there is a 90% chance of you earning \$1,000 in any given year from the investment. However, there is a 10% chance of losing \$1,000 in any given year. The website says this investment offers potentially higher rates of return albeit with some risks." Participants in the riskless condition read the following text: "...make an investment of \$10,000 in this resort, you will be guaranteed an annual return of \$800. The website says there is no risk involved." In all conditions, the instructions ended by asking participants to take a careful look at the website image. After viewing the site image, participants answered two questions that constituted the main dependent variable for the study: how likely were they to 1) invest in the Sky Ski Resort at present and 2) invest in the Sky Ski Resort when they next invest towards retirement savings, both on 10-point Likert scales (1 = not at all likely, 10 = extremely likely).

Thereafter, participants were directed to the next page and again presented with the same website image, and estimated how far away the ski resort in the image is from their current location (1 = very near, 10 = very far). Next, in order to assess participants' levels of construal, we introduced the response category width task, adopted from Krüger et al. (2014), whereby a wider interval estimation is indicative of a higher-level of construal. For this task, participants saw the same ski resort building and provided their estimated width of the building by writing down their estimate of the minimum and maximum width (feet) of the building, respectively (e.g., minimum width: 100 (ft), maximum width: 300(ft)). The operational

measure of construal level was the difference between the maximum and minimum width each participant estimated.

Lastly, participants answered some demographic questions, followed by several open-ended general questions about the study (e.g., Have you taken a similar survey before? What was it?), and finished the study after being paid and debriefed.

Results and Discussion

Investment intention. We averaged the two items as the operational measure of investment intention ($M = 5.38$, $SD = 2.83$; $\alpha = .96$). A two-way ANOVA with blurriness and riskiness as the independent variables did not yield a significant main effect of blurriness ($F < 1$) but did yield a significant main effect of riskiness ($F(1, 448) = 9.41$, $p = .002$). Importantly, there was a significant interaction between blurriness and riskiness ($F(1, 448) = 5.58$, $p = .018$). As predicted, exposure to blurry backgrounds significantly increased participants' intention to invest in the Sky Ski Resort as part of their retirement plan in the risky condition ($M_{\text{blurry}} = 6.21$ vs. $M_{\text{sharp}} = 5.36$; $F(1, 448) = 5.21$, $p = .022$), but not in the riskless condition ($M_{\text{blurry}} = 4.78$ vs. $M_{\text{sharp}} = 5.17$; $F(1, 448) = 1.12$, $p = .29$). These results provide support for H3A and H4.

[Insert Figure 3 about here]

Perceived distance. A two-way ANOVA detected a marginally significant main effect of blurriness ($F(1, 448) = 3.06$, $p = .081$), such that participants in the blurry background condition tended to view the ski resort as more distantly located ($M_{\text{blurry}} = 7.63$ vs. $M_{\text{sharp}} = 7.31$). Importantly, the ANOVA indicated a significant interaction between blurriness and riskiness ($F(1, 448) = 5.71$, $p = .017$). Exposure to blurry backgrounds significantly increased participants'

perceived distance of the Sky Ski Resort in the risky condition ($M_{\text{blurry}} = 7.98$ vs. $M_{\text{sharp}} = 7.23$; $F(1, 448) = 5.71, p = .003$), but the effect did not reach significance in the riskless condition ($M_{\text{blurry}} = 7.28$ vs. $M_{\text{sharp}} = 7.39$; $F < 1$). This result provides support for H1 and H4.

Category Width. For the analysis, we first calculated the category width scores by subtracting the minimum width score from the maximum width score. A two-way ANOVA found only a significant interaction between blurriness and riskiness ($F(1, 448) = 6.23, p = .012$). No other effect was significant (all $ps > .25$). When the retirement investment plan was risky, participants in the blurry condition reported a significantly wider gap between their maximum and minimum estimations of the width of the ski resort building ($M_{\text{blurry}} = 3020.39$ vs. $M_{\text{sharp}} = 1500.3$; $F(1, 448) = 6.58, p = .01$), but the difference was not significant in the riskless condition ($M_{\text{blurry}} = 1510.5$ vs. $M_{\text{sharp}} = 2082.28$; $F < 1$). These results provide support for H2A and H4.

Serial Moderated Mediation. Employing the SPSS macro PROCESS (model 6) (Hayes 2017), we conducted a serial moderated mediation analysis to test whether the indirect effect of blurriness on risky decision via construal level, induced by perceived distance of the background object, would only be valid when the context is risky. Bootstrapping results with 10,000 resamples found that the serial mediating pathway ‘blurry background → perceived distance → category width → purchase intention’ was valid in the risky condition, as indicated by the 95% confidence interval that excludes zero (95% CI [.031, .205]). However, there was no corresponding indirect effect in the riskless condition (95% CI [-.002, .003]), validating several of the steps in our hypothesized mechanism, and supporting H2B, H4, and at least partially H3C.

Discussion. The results of Study 1 provide initial evidence for our main proposition. They showed that participants exposed to a blurry background were more likely to perceive the background object as more distantly located and engage in higher-level construal, thereby exhibiting higher purchase intention for the risky investment. The results also demonstrate that the effect is only valid for the risky consumption context, further supported by a serial moderated mediating effect.

Study 2: Simultaneously Examining All the Causal Links of the Underlying Mechanism

There were three key objectives in Study 2. First, and most importantly, in Study 2 we aimed to test all the causal links hypothesized in our conceptualization leading to the focal effect (i.e., blurriness → distance → construal level → payoff focus → preference for risky option). Second, we aimed to replicate Study 1 by using another important consumption context that could exert a lasting influence on consumers' lives (i.e., choice of MBA program to attend), thereby testing the robustness and generalizability of our initial findings. Third, prior research has shown that individuals' mood states may affect risk-taking, although opposing findings have emerged as to whether positive or negative moods facilitate risky decisions (e.g., Chou, Lee, and Ho 2007; Morgan, Jones, and Harris 2013; Yuen and Lee 2003). Given such a backdrop, Study 2 aimed to rule out that mood states might have contributed to the findings reported in Study 1, by measuring and analyzing mood effects across conditions.

Method

Stimuli. Just as in Study 1, we downloaded a HD photograph of a business school building

suitable for a website background. Again, by applying the Gaussian Blur (filter values: 3%), we generated two versions of the same background (sharp vs. 3% blurred). We then merged these two versions with the website format adopted from the main page of a real MBA program, on which the first 3-month placement rate (%) and starting salary were simultaneously displayed. It is important to note, when it comes to an MBA application, the former denotes the probability (risk) factor whereas the latter denotes the payoff factor. We chose the placement rate as the key risk information to display based on an online survey (See Web Appendix for details).

We manipulated the numbers relating to 3-month placement rate and starting salary displayed by referring to the 2018 MBA ranking data published in US News and World Report. Specifically, we equated our starting salary with the highest average salary for a school in the ranking (\$144,455). For placement rate (56.4%), we used the number reported for the 95th-ranked school on the list. It was our intention to make this fictitious MBA program named Calford MBA appear sufficiently risky, yet with a rosy prospective payoff. Notably, unlike Study 1 that had both risky and riskless versions, Study 2 only had the risky version, given that Study 1 had established that the focal effect is confined to risky contexts. Lastly, consistent with Study 1, we ran an MTurk pretest ($N = 101$) and found that the blurry versus sharp background versions differed in blurriness ($p = .001$) while matching on other dimensions (all $F_s < 1$).

Participants and Procedure. As in Study 1, we determined the sample size on the basis of a prospective power analysis using G*power (Version 3.1; Faul, Erdfelder, Lang, and Buchner 2007), which suggested a minimum sample size of 146 participants to have 85% power (conservatively assuming $d = 0.25$). We recruited 197 MTurk participants and randomly assigned them to one of the two conditions (blurriness: blurry vs. sharp). Two individuals were excluded

from the analysis due to missing data on the dependent measures, yielding a final sample of 195 participants (43% female, median age 33, aged 9–71).

The basic structure was similar to that of Study 1, albeit instructions adjusted to the new scenario. Participants in both conditions read the following scenario about applying to MBA programs: “Imagine you're deciding on which MBA program to apply to next year, so that you can switch careers as you would like to. While searching for MBA programs, you've come across a top 10 American business school named Calford Business School. The school's website introduces the prestigious Calford MBA Evening and Weekend program, and notes that the average annual starting salary of their latest MBA graduates is US \$144,455. The advertisement also says that 56.4% of the 2018 MBA graduates found jobs within the first 3 months after graduation. The following image is the main MBA advertisement page from the Calford Business School's website. Please take a careful look at the image.”

After viewing the webpage image, participants answered two questions: 1) how likely were they to apply for the Calford MBA program and 2) how likely were they to re-apply for the Calford MBA next year should they fail to get admitted to any of the MBA programs that they applied to this year (1 = not at all likely, 10 = extremely likely). On the following page, participants estimated perceived distance to the business school building (1 = very near, 10 = very far). On the same page, participants were next asked the following question: “While deciding whether to apply for the MBA program on the previous page, which factor did you consider to be more important: the 3-month placement rate (56.4 %) or the starting salary (US \$ 144,455)?”. They responded using a horizontal slider titled “relative importance” with a range from 0 to 100 and an initial value of 50. Zero was anchored as “3-month placement rate” and 100 as “starting salary”. Each participant indicated his or her own response for the question by dragging

the slider between 0 and 100 to reflect their relative weighting of risk versus payoff.

Next, we used the response category width task to assess participants' level of construal. Participants reported their estimate of the maximum and minimum number of windows on the business school building. On the next page, participants rated their current feelings on six mood items (happy, cheerful, joyful, sad, depressed, glum), presented in random order, using a 7-point scale (1 = not at all, 7 = very much). The remaining procedure was identical to that of Study 1.

Results and Discussion

Application intention. As in Study 1, we averaged the two purchase intention items to create the operational measure of purchase intention ($M = 6.94$, $SD = 2.11$; $\alpha = .84$). A one-way ANOVA revealed that exposure to blurry backgrounds significantly increased consumers' intention to apply for the Calford MBA program ($M_{\text{blurry}} = 7.28$ vs. $M_{\text{sharp}} = 6.59$; $F(1, 193) = 5.29$, $p = .022$), replicating the previous result and supporting H3A.

Perceived distance. A one-way ANOVA on perceived distance found that participants in the blurry background condition perceived the business school building as more spatially distant ($M_{\text{blurry}} = 7.54$ vs. $M_{\text{sharp}} = 6.94$; $F(1, 193) = 4.04$, $p = .045$), replicating the previous result and providing support for H1.

Payoff focus. A one-way ANOVA indicated that participants exposed to blurry backgrounds focused more on starting salary than on 3-month placement record when making their application decision ($M_{\text{blurry}} = 63.45$ vs. $M_{\text{sharp}} = 53.97$; $F(1, 193) = 7.63$, $p = .006$), thereby supporting H3B.

Category Width. Consistent with Study 1, we calculated the category width scores by subtracting the minimum number of windows from the maximum. A one-way ANOVA indicated that participants in the blurry background condition reported a significantly higher gap between their maximum and minimum estimates of the number of windows ($M_{\text{blurry}} = 664.6$ vs. $M_{\text{sharp}} = 312.88$; $F(1, 193) = 15.11, p < .001$). This result replicates Study 1 and again suggests that exposure to a blurry background induced a higher-level construal, consistent with H2A.

Serial Mediation. As in Study 1, using the SPSS macro PROCESS (Model 6; Hayes 2017), we ran a serial mediation analysis to test the indirect effect of blurriness on risky decision via construal level, while newly including the payoff focus variable in the pathway. Bootstrapping results with 10,000 resamples showed that the serial mediating pathway ‘blurry background → perceived distance → category width → payoff focus → application intention’ was significant as indicated by the 95% confidence interval that excludes zero (95% CI [.001, .083]). This provides support for the entire causal mechanism we hypothesize and validates both H2B and H3C.

Mood Effects. To analyze participants’ responses on the six mood items, the positive and negative items were averaged to create a positive ($\alpha = .93$) and a negative mood index ($\alpha = .94$), respectively. As anticipated, we found no significant mood effects across webpage background conditions (positive: $M_{\text{blurry}} = 4.61$ vs. $M_{\text{sharp}} = 4.64$; negative: $M_{\text{blurry}} = 2.42$ vs. $M_{\text{sharp}} = 2.58$; all F s < 1).

Discussion. The results of Study 2 conceptually replicate the previous study and

demonstrate that exposure to a blurry (vs. sharp) background nudges consumers towards riskier options, suggesting that this effect is robust. More importantly, the results provide strong and comprehensive support for the entire hypothesized causal mechanism, given that the serial mediating path is significant. Lastly, the results of Study 2 successfully rule out the rival hypothesis that mood states might have driven the effect, thereby boosting internal validity.

Study 3: Ruling Out Ambiguity Tolerance as an Alternative Explanation

In Study 3, we subjected another potential rival hypothesis to scrutiny that the effects reported in Studies 1 and 2 might have been driven by elevation of ambiguity tolerance, as previous research has shown that a blurry image contains ambiguous information (Gaver, Beaver and Benford 2003), and that exposure to ambiguous stimuli promotes ambiguity tolerance (Klugman, Peel, and Beckmann-Mendez 2011), which is positively associated with riskier decisions (Begley and Boyd 1987; Schere 1982; Tymula et al. 2012). Thus, it is theoretically possible that our previous results might be due to changes in participants' level of ambiguity tolerance as a function of our blurriness manipulation. In order to tackle this possibility, we planned to manipulate ambiguity tolerance directly via a priming method and examine whether the blurriness effects still hold, regardless of the manipulation. If both the direct and indirect effects are replicated, irrespective of the level of ambiguity tolerance, this would enable us to rule out the alternative hypothesis effectively and provide further support for our construal level hypothesis.

Contrary to what some have argued, that ambiguity tolerance is a stable dispositional trait hardly malleable via experimental manipulations (e.g., Lauriola, Levin, and Hart 2007), there is evidence that the construct is experimentally manipulatable (Sagiloglou and Forstmann 2013;

Endres, Camp, and Milner 2015). Drawing on Sagiloglou and Forstmann's (2013) research, we adopted the scrambled sentence format they used to manipulate ambiguity tolerance and MacDonald's (1970) 20-item Revised Scale of Ambiguity Tolerance (AT-20) to assess the construct. Wording of the scrambled sentence task was modified, to suit our context.

The basic task was to make twelve grammatically correct and meaningful sentences using all of the words for each sentence. In the ambiguity tolerance prime condition, 10 out of 12 sentences were related to either justification or acceptance of ambiguity (e.g., "acceptable answers unclear are"). However, in the control prime condition not a single sentence was related to ambiguity (e.g., "acceptable answers belated are"), even though all the words except one were identical. An MTurk pretest ($N = 119$) using this scrambled sentence task confirmed that participants in the ambiguity tolerance prime condition reported significantly higher scores on the AT-20 scale ($\alpha = .83$; $M_{\text{ambiguity_tolerance}} = 3.66$ vs. $M_{\text{control}} = 3.42$; $F(1, 117) = 5.2, p = .024$), thereby validating our manipulation.

Method

Stimuli. The stimuli created for Study 1—Sky Ski Resort—were used again in the present experiment. However, this time we only used the stimuli from the risky condition, as in Study 2.

Participants and Procedure. The present study employed a 2 (blurriness: blurry vs. sharp) x 2 (ambiguity tolerance prime: ambiguity tolerance vs. control) between-subjects design. 506 Mturk participants took part in the study in exchange for a small payment and were randomly assigned to one of the four conditions. In contrast to the prior studies that did not have such outliers, in this study we detected seven outliers ($> 3SD$ from mean), for the response category

width task, and removed them from the analysis, resulting in a final sample of 499 participants (54% female, median age = 35, aged 19–76).

Upon entering the study, participants in all conditions first completed the scrambled sentence task along with the following instruction: “Listed below are 12 sets of words. For each, please write on the line a grammatically correct and meaningful sentence using all of the words in the set.” The procedure that followed after the scrambled sentence task was identical to that of Study 2, but for two differences. First, the instruction for the payoff focus question, as a dependent variable, was adjusted to suit the retirement investment scenario (i.e., the probability of earning annual returns (90%) vs. the potential amount of annual returns (\$1, 000)). Second, after participants estimated perceived distance, as a manipulation check, participants in all conditions completed the AT-20 scale. We calculated a mean score of ambiguity intolerance ($\alpha = .83$), with higher values representing higher ambiguity intolerance.

Results and Discussion

Manipulation Check. A two-way ANOVA with blurriness and ambiguity tolerance prime as the independent variables and participants’ AT-20 scores as the dependent variable indicated a significant main effect of blurriness ($F(1, 495) = 7.37, p = .006$), and more importantly, a significant main effect of ambiguity tolerance prime ($F(1, 495) = 4.46, p = .035$). The interaction between blurriness and ambiguity tolerance prime was not significant ($F(1, 495) = .03, p = .86$). Consistent with the pretest, participants primed with ambiguity tolerance via the scrambled sentence task reported significantly higher AT-20 scores than those primed with neutral words, ($M_{\text{ambiguity_tolerance}} = 3.69$ vs. $M_{\text{control}} = 3.57$), suggesting the priming manipulation was successful.

Investment Intention. We averaged the two items to create an operational measure of investment intention ($M = 5.11$, $SD = 2.80$; $\alpha = .95$), identical to previous studies. A two-way ANOVA detected a significant main effect of ambiguity tolerance prime ($F(1, 495) = 8.16$, $p = .004$) and, importantly, a significant effect of blurriness ($F(1, 495) = 9.58$, $p = .002$). Participants in the blurry background condition reported significantly greater investment intention in the Sky Ski Resort ($M_{\text{blurry}} = 5.79$ vs. $M_{\text{sharp}} = 5.13$). Notably, there was no interaction between these two variables ($F(1, 495) = 0.19$, $p = .665$). These results replicate prior results and reconfirm H3A.

Perceived Distance. A two-way ANOVA revealed only a significant main effect of blurriness ($F(1, 495) = 12.54$, $p < .001$). No other effects were significant (All $F_s < 1$). Consistent with previous studies, participants exposed to a blurry background rated the Sky Ski Resort as more spatially distant ($M_{\text{blurry}} = 7.63$ vs. $M_{\text{sharp}} = 6.89$), again supporting H1.

Category Width. For the analysis, we again subtracted the minimum number of windows from the maximum score. A two-way ANOVA yielded only a significant main effect of blurriness ($F(1, 495) = 39.68$, $p < .001$). Neither the main effect of ambiguity tolerance prime ($F(1, 495) = 2.08$, $p = .14$) nor the interaction term ($F < 1$) was significant. In line with previous results, participants in the blurry background condition generated a wider gap between their maximum and minimum estimations of the number of windows ($M_{\text{blurry}} = 204.65$ vs. $M_{\text{sharp}} = 114.68$), suggesting they engaged in a high-level construal. (H2A)

Payoff Focus. A two-way ANOVA showed only a significant main effect of blurriness

($F(1, 495) = 5.12, p = .024$). No other effects were significant (all $F_s < 1$). As predicted, participants in the blurry background condition paid more attention to the payoff side (i.e., potential amount of annual returns) relative to the risk side (i.e., probability of earning annual returns) ($M_{\text{blurry}} = 49.8$ vs. $M_{\text{sharp}} = 45.37$), empirically buttressing our theorizing (H3B).

Serial Mediation. Using Model 6 of the SPSS macro PROCESS (Hayes 2017), we conducted a serial mediation analysis to examine the indirect effect of blurriness on risky decision via all the mediators as in Study 2. Bootstrapping results with 10,000 resamples validated the serial mediating link ‘blurry background → perceived distance → category width → payoff focus → investment intention’ – as shown by the 95% confidence interval that excludes zero (95% CI [.041, .162]), replicating the mediating results of Study 2 (H2B, H3C).

Discussion. The current study showed that the effects of a blurry background on risky decision making persisted across every level of ambiguity tolerance, while providing further evidence for the construal level hypothesis. It therefore enables us to rule out the alternative ambiguity tolerance account and empirically bolsters our theorizing.

Study 4: Probability Salience Moderates the Effect

The main objectives of Study 4 were threefold. First, we wanted to examine whether our results hold when participants are faced with a consequential choice, as this would extend the generalizability of our findings to actual choices. Second, we aimed to test the mediating mechanism that blurry backgrounds cause people to focus more on payoff, thereby promoting

riskier choices, by directly manipulating the mediator, i.e., focus on payoff versus probability. This provides another strong test of this part of the mediating mechanism. Additionally, in Study 4, we used a stronger manipulation of blurriness.

Method

Design and Participants. The experiment was a 2 (blurriness: blurry vs. sharp) x 3 (headline: payoff salient vs. probability salient vs. control) between-subjects design. 317 Mturk participants (49% female, median age = 33, aged 18–73) participated in the study. The number was determined using G*Power which suggested a minimum sample size of 277 participants to have 85% power (with effect size $F = 0.2$). The number was adjusted upwards to ensure an adequate sample after eliminating any participants who were dropped for one reason or another. Fourteen participants who did not follow the instructions correctly or failed the attention check were excluded from the analysis, yielding a final sample of 303 participants (49% female, median age = 33, aged 18–73).

Stimuli. To strengthen the blurriness manipulation, 303 participants were first exposed to three background images prior to the main lottery task, which were either sharp or blurry. These images were selected on the basis of a pretest (see Web Appendix). To further strengthen the manipulation, the level of blur used in this study was 10%, as compared to 3% in the previous three studies,

From the set of pretested images above, we also selected fourth pair of images that served as background images (sharp vs. 10% blurred) that differed significantly in blurriness ($p < .001$) while matching other attributes (all F s < 1). The stimuli consisted of two pages with the same

image background. On the first page, text was superimposed on the image to inform participants that they had an opportunity to participate in a real lottery in exchange for their participation fee. The text manipulated the saliency of payoff versus probability. Specifically, the headline was used to manipulate the saliency of the payoff, probability, or neither (control condition). In the payoff salient condition, the headline read: “Now we would like to offer you the option to enter into a lottery with a chance of winning an extra \$2!” In the probability salient condition, “with a chance of winning an extra \$2!” was replaced by “with a 25% chance of winning!” In the control condition, the headline ended with “Now we would like to offer you the option to enter into a lottery!” without emphasizing either payoff or probability.

The wording of the text on the second page was identical across conditions and offered participants the option to participate in the lottery in exchange for their participation fee. The text was as follows: “Would you like to participate in the lottery? (next line) Now you have a chance to enter into a lottery with a 25% chance of winning an extra \$2 in addition to the \$0.50 compensation for participating in this study. If you do not win, however, you will forfeit the promised compensation of \$0.50 for participating in this study.” Thus, participants were offered a consequential choice to participate in the lottery.

Procedure. Upon entering the study, participants were first shown a cover story titled “A survey on wallpaper preference” and asked to view three background images that were either blurry or sharp, depending on the condition. Participants rated each image, in turn, in terms of the level of sharpness and crispness, on a 10-point Likert scale (1 = not at all, 10 = very much). Next, participants were directed to the page with the main image offering the opportunity to participate in the lottery. Participants were offered a binary choice (“Yes” vs. “No”) to participate in the

lottery.

Next, participants completed the response category width task. In the present study, participants provided their estimated maximum and minimum number of blueberries in a bowl of blueberries pictured. As in previous studies, participants answered some demographic questions, were paid, and ended the study.

Results and Discussion

Manipulation Check. We first analyzed participants' evaluations of the three background images to which they were first exposed. The measures of sharpness and crispness were averaged (reverse coded; all α s $> .88$) to create a 2-item perceived blurriness index for each background image. A 2 (blurriness: blurry vs. sharp) $\times$ 3 (background image: image 1 vs. image 2 vs. image 3) mixed model ANOVA with repeated measures on the second factor revealed only a significant main effect of blurriness (collapsed across the three images; $M_{\text{blurry}} = 7.79$ vs. $M_{\text{sharp}} = 3.41$; $F(1, 301) = 640.45, p < .001$; other effects $F_s < 1$), indicating the manipulation was successful.

Lottery choice. Next, we ran a binary logistic regression with lottery choice (i.e., whether the participant entered into the lottery; "Yes" = 1, "No" = 0) as the dependent variable and blurriness, headline, and their interaction as the independent variables. As anticipated, there was a significant interaction between blurriness and headline (Wald $\chi^2 = 5.41, p = .02$). In the control condition, as with previous studies, we found a facilitating effect of blurriness; participants were more likely to enter into the lottery when they were exposed to blurry, as opposed to sharp, backgrounds ($M_{\text{blurry}} = 62\%$ vs. $M_{\text{sharp}} = 39\%$; $\chi^2(1) = 5.5, p = .02$). The same was observed in the payoff salient condition ($M_{\text{blurry}} = 59\%$ vs. $M_{\text{sharp}} = 28\%$; $\chi^2(1) = 9.52, p = .003$). It is noteworthy

that there were no significant differences in the propensity to choose the lottery between the control and the payoff salient conditions ($\chi^2(1) = .38, p = .53$). Finally, in the probability salient condition, the previously observed effect of blurriness was eliminated ($M_{\text{blurry}} = 38\%$ vs. $M_{\text{sharp}} = 40\%$; $\chi^2(1) = .06, p = .80$). Taken together, these results strongly support both H3A and H3B, i.e., blurriness augments consumers making riskier choices by shifting their attention to payoffs, when making risky decisions.

[Insert Figure 4 about here]

Category width. As predicted, a two-way ANOVA with category width as the dependent variable and blurriness, headline, and their interaction as the independent variables revealed a significant interaction between blurriness and headline ($F(2, 297) = 3.45, p = .032$). In the control condition, participants generated a wider category estimate when they were exposed to blurry backgrounds ($M_{\text{blurry}} = 347.92$ vs. $M_{\text{sharp}} = 185.69$; $F(1, 297) = 4.74, p = .03$). The same pattern was revealed in the payoff salient condition ($M_{\text{blurry}} = 309.75$ vs. $M_{\text{sharp}} = 156.64$; $F(1, 297) = 4.74, p = .048$). Again, there were no significant differences between the control and the payoff salient conditions ($F(1, 202) = .01, p = .93$). In the probability salient condition, the effect of blurriness on category estimation was eliminated ($M_{\text{blurry}} = 186.28$ vs. $M_{\text{sharp}} = 276.66$; $F(1, 297) = 1.35, p > .2$). These results provide strong evidence that the causal link between blurriness and construal level is moderated by probability salience (H2A and H3B).

Moderated Mediation Analysis. Employing Model 7 of the SPSS macro PROCESS (Preacher and Hayes 2013), we conducted a moderated mediation analysis to test whether the

indirect effects of blurriness is moderated by making the probability of winning salient.

Bootstrapping results with 10,000 resamples found that the effect of blurriness on lottery choice was mediated by construal level, as measured by category estimation, among participants in the control condition (95% CI [.006, .098]), replicating the results of previous studies. The same effect was observed in the payoff salient condition (95% CI [.008, .103]). As predicted, however, there was no corresponding indirect effect among those in the probability salient condition (95% CI [-.088, .002]), thereby providing support for our hypothesized mechanism (H3B and H3C).

[Insert Figure 5 about here]

Discussion. The present study yielded three key results. First, consistent with prediction, we found that while the effect of blurry backgrounds on lottery choice was replicated in the payoff salient and control conditions, it was eliminated in the probability salient condition. Second, as demonstrated by the results of the response category width task, we also found that participants' levels of construal were higher in the blurry condition in the payoff salient and control conditions, but stayed unchanged, as a function of blurriness, when the probability of winning was highlighted. Finally, bootstrapping analyses revealed that although the pathway between blurriness and risky choice was mediated by construal level in the payoff salient and control conditions, this pathway was not significant in the probability salient condition. Taken together, these results provide additional strong empirical support for our hypothesized mechanism that a blurry background, by elevating construal level, increases consumers' payoff focus, which in turn heightens risky choices.

Study 5: Ex-ante Inoculation Reduces Risky Choice Propensity

Using a simplified version of the experimental design of Study 4, we conducted an additional (mini) real lottery study on 280 Mturk participants (39% female, median age 33, aged 19–70) to examine if forewarning consumers about the potential influence of background images could fend off the risk-promoting effect of a blurry background. For this purpose, in Study 5, we only used the sharp and blurry stimuli of the control condition of Study 4, but added a novel between-subjects factor to the design: an ex-ante inoculation. As a consequence, Study 5 employed a 2 (blurriness: blurry vs. sharp) x 2 (inoculation: present vs. absent) between-subjects design.

In the inoculation-absent condition the basic procedure was identical to that of Study 4. In the inoculation-present condition, participants were given the following warning message, based on the work of Sweldens, van Osselaer and Janiszewski's (2010), prior to being directed to the main lottery task: "warning: On the next page, we will show you a second survey and ask you a question about it. Before you take a look at the survey, it is important to realize that a recent scientific study has found that a survey's background image significantly influences people's thinking, which in turn affects their subsequent responses to the survey. Therefore, it is advisable to try not to be affected by the survey's backgrounds when you take this survey." The rest of the procedure was identical to that of Study 4, but for the fact that we only used the binary lottery choice ("Yes" vs. "No") as the single dependent variable and excluded other dependent variables, given that our main focus was on the moderating effect of inoculation on risky choice.

Results and Discussion

A binary logistic regression with lottery choice (“Yes” = 1, “No” = 0) as the dependent variable and blurriness, inoculation, and their interaction as the independent variables yielded a significant interaction (Wald $\chi^2 = 4.14$, $p = .042$). In the inoculation-absent condition, just as in Study 4, participants in the blurry background condition were significantly more likely to enter into the lottery ($M_{\text{blurry}} = 65\%$ vs. $M_{\text{sharp}} = 42\%$; $\chi^2(1) = 7.23$, $p = .007$). However, in the inoculation-present condition, the effect of blurriness was dampened and participants did not differ between the backgrounds in their likelihood of entering the lottery ($M_{\text{blurry}} = 40\%$ vs. $M_{\text{sharp}} = 41\%$; $\chi^2(1) = .03$, $p = .86$). Importantly, they were as likely (40%) to enter the lottery as those exposed to sharp backgrounds in the control condition (42%). These results suggest that providing an ex-ante inoculation for consumers may prevent the risk-facilitating effect of a blurry background from occurring and, thereby, could serve as an effective boundary condition.

[Insert Figure 6 about here]

General Discussion

Across a series of five studies, using different online consumption situations and operational measures, including both hypothetical and real choices, the present research documents a novel effect: background blurriness facilitates consumers’ risky decisions. More specifically, we show that a blurry background increases participants’ intention to invest in a ski resort when the prospective returns appear uncertain (Studies 1, 3), augments participants’ likelihood of applying for an MBA program even when the chances of getting a job are low (Study 2) and of paying to enter a real lottery (Studies 4-5). We also demonstrate that blurry backgrounds make people perceive the objects in the images as more distantly located (Studies 1-

3). Building on this, we demonstrate that exposure to blurry backgrounds induces a high-level construal (Studies 1-4), and that this increases participants' focus on payoff (Studies 2-3), leading to more risky decisions. Particularly, Study 2 and Study 3 include all the causal steps of our hypothesized model within a single study and serial mediation tests support the entire proposed model. In regard to the rival hypotheses, we rule out ambiguity tolerance and mood states as alternative hypotheses (Studies 2-3). Lastly, we find that the effect of a blurry background on risky decision does not occur if we provide participants with a warning message about the potential impact of background images beforehand, and thus propose ex-ante inoculation as an effective boundary condition and remedy.

Theoretical contributions. The present research makes six theoretical contributions. First, it shows that visual blurriness can be a pivotal determinant of construal level, thereby enriching the scanty knowledge about how visual perception affects construal level (e.g., Lee et al. 2014). Second, while the depth perception literature has reached a theoretical consensus that blurriness may function as a cue for distance, there has been a fierce debate as to whether blurriness is a strong cue that could reliably drive distance perception, more than just a weak cue only enabling relative depth-ordering of two juxtaposed textures. By demonstrating that blurry backgrounds single-handedly and consistently yield spatially farther judgments, our work provides additional evidence to suggest that blurriness is a strong depth cue, thereby contributing to the resolution of the debate. Third, given that our experimental contexts include financial decision-making for retirement investments and application decisions for an MBA program, both of which exert lasting influences on consumers' lives, the present research suggests that blurry backgrounds can influence significant life decisions and in our context be a force for good. Fourth, we

theoretically contribute by showing that the effect of a blurry background is preventable via an ex-ante inoculation, as consumers no longer were affected by the blurry backgrounds once they were forewarned against the potential influence of a background image. This provides a clear guidance to regulators, should they need to intervene in marketing efforts that use blurry backgrounds to nudge consumers towards overly risky decisions. Fifth, we add to the nascent literature on how visual cues impact consumers' risky behavior (Gnambs, Appel, and Oeberst 2015) by showing that blurry backgrounds are a critical determinant of risky decisions. Last, given that blurriness has widely been considered a negative aesthetic element (Berlyne and Normore 1972), our work contributes to the literature on aesthetics in marketing, by demonstrating the positive role of negatively-valenced aesthetic stimuli in a commercial setting.

Practical implications. The findings of our research carry important practical implications. Various commercial websites have adopted blurry backgrounds mostly because they appear “cool” and “awesome” (e.g., Patterson 2013), without a clear understanding of their psychological effects on consumer behavior, as clearly shown by the results of our survey of senior business executives with influence over the companies' website design. Our findings can thus provide guidance to practitioners dealing with online business communications, especially if their businesses involve uncertainty/risk. For various risk-taking businesses (e.g., lottery, financial investment, education, etc.) the present research suggests that blurry backgrounds can be beneficial as they increase consumers' purchase intention. Since far-extended brands tend to be perceived as risky (e.g., Aaker 1997), our work can also be helpful for businesses with such products and/or brands.

The current research also has implications for policy makers interested in promoting

entrepreneurship or attracting foreign investments. Today, governments around the world rely substantially on websites in order to increase public awareness about their campaigns (e.g., EDB Singapore: Singapore's government agency for planning strategies for economy and business). In this regard, the use of blurry backgrounds in government agency websites can increase target viewers' risk propensity and, thereby, increase their likelihood of investing in the country.

Consumers sometimes make dysfunctional risky decisions. For example, virtual currencies (e.g., bitcoin) has recently drawn the attention of the United States and other nations' authorities, who have warned investors against excessively investing in them, as they are highly unstable and could trigger a serious financial crisis. Policy makers, thus, might consider regulating the use of blurry backgrounds for websites on such highly risky investments. Our final study suggests that the use of an ex-ante inoculation may be one possible remedy.

Foreground fluency hypothesis. Some might argue that it is rather foreground fluency, increased by background blurriness, that drives the main findings. In fact, Song and Schwartz (2009) found that high processing fluency (e.g., easier-to-pronounce names) decreases risk perceptions, as mediated by greater familiarity stemming from fluent objects. Reber, Schwartz, and Winkielman's (2004) work also suggests that fluency might prompt risky decisions by increasing aesthetic appeal of the stimuli. While we acknowledge the theoretical possibility that background blurriness might facilitate risky decisions via foreground fluency, when webpages differ in familiarity or likeability, this explanation is unlikely to explain our findings, since none of our blurry and sharp stimuli differed in their degrees of familiarity and preference (all $ps = ns$) (see Web Appendix). Thus, our work suggests a different causal route driven by construal level and provides evidence consistent with it, controlling for familiarity and preference.

Limitations and future research. We recognize that the dependent variables used in our studies only address limited facets of decision making, as we focused on participants' purchase intention or actual choice. Future research could look at other relevant aspects of decision making, e.g., how confident participants feel about their decision. Another limitation of our work is that all our study settings are online and the data are collected through the online survey platform, Amazon MTurk. In this respect, field experiments will be helpful in testing the external validity.

In this research we propose riskiness, probability salience, and inoculation as moderating variables for the effect. Additional moderators may also exist, especially in relation to varying levels of risk. When the environment is extremely risky, with a very high probability of losing and a negligible payoff, a blurry background might not foster risky decisions because of excessive negative moods triggered by the environment. Conversely, if the risk-taking environment is overly promising, people might not be affected by a blurry background as they already feel confident and positive. Future research could explore these questions.

In conclusion, the present research documents a facilitating effect of blurry backgrounds on consumers' risky decisions. A blurry background has been considered effective in photography and design because it is "cool-looking" (Pogue 2009). Our research suggests that in addition to its perceived coolness, there may be another reason to consider a blurry background—it increases consumers' risky decision making. As such, we suggest that online marketers and web designers pay closer attention to their website background, especially when their businesses deal with risk-taking. A simple background change might make one's online business more lucrative, and a blurry background will not merely be "cool-looking", but also "money-making."

References

- Aaker, David A. (1997), "Should You Take Your Brand to Where the Action Is?" *Harvard Business Review*, 75 (September–October), 135–143.
- Aggarwal, Pankaj and Min Zhao (2015), "Seeing the Big Picture: The Effect of Height on the Level of Construal," *Journal of Marketing Research*, 52 (1), 120-133.
- Alter, Adam L., and Daniel M. Oppenheimer (2008), "Effects of fluency on psychological distance and mental construal (or why New York is a large city, but New York is a civilized jungle)," *Psychological Science*, 19 (2), 161-167.
- Bakir, Ahmer (2014), "Welcome to iOS media app development," *Beginning iOS media app development*, Springer.
- Banks, Martin S., Johannes Burge, and Robert T. Held (2011), "The statistical relationship between depth, visual cues, and human perception," *Sensory Cue Integration*, 195.
- Bagchi, Rajesh, and Amar Cheema (2012), "The effect of red background color on willingness-to-pay: The moderating role of selling mechanism," *Journal of Consumer Research*, 39 (5), 947-960.
- Begley, Thomas M., and David P. Boyd (1987), "Psychological characteristics associated with performance in entrepreneurial firms and smaller businesses," *Journal of business venturing*, 2 (1), 79-93.
- Berlyne, David E., and Lorraine F. Normore (1972), "Effects of prior uncertainty on incidental free recall." *Journal of Experimental Psychology*, 96 (1), 43.
- Bettencourt, Jamie (2018), "Why Financial Institutions Are Betting on Multi-Sensory Branch Experiences," *The Financial Brand*, thefinancialbrand.com/71322/multisensory-marketing-banking-branch-brand-experiences/

- Blake, Adam B., Meenely Nazarian, and Alan D. Castel (2015), "The Apple of the mind's eye: Everyday attention, metamemory, and reconstructive memory for the Apple logo," *The Quarterly Journal of Experimental Psychology*, 68 (5), 858-865.
- Burge, Johannes, and Wilson S. Geisler (2011), "Optimal defocus estimation in individual natural images," *Proceedings of the National Academy of Sciences*, 108 (40).
- Bushberg, Jerrold T., and John M. Boone (2011), *The essential physics of medical imaging*, Lippincott Williams & Wilkins.
- Buss, David. M. (2015), *The handbook of evolutionary psychology, volume 1: foundation*, New Jersey: John Wiley & Sons.
- Chou, Kee-Lee, Tatia Lee, and Andy HY Ho (2007), "Does mood state change risk taking tendency in older adults?," *Psychology and aging*, 22 (2), 310-318.
- Endres, Megan L., Richaard Camp, and Morgan Milner (2015), "Is ambiguity tolerance malleable? Experimental evidence with potential implications for future research," *Frontiers in psychology*, 6.
- Faul, Franz, Edgar Erdfelder, Albert Georg Lang, and Axel Buchner (2007), "G*Power3: A Flexible Statistical Power Analysis Program for the Social, Behavioral, and Biomedical Sciences," *Behavior Research Methods*, 39 (2), 175–91.
- Foley, Hugh, and Margaret Matlin (2015), *Sensation and perception*, Psychology press.
- Fujita, Kentaro, Marlone Henderson, Juliana Eng, Yaacov Trope, and Nira Liberman (2006), "Spatial Distance and Mental Construal of Social Events," *Psychological Science*, 17 (April), 278–82.
- Gaver, William W., Jacob Beaver, and Steve Benford (2003), "Ambiguity as a resource for design," *Proceedings of the SIGCHI conference on Human factors in computing*

systems, ACM, 2003.

Gnambs, Timo, Markus Appel, and Aileen Oeberst (2015), "Red color and risk-taking behavior in online environments," *PloS one*, 10 (7), e0134033.

Gollwitzer, Peter M. (1986), "Striving for specific identities: The social reality of self-symbolizing," *Public self and private self*, Springer New York, 143-159.

Gosha, Gabriel (2012), "Blurred Backgrounds Use in Web Design," *Web design views*, webdesignviews.com/design-trends-blurred-backgrounds.

Haviland, William A., Dana Walrath, Herald E. L. Prins, and Bunny McBride (2013), *Evolution and prehistory: The human challenge*, Wadsworth Publishing.

Hayes, Andrew F. (2017), *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*, Guilford Publications, 2017.

Held, Robert T., Emily A. Cooper, and Martin S. Banks (2012), "Blur and disparity are complementary cues to depth," *Current biology*, 22 (5).

Henderson, Marlone D, Cheryl J. Wakslak, Kentaro Fujita, and John Rohrbach (2011), "Construal Level Theory and Spatial Distance," *Social Psychology*, 42 (3), 165–73.

Hoffman, Nathaniel, and Arcot J. Preetham (2002), "Rendering outdoor light scattering in real time," *Proceedings of Game Developer Conference*, Vol. 2002, 337-352.

Howard, Ian (2012), *Perceiving in depth, volume 3: Other mechanisms of depth perception*, Oxford: Oxford University Press.

Israelson, Bill (2014), *Hollywood Essential Elements of Portrait Photography: Lighting and Posing Techniques to Make Everyone Look Their Best*, Amherst Media.

Jaoudi, Mike (2014), "iOS 7 Blur Effects with GPU Image," *Raywenderlich*, www.raywenderlich.com/60968/ios-7-blur-effects-gpuimage.

- Kamps, Haje Jan (2013), *The Rules of Photography and When to Break Them*, Focal Press.
- Kim, Hyunji, Simone Schnall, and Mathew P. White (2013), "Similar psychological distance reduces temporal discounting," *Personality and Social Psychology Bulletin*, 39 (8).
- Kingslake, Rudolf (1992), *Optics in photography*, SPIE press.
- Klugman, Craig M., Jennifer Peel, and Diana Beckmann-Mendez (2011), "Art rounds: Teaching interprofessional students visual thinking strategies at one school," *Academic Medicine*, 86 (10), 1266-1271.
- Krüger, Tobias, Klaus Fiedler, Alex Stefan Koch, and Hans Alves (2014), "Response category width as a psychophysical manifestation of construal level and distance," *Personality and Social Psychology Bulletin*, 40 (4), 501-512.
- La Fleur, Byron (2018), "Sensory Marketing : How the senses affect the lottery industry," *La Fleur's*, lafleurs.com/magazine-feature/feature-magazine-feature/2018/09/19/sensorymarketing/
- Lauriola, Marco, Irwin P. Levin, and Stephanie S. Hart (2007), "Common and distinct factors in decision making under ambiguity and risk: A psychometric study of individual differences," *Organizational Behavior and Human Decision Processes*, 104 (2).
- Lee, Hyojin, Xiaoyan Deng, H. Rao Unnava, and Kentaro Fujita (2014), "Monochrome Forests and Colorful Trees: The Effect of Black-and-White versus Color Imagery on Construal Level," *Journal of Consumer Research*, 41 (4), 1015-32.
- Lermer, Eva, Bernhard Streicher, Rainer Sachs, Martina Raue, and Dieter Frey (2015), "The effect of construal level on risk-taking." *European Journal of Social Psychology*, 45 (1), 99-109.
- Liberman, Nira and Jens Förster (2009), "The Effect of Psychological Distance on Perceptual

- Level of Construal,” *Cognitive Science*, 33, 1330–1341.
- Liberman, Nira and Yaacov Trope (1998), “The Role of Feasibility and Desirability Considerations in Near and Distant Future Decisions: A Test of Temporal Construal Theory,” *Journal of Personality and Social Psychology*, 75 (1), 5-18.
- Liberman, Nira, Yaacov Trope, and Elena Stephan (2007), "Psychological distance." *Social psychology: Handbook of basic principles 2*.
- MacDonald Jr, Alfred P. (1970), "Revised scale for ambiguity tolerance: Reliability and validity," *Psychological reports*, 26 (3).
- Mandel, Naomi (2003), "Shifting selves and decision making: The effects of self-construal priming on consumer risk-taking," *Journal of Consumer Research*, 30 (1), 30-40.
- Mandel, Naomi, and Eric J. Johnson (2002), "When web pages influence choice: Effects of visual primes on experts and novices," *Journal of consumer research*, 29 (2), 235-245.
- Mather, George (1997), "The use of image blur as a depth cue," *Perception*, 26 (9).
- Mather, George, and David R.R. Smith (2000), "Depth cue integration: stereopsis and image blur." *Vision research*, 40 (25).
- Mather, George, and David R.R. Smith (2002), "Depth cue integration: stereopsis and image blur." *Vision research*, 40 (25).
- Mehta, Ravi, Rui Zhu, and Amar Cheema(2012), "Is noise always bad? Exploring the effects of ambient noise on creative cognition," *Journal of Consumer Research*, 39 (4).
- Morgan, James I., Fiona A. Jones, and Peter R. Harris (2013), "Direct and indirect effects of mood on risk decision making in safety-critical workers," *Accident Analysis & Prevention*, 50, 472-482.
- Nasar, Jack L., Hugo Valencia, Zainal A. Omar, Shan-Chy Chueh, and JiHyuan Hwang (1985),

- “Out of Sight, Further from Mind: Destination Visibility and Distance Perception,”
Environment and Behavior, 17 (September), 627–39
- Nobre, A. C., and S. Kastner (2014), *Oxford handbook of attention*, Oxford University Press.
- O'Shea, Robert P., Donovan G. Govan, and Robert Sekuler (1997), “Blur and contrast as pictorial depth cues”, *Perception*, 26 (5), 599-612.
- Palmer, Stephen E., and Joseph L. Brooks (2008), "Edge-region grouping in figure-ground organization and depth perception." *Journal of Experimental Psychology: Human Perception and Performance*, 34 (6), 1353.
- Patterson, Charles (2013), “Photoshop Tutorial – Awesome Blurred Backgrounds,” *Tutorials and resources*, harkable.com/blog/photoshop-tutorial-awesome-blurred-backgrounds.
- Pogue, David (2009), *David Pogue's Digital Photography: The Missing Manual*, O'Reilly Media, Inc.
- Raue, M., Streicher, B., Lermer, E., Frey, D. (2015), “How far does it feel? Construal level and decisions under risk,” *Journal of Applied Research in Memory and Cognition*, 4.
- Read, Jenny C. A. (2012), "Visual perception: Understanding visual cues to depth," *Current Biology*, 22 (5), 163-165.
- Reber, Rolf, Norbert Schwarz, and Piotr Winkielman (2004), "Processing fluency and aesthetic pleasure: Is beauty in the perceiver's processing experience?," *Personality and social psychology review*, 8 (4), 364-382.
- Rosen, Marvin J., and Dave DeVries (1993), *Introduction to photography*, Wadsworth Pub Co.
- Sagioglou, Christina, and Matthias Forstmann (2013), "Activating Christian religious concepts increases intolerance of ambiguity and judgment certainty," *Journal of Experimental Social Psychology*, (49) 5, 933-939.

- Sagristano, Michael D., Yaacov Trope, and Nira Liberman (2002), "Time-Dependent Gambling: Odds Now, Money Later," *Journal of Experimental Psychology: General*, 131 (September), 364–76.
- Schere, Jean L. (1982), "Tolerance of Ambiguity as a Discriminating Variable Between Entrepreneurs and Managers," *Academy of management proceedings*, 1, 404-408.
- Shimp, Terence A., and William O. Bearden (1982), "Warranty and other extrinsic cue effects on consumers' risk perceptions," *Journal of Consumer research*, 9 (1), 38-46.
- Song, Hyunjin, and Norbert Schwarz (2009), "If it's difficult to pronounce, it must be risky: Fluency, familiarity, and risk perception," *Psychological Science*, 20 (2), 135-138.
- Sweldens, Steven, Stijn MJ Van Osselaer, and Chris Janiszewski (2010), "Evaluative conditioning procedures and the resilience of conditioned brand attitudes," *Journal of consumer Research*, 37 (3), 473-489.
- Steel, Piers, and Cornelius J. König (2006), "Integrating theories of motivation," *Academy of management review*, 31 (4), 889-913.
- Taheri, Arash, Brad A. Yentzer, and Steven R. Feldman (2013), "Focusing and depth of field in photography: application in dermatology practice," *Skin Research and Technology*, 19 (4).
- Trope, Yaacov, and Nira Liberman (2010) "Construal-level theory of psychological distance," *Psychological review*, 117 (2), 440-463.
- Trope, Yaacov, Nira Liberman, and Cheryl Wakslak (2007), "Construal levels and psychological distance: Effects on representation, prediction, evaluation, and behavior," *Journal of consumer psychology*, 17 (2), 83-95.
- Tversky, Barbara (2003), "Structures of mental spaces: How people think about

space," *Environment and behaviour*, 35 (1).

Tymula, Agnieszka, Lior A., Rosenberg Belmaker, Amy K. Roy, Lital Ruderman, Kirk

Manson, Paul W. Glimcher, and Ifat Levy (2012), "Adolescents' risk-taking behavior is driven by tolerance to ambiguity," *Proceedings of the National Academy of Sciences*, 109 (42), 17135-17140.

Vallacher, Robin R., and James Kaufman (1996), "Dynamics of action identification: Volatility and structure in the mental representation of behavior," *The psychology of action: Linking cognition and motivation to behavior*, New York, Guilford Press.

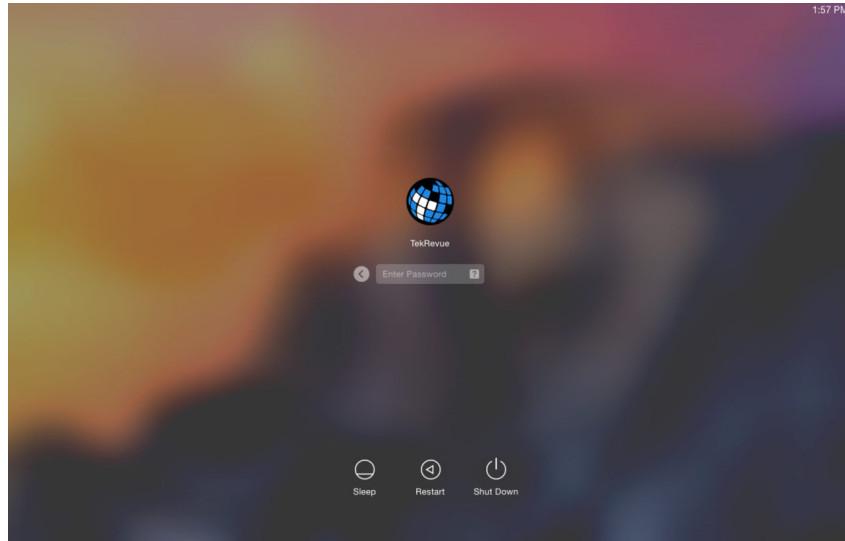
Van Kerckhove, Anneleen, Maggie Geuens, and Iris Vermeir (2015), "The floor is nearer than the sky: how looking up or down affects construal level," *Journal of Consumer Research*, 41 (6), 1358-1371.

Vroom, Victor H (1964), *Work and motivation*, NY: John Wiley & sons, 45.

Yuen, Kenneth S.L, and Tatia M.C Lee (2003), "Could mood state affect risk-taking decisions?," *Journal of affective disorders*, 75 (1), 11-18.

FIGURE 1

Example of a Blurred Wallpaper Used in Mac's OS X El Capitan

**FIGURE 2**

Flow Chart Summarizing The Five Causal Steps of Conceptualization

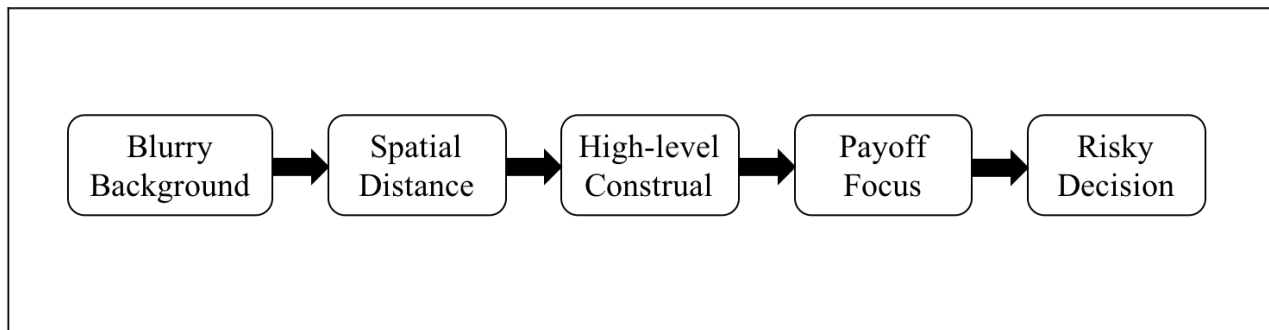


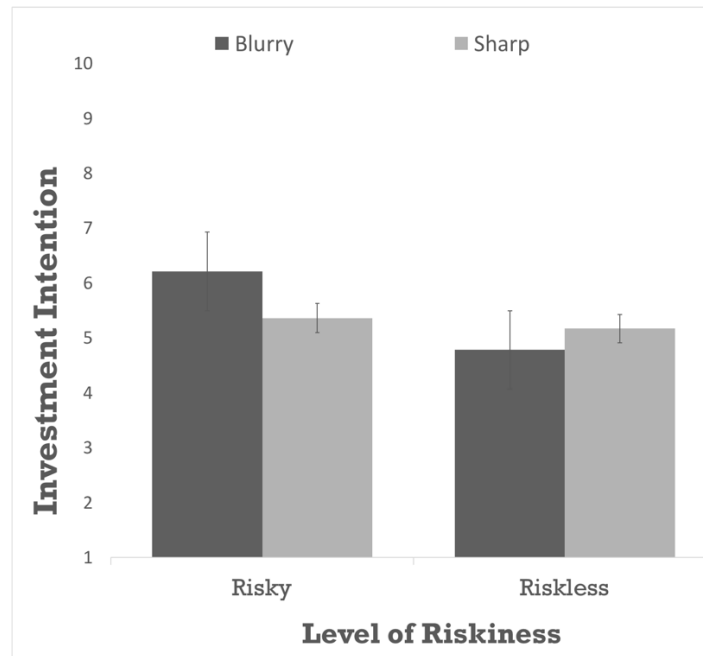
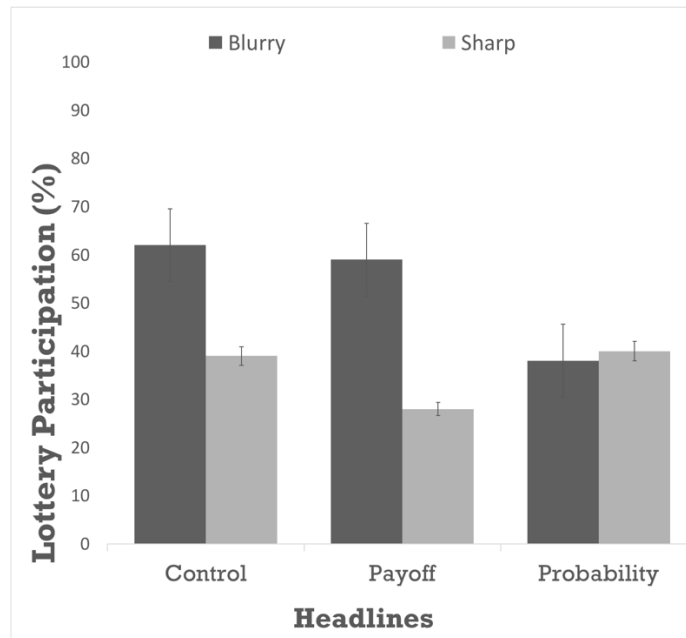
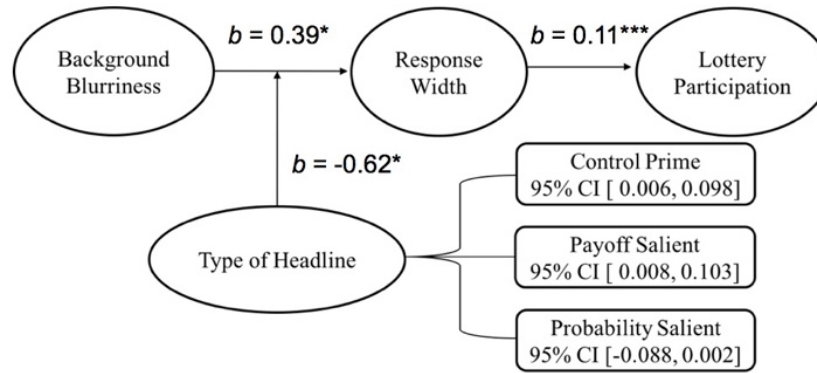
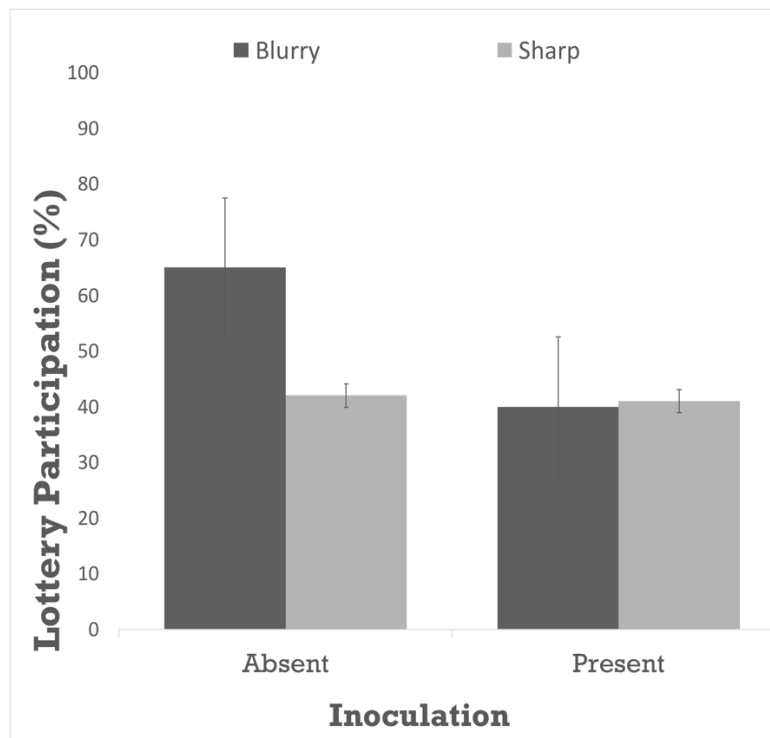
FIGURE 3**Study 1: The Interaction Between Blurriness and Riskiness on Purchase Intention****FIGURE 4****Study 4: The Interaction Between Blurriness and Headline on Lottery Participation**

FIGURE 5**Serial Moderated Mediation Results in Study 4**

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$

FIGURE 6**Study 5: The Interaction Between Blurriness and Inoculation on Lottery Participation**

Appendix A.

The image displays two versions of a ski resort advertisement. The top version is the 'Sharp (U)' version, and the bottom version is the 'Blurry (D)' version. Both versions feature the same content, which includes the Avantis Wealth logo, navigation links, and a list of key features for the Sky Ski Resort.

AVANTIS WEALTH
THE RICHER RETIREMENT SPECIALISTS

ANNUITIES IRAs / 401(K) RETIREMENT PLANNING ESTATE PLANNING INVESTING

**Will you be ready for the retirement you have in mind?
Plan your investment in Sky Ski Resort!**

Key Features

- ✓ Initial investment of \$10,000
- ✓ Projected annual returns: 90% chance of earning \$1,000 and 10% chance of losing \$1,000 (per year)
- ✓ Developer financially strong
- ✓ High risk, high return property
- ✓ Available to all investors

Ski Resort Stimuli in Study 1 and Study 3 (Risky Condition): Sharp (U) and Blurry (D) Versions

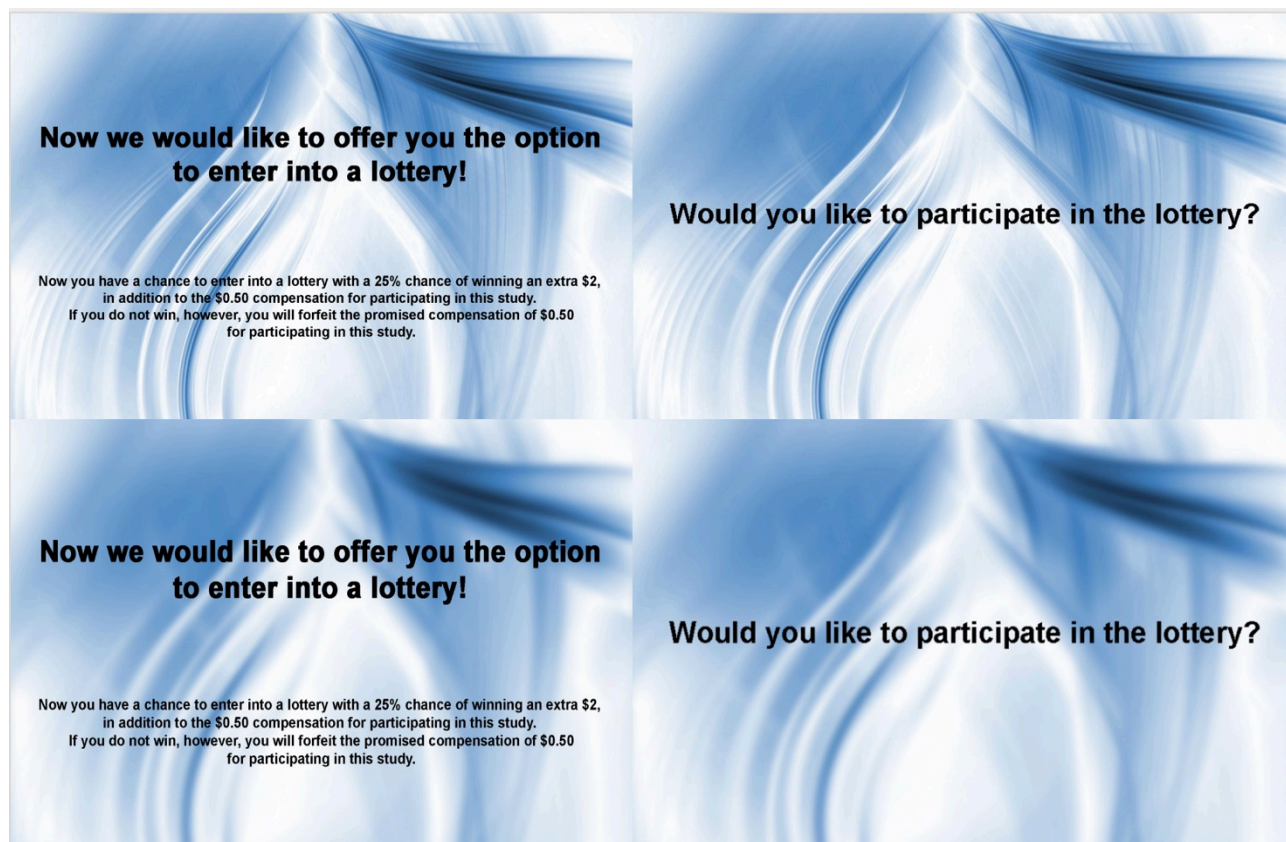
Appendix B.

The image displays two versions of a Calford MBA advertisement. The left version is the 'Sharp (L)' version, and the right version is the 'Blurry (R)' version. Both versions feature the same content, which includes the average starting salary, ranking, and placement rate for the Calford MBA program.

Average Starting Salary of
US\$144,455
#10 among all MBA programs
Forbes Best Business Schools 2018
Placements (3 months) **56.4%**
The Calford MBA
EVENING & WEEKEND MBA PROGRAM

MBA Advertisement Stimuli Used in Study 2: Sharp (L) and Blurry (R) Versions

Appendix C.



Lottery Task Used in Studies 4-5 (Control Condition): Sharp (U) and Blurry (D) Versions

Web Appendix

PRETEST FOR STIMULI USED IN STUDY 1 AND STUDY 3 (SKY SKI RESORT)

A total of 201 participants recruited from Amazon's MTurk were randomly assigned to a 2 (blurriness: blurry vs. sharp) x 2 (riskiness: risky vs. riskless) between-subjects study. Upon entering the study, participants first saw one of the four versions of the Sky Ski Resort website image depending on the condition, and without receiving any particular explanation about the stimulus, they were asked to take a careful look at the background image of the website. They then rated the background image in terms of the levels of sharpness, clarity, preference, arousal, and familiarity, each using a 10-point Likert scale (1 = not at all, 10 = very much). On the next page, participants were again presented with the same Sky Ski Resort website image. At this juncture, participants in the two risky conditions saw the following instruction: "Below is a retirement investment company AVANTIS WEALTH's website, which introduces their signature retirement investment product for Sky Ski Resort. According to the company's website, if you make an investment of \$10,000 in this resort, there is a 90% chance of you earning \$1,000 in any given year from the investment. However, there is a 10% chance of losing \$1,000 in any given year. The website says this investment offers higher rates of return albeit with some risks." Participants in the two riskless conditions saw the following instruction: "Below is a retirement investment company AVANTIS WEALTH's website, which introduces their signature retirement investment product for Sky Ski Resort. According to the company's website, if you make an investment of \$10,000 in this resort, you will be guaranteed an annual return of \$800. The website says there is no risk involved." Participants in both conditions then answered the following question: how risky do they think this retirement investment plan is, on a 10-point scale (1 = not risky at all, 10 = very risky). Participants finally answered some demographic questions and ended the study.

A two-way ANOVA with blurriness, riskiness, and their interaction term as the independent variables and the 2-item (sharpness and clarity, $\alpha = .93$; reverse-coded) blurriness index as the dependent variable found only a significant main effect of blurriness ($M_{\text{blurry}} = 7.91$ vs. $M_{\text{sharp}} = 3.62$; $F(1, 197) = 155.92, p < .001$), but neither the main effect of riskiness ($F(1, 197) = 1.61, p = .20$) nor the interaction between the two variables ($F < 1$). A two-way ANOVA with the same independent variables as above and perceived riskiness of the retirement investment plan as the dependent variable also found only a significant main effect of riskiness ($M_{\text{risky}} = 7.42$ vs. $M_{\text{riskless}} = 5.79$; $F(1, 197) = 18.42, p < .001$), but no other effects ($F_s < 1$). A series of two-way ANOVAs with the same independent variables and the other dependent variables, i.e., arousal, familiarity, preference, found neither the main effects of blurriness and riskiness nor the interactions between the two variables (all $F_s < 1$). The results of this pretest therefore indicate that the four versions of the stimulus only differed significantly in perceived blurriness and riskiness, with the two blurry versions being perceived as significantly blurrier than the two sharp versions and the two risky versions being perceived as significantly riskier than the two riskless versions. But these

results show that the four versions matched in other measures such as preference, arousal, and familiarity.

PRETEST FOR STIMULI USED IN STUDY 2 (CALFORD MBA)

101 Amazon's MTurk workers recruited for the pretest were randomly assigned to one of the two (blurriness: blurry vs. sharp) experimental conditions. Depending on the condition, participants were first presented with one of the two versions of the main page image of the Calford MBA program website. They were then asked to take a careful look at the background image consisting of the school building and rated the picture in terms of levels of sharpness, clarity, preference, arousal, and familiarity, on 10-point scales (1 = not at all, 10 = very much). The rest of the procedure was identical to that of the pretest for Study 1 and Study 3.

A one-way ANOVA found that the blurry and sharp versions significantly differed in the 2-item (sharpness and clarity, $\alpha = .83$; reverse-coded) blurriness index ($M_{\text{blurry}} = 5.25$ vs. $M_{\text{sharp}} = 3.84$; $F(1, 99) = 10.21, p = .001$). A series of one-way ANOVAs, however, indicated that the two versions matched in other measures such as preference ($M_{\text{blurry}} = 6.21$ vs. $M_{\text{sharp}} = 6.28$; $F(1, 99) = 0.03, p = .894$), arousal ($M_{\text{blurry}} = 6.49$ vs. $M_{\text{sharp}} = 6.8$; $F(1, 99) = 0.03, p = .494$), and familiarity ($M_{\text{blurry}} = 4.07$ vs. $M_{\text{sharp}} = 3.88$; $F(1, 99) = 0.16, p = .692$).

PRETEST FOR IDENTIFYING THE KEY RISK FACTOR FOR EDUCATION IN STUDY 2

Salary is often touted as the key benefit of getting an MBA and thus easily emerges as the most important payoff factor (e.g., Gunther et al. 2013; Godfrey 2017). However, it is less obvious as to which factor would constitute the most critical risk consumers take into account when considering applying for an MBA degree. Against this backdrop, to identify the risk factor consumers deem the most important, we solicited 100 workers through Amazon's MTurk to complete a short online survey in return for a small financial incentive. Upon entering the questionnaire online, participants were first presented with the following instruction: "When considering applying for a university degree program, there may exist several different kinds of potential risks that prospective applicants might take into account. These range from the likelihood of crimes that could occur around the campus to the post-degree job market prospects. Below are five potential risks. Please rank-order their relative importance for you by clicking on the options and dragging them such that the most important is on top and the least important is at the bottom." The instruction was then followed by the five risk factors: 1) The risk to personal safety from being mugged or robbed on and around campus, 2) The risk of not getting a job after graduation, 3) The risk of not being able to complete the degree and dropping out, 4) The risk of not getting a job that pays well enough to pay off my student loan, 5) The risk of life being boring life due to a small and isolated college town environment. By clicking and dragging these five choices, participants ranked-ordered these risks factors such that the most critical risk would receive the least mean rank number. On the next page, below the headline "Here are the

ranks that you just attributed to each of the five risks,” each participant saw the five potential risks juxtaposed with the rank numbers that he or she had assigned on the previous page, next to each of which was a number input field. They then rated the relative importance of the five risks by distributing a 100 points in the input fields (e.g., if a participant thinks all the risks are equally important, then the participant gives each risk a score of 20 points. Alternatively, if the participant thinks the first option is the only risk that matters, then the participant gives the entire 100 points to that option, and zero importance to the rest.). Participants then filled out some demographic questions and ended the survey.

The results suggest that in terms of both rank-ordering ($M_{\text{risk1}} = 3.42$ vs. $M_{\text{risk2}} = 2.08$ vs. $M_{\text{risk3}} = 2.8$ vs. $M_{\text{risk4}} = 2.73$ vs. $M_{\text{risk5}} = 3.97$) and point distribution ($M_{\text{risk1}} = 14.13$ vs. $M_{\text{risk2}} = 27.18$ vs. $M_{\text{risk3}} = 21.12$ vs. $M_{\text{risk4}} = 25.09$ vs. $M_{\text{risk5}} = 12.48$), the risk of not getting a job after graduation, is the most critical risk factor considered when applying for a university degree program (mean rank: 2.08 and mean importance points: 27.18). On the basis of the survey results, in Study 2 we included and manipulated the first 3-month placement rate (%) as the key risk information to display on the website.

PRETEST FOR STIMULI USED IN STUDIES 4 AND 5 (REAL LOTTERY CHOICE)

124 Mturk participants recruited in return for a financial reward were randomly assigned to one of the three background conditions (Sharp vs. 10% blurred vs. 15% blurred). The participants rated 20 abstract background images in terms of the levels of sharpness, clarity, like/dislike, arousal, and familiarity, each item using a 10-point Likert scale (1 = not at all, 10 = very much). On the basis of this pretest, we selected a pair of images as the background stimuli for the main lottery choice task used in Studies 4-5; the pair differed significantly in terms of blurriness (sharpness and clarity, $\alpha = .98$; reverse-coded; $M_{\text{blurry}} = 7.10$ vs. $M_{\text{sharp}} = 2.93$; $F(1, 43) = 47.89$, $p < .001$) while matching other dimensions: preference ($M_{\text{blurry}} = 6.21$ vs. $M_{\text{sharp}} = 5.77$; $F(1, 43) = 0.38$, $p = .54$), arousal ($M_{\text{blurry}} = 5.68$ vs. $M_{\text{sharp}} = 5.52$; $F(1, 39) = 0.04$, $p = .83$), and familiarity ($M_{\text{blurry}} = 4.47$ vs. $M_{\text{sharp}} = 3.95$; $F(1, 43) = 0.40$, $p = .53$). In addition, three pairs of background images (sharp vs. 10% blurred), used to strengthen the blurriness manipulation, were selected from the set of pretested images. These pairs also differed significantly in terms of 2-item (sharpness and clarity, $\alpha = .96$; reverse-coded) blurriness index (collapsed across the three images; $M_{\text{blurry}} = 7.39$ vs. $M_{\text{sharp}} = 3.22$; $F(1, 37) = 140.36$, $p < .001$), but matched other dimensions (all $ps > .18$).

PRETEST FOR TESTING ADEQUACY OF PREFERENCE (FOR ALL THE MAIN STIMULI)

Some might raise a question as to whether controlling for general preference (“liking/disliking”) is enough to capture other aesthetics-related concepts such as image attractiveness and aesthetic preference (appeal). This question is important for all the main stimuli used in our research as we

hypothesize the effects we find are not driven by the aesthetic appeal of blurry backgrounds. This question is also relevant for the fluency-based alternative hypothesis – as Reber, Schwarz, and Winkielman (2004) argues that fluent objects are aesthetically pleasurable, which might facilitate risky decisions. In fact, Reber and colleagues (2004) themselves operationalized aesthetic pleasure as general liking in their paper, in line with Berlyne's (1971) view that beauty is equated with either attitude similarity or liking, and argue that there are reasons to believe that judgments of preference, liking, and beauty are closely related (Reber, Schwarz, and Winkielman 2004; p. 365). Still, to provide strong empirical evidence, we have run an additional pretest to examine the hypothesis that general preference (i.e., liking) is sufficiently highly correlated with other aesthetic concepts such as aesthetic appeal and image attractiveness, so as to be a unified concept, and that our main stimuli do not vary between blurry and sharp conditions in terms of the unified concept including preference, aesthetic appeal, and image attractiveness.

The pretest employed a 2 (blurriness: blurry vs. sharp) x 3 (stimulus type: Sky Ski Resort vs. Business School vs. Lottery Task) mixed-design, with the stimulus type as the within-subjects factor. We employed the blurry and sharp versions of the three different images (i.e., Sky Ski Resort (risky condition), Calford Business School, and Real Lottery Task (control condition)), used as the actual stimuli of all our main studies, as the stimuli for this pretest. 102 participants, recruited from Amazon's MTurk panel in return for a small financial reward, were randomly assigned to either the sharp or blurry condition. Upon beginning the study, participants were presented with each of the three background images, for the condition they were assigned to, in a random order. Participants were instructed to take a careful look at the background image, and rate it using three items: "I like this background image" (liking), "This background image is aesthetically appealing" (aesthetic appeal), and "This background image is attractive (image attractiveness). Participants responded for each item for each image by indicating their level of agreement on a 10-point scale (1 = not at all, 10 = very much). After rating all three background images, participants answered some demographic questions and ended the study.

The reliability of the three items (liking, aesthetic appeal, image attractiveness), as measured by Cronbach's alpha, was high for all the three background images: Sky Ski Resort ($\alpha = .93$), Calford Business School ($\alpha = .94$), real lottery task ($\alpha = .96$). These results suggest that the three items are so highly interrelated as to be unified as one single concept. We thus averaged these three items to create a single preference measure for each image and ran a series of one-way ANOVAs. We found that participants did not report any differences in preference for the three background images as a function of blurriness: Sky Ski Resort ($M_{\text{blurry}} = 7.17$ vs. $M_{\text{sharp}} = 7.40$; $F < 1$), Calford Business School ($M_{\text{blurry}} = 7.21$ vs. $M_{\text{sharp}} = 7.13$; $F < 1$), and real lottery task ($M_{\text{blurry}} = 6.53$ vs. $M_{\text{sharp}} = 6.52$; $F < 1$). Overall, these results are consistent with that obtained with the overall preference scale used previously and lend further support for the blurry manipulation being independent of preference. Given these results it is reasonable to argue that the effects of blurriness on risky decisions that we find are not driven by variation in liking or aesthetic preference, enabling us to effectively rule out the fluency-based hypothesis.

MINI META-ANALYSIS OF EIGHT EXPERIMENTS

On top of the five main studies hitherto reported, we ran three additional Mturk experiments (N1 = 120; N2 = 124; N3 = 117) all of which were based on hypothetical scenarios and pertained to risk-taking consumption contexts. In line with previous studies, we manipulated blurriness of the webpage backgrounds in all of these three studies and examined whether exposure to blurriness could promote risky decisions among participants. As for the experimental context, the first two studies were based on a hotel-booking situation under uncertainty, where participants had to decide whether to book a hotel room online (at a fictitious website called Mystery Hotels) without knowing the hotel names beforehand. The other study employed an online lottery (i.e., Powerball) website setting involving purchase decision of a lottery ticket, the price and jackpot of which were set at \$2 (the offline price for Powerball lotteries) and \$141 million (the average jackpot amount calculated based on 1534 draws since the draw held on August 6, 2000), respectively.

As for the background stimuli used in the three studies, we employed three pairs of pictures, two pairs of which were taken from the pretest reported along with Study 4, including the same pair that was used in both Study 4 and Study 5. In the case of the last pair, we created two versions (sharp vs. 10% blurred) of the 19 visual backgrounds that portrayed real hotel locations (i.e., hotel lobby) and ran a separate pretest again using the Amazon MTurk Panel. 51 participants solicited through Mturk were randomly assigned to one of the two background conditions and rated 19 visual images on the five dimensions. Each of the three pairs differed significantly in blurriness (all $ps < .001$) while matching in terms of familiarity, arousal, and preference (all $ps = ns$). Across the three studies, the basic experimental procedure was, albeit simplified, highly similar to that of the four main studies. In all studies, participants were randomly assigned to one of the two conditions (blurriness: blurry vs. sharp), read a hypothetical scenario text explaining they happened to visit the target website while surfing on the net, and then proceeded with the two dependent measures which assessed their intention to take risks: 1) booking/purchase intention (of a hotel room or a lottery ticket) on the spot and 2) willingness to revisit the next time they need a hotel room or a lottery ticket, both on a 10-point Likert scale (1 = not at all, 10 = extremely).

Mini Meta-Analytic Approach

Given that these three supplementary studies were virtually the same in terms of their experimental procedure and dependent variables, and were likewise identical to the five main studies in terms of risk-taking assessment, we decided to adopt an internal ‘mini meta-analytic approach’ (Cumming 2014; Goh, Hall, and Rosenthal 2016; Maner 2014) vis-à-vis all the eight studies including both the main and unreported supplementary studies alike, with a focus on the main effects of blurry backgrounds on preference and choice of riskier options, as measured by either the 2-item purchase intention indexes (for six studies) or the actual lottery choices (Study 4 and Study 5), with the goal of succinctly summarizing the findings across studies.

Following the primer provided by Goh et al (2016), we first meta-analyzed our eight studies using fixed effects whereby the mean effect size (i.e., mean correlation) was weighted by sample size. To facilitate the meta-analysis, we first converted our Cohen's d into Pearson's correlation. Following recommendations by Goh, Hall, and Rosenthal (2016), in the cases of Study 1 and Study 4 that included significant interaction effects between two independent variables, we only used the simple effects for the conditions in which blurriness was expected to promote risky decisions (i.e., risky (vs. riskless) conditions in Study 1, payoff salient/control conditions in Study 4, inoculation-absent condition in Study 5). As the next step, we applied Fisher's z -transformation to all correlations for analyses and then converted back to Pearson's correlations for presentation. Overall, we found that our focal effect was highly significant ($Mr = .17$, $Z = 7.262$, $p < .001$, two-tailed), such that exposure to blurry backgrounds significantly augmented the likelihood of making risky decisions. A fully random effects test was likewise significant, as demonstrated by a one-sample t -test of the mean effect size against zero ($Mr = .19$, $t(7) = 13.44$, $p < .001$, two-tailed). Taken together, these results from the mini meta-analysis provide evidence that the impact of blurry backgrounds on consumers' risky decisions is both robust and positive.