

The Dark Side of Scarcity Promotions: How Exposure to Limited-Quantity Promotions Can Induce Aggression

KIRK KRISTOFFERSON
BRENT MCFERRAN
ANDREA C. MORALES
DARREN W. DAHL

Marketers frequently use scarcity promotions, where a product or event is limited in availability. The present research shows conditions under which the mere exposure to such advertising can activate actual aggression that manifests even outside the domain of the good being promoted. Further, we document the process underlying this effect: exposure to limited-quantity promotion advertising prompts consumers to perceive other shoppers as competitive threats to obtaining a desired product and physiologically prepares consumers to aggress. Seven studies using multiple behavioral measures of aggression demonstrate this deleterious response to scarcity promotions.

Keywords: scarcity, aggression, consumer promotions, advertising, violence

He was bum-rushed by 200 people. They took the doors off the hinges. He was trampled and killed in front of me. They took me down, too. . . . I didn't know if I was going to live through it. I literally had to fight people off my back.

—Jimmy Overby, Walmart employee

They pushed him down and walked all over him. How could these people do that?

—Danielle Damour, sister of victim

Kirk Kristofferson is Assistant Professor of Marketing at the W.P. Carey School of Business, Arizona State University, Tempe, AZ 85287 (kirk.kristofferson@asu.edu). Brent McFerran is W.J. VanDusen Associate Professor of Marketing at the Beedie School of Business, Simon Fraser University, Vancouver, BC, Canada V6C 1W6 (brent.mcferran@sfu.ca). Andrea C. Morales is Lonnie L. Ostrom Chair in Business and Professor of Marketing at the W.P. Carey School of Business, Arizona State University, Tempe, AZ 85287 (acmorales@asu.edu). Darren W. Dahl is BC Innovation Council Professor at the Sauder School of Business, University of British Columbia, Vancouver, BC, Canada V6T 1Z2 (darren.dahl@sauder.ubc.ca). The authors thank the editor, associate editor, and reviewers for their insightful and constructive comments throughout the review process. Financial support from the Social Sciences and the Humanities Research Council of Canada (SSHRC) is gratefully acknowledged.

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These quotes describe the actions of consumers that trampled and killed Jdimytai Damour while shopping on Black Friday at a Long Island Walmart location (Gould, Trapasso, and Schapiro 2008). In addition to causing this death, these same consumers sent three other shoppers, including a 28-year-old pregnant woman, to the hospital with injuries. Each year, the number of violent incidents occurring during shopping-crazed holidays, such as Black Friday (largely in the United States) and Boxing Day (in several countries), increases. In fact, a website called Black Friday Death Count keeps track of and details the injuries and fatalities that occur directly from Black Friday promotional sales (<http://blackfridaydeathcount.com/>). These incidents are not limited only to mob-oriented trampling behavior, but also consist of individuals physically and verbally assaulting, robbing, and even shooting fellow consumers (Morrow 2011). The current research examines when and why scarcity promotions may lead to such aggressive outcomes.

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Evolutionary psychologists have documented that individuals will resort to aggression and violence when survival resources (e.g., food or water) are in short supply (Brownfield 1986; Cohen and Machalek 1988; Griskevicius et al. 2009). Although not empirically tested in the consumer domain, the multitude of violent incidents reported during marketer-induced scarcity promotions suggests such behavior can also occur in resource-rich environments, or environments in which consumers' survival is not threatened. But what factors might activate such aggression? Although mob aggression toward other consumers during deep-discounted retail sales is likely multiply determined, very little is known about the drivers of such acts. The present research investigates one such driver and focuses on the impact that scarcity promotions may have on this aggressive outcome. Here, we test the idea that simply encountering a scarcity promotion, such as a newspaper or television advertisement or online pop-up ad, may cultivate seeds of aggressive behavior in consumers and predispose them to act in a violent manner.

Strikingly, we find that merely exposing consumers to a scarcity (vs. control) promotional ad can lead to increased aggressive behavior. We find that this outcome results after exposure to scarcity promotions that limit product quantity because consumers perceive a potential competitive threat of other people trying to obtain the desired product and experience a physiological change that prepares the body to aggress. In service of eliminating this perceived threat, consumers respond with aggression.

This research makes several important contributions to the literature. From a theoretical perspective, we add to the scarcity literature by showing that aggressive reactions to scarcity can occur not only for survival resources such as food and water, but also for luxury goods in resource-rich consumer environments—a proposition previously discussed (Cialdini 2009) but never empirically tested. Most importantly, however, this research is the first to show that exposure to scarcity promotions—a common marketing tactic used by firms—can lead to increased aggression among consumers (studies 1 and 2, 4–7). We show that marketplace aggression is not merely the outcome of crowds during shopping holidays, but can actually be activated beforehand, at ad exposure. Further, we show that scarcity promotion exposure increases the human body's physiological responses associated with aggression (study 3), and facilitates aggression when an opportunity is available. However, although aggression and competition are related constructs, we find that while competition triggered by limited-quantity scarcity promotions heightens the likelihood that consumers will engage in aggressive competitive actions like shooting, hitting, and kicking, it does not increase nonaggressive competitive actions like working/thinking harder (study 7), highlighting the specific association between scarcity and aggression in particular.

In addition to demonstrating the negative, nonnormative behavioral outcome of aggression, we provide evidence for

the underlying process. First, we show that exposure to a scarcity promotion that highlights competition between shoppers can lead consumers to perceive others as competitive threats to obtaining the desirable good (study 4) and physiologically prepares the consumer to aggress by increasing testosterone levels (study 3). To our knowledge, this is the first consumer behavior work to empirically demonstrate this type of physiological reaction to a promotional ad. We provide process evidence for the role of perceived competitive threat through direct measurement and mediation (study 4), as well as through direct manipulation by increasing social affiliation (study 5), reducing aggressive brand image associations (study 6), or changing the type of scarcity promotion (quantity vs. time, study 7). We next turn to a review of the literature and outline our conceptual framework.

CONCEPTUAL FRAMEWORK

At a basic level, scarcity originates from an imbalance between demand and supply, leading to shortages and competition for resources. Foundational scarcity research has focused primarily on events such as economic recessions (Griskevicius et al. 2012) or periods of famine or drought (Chakravarthy and Booth 2004). Scarcity as a phenomenon, however, is also found in resource-rich environments, such as (nonessential) consumer good shortages (Lynn 1992, 1993). These shortages can be the result of many factors, including demand shocks, production delays, capacity constraints, and limited production runs (Verhallen and Robben 1994). Firms may even attempt to create scarcity by intentionally holding supplies artificially low, or creating the perception of scarcity by means of promotions or sales (Cialdini 2009; Gitlin 2007). A “scarcity promotion” is defined as a marketing tactic that emphasizes limited availability (either in quantity or time) of a specific product or event (Ku, Kuo, and Kuo 2012). Firms utilize scarcity promotional tactics throughout the year, but their most salient usage is for high-profile shopping-oriented events (e.g., Black Friday, Boxing Day) in which large discounts are offered on highly desirable items, but available quantity is often limited, as is the time to access the promotion (only that day or week).

Prior research has consistently shown that product scarcity may influence perceptions of value. Specifically, products and services seem more valuable when they are in short supply (Brock 1968; Cialdini 1993; Sharma and Alter 2012). More recent work has examined the degree to which product familiarity may influence the relationship between scarcity and purchase intentions, demonstrating that consumers who are uninformed or unfamiliar with the available options may rely more on the behavior of others when making choices, as compared to consumers who already possess information about the available options (Castro,

Morales, and Nowlis 2013). In addition, this work shows that scarce products are evaluated more positively when the scarcity is due to market circumstances (i.e., a product is in high demand due to popularity), as compared to when it is due to accidental or nonmarket circumstances (i.e., a product has inadvertently not yet been restocked). As a result, the preference for scarce products is due at least in part to what the consumer believes is the underlying cause of the shortage (Lynn 1992; Verhallen 1982; Verhallen and Robben 1994).

While items that are scarce are frequently perceived as valuable, the converse is also true: entities that are valuable are often scarce (King, Hicks, and Abdelkhalik 2009). When necessary resources, such as food, water, or shelter, are in short supply, competition for survival increases and individuals can resort to aggression. We define “aggression” broadly as behaviors intended to harm or injure another person or object (Lorber 2004). Previous research supports the link between extreme resource scarcity, competition, and aggression. In some cases, it has been shown that fatal violence has been used to obtain such scarce resources (Hagmann and Mulugeta 2008; Harvey 2009; Reuveny 2007). However, this research is limited to nonexperimental contexts (e.g., ethnographies, case studies), very impoverished environments, and/or nonbehavioral aggression measures (e.g., aggression scales, intentions to harm others).

Although aggressing toward fellow consumers within a retail context to obtain one of the few 72-inch LED televisions or Kleinfeld wedding gowns on sale at a bargain price can hardly be explained by the need to obtain life-essential resources, aggression in such contexts is perhaps less surprising given the many documented instances of mob-oriented behavior (e.g., Bandura 1977; Bandura et al. 1996; Zimbardo 1969), even in consumption contexts (Roberts and Benjamin 2000; Simpson et al. 2011). However, aggressive behavior in a consumption context, such as a retail store, may not only be the outcome of the scarcity and value of the good itself, but could also be a reaction to social norms for what is appropriate behavior. One might argue that many of the consumers shopping on Black Friday, for example, would likely not aggress if other people who were already pushing and shoving did not surround them, indicating by their behavior that aggression in this context is acceptable (Asch 1954; Sherif 1936). It is also possible that consumers view certain sale days as sacred (or “mythical”; Tumbat and Belk 2011) events that warrant the suppression of appropriate behavior and license consumers to behave antisocially.

In the current work, we not only extend the scarcity literature to show that consumers can aggress in resource-rich environments, but we also challenge the assumption that marketplace violence is necessarily the result of a mob mentality or idiosyncratic to certain days, which push otherwise nonviolent individuals over the edge in the heat

of the moment. Instead, we show evidence for another potential driver: consumers may in fact come to the stores predisposed to aggress as a result of marketing actions, and this effect may occur anytime the quantities of desired goods are scarce. Put another way, we propose that a scarcity cue *outside* of the immediate consumption context that highlights potential competition between consumers may elicit physiological aggressive impulses, which may subsequently release consumers to act on these impulses when given the opportunity to aggress. Further, we propose that these tendencies can result in more generalized aggressive actions, meaning that the target of the aggression need not be a person who is actually competing for the scarce items, nor does the target need be a person at all. We show that as long as there is an opportunity to aggress, consumers for whom aggressive impulses have already been activated are more likely to behave accordingly.

But why would consumers resort to aggression versus other, less dangerous competitive behaviors (e.g., product hoarding; Byun and Sternquist 2011) upon exposure to a limited-quantity scarcity promotion? This deleterious behavior may be less surprising given psychological research on aggression. We adopt the perspective of Berkowitz and LePage (1990), who argues that aggression is multiply determined, and that there exist several factors that can make anger and aggression more or less likely to occur. Specifically, he suggests that aggressive behavior can result not only from negative affect (e.g., anger) or perceived safety threat (Stein and Levine 1989), but also from situational cues that highlight linkages associated with violent behavior. A review of more recent work suggests that scarce environments—specifically, we would argue, ones with cues of competitive threat within them—may in fact foster an aggressive association and facilitate violent action.

In particular, findings suggest that scarce environments can impair consumer cognitive functioning and lead to poorer decision making (Mani et al. 2013). Shah, Mullainathan, and Shafir (2012) found that a scarcity mind-set induces an intense present focus and a willingness to sacrifice one’s future well-being in order to meet present goals. This present focus, in turn, has been shown to cause consumers to adopt a more agentic and competitive mind-set (Roux, Goldsmith, and Bonezzi 2015), neglect other situational dimensions (Zwane 2012), and exhibit lower self-control (Laran 2010). Taken together, under certain conditions that highlight competition between consumers, we propose that scarcity cues, such as limited-quantity promotions for nonnecessity or luxury items, may foster a specific association with aggression that leads consumers to ignore the significant costs associated with violence, and makes them more likely to engage in competitive, aggressive actions (Campbell 1999; Taylor et al. 2000; Wilson and Daly 1985).

Scarcity Promotions and Aggressive Behavior: The Role of Perceived Competitive Threat

But what underlying psychological mechanism could lead consumers to act aggressively in response to scarcity promotions? We propose that when quantities are limited, scarcity promotions prompt consumers to perceive other shoppers as competitive threats to obtaining the highly attractive products. In other words, a perceived competitive threat mediates the effect of limited-quantity promotions on aggression. By advertising the limited quantity of the featured products, the scarcity promotions necessarily highlight that few people will actually be able to purchase the goods, thereby fostering competition between shoppers. Furthermore, we contend that perceiving other consumers as competitive threats following exposure to scarcity promotions elicits a physiological response that prepares consumers to aggress. Specifically, we argue that exposure to limited-quantity scarcity promotions causes an increase in physiological hormone levels associated with aggression—in particular, testosterone.

Previous evolutionary research has established a positive relationship between testosterone and aggressive behavior in both humans (Book, Starzyk, and Quinsey 2001) and nonhuman animals (Rines and vom Saal 1984), and increased testosterone levels have been shown to prepare the body to act in an aggressive manner (Terberg and van Honk 2013). In the consumer domain, Wood, McInnes, and Norton (2011) speculated that sports games with a close final score (where competition is fiercest) may lead to increased testosterone levels in spectators, subsequently resulting in more aggressive, violent driving behavior. Relatedly, neuroendocrine research has demonstrated that in highly competitive situations, testosterone levels can increase even when the competitive situation is merely anticipated (Gonzalez-Bono et al. 1999; Mazur, Booth, and Dabbs 1992; Mazur and Booth 1998). Prior work has also shown that changes in hormone levels can occur in response to anticipated or imagined interactions not of a competitive nature (Cesario, Plaks, and Higgins 2006; Goldey and van Anders 2011); however, such work has explicitly asked participants to imagine an interpersonal interaction (we do not). Further, to our knowledge, no research to date has demonstrated any hormonal change in response to a marketing appeal.

Indeed, in the current research we propose that exposure to limited-quantity scarcity promotions can lead to an observable behavioral change (increased aggression) that is the result of both a psychological (perceived competitive threat), as well as an internal, physiological change (increased testosterone). More specifically, we propose that a scarcity cue that highlights other people as competition, such as a limited-quantity promotional ad, can heighten the perceived threat other consumers play in obtaining the target good, activate a physiological response

associated with aggression, and lead to aggressive behavior even outside of the competitive context. Formally,

- H1:** Consumers exposed to a scarcity promotion highlighting limited quantity (vs. a promotion that does not highlight limited quantity) will behave more aggressively.
- H2:** Exposure to a scarcity promotion highlighting limited quantity (vs. a promotion that does not highlight limited quantity) leads consumers to perceive other consumers as potential competitive threats to obtaining the focal product. Perceived threat will mediate the relationship between limited-quantity scarcity promotion exposure and increased aggression.
- H3:** Consumers exposed to a scarcity promotion highlighting limited quantity (vs. a promotion that does not highlight limited quantity) will exhibit higher testosterone levels.

Scarcity Promotion Type and Subsequent Violent Action

But when might scarcity promotions not lead to such a destructive outcome? We propose that factors that reduce the perceived competitive threat other consumers pose to obtaining the desired product will interrupt the activation of aggression-related responses to scarcity and not result in such behavior. In other words, when cues are present that directly minimize competition with other consumers, aggressive tendencies in response to scarcity promotions should be muted.

One critical factor of both theoretical and practical significance that directly affects perceived competitive threat is the type of scarcity promotion employed. Marketers use scarcity promotions in two primary ways: either by limiting the number of products available (quantity: “Only 5 Available”) or the time period for which the sale lasts (time: “One Day Only,” “Sale Lasts Until Noon”). According to our conceptualization, if perceived competitive threat of other consumers is the process through which exposure to scarcity promotions drives aggression, then this deleterious consequence should result only when the scarcity promotion limits promotional quantity (vs. time). This is because promotions that limit product quantity inherently pit consumers against each other and heighten the competitive threat others pose to securing the desired good. Put another way, when product quantity is limited, consumers will miss out if they do not get to the product before other consumers. Previous research supports this claim, showing that limited-quantity promotions increase both uncertainty about successfully obtaining the scarce product and the locus of causality in acquisition (Aggarwal, Jun, and Huh 2011; Inman, Peter, and Raghubir 1997; Lynn 1993; Meyer 1980). Conversely, in

promotions that limit time, all consumers who want to secure the promotional product will do so as long as they arrive within the allotted time, making the perceived competitive threat other consumers pose in inhibiting product acquisition minimal (i.e., consumers are competing only against the clock, not each other). Thus, we predict that the type of scarcity promotion will moderate the relationship between scarcity promotions and subsequent aggressive behavior by impacting the perceived competitive threat of other consumers, such that aggression will result only when the promotion is limited quantity but not limited time. Formally,

H4: The type of scarcity promotion will moderate the relationship between scarcity promotions and aggression, such that exposure to scarcity promotions will lead to increased aggressive behavior when the promotion limits available product quantity, but not when the promotion limits available time to obtain the product.

Aggressive versus Nonaggressive Competitive Reactions to Scarcity Promotions

Finally, our framework predicts that exposure to limited-quantity scarcity promotions will lead specifically to aggressive (vs. nonaggressive) competitive behaviors. This is because scarcity is specifically associated with aggression. Thus, we contend that while competition triggered by scarcity promotions will increase the likelihood of consumers engaging in aggressive competitive behaviors like shooting, hitting, and kicking, it will not have the same effect on nonaggressive competitive actions like working or thinking harder. That is, because of the perceived competitive threat and physiological responses that are activated upon exposure to limited-quantity scarcity promotions, aggressive competitive actions become more likely as consumers are predisposed to aggress, but nonaggressive behaviors should remain relatively unaffected.

Overview of Studies

We test our proposed framework in seven studies using multiple behavioral measures of aggression. Study 1 demonstrates that exposure to limited-quantity scarcity promotion advertising leads to increased aggressive behavior (hypothesis 1). Study 2 replicates this effect in a different consumption context and begins to disentangle the aggressive response from more general competitive (but nonaggressive) behavior. Study 3 shows that exposure to a scarcity promotion leads to physiological increases in testosterone (hypothesis 3). Study 4 provides support for the underlying process of perceived competitive threat driving aggression (hypothesis 2) through measured mediation. Studies 5 and 6 also document the process by manipulating perceived threat directly through social affiliation (study 5)

and brand image association (study 6). Finally, study 7 examines type of scarcity promotion (quantity vs. time, hypothesis 4), again supporting the proposed mechanism, and further highlights when aggressive competitive responses can manifest compared to nonaggressive competitive behaviors.

STUDY 1

Study 1 provided preliminary support for the hypothesis that limited-quantity scarcity promotions for a desirable product can lead to increased aggression (hypothesis 1). In this study, we contrasted a scarcity promotion ad with a control promotion ad for the same product in which no restrictions on product quantity availability are made. Because of the difficulty (and ethical implications) of studying interpersonal violence in a controlled lab setting, we examined aggressive behavior in this study using violent video games (Anderson and Bushman 2002; Englehardt et al. 2015).

Procedure

One hundred forty marketing undergraduates from the University of British Columbia (ages 18–56, $M_{\text{age}} = 22.7$, 56.3% female) participated in this study in exchange for course credit, and were randomly assigned to one of two conditions (promotional ad: scarcity, control), manipulated between-participants.

Participants arrived at the lab in groups of four and completed the study at individual computer terminals. They were told that they would be completing a number of unrelated studies, the first of which would be to provide feedback to the university's bookstore regarding a promotion it planned to run in the near future. Participants were then directed to an online survey, given a sealed envelope that contained the promotional ad stimuli, and directed to open the envelope when prompted by the survey.

Scarcity Manipulation. Participants reviewed one of two promotional ads from the UBC bookstore that served as our scarcity manipulation. The ads described a promotional sale featuring the (then new) 64 GB Apple iPhone 5 for only \$50 (retail value of \$650 crossed out; see appendix A for stimuli and web appendixes A and B for product and stimuli pre-tests). The heading Promotional (vs. Black Friday) Sale was selected to ensure reactions were not due to the perception that Black Friday is a sacred or mythical event. It also served to enhance the generalizability of the potential effect. To manipulate scarcity, we varied the quantity of iPhones available to consumers via the promotion. In the scarcity (control) promotion, only 3 (3,000+) iPhones were available to consumers.¹ This information

¹ Retailers in the marketplace do advertise both large and small quantities available during scarcity promotions.

was presented in the main text of the ad, as well as at the bottom. All other information was identical between the two promotions.

After reviewing the bookstore's promotional ad, participants answered cover story questions regarding anticipated demand for the promotion and expected word of mouth among the university population. Finally, participants completed the following manipulation check item on a scale from 1 (very scarce) to 7 (very abundant): "How would you describe the University Book Store's iPhone 5 promotional package quantity?"

Eliciting Aggressive Behavior. Immediately after reviewing the scarcity ad, participants moved on to our measure of aggression, ostensibly described as a separate study on classic video games: firearm shooting behavior. Specifically, participants were told that marketing researchers were investigating the recent trend among video game players of downloading, purchasing, and playing classic video game systems (e.g., Super Nintendo, Atari), and that they would be randomly assigned to play a classic game and report on their experience. In actuality, all participants were directed to play an online first-person shooting game called *Deadeye*. In this game, participants use the mouse to aim a gun and shoot at moving targets. The game is referred to as "first-person" because the game play is designed such that players aim the gun as if they are holding it in their hands and aiming with their own eyes.

One feature of the game is that the dominant strategy is not to fire bullets recklessly. Upon starting the game, participants were given basic on-screen instructions about how to shoot and informed that game scoring is dependent upon both the number of targets hit and the accuracy of shooting behavior. We chose to operationalize aggression as the number of bullets participants fired during game play. Given that experience with first-person shooting games could impact measures such as accuracy and overall score, we felt the quantity of bullets fired was the cleanest measure of aggressive behavior in this experimental context, although we also report accuracy results below. Shooting behavior was unobtrusively recorded using a program called *Morae Recorder* (see web appendix C for a detailed description of the software).

As the overall difficulty and complexity of the game is low, and in order to increase the number and speed of the moving targets, participants were instructed to play the game on the most difficult setting. Participants who played the game on an incorrect setting were removed prior to analyses to ensure consistency. In this and all subsequent studies exclusions did not vary systematically by condition. The game took approximately 1 minute to complete. Upon completion of the game, participants answered cover story questions, and then proceeded to a separate study.

Dependent Variable. Participant mouse clicks were recorded to measure the number of bullets participants fired,

which served as our dependent measure of aggressive behavior. Two coders, blind to the hypothesis, manually viewed each participant's game play video file and recorded the dependent measure using the *Morae* software.

Results

Manipulation Check. The manipulation check revealed that the scarcity manipulation was successful. Participants perceived the promotional package quantity to be more scarce (lower values indicate more scarce) in the scarcity condition than the control condition ($M_{\text{Scarcity}} = 1.72$ vs. $M_{\text{Control}} = 3.97$; $F(1, 138) = 68.5, p < .001$).

Dependent Variable. The number of shots fired was severely nonnormal ($Y_{\text{Shots Fired}} = 2.48, \omega(140) = .72, p < .001$); thus, we log-transformed this variable to test our hypothesis. We note, however, that results are consistent if the analysis is performed using raw values. We report raw score means and standard deviations for ease of understanding. We examined the shooting behavior of participants using a one-way ANOVA with shots fired as the dependent variable. As predicted, participants exposed to the scarcity promotion fired significantly more bullets than participants exposed to the control promotion ($M_{\text{Scarcity}} = 42.3, SD = 19.4$ vs. $M_{\text{Control}} = 37.0, SD = 11.7$; $F(1, 138) = 4.02, p = .047$).²

Discussion

Study 1 provided preliminary support for our hypothesis that exposure to limited-quantity scarcity promotions can lead to increased aggressive behavior among consumers (hypothesis 1). We found that consumers behave more aggressively after viewing a scarcity (vs. control) promotional ad for a desirable product. To our knowledge, this is the first study to empirically demonstrate that exposure to a marketing promotion can induce aggressive behavior. Importantly, this increased aggression resulted from a scarcity promotion that featured a *nonnecessity* product (iPhone) among participants operating in a *resource-rich* environment (a university in a large North American city). This suggests that individuals may resort to aggression not only to ensure their very survival, but also in other consumption contexts.

² Subsequent investigation revealed that scarcity participants were significantly less accurate in their shooting behavior than control participants ($p = .052$), although their overall scores did not differ ($p > .90$). Analysis shows that participants were hitting the same number of targets in each condition, but were using more bullets to do so under scarcity (acting more aggressively). Given participant knowledge that overall score was based in part on higher accuracy, this suggests that scarcity was leading them to be more aggressive, even when they were instructed that it was not beneficial to do so.

STUDY 2

In study 2, we built on the findings from study 1 in two ways. First, we extended our experimental paradigm by testing and measuring *physical* aggression in response to limited-quantity scarcity promotions in a real consumption setting. Since many of the shopping holiday altercations reported in the media are physical, we wanted to examine whether a scarcity promotion ad could increase aggression to a high enough level to cause participants to engage in physical assaults (though not toward other humans, for ethical reasons). In addition, we introduced a second control condition in which no mention of quantity is present in the promotional stimuli. It could be argued that the control stimuli used in study 1 is not a pure control condition, but one of abundance, given the large quantity (3,000+) available. Therefore, it is possible that the difference in aggressive responses observed was due to a reduction in aggression in the control condition (vs. an increase in aggression in the scarcity condition). To rule out this possibility, we introduced a third condition in study 2 with no reference to quantity.

Procedure

Two hundred twenty-seven marketing undergraduates from the University of British Columbia (ages 18–30, $M_{\text{age}} = 20.1$, 57.7% female) participated in this study in exchange for course credit and were randomly assigned to one of three conditions in a 3 (scarcity, control, control–quantity omitted) between-participants design. Participants were run individually in 15-minute intervals.

Upon arrival to the lab, participants were told that they would complete multiple unrelated studies, the first of which was to provide feedback for the university bookstore regarding an iPhone promotion it planned to launch. Participants received the same instructions as study 1 and evaluated one of the three promotions (see appendix B for control–quantity omitted stimuli). After viewing the promotional ad, participants completed the same cover story and manipulation check (1 = very scarce to 7 = very abundant) questions.

Once finished, participants moved on to the next study: a retail experience study. Participants were told that the experience would involve purchasing and sampling a product at one of the retail locations in the business school. Participants were then asked to randomly select an envelope from a box that identified which shopping task they would complete. All envelopes identified the same task: purchasing and sampling a Reese's peanut butter bar from the vending machine located in the basement of the school. After showing the selected task to the experimenter, each participant was told that he or she must purchase and sample that exact product to complete the study, and was then escorted to the vending machine. We situated the vending

machine in an isolated area at the end of a long corridor in the basement between a small desk and chair and a filing cabinet. This was done to minimize the likelihood of participants encountering other individuals during the experiment. Each participant was given \$2 in quarters, instructed to obtain the Reese's bar by pressing "B2" on the machine, and told to complete the paper/pencil survey at the desk beside the vending machine after purchasing and sampling the product. Finally, the experimenter stated that because he needed to greet another participant that was arriving shortly, the participant should remain at the vending machine until his return. The experimenter then left the participant alone at the vending machine.

Unbeknownst to the study participants, we hired a technician to adjust the machine so that the Reese's slot jammed every time it was selected. Specifically, the circular coil holding the Reese's bar would turn enough to make the front bar descend horizontally toward the participant, but not far enough to allow it to fall from the shelf to the retrieval slot at the bottom of the machine (see appendix C for pictures). Thus, physically assaulting the machine served as an aggressive and nonnormative method to retrieve the product required to complete the study.

In addition to adjusting the machine to jam, we discretely positioned a video camera to record participant interaction with the machine. The camera was positioned on top of the filing cabinet beside the vending machine with books placed in front to keep it from participants' view.

Dependent Variables. To measure aggressive behavior, we used three dependent measures: (1) the number of physical assaults on the vending machine (defined as pushing, hitting, kicking, or shaking the machine), (2) the extremity level of participant physical assaults (1 = no aggression, 2 = aggressively pushing the buttons/pushing the buttons hard, but not hitting/shoving the machine, 3 = lightly shaking/pushing the machine, 4 = punching the machine, 5 = violently shaking the machine so it lifted off the ground, or kicking the machine), and (3) participants' aggressive body language (1 = not at all aggressive to 5 = very aggressive). Two trained coders watched each participant's video and coded each of the dependent measures. If disagreements arose, both coders rewatched the participant video together until agreement was reached. After interacting with the vending machine, participants completed cover story questions and the PANAS mood inventory scale, and were then retrieved by the experimenter.

Results

Participants. Twenty-six participants are not included in the analysis for the following reasons defined prior to data coding and analysis: participant noticed the video camera (5), participant inadvertently encountered another

person at the vending machine (11), participant interacted with previous study participant while waiting to begin the study (4), machine error due to foreign (US) currency usage (6). The pattern of results is consistent if all participants are included.

Manipulation Check. The scarcity manipulation worked as intended between the three conditions. Participants exposed to the scarcity ad perceived the iPhone promotional quantity to be more scarce than participants exposed to both control–quantity omitted ($M_{\text{Scarcity}} = 2.00$, $SD = 1.50$ vs. $M_{\text{Control-Quantity Omitted}} = 3.33$, $SD = 1.48$, $F(1, 198) = 23.2$, $p < .001$) and control ($M_{\text{Control}} = 4.45$, $SD = 1.76$, $F(1, 198) = 80.2$, $p < .001$) ads. Moreover, participants in the control–quantity omitted condition perceived the iPhone promotional quantity to be more scarce than participants in the control condition ($F(1, 198) = 16.6$, $p < .001$).

Mood. No differences in participant mood emerged between the three conditions. Moreover, mood did not predict the dependent measure and will not be discussed further.

Dependent Variables. We standardized the three dependent measures and averaged them to form a single aggressive behavior score. We note that each of the three dependent measures is independently significant and matches the results of the combined measure (we provide full details and statistics in web appendix D). To test whether participants exposed to the scarcity promotion behaved more aggressively than participants exposed to the control or control–quantity omitted promotions, we created two dummy variables and entered them in a linear regression to predict aggressive behavior. Supporting our predictions, participants exposed to the scarcity promotion behaved significantly more aggressively toward the machine than participants exposed to both control–quantity omitted ($M_{\text{Scarcity}} = .29$, $SD = 1.11$ vs. $M_{\text{Control-Quantity Omitted}} = -.09$, $SD = .79$, $b = .49$, $t(198) = 3.14$, $p = .002$) and control promotion conditions (vs. $M_{\text{Control}} = -.20$, $SD = .78$, $b = .39$, $t(198) = 2.44$, $p = .016$), both of which did not differ from each other ($p > .50$).

Discussion

The results of study 2 provide further support for our claim that exposure to a limited-quantity scarcity promotion can lead to aggressive behavior (hypothesis 1). Specifically, in a real consumption setting, the results of study 2 showed that exposure to a limited-quantity scarcity promotional ad led to greater physical aggression. We also found no differences in aggressive behavior between the control and control–quantity omitted conditions in this study, thus ruling out the alternative explanation that our effects are due to a reduction in aggression when a large quantity is presented. In study 3, we begin to test our proposed process claim by examining whether exposure to

limited-quantity scarcity promotions elicits physiological responses shown previously in the literature to predict aggressive behavior.

STUDY 3

The goal of study 3 was to extend the behavioral findings of studies 1 and 2 by examining whether exposure to a limited-quantity scarcity promotion can elicit automatic physiological responses associated with aggressive behavior (hypothesis 3). If consumers exhibited increased testosterone levels after exposure to a scarcity (vs. control) promotion, this would lend support to our claim that limited-quantity scarcity promotions may lead to increased likelihood of aggressive behavior.

To test this proposition, we partnered with a leading salivary bioscience research institute, Arizona State University's Institute for Interdisciplinary Salivary Bioscience Research, to conduct an experiment to measure testosterone levels after exposure to a scarcity (vs. control) promotion.

Procedure

One hundred fifty marketing undergraduates (ages 18–48, $M_{\text{age}} = 22.3$, 48.1% female) from Arizona State University participated in this study in exchange for course credit and were randomly assigned to one of two conditions (scarcity, control) in a between-participants design. Saliva testing was selected as the testosterone measurement procedure to maximize measurement accuracy and to minimize invasiveness to participants. The study lasted approximately 30 minutes.

Our procedure and analysis were guided by the expertise of the bioscience institute and recent bioscience salivary research design findings (Bosch et al. 1996; Granger et al. 1999; Granger et al. 2004; Out et al. 2013). Participants were instructed not to eat, drink, smoke, brush their teeth, or use mouthwash for at least one hour prior to the session (Dabbs 1991). Participants arrived at the lab in groups of six to 10 and were seated at individual workstations. Upon arrival, participants were given a cover story explaining that researchers were investigating how different oral hygiene products affect user saliva, and that three saliva samples would be taken during the course of the session. Following previous research involving salivary measurement, three saliva samples were taken to obtain reliable estimates of individual baseline hormone levels (Out et al. 2013). Thus, baseline testosterone levels were measured both at the beginning and end of the experimental session (separated from target stimuli exposure; Bosch et al. 1996).

Baseline Measurement 1. The first of the two baseline measures was taken at the beginning of the session. Participants were given an oral swab and instructed to

place it on the tongue for 2 minutes until saturation. Upon saturation, the experimenter brought a glass test tube (labeled with a bar code to track participant and measurement timing) and the participant placed the swab inside. The experimenter then stored the samples in the freezer at -20 degrees Celsius.

Scarcity Manipulation. After completing the first baseline testosterone measure, the experimenter informed participants that they would move on to an unrelated study before continuing with the oral hygiene products study. Specifically, participants were told that they would provide feedback on a marketing promotion the university bookstore was planning to run. The instructions and stimuli were identical to those used in study 1. Participants were exposed to either a scarcity or control ad for the bookstore's iPhone promotion and answered the same cover story questions and manipulation checks.

Dependent Variable. After participants' exposure to the scarcity manipulation, the target testosterone measurement was taken, with participants receiving a second oral swab. Identical measurement and storage procedures were followed.

Demographic Covariates. After the target testosterone measurement was taken, participants completed an oral hygiene health and demographic questionnaire for approximately 10 minutes. In addition to supporting the cover story, this questionnaire collected demographic measures that bioscience research has shown to affect testosterone levels: time of day, gender, age, ethnicity, dental habits, and smoking history (Shirtcliff, Granger, and Likos 2002). Upon completion of the questionnaire, participants were directed to watch a neutral video about tourism in a European city and answered cover story questions for the remainder of the study (approximately 10 minutes). This neutral task was performed to allow testosterone levels to return to a baseline state following stimuli presentation (Bosch et al. 1996).

Baseline Measurement 2. After the study finished (approximately 20–30 minutes), the second baseline testosterone measurement was taken and identical measurement and storage procedures were again followed. At the end of each session, the experimenter ensured all three participant samples were labeled, organized, and stored properly. At the conclusion of the study, samples were taken to the bioscience institute, where trained personnel performed the testosterone measurement on our behalf.

Results

Data Preparation. Testosterone scores were measured and compiled by the ASU Institute for Interdisciplinary Bioscience Research. Each participant sample was centrifuged at 3,000 rpm for 5 minutes and measured twice. The mean of

the two measurements was provided to us for data analysis. No other hormones besides testosterone were assayed.

Participants. Four participants experienced problems during the session and were not able to complete the measurements as directed (e.g., swab-induced gagging, target measurement was taken prior to ad exposure). Further, six participants exhibited testosterone levels that exceeded 3 standard deviations from the mean, suggesting measurement or procedural error, as these outliers far exceeded documented levels found in humans (Goldey and van Anders 2011; Granger et al. 2013). Therefore, the analysis was conducted with 140 valid participant samples.

Manipulation Check. The scarcity manipulation check was successful. Participants perceived the iPhone promotional package quantity to be more scarce in the scarcity versus the control ad (1 = very scarce to 7 = very abundant; $M_{\text{Scarcity}} = 2.19$ vs. $M_{\text{Control}} = 4.14$; $F(1, 138) = 41.9, p < .001$).

Covariates. The following factors were included as covariates following previous salivary testing research: baseline levels, gender, time of day, age, ethnicity, smoking history, and dental habits (Shirtcliff et al. 2002). Only the two baseline testosterone levels emerged as significant. For model parsimony, we included only the significant covariates in our analysis.

Dependent Variable. Our target dependent measure was participant testosterone levels after exposure to the scarcity stimulus. A one-way ANCOVA supported our proposition. Participants exposed to the scarcity promotion exhibited significantly higher testosterone levels than participants exposed to the control promotion ($M_{\text{Scarcity}} = 121.5, SD = 66.9$ vs. $M_{\text{Control}} = 120.8, SD = 52.9$; $F(1, 136) = 3.82, p = .053$).³ This result suggests that scarcity promotions elicit physiological changes in hormones shown to be associated with aggressive behavior.

Discussion

The results of study 3 complemented the behavioral findings from studies 1 and 2 by showing that limited-quantity scarcity promotions elicit a physiological change in consumers. Specifically, we showed that scarcity (vs. control) promotions increase testosterone levels in consumers. This suggests that upon exposure to a scarcity (vs. control) promotion, the body automatically prepares itself to act in an aggressive manner. To our knowledge, this is

³ Results are consistent if the other covariates are included in the model (e.g., time of day (Shirtcliff et al. 2002), $F(1, 136) = 4.23, p = .042$; all covariates, $F(1, 128) = 3.09, p = .081$). Results are also consistent if testosterone scores are standardized by gender and combined ($F(1,136), = 4.80, p = .030$). Given this consistency in results, we include only significant covariates in the main analysis.

the first research to show that exposure to a marketing promotion can elicit a physiological change in consumers. The results of study 3 also supported our process claim regarding why limited-quantity scarcity promotions can lead to generalized aggressive behavior. Our framework proposes that exposure to limited-quantity scarcity (vs. control) promotions leads consumers to perceive others as competitive threats to obtaining the target good, and physiologically prepares the body to potentially aggress when given the opportunity to do so. We provide more process support in study 4 by demonstrating the psychological mechanism driving this behavior, while also examining another type of physical violence: punching.

STUDY 4

Study 4 had two goals. First, we sought direct evidence for the psychological process underlying increased aggressive behavior in response to scarcity promotions. Our framework predicts that limited-quantity scarcity promotions can prompt individuals to perceive other consumers as potential competitive threats to obtaining the desired product (hypothesis 2), and this increased threat mediates the relationship between the scarcity promotion and aggressive action. Second, in study 4 we sought to examine yet another type of physical aggression: punching. As mentioned in study 1, given the low likelihood of observing—not to mention the ethical impossibility of encouraging—punching behavior among lab participants, we return to our violent video game paradigm to assess participants' attacking of a target with human likeness.

Procedure

One hundred seven marketing undergraduates (ages 18–41, $M_{\text{age}} = 21.9$, 55.1% female) from Arizona State University participated in this study in exchange for course credit, and were randomly assigned to one of two between-participants conditions (promotional ad: scarcity vs. control). Upon arrival to the lab, participants were seated at the computer station and told that they would be completing a number of unrelated studies, the first of which was to provide feedback to the university bookstore on an upcoming promotion it planned to run. The instructions were identical to those of previous studies, and the university bookstore promotional ad served as our scarcity promotion manipulation. Participants reviewed either the scarcity or control ad from study 1, and answered the same cover story and manipulation check questions. Upon completion of the scarcity ad manipulation, participants were given the same classic video game cover story as study 1, but were instead assigned to play the Wii boxing game *Ready 2 Rumble Revolution*. Participants were provided with an information sheet that outlined how to punch using the Wii controller, but no additional instructions were

given on how participants should behave during the game. These basic instructions were provided to minimize any uncertainty regarding how to punch using a Wii controller, as our main dependent variable was number of punches thrown.

Immediately after reviewing the scarcity manipulation and instructions, the research assistant instructed the participant to stand on a marked spot and to play a 1-minute round of the game. Each gaming session was recorded with participant consent; no participants declined. Importantly, to control for differences in gaming experiencing or prior video game knowledge, we selected a training setting in which the opponent did not fight back. This decision allowed the participant to blatantly aggress against a defenseless “human” opponent, and ruled out provocation as a driver of participant aggression. In addition, this study addresses a minor limitation of study 1, where participants were given a score. While in that study, participants were told that firing recklessly would not increase their score, seeing a score is still “feedback,” in that it is a signal about the normative value of aggression, and a cue of a competitive setting. In this study, no score or performance feedback was given in any way (it was merely a training session). Thus, throwing more punches yielded no strategic benefits, nor could any validation or disapproval (from the game) be inferred. Participants attacked a person that was visually identical to the participant's assigned character (i.e., white male with an average build).

Dependent Variable. The number of punches thrown served as our dependent measure of physical aggression. Two coders, blind to the hypotheses, watched each participant's video and manually counted the number of punches thrown during the 1-minute session. If disagreements arose, both coders rewatched the participant video together until agreement on the number of punches thrown was reached.

Process Measure: Perceived Competitive Threat. After completing the gaming session, participants returned to their computer workstation and completed the following question to measure perceived competitive threat on a scale from 1 (not at all threatening) to 7 (very threatening): “How much do you perceive other people as a threat to you obtaining the product in the promotion?” After completing this item, participants moved on to a separate study.

Results

Manipulation Check. The manipulation check revealed that the scarcity manipulation was successful. Participants perceived the iPhone promotional package quantity to be more scarce in the scarcity versus the control ad ($M_{\text{Scarcity}} = 1.95$ vs. $M_{\text{Control}} = 3.47$; $F(1, 105) = 22.8$, $p < .001$).

Dependent Variable. Supporting hypothesis 1, participants threw marginally more punches at the defenseless opponent after exposure to the scarcity promotion than

after exposure to the control promotion ($M_{\text{Scarcity}} = 68.2$, $SD = 33.4$ vs. $M_{\text{Control}} = 57.3$, $SD = 26.3$; $F(1, 105) = 3.48$, $p = .065$).

Mediation Test. To test the indirect effect, we followed Preacher, Rucker, and Hayes (2007)'s bootstrapping procedure of 10,000 resamples with replacement. Participants exposed to the scarcity promotion perceived other consumers as higher potential threats to obtaining the target product than participants exposed to the control promotion ($M_{\text{Scarcity}} = 5.88$, $SD = 1.50$ vs. $M_{\text{Control}} = 4.78$, $SD = 1.84$; $F(1, 105) = 11.4$, $p = .001$). Next, controlling for scarcity condition, perceived threat significantly predicted the number of punches thrown ($b = 3.86$, $t(104) = 2.23$, $p = .028$). Supporting hypothesis 2 and our overall framework, the indirect effect of scarcity promotion on aggressive behavior through perceived threat was significant ($b = -2.11$, $SE = 3.02$, $CI_{95\%} = -4.85, -0.55$).

Discussion

The results of study 4 support our framework and replicate previous studies, again showing that exposure to a limited-quantity scarcity promotion can lead to more aggressive behavior (hypothesis 1). In addition, we extend the findings of the previous studies in two ways. First, we demonstrate support for our proposed process: perceived competitive threat to obtaining the target good. We found that exposure to limited-quantity scarcity promotions leads consumers to view other consumers as potential threats to obtaining the target product (hypothesis 2), and this increased threat mediates the relationship between the promotional ad and aggressive behavior. Second, study 4 extended the generalizability of our effects by examining yet another type of aggression: physical violence through punching. We found that individuals exposed to a limited-quantity scarcity promotion physically threw more punches at a defenseless, human-like individual than participants exposed to a control ad. In study 5 we provide further support for our proposed process by manipulating perceived threat.

STUDY 5

The goal of study 5 was three-fold. First, we wished to provide further support for our proposed process (hypothesis 2) by manipulating perceived threat. If our theorizing is correct, factors that strengthen the degree to which other consumers are perceived as competitive threats will amplify the degree to which aggressive tendencies are activated upon exposure to scarcity promotions. On the other hand, anything that mitigates the degree to which other consumers are perceived as competitive threats should reduce the activation of such tendencies, making consumers less likely to aggress after exposure. We manipulated perceived threat in study 5 by means of an established proxy: social

affiliation. Research has established that similarity and affiliation with others can reduce a perceived threat to the self by reducing uncertainty and informing consumers how they should feel toward, view, and treat others (Park and Maner 2009). Specifically, feelings of affiliation with others are related to positive affect and subsequent behavior (Hogg et al. 2007). Thus, we manipulated perceived threat by reinforcing a social affiliation between the self and fellow consumers using a manipulation from previous research (Wellen, Hogg, and Terry 1998). Participants wrote down two ways in which they were similar to (low threat) or different from (high threat) other consumers that lived in their city. A separate pre-test ($n = 60$) confirmed that writing about being similar to (vs. different from) people in their city led participants to view fellow consumers as less threatening (see web appendix E for details).

Second, we wished to extend the generalizability of our effects by using a more diverse sample and an additional measure of generalized aggression: preference for violent experiences. In this study, participants were presented with seven pairs of classic video games (one violent and one nonviolent) and chose which of the two games they would like to play at that moment. The proportion of violent games selected served as our measure of generalized aggression.

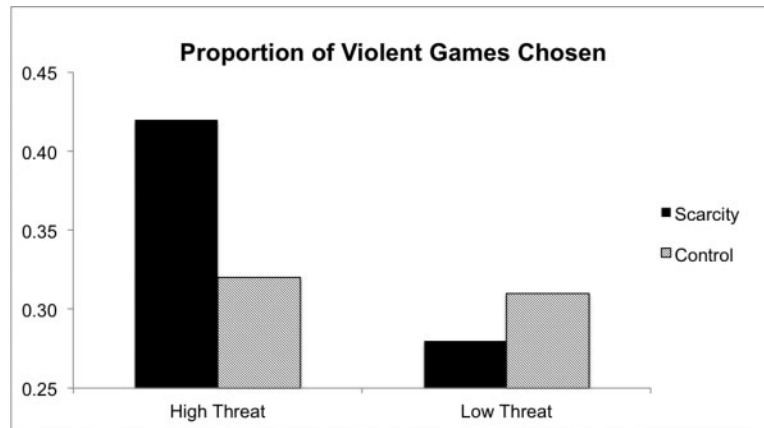
This study also served a third purpose by further disentangling our proposed aggressive-competitive response from a nonaggressive competitive goal by utilizing a dependent measure that detects differences in aggression, while holding competition constant (choice of two competitive video games). If our effects are specific to an aggressive manifestation of competition, we should observe higher preferences for violent experiences after exposure to the limited-quantity scarcity promotion (vs. control) among participants who did not reduce the competitive threat via the affiliation task.

Procedure

One hundred ninety-four participants (ages 19–67, $M_{\text{age}} = 33.6$, 43% female) from Amazon Mechanical Turk participated in this study for \$1, and were randomly assigned to conditions in a 2 (promotional ad: scarcity, control) \times 2 (perceived competitive threat: high, low) between-participants design. Participants were told they would complete two unrelated studies: one on a consumer promotion, and one on classic video games. Participants first completed the perceived threat manipulation, and then were immediately presented with our scarcity manipulation. Specifically, they viewed one of the two promotional ads from study 1 and were told this promotion was from their local electronics retail store (no name or logo was present on the promotional ad). Next they read a scenario about lining up to participate in the local retailer's sale with fellow local consumers. Participants read that they had arrived before the store opened and

FIGURE 1

PREFERENCE FOR VIOLENCE: PROPORTION OF VIOLENT VIDEO GAMES SELECTED (STUDY 5)



were positioned ahead of other local consumers near the front of the line to enter once the doors opened. After completing cover story questions, participants completed an attention check item that asked whether the person next to them in line in the scenario was from their city or a different city (0 = person beside me was from my city, 1 = person beside me was from a different city; Oppenheimer, Meyvis, and Davidenko 2009). Finally, participants moved on to the dependent measure: preference for violent experiences.

Dependent Variable. In study 5, we operationalized aggression as a preference for violent experiences via video game choice. Participants were presented with seven pairs of Super Nintendo games and chose which of the two games they wished to play right now. Pre-testing confirmed that game pairings differed on perceived violence and not other attributes (see web appendix F for details). The number (i.e., proportion) of violent games selected served as our dependent measure, which ranged from 0 (no violent choices) to 1 (all violent choices).

Results

Participants. Seven participants skipped though the scenario without reading and 27 participants failed the instructional attention check and are excluded from the analysis. Thus, the analysis is conducted using 160 participants who completed the study as designed. The pattern of results is consistent if all participants are used.

Manipulation Check. The manipulation check was successful. Participants perceived the iPhone promotional package quantity to be more scarce in the scarcity versus the control ad (1 = very scarce to 7 = very abundant;

$M_{\text{Scarcity}} = 1.49$ vs. $M_{\text{Control}} = 4.84$; $F(1, 156) = 209.4$, $p < .001$). No main effect ($p > .75$) or interactions with perceived threat emerged ($p > .13$).

Dependent Variable. We contrast-coded both promotion ad (−1 = scarcity, +1 = control) and perceived threat (−1 = low, +1 = high) independent variables and entered them in a 2 × 2 ANOVA with the proportion of violent games selected as the dependent variable. The ANOVA revealed a main effect of perceived threat (higher threat led to more violent game choices; $P_{\text{High Threat}} = .37$, $SD = .23$ vs. $P_{\text{Low Threat}} = .30$, $SD = .22$, $F(1, 156) = 4.14$, $p = .044$), but no effect of scarcity promotion ($p > .20$). However, the main effect was qualified by the expected interaction ($F(1, 156) = 3.96$, $p = .048$).⁴ As predicted, participants in the scarcity–high-threat condition expressed a significantly higher preference for violent games than participants in the control–high-threat condition ($P_{\text{Scarcity–High Threat}} = .42$ vs. $P_{\text{Control–High Threat}} = .32$, $F(1, 156) = 4.42$, $p = .032$). However, no differences between scarcity and control ads emerged among participants in the low-threat condition ($P_{\text{Scarcity–Low Threat}} = .28$ vs. $P_{\text{Control–Low Threat}} = .31$, $F(1, 156) = .46$, $p = .499$; see figure 1).⁵

⁴ When participants who failed the attention check were included, the predicted interaction remains consistent ($F(1,183) = 3.82$, $p = .052$) as does the high-threat contrast ($F(1,183) = 4.65$, $p = .032$).

⁵ We also note that participants in the scarcity–high-threat condition expressed a significantly higher preference for violent video games than participants in each of the other three conditions individually ($P_{\text{Scarcity–High Threat}} = .42$ vs. $P_{\text{Scarcity–Low Threat}} = .28$, $F(1, 156) = 8.24$, $p = .005$; $P_{\text{Scarcity–High Threat}} = .42$ vs. $P_{\text{Control–High Threat}} = .32$, $F(1, 156) = 4.42$, $p = .037$; $P_{\text{Scarcity–High Threat}} = .42$ vs. $P_{\text{Control–Low Threat}} = .31$, $F(1, 156) = 4.69$, $p = .032$) as well as against the average of other three conditions ($F(1,156) = 8.49$, $p = .004$).

Discussion

The results of study 5 provide further evidence in support of hypothesis 2 and the role of perceived threat as the underlying process driving aggressive behavior in response to limited-quantity scarcity promotion advertising. Using a diverse sample and another operationalization of aggression, we replicated the results of studies 1–4, such that participants who view other consumers as potential competitive threats to obtaining the target product exhibit more aggressive tendencies after exposure to a limited-quantity scarcity promotion ad. However, when the perceived threat was reduced (in this case through affiliation), the aggression response to scarcity was mitigated.

Study 5 also helped to disentangle a generalized aggressive-competitive response from a nonaggressive competitive response (e.g., drive to win) by demonstrating that consumers exposed to limited-quantity scarcity promotions display a higher preference for violent (aggressive) experiences specifically. To be clear, we do not claim that aggressive and nonaggressive competitive responses to scarcity are orthogonal; however, we argue that the aggression we observe is a specific manifestation of competition that emerges due to the perceived competitive threat from other consumers as a result of the scarcity promotion. In other words, consumers do not go out looking to *win* after exposure to a scarcity promotion, but rather they are predisposed to aggress and act on the physiological reaction elicited by the scarcity promotion.⁶

One limitation of study 5 was its hypothetical nature; participants imagined lining up for a Black Friday promotion (a topic we return to in the General Discussion). Although internally valid, our manipulation of perceived threat lacked generalizability. In order to address this limitation and to provide further evidence for hypothesis 2, we returned to the behavioral lab in study 6 and manipulated perceived competitive threat using a managerially and consumption-relevant factor: brand image association.

STUDY 6

Study 6 had two goals. The first was to provide further conceptual support for the observed phenomenon and

proposed process by manipulating perceived threat using brand image association, a factor that is theoretically and practically relevant for marketers. We predicted that the image of the promoting retail brand would moderate the relationship between exposure to a limited-quantity scarcity promotion and subsequent aggressive behavior. Specifically, we proposed that the associations consumers have with typical shoppers of a specific retail brand would heighten or reduce perceived threat upon exposure to a scarcity promotion. Previous research has found that exposure to a brand strongly associated with specific knowledge structures impacts subsequent consumer behavior (e.g., Fitzsimons, Chartrand, and Fitzsimons 2008). Thus, we proposed that the threat consumers perceived from other shoppers upon exposure to a limited-quantity scarcity promotion may be driven in part by the retail brand offering the promotion. Put another way, consumers will perceive threat from shoppers differently depending on the brand offering the promotion. This suggests that if aggressive associations with a brand's shoppers are low, then the perceived competitive threat of these shoppers should be low, thereby mitigating the generalized aggression we have documented in response to a limited-quantity scarcity promotion. Accordingly, we manipulated perceived threat in this study using brand image.

The second goal of study 6 was to increase the generalizability of our effects. We did so by utilizing two real retail brands in our experimental stimuli and by using a different (nonelectronic) product. To select the appropriate retail brands to use in the study, we content-analyzed the Black Friday Death Count website and selected the major retail brands showing the highest and lowest frequency of aggressive incidents. Thus, we selected Walmart (36%) to serve as the high-threat brand and Nordstrom (3%) to serve as the low-threat brand. A subsequent online pre-test ($n = 117$) confirmed that consumers associated aggression with both the Nordstrom brand and its shoppers significantly less than they did with the Walmart brand (see web appendix G for details).

Procedure

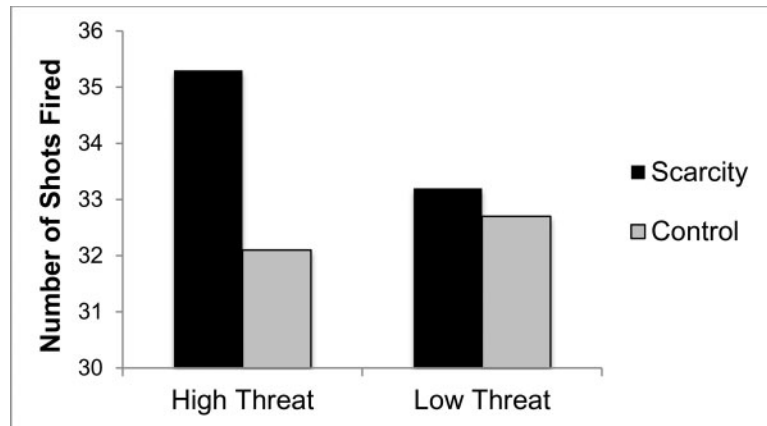
Two-hundred seventy-seven marketing undergraduates (ages 18–49, $M_{\text{age}} = 21.9$, 49.8% female) from Arizona State University completed this study in exchange for course credit and were randomly assigned to one of four conditions in a 2 (promotional ad: scarcity, control) \times 2 (perceived threat via brand association: high, low) between-participants design. Study 6 utilized the firearm shooting experimental paradigm from study 1.

Experimental Manipulations and Stimuli. To ensure our effect was robust across products and product categories, we selected luxury watches as the target product in the promotional ad. We created four promotional ads that

⁶ We also conducted a follow-up study (Amazon MTurk, $n = 176$) to ensure that participants made the explicit connection between affiliation with individuals in one's community and the potential threat of participating in the promotion. This study mirrored the main study with one difference: the perceived threat manipulation occurred immediately after scarcity promotion exposure but before the shopping scenario. Replicating the main study results, a significant interaction emerged ($p = .020$) with the scarcity–high-threat condition expressing a significantly higher preference for violence when tested against the control–high-threat condition ($p = .042$) and the other three conditions ($p = .043$).

FIGURE 2

NUMBER OF SHOTS FIRED AS A FUNCTION OF PERCEIVED THREAT VIA AGGRESSIVE BRAND IMAGE ASSOCIATION (STUDY 6)



featured a Tag Heuer luxury watch for \$50 (retail price was \$1,000) from either Walmart (high threat) or Nordstrom (low threat).⁷ We manipulated scarcity by varying the quantity of watches available (scarcity = 3, control = 3,000). Upon exposure to the promotional ad, participants completed the same scarcity manipulation check as in previous studies (1 = very scarce, 7 = very abundant; see appendix D for stimuli), as well as an attention check (consisting of recalling the promoting brand; Oppenheimer et al. 2009).

Dependent Variable. Participants completed the first-person shooting game and the number of shots fired served as our dependent variable.

Results

Participants. Four participants failed the attention check and are excluded. Thus, the analysis is conducted using 273 participants. The pattern of results is consistent if all participants are included.

Manipulation Check. The scarcity manipulation was successful. Participants who received the scarcity promotional ad perceived the promotional quantity to be significantly more scarce than participants who received the control ad ($M_{\text{Scarcity}} = 1.90$, $SD = 1.48$ vs. $M_{\text{Control}} = 4.75$, $SD = 1.67$, $F(1,269) = 221.0$, $p < .001$). No main effects or interactions with brand emerged ($ps > .23$, NS).

Aggressive Behavior. As in previous studies, shots fired was severely nonnormal ($\Upsilon_{\text{Shots Fired}} = 4.50$, $\omega(273) = .91$, $p < .001$) and was log-transformed. We contrast-coded promotional ad ($-1 = \text{scarcity}$, $+1 = \text{control}$) and perceived threat ($-1 = \text{high}$, $+1 = \text{low}$) and entered them in a 2×2 ANOVA to predict shots fired. Results revealed a main effect of promotional ad ($M_{\text{Scarcity}} = 34.2$, $SD = 6.67$ vs. $M_{\text{Control}} = 24.4$, $SD = 6.63$, $F(1,269) = 6.11$, $p = .014$), but no effect of perceived threat via aggressive brand association ($p > .50$). However, the expected interaction emerged ($F(1,269) = 3.89$, $p = .049$).⁸ Supporting our predictions, when perceived threat was high, we replicated the results from the previous studies. Participants exposed to the scarcity promotion fired significantly more bullets than participants exposed to the control promotion ($M_{\text{Scarcity}} = 35.3$, $SD = 6.69$ vs. $M_{\text{Control}} = 32.1$, $SD = 7.26$, $F(1,269) = 9.53$, $p = .002$). However, when perceived threat was low, no differences emerged between scarcity and control promotional ads ($M_{\text{Scarcity}} = 33.2$, $SD = 6.53$ vs. $M_{\text{Control}} = 32.7$, $SD = 6.07$, $F(1,269) = .13$, $p > .70$; see figure 2).

Discussion

Study 6 provided further insight into consumer aggressive responses to limited-quantity scarcity promotions by manipulating perceived threat using a factor relevant to both consumer behavior researchers and marketers: brand image. Results showed that when the association between

⁷ Both Walmart and Nordstrom sell Tag Heuer watches. Male and female watch ads were created and stimuli were matched to participant gender in the experiment.

⁸ When participants who failed the attention check were included, the predicted interaction remains consistent ($F(1,273) = 2.86$, $p = .092$), as does the high-threat contrast ($F(1,273) = 7.58$, $p = .006$).

brand and perceived threat was high, exposure to a limited-quantity scarcity promotion led to increased aggression among consumers; however, when the association between perceived threat and brand was low, scarcity did not elicit aggressive actions.

We also conducted an additional experiment that manipulated perceived competitive threat in yet another way: through the ability to participate in the promotion. We reasoned that when ability to participate in the promotion is low, such as when the promotion takes place in a distant location, perceived competitive threat of other consumers is reduced, and we should not observe the aggressive response. Thus, we adapted the previous promotional stimuli such that the promotion was conducted at the University of Vermont (pre-tested to be viewed neutrally, not as a rival university but one physically distant from participants' home university). ASU Undergraduates ($n = 239$) took part in a 2 (promotional ad: scarcity, control) \times 2 (perceived threat: high, low) between-participants design in which participants evaluated one of the two iPhone promotions from either the home university (high perceived threat) or from the University of Vermont (low perceived threat). After exposure to the promotion, participants were given the opportunity to aggress via the firearm-shooting paradigm from study 1. Results revealed the expected interaction ($p < .05$) and moderation. Participants in the high-threat condition (home university) fired significantly more bullets after exposure to the scarcity versus control ad, but the effect was attenuated when perceived threat was low (University of Vermont promotion; see web appendix H for full details). Taken together, the results from the main and ancillary studies provide further evidence for our claim that perceived threat of other consumers is the process through which limited-quantity scarcity promotions elicit aggressive behavior. We provide additional support for our conceptual process in study 7 by examining a boundary condition for our effects: type of scarcity promotion.

STUDY 7

The primary goal of study 7 was to provide further evidence for our process claim that the type of scarcity promotion affects the perceived competitive threat of other consumers and thus the likelihood of aggression in response to scarcity (hypothesis 4). Marketers primarily use two types of scarcity promotions to attract consumers: limited quantity and limited time. For example, while the majority of Black Friday promotions utilize limited-quantity scarcity promotions, retailers often run promotions throughout the year that offer a deal for a specific time period, with no limit on product quantity (e.g., "One Day Only," "Sale Lasts Until Noon"). Given that all consumers who participate in a limited-time promotion can

secure the promotional product as long as they arrive within the allotted time, the competitive threat other consumers play in inhibiting product acquisition is attenuated. Thus, our framework predicts that aggressive behavior should not result from scarcity promotion exposure when the promotion limits the time the product is available. A separate pre-test confirmed that the competitive threat other consumers pose is perceived to be significantly higher in limited-quantity promotions than both limited-time promotions and promotions in which no mention of quantity or time is present (both of which did not differ from each other; see web appendix I for full details).

In addition, in study 7 we sought to provide further construct clarity between aggressive and nonaggressive competitive responses to scarcity promotions, by including dependent measures of both. Specifically, in study 7 we presented participants with an additional task (an online word search game) that is competitive, but not aggressive. If scarcity promotions activate a generalized competitive or achievement goal (vs. a specific aggressive manifestation of competition), then results should align across both the aggressive and nonaggressive competitive tasks. However, consistent with our theorizing, we contend that only limited-quantity scarcity promotions will lead to an increase in aggressive competitive tasks.

Finally, study 7 again utilized a control-information omitted condition in which no reference to product quantity or promotional time is present (as in study 2) to add further confidence that the increased aggression is due to exposure to scarcity (and not abundance). Our framework predicts that participants exposed to the limited-quantity promotional ad will behave more aggressively than participants exposed to the control ad; however, we expect no differences in aggressive behavior between participants exposed to the limited-time and control ads.

Procedure

One hundred fifty-two undergraduates (ages 18–38, $M_{\text{age}} = 20.3$, 50.9% female) from Arizona State University participated in this study in exchange for course credit and were randomly assigned to one of five conditions in a 2 (promotional ad: scarcity, control) \times 2 (scarcity type: quantity, time) + 1 (control-information omitted) between-participants design. Participants arrived in groups of eight to 12 and were seated at individual computer terminals. The procedure of study 7 mirrored that of study 1 (firearm shooting paradigm).

Scarcity Manipulation. Participants received one of five iPhone promotional ads that served as our manipulation. Participants in the quantity conditions either received a promotional ad in which 3 (scarcity) or

3,000+ (control) products were available. Participants in the time conditions received a promotional ad in which the sale lasted for 1 day only (scarcity) or 30+ days (control; see appendix E for time stimuli). Participants in the control-information omitted condition received the identical ad, but no reference to quantity or time was made. Participants next completed the same cover story questions as in previous studies and the following manipulation check items on a scale from 1 (very scarce) to 7 (very abundant): “How would you describe the university bookstore’s iPhone 6 promotional package quantity (time length)?”

Aggressive versus Nonaggressive Competitive Behavior. Upon exposure to the promotion participants were given the classic video game cover story as in study 1; however, we modified the previous procedure such that participants played two competitive games: one that was aggressive and one that was not aggressive. To measure aggressive behavior, we utilized the first-person shooting game (*Deadeye*) as in study 1, with the number of shots fired serving as our dependent measure. To measure a generalized (nonaggressive) competitive goal, participants played a 1-minute round of an online word search game on the most difficult setting. Participants were instructed that the goal of the game was to find as many words as possible in the 1-minute round, and the number of words found served as our dependent measure of nonaggressive competitive orientation. Presentation order of the two games was counterbalanced. As in study 1, we used the Morae recording software to remotely record and quantitatively measure participant behavior for both games. Two coders, blind to the hypothesis, watched each individual participant video and recorded both the number of shots fired (aggressive competitive) and number of words found (nonaggressive competitive).

Results

Manipulation Checks. The two manipulation checks revealed that the manipulations worked as intended. Participants in the limited-quantity condition perceived the iPhone promotional quantity to be significantly more scarce than participants in control-quantity conditions ($M_{\text{Limited-Quantity}} = 1.76$, $SD = 1.34$ vs. $M_{\text{Control-Quantity}} = 4.00$, $SD = 1.61$, $F(1,130) = 38.4$, $p < .001$). Participants in the limited-time condition perceived the iPhone promotional time length to be significantly more scarce than participants in the control-time condition ($M_{\text{Limited-Time}} = 3.00$, $SD = 1.94$ vs. $M_{\text{Control-Time}} = 4.83$, $SD = 1.85$, $F(1,136) = 17.3$, $p < .001$).

Aggressive Behavior. We first sought to test our prediction that the type of promotion moderated the relationship between scarcity promotions and aggressive behavior. As in previous studies, the number of shots

fired was severely nonnormal ($\Upsilon_{\text{Shots Fired}} = 7.25$, $\omega(152) = .82$, $p < .001$) and was log-transformed. We contrast-coded both the scarcity condition ($-1 = \text{scarcity}$, $+1 = \text{control}$) and scarcity type ($-1 = \text{quantity}$, $+1 = \text{time}$) independent variables and entered them in a 2×2 ANOVA to predict aggressive behavior.⁹ Results revealed no effect of scarcity condition ($p > .95$) but a main effect of scarcity type ($M_{\text{Quantity}} = 33.0$, $SD = 5.37$ vs. $M_{\text{Time}} = 30.5$, $SD = 5.75$, $F(1,130) = 5.18$, $p = .025$). However, this main effect was qualified by the predicted two-way interaction ($F(1,130) = 8.37$, $p = .004$). Supporting hypothesis 4 and replicating the previous results, participants exposed to the limited-quantity promotional ad fired significantly more bullets than participants exposed to the control-quantity promotional ad ($M_{\text{Limited-Quantity}} = 34.2$, $SD = 6.28$ vs. $M_{\text{Control-Quantity}} = 31.8$, $SD = 3.85$, $F(1,130) = 4.69$, $p = .032$). However, the time condition did not elicit the same aggressive outcome, as participants in the limited-time condition in fact fired marginally fewer bullets than participants exposed to the control-time promotional ad ($M_{\text{Limited-Time}} = 30.0$, $SD = 3.24$ vs. $M_{\text{Control-Time}} = 31.2$, $SD = 7.64$, $F(1,130) = 3.75$, $p = .055$). Although unexpected, this result may have occurred because the limited-time promotion served as an explicit cue that minimized the perceived threat of other consumers and subsequent aggressive action by signalling that aggression is not necessary. Importantly, to show that the observed aggressive actions are caused by an *increase* in shots fired in the limited-quantity condition, we performed a planned contrast against the control-information omitted condition. Supporting our claim, participants exposed to the limited-quantity promotion fired significantly more bullets than participants exposed to the control-information omitted condition ($M_{\text{Limited-Quantity}} = 34.2$, $SD = 6.28$ vs. $M_{\text{Control-Information Omitted}} = 31.6$, $SD = 7.67$, $F(1,147) = 4.08$, $p = .045$; see figure 3).¹⁰

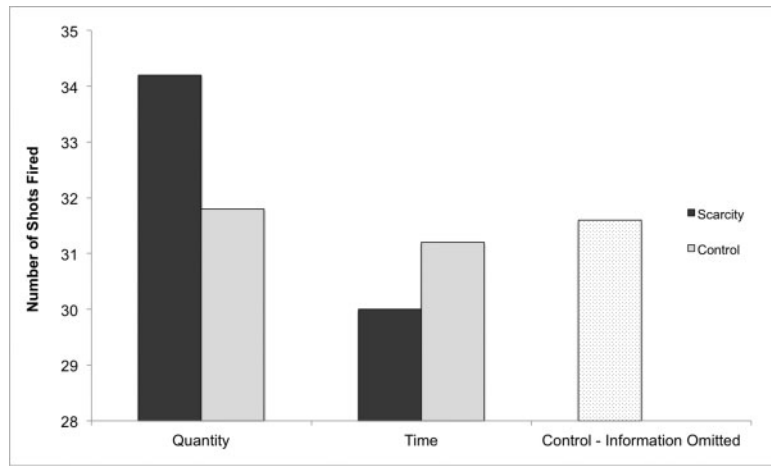
Aggressive versus Nonaggressive Competitive Behavior. Next, we sought to show that the observed effects were specific to aggressive competitive behaviors and not simply an increase in competitive behavior more broadly. We conducted the same ANOVA with the number

⁹ We conducted an ANOVA with presentation order of the two tasks as an additional factor. No interactions with the scarcity condition or scarcity type variables emerged ($ps > .16$). Moreover, the main effect and reported interaction remain significant if order is left in the model. Thus, we collapsed across the order factor and report the 2×2 ANOVA.

¹⁰ We also analyzed the data using a one-way design to utilize all five cells of the design. The ANOVA yielded significant differences across conditions ($F(4,147) = 3.39$, $p = .011$), with participants in the limited-quantity condition exhibiting significantly more aggression compared to participants in the other conditions ($t(147) = 3.02$, $p = .003$).

FIGURE 3

AGGRESSIVE BEHAVIOR: NUMBER OF SHOTS FIRED (STUDY 7)



of words found as the dependent measure. If exposure to a limited-quantity ad elicited a general increase in competitive behavior, we should have observed the same pattern of results as the firearm shooting measure. However, supporting our theorizing that scarcity promotion exposure manifests in aggressive behavior, no differences in the number of words found emerged across conditions (main effect $p > .30$, interaction $p > .16$). While strong conclusions cannot be drawn from a null result, subsequent analysis showed that the correlation between shots fired and number of words was negative ($r = -.23$, $p = .004$), suggesting that the two outcomes were operating independently, and lending support for our claim that the effect is specific to aggressive behavior.

Discussion

The results of study 7 provide further insight into aggressive reactions to scarcity promotions by examining a moderator of both theoretical and practical importance: type of scarcity promotion. When participants were exposed to promotional material that limited the quantity of the desired product and emphasized competition between consumers, we replicated the results of studies 1–6 such that participants reacted with increased aggression. However, promotional material that limited time did not elicit the same aggressive outcomes. Given that the threat of other consumers limiting one's ability to obtain the desirable product is present in limited-quantity, but not limited-time, promotions, the results of study 7 further support

our overall framework and process claims. In addition, study 7 helped provide construct clarity, suggesting that scarcity promotions can alter consumer aggressive competitive responses, but do not lead to a generalized achievement motivation mind-set.

GENERAL DISCUSSION

Across seven studies, we demonstrate the existence of a dark side to scarcity promotions: aggression. We propose a framework to outline the process that drives when and why consumers may turn to violence and identify contexts when scarcity promotions will not lead to aggression. In study 1, we found that consumers exposed to limited-quantity scarcity promotions behave more aggressively than participants exposed to a control ad featuring identical highly desired products. Operationalizing aggression as firearm shooting behavior, we found that exposure to a limited-quantity scarcity promotion led to participants firing significantly more bullets than exposure to a control ad. In a real consumption context, study 2 showed that participants exposed to a limited-quantity scarcity promotion physically assaulted a vending machine significantly more than participants exposed to a control promotion, and a promotion in which no mention of quantity was present. Study 3 provided support for our proposed process and demonstrated that exposure to a limited-quantity scarcity (vs. control) promotion led to increased levels of testosterone—a hormone shown to be predictive of aggressive behavior—among participants. Study 4 demonstrated support

for our claim that realized aggression is driven by the perceived competitive threat of other consumers. Using physical punching as our behavioral measure of aggression, we showed that exposure to limited-quantity scarcity promotion advertising led consumers to perceive others as potential competitive threats to obtaining the target product. This increased threat, in turn, led to participants throwing significantly more punches at a defenseless target. Study 5 provided further support for our proposed process by manipulating perceived threat using social affiliation as a proxy for threat. Study 6 manipulated perceived competitive threat via brand image association using two real brands and a different focal product. Finally, by examining promotion type, study 7 showed that the aggressive reaction to scarcity promotions occurs when the promotion limits quantity, but not time.

Contributions

This research makes a number of theoretical and substantive contributions. Theoretically, we add to the scarcity literature by showing that the observed response of aggression extends beyond life-threatening and retailer-induced consumption contexts and can result from exposure to advertising featuring nonessential goods. To our knowledge, this research is the first to show that advertising can drive consumers to aggress in response to scarcity of nonnecessity luxury items. The present research contributes by showing that aggressive tendencies from scarcity not only happen in such contexts, but more importantly can *originate* from mere exposure to scarcity marketing materials and *generalize* outside of the promotional context. This suggests that marketplace aggression can actually be activated before a consumer even reaches the store.

We also theoretically contribute to recent scarcity findings (Shah et al. 2012; Roux et al. 2014) by demonstrating that scarcity promotions can lead consumers to engage in dangerous and antinormative behavior toward others. Our results support previous work by showing that scarcity cues can lead to an increased focus on one's present environment, but extend knowledge by showing that consumers may be willing to risk significant costs to achieve their present goal. Further, we show these tendencies can result in generalized aggressive actions, meaning that the target of the aggression need not be a person who is actually competing for the scarce items, nor does the target need be a person at all.

In addition to showing the negative behavioral outcome of aggression, we provide evidence for the process driving our effects. We find that exposure to limited-quantity scarcity promotion advertising can lead consumers to perceive others as potential competitive threats to obtaining the

focal product, and prepares consumers to aggress by increasing testosterone levels. To our knowledge, this is the first research to empirically demonstrate that a marketing tactic can automatically elicit physiological changes and, in turn, lead consumers to behave aggressively when given the opportunity to do so. We provide evidence for this claim by both directly measuring testosterone levels and perceived threat, and by manipulating threat using social connection, brand image, and ability to participate in the promotion as proxies. Importantly, we provide further evidence for our proposed process examining the type of scarcity promotion. Specifically, we find that aggressive responses to scarcity result when the promotion limits available quantity, but not available time. This is because under quantity restraints, obtaining the promotion before other consumers is imperative to successful acquisition; thus, the perceived competitive threat of other consumers is high. However, as long as all consumers who choose to participate in a limited-time promotion arrive within the allotted window to obtain the product, the competitive threat other consumers pose is attenuated and aggression does not result.

Finally, our research makes important substantive contributions to firms, consumers, and policy makers. For practitioners, the knowledge that scarcity promotions may activate aggression among consumers allows firms to design promotions more effectively by better managing both product availability and potential altercations that can lead to costly negative consumer-brand experiences (e.g., more efficient retail layouts, multiple sales channels). Further, marketers could choose to implement limited-time promotions if they seek to reduce the likelihood of physical altercations and the accompanying media hype. From a consumer standpoint, those planning to purchase a limited-quantity product may seek out alternative points of purchase, such as online or secondhand outlets, rather than physically shopping inside the retail outlet. Moreover, if consumers choose to participate in the promotion alongside other consumers, awareness of potential aggressive tendencies a priori can help to control one's responses and minimize the potential for harm. Finally, from a public policy perspective, a better understanding of negative consumer responses to scarcity promotions can help policy makers better regulate these types of marketing tactics to proactively protect consumer welfare. This may be achieved by ensuring adequate staff-to-consumer ratios, requiring trained security staff in retail stores during promotional periods, or directly regulating the use of promotional tactics that employ scarcity methods. These types of policy changes are likely to ensure the safety of consumers and firm employees alike.

Limitations and Directions for Future Research

While we believe this research makes important contributions to both theory and practice, it is not without its limitations. One such limitation is relationship clarity regarding our psychological and physiological process claims that drive generalized aggression in response to scarcity promotions. Specifically, while we empirically demonstrate that limited-quantity scarcity promotions both prompt consumers to perceive others as competitive threats and elicit physiological responses associated with aggression, we are unable to definitively isolate the relationship between these two processes. Do they operate in a causal chain such that scarcity promotion exposure elicits the automatic physiological response of increased testosterone, which in turn leads to threat perception and subsequent aggression, or do they operate independently (e.g., in parallel) and jointly drive subsequent aggression? Currently, we are unable to clarify this relationship and call on future research to examine the relationship between these constructs more closely.

Moreover, further clarity is needed regarding how consumers actually experience the heightened competitive threat upon exposure to scarcity promotions. Do consumers explicitly visualize or anticipate an aggressive altercation upon exposure to the promotional ad, or do they just think more generally about the fact that other shoppers have also seen the ad and will want to obtain the product as well? While our results appear to be consistent with a preparation-to-interact/visualization type of process documented to result from automatic primes (Berkowitz and LePage 1967; Cesario, Plaks, and Higgins 2006), it is also possible that consumers do not explicitly try to visualize a specific altercation between them and other shoppers but instead form a more vague perception of other shoppers as a potential competitive threat. Our data does not definitively answer what it means for participants to perceive other consumers as a competitive threat, and future research is needed to uncover what this process entails psychologically, as well as physiologically.

We believe our work provides researchers many opportunities for future research. For example, a natural extension of our work would be to examine the relationship between scarcity promotions and aggression in online shopping environments. We used physical ads to manipulate scarcity, but might our findings differ in online shopping contexts? Moreover, while we focused our investigation on aggressive reactions to scarcity promotions, future research could examine other downstream consequences, such as store or brand evaluation or

compensatory shopping behavior. Another important extension for future research could be to examine the duration of our documented aggressive responses to scarcity promotions. In our investigation, aggressive behavior was measured shortly after exposure to the promotional ad, but does this response dissipate or get worse over time? Given the multitude of scarcity promotions occurring during shopping-oriented holidays such as Black Friday, it might also be interesting to examine how exposure to multiple ads within a short period of time interacts with aggressive responses.

In conclusion, our research demonstrates that scarcity-driven aggression is not confined to life-threatening or even retailer-induced consumption environments, but can result from mere exposure to scarcity promotional advertising. Across seven studies, multiple contexts, and numerous behavioral measures of aggression, we find that exposure to limited-quantity scarcity promotions leads consumers to behave more aggressively. We show that scarcity promotion advertising drives consumers to perceive others as potential threats to obtaining the desired product, biologically prepares the body to aggress, and leads to violence when the opportunity arises. Thus, when the doors open on Black Friday and the consumers rush in, racing toward the few discounted items, the aggression that ensues likely originated long before they entered the store, as soon as they saw the first Black Friday ad.

DATA COLLECTION INFORMATION

The first author supervised the collection of data by research assistants for study 1 at the University of British Columbia in spring 2013 and analyzed the data. The first author supervised the collection of data by research assistants for study 2 at the University of British Columbia in spring 2015 and analyzed the data. The third author supervised the collection of data by research assistants for study 3 at Arizona State University in spring 2015. The Arizona State University Institute for Interdisciplinary Salivary Bioscience Research generated the data and all authors analyzed the data. The third author supervised the collection of data by research assistants for study 4 at Arizona State University in winter 2013 and all authors analyzed the data. The first author collected the data for study 5 on Amazon Mechanical Turk in spring 2014 and analyzed the data. The third author supervised the collection of data by research assistants for study 6 at Arizona State University in spring 2014 and the first author analyzed the data. The third author supervised the collection of data for study 7 at Arizona State University in winter 2014 and the first author analyzed the data.

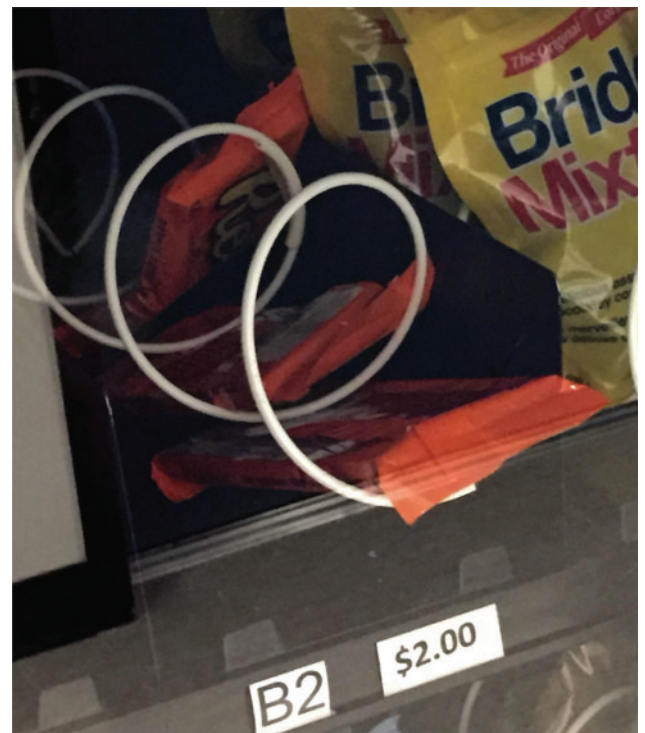
**APPENDIX A
STUDY 1 STIMULI**

Scarcity Promotion

Control Promotion

**APPENDIX B
STUDY 2 CONTROL STIMULI**

**APPENDIX C
STUDY 2 PRODUCT JAM**



APPENDIX D WALMART/NORDSTROM PROMOTIONS (STUDY 6)

Walmart 

PROMOTIONAL SALE



~~\$1,000~~
small value

ONLY \$50

3,000+ AVAILABLE TO CUSTOMERS!

Women's Tag Heuer Link Watch

Swiss-made; quartz movement
Scratch-resistant sapphire crystal dial
Double anti-reflective treatment
Deployant clasp closure.
Water-resistant to 660 feet (200 M)

DOORS OPEN AT 9:30 AM

3,000+ AVAILABLE!

NORDSTROM

PROMOTIONAL SALE



~~\$1,000~~
small value

ONLY \$50

ONLY 3 AVAILABLE TO CUSTOMERS!

Men's Tag Heuer Link Watch

Swiss-made; quartz movement
Scratch-resistant sapphire crystal dial
Double anti-reflective treatment
Deployant clasp closure.
Water-resistant to 660 feet (200 M)

DOORS OPEN AT 9:30 AM

ONLY 3 AVAILABLE!

APPENDIX E TIME PROMOTION STIMULI (STUDY 7)

Scarcity Promotion

ASU  

PROMOTIONAL SALE



~~\$699~~
small value

ONLY \$50

SALE LASTS FOR 1 DAY ONLY!

iPhone 6 64GB

ALSO AVAILABLE

FLEXIBLE CONTRACT OPTIONS
PROTECTIVE CASES
iPhone ACCESSORIES
iTunes GIFT CARDS

DOORS OPEN AT 9:30 AM

1 DAY ONLY!

Control Promotion

ASU  

PROMOTIONAL SALE



~~\$699~~
small value

ONLY \$50

SALE LASTS FOR 30+ DAYS!

iPhone 6 64GB

ALSO AVAILABLE

FLEXIBLE CONTRACT OPTIONS
PROTECTIVE CASES
iPhone ACCESSORIES
iTunes GIFT CARDS

DOORS OPEN AT 9:30 AM

30+ DAYS!

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