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The Effect of Red Background Color on Willingness-to-Pay: The Moderating Role of Selling Mechanism

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The authors investigate the effect of red backgrounds on willingness-to-pay in auctions and negotiations. Data from eBay auctions and the lab show that a red (vs. blue) background elicits higher bid jumps. By contrast, red (vs. blue) backgrounds decrease price offers in negotiations. An investigation of the underlying process reveals that red color induces aggression through arousal. In addition, the selling mechanism—auction or negotiation—alters the effect of color by focusing individuals on primarily competing against other bidders (in auctions) or against the seller (in negotiations). Specifically, aggression is higher with red (vs. blue or gray) color and, therefore, increases bid jumps in auctions but decreases offers in negotiations.

Colors play an important role in affecting our perceptions. They form an omnipresent part of our daily lives, influencing our interactions with other individuals and with inanimate objects. Colors are ubiquitous in consumer contexts. Identical products are often sold in different colors or with different colors of packaging. Shopping mall walls, aisles, and displays use multiple colors. Website backgrounds and product displays use varied colors. Furthermore, colors are integral in ads and in company logos. Yet, little is known about how color affects consumers' willingness-to-pay in purchase settings such as auctions and negotiations. We study how red versus blue colors influence consumers' willingness-to-pay in such purchase settings and investigate the underlying process.

We posit that color influences willingness-to-pay through aggression. Indeed, the literature on animal behavior suggests that red signals vigor and dominance and induces aggression (Andersson et al. 2002; Cuthill et al. 1997). Similar findings are reported among humans (Babbitt 1878; Gerard 1957; Hill and Barton 2005; Little and Hill 2007). The extant literature, however, provides inconclusive evidence about how aggression manifests in different purchase environments. We argue that color-induced aggression may have two disparate effects in purchase settings: a greater desire to acquire an object or a desire to get the best possible deal. Depending on which of these two effects predominates, results might differ. Because consumers compete with other bidders in auctions, we expect aggression to elicit a greater desire to acquire the object. Consequently, we expect aggression to elicit a higher willingness-to-pay in auctions. Negotiations, in contrast, pit the consumer against a seller. We expect aggressive negotiators to desire the best possible deal, and we therefore expect lower willingness-to-pay in negotiations.

Because red induces greater aggression relative to blue, we posit that red would elicit higher willingness-to-pay in auctions but would lower willingness-to-pay in negotiations. We also study the role of color in fixed-price settings where the price is posted by the seller (e.g., in a store) and the consumer decides whether to buy. Because consumers com-

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pete with a seller when faced with a fixed price, as they do in negotiations, we expect color to induce effects similar to those in negotiations: lower willingness-to-pay with red relative to blue.

Across three studies, we show that red (vs. blue) backgrounds affect behavior differently in auctions and negotiations. Delving deeper into the process, we show that red background color induces aggression via a feeling of arousal. Furthermore, red increases arousal-induced aggression relative to blue or gray backgrounds. This aggression causes individuals to enter higher bid jumps in auctions but to make lower offers in negotiations. Thus, the selling mechanism—auction or negotiation—moderates the effect of color on willingness-to-pay.

THEORETICAL BACKGROUND

A rich collection of literature documents the influence of environment on consumer decision making (Chebat and Morrin 2007; Mandel and Johnson 2002). Belk (1975) and Kotler (1973–74) suggest that environmental cues such as noises, sizes, shapes, scents, and colors influence consumer perceptions and purchases. We focus on one specific cue: the color that consumers are exposed to in the environment.

Physiological Effects of Color on Humans

Research focusing on the physiological effects of color on humans dates back over 100 years (Babbitt 1878). Most of this research contrasts the effects of red colors with those of blue, with some exceptions. These colors are chosen because red and blue are on opposite sides of the color spectrum (red is the warmest, while blue is the coolest) and have a strong influence on behavior. For instance, Babbitt (1878) finds that red aggravates violent patients more than blue. Similarly, Gerard (1957) reports that, relative to blue, red increases blood pressure, respiratory rate, and eye blink frequency. Furthermore, skin-conductance studies find red to be more arousing than green (Wilson 1966) and blue to be more relaxing than red (Jacobs and Hustmyer 1974). The physiological correlates of aggression are similar to those that are influenced by color. For instance, autonomic and cardiovascular reactivity (measured via skin conductance, blood pressure, and heart rate) to stressful events is higher among aggressive individuals (Lorber 2004; Patrick 2008; Suls and Wan 1993). Thus, by increasing autonomic and cardiovascular activity, red (vs. blue) colors may facilitate an aggressive response to purchase stimuli.

Effect of Color on Emotions, Perceptions, and Performance

Colors have a significant effect on emotions. Hemphill (1996) shows that brighter colors (e.g., white, pink, red, blue) elicit more positive reactions (e.g., happy, excited) than do darker colors (e.g., brown, black). Red induces aggression and excitation, while green induces withdrawal, and black, anxiety.

The role of color in influencing consumer perceptions is also well studied. Colors help differentiate a brand and influence brand evaluations (Gorn et al. 1997; Macklin 1996). More recently, Labrecque and Milne (2011) find that a brand's use of the color red (along with other warm colors such as orange) conveys more excitement than cooler colors (such as blue). Colors of web page backgrounds also affect consumers. Specifically, Gorn et al. (2004) find that colors which induce relaxation (such as blue vs. yellow or red) shorten perception of download time. Similarly, study participants judge hospital rooms with blue walls as less stressful, and orange rooms as more arousing, relative to rooms with white walls (Dijkstra, Pieterse, and Pruyn 2008). Finally, colors also affect performance. Mehta and Zhu (2009) show that while red enhances performance on detailed tasks, blue helps performance on creative tasks (Hatta et al. 2002).

Although the current research focuses on hue (red vs. blue), the two other dimensions of color—saturation and value—have been receiving more attention in recent work (Gorn et al. 1997, 2004). Consistent with recent research benchmarks (Mehta and Zhu 2009), we control the level of saturation and value (saturation = 240; lightness = 120) and manipulate only the hue to be red (0) or blue (160). In order to provide process support, we do, however, compare our results with gray and white, even though these differ from red and blue on several dimensions (gray: hue = 0, saturation = 0, lightness = 120; white: hue = 0, saturation = 0, lightness = 240).

Effect of Color on Shopping Behavior

There is limited research on the influence of color on consumer purchases. Comparing shopping behaviors, Bellizzi and Hite (1992) find that red induces more negative outcomes relative to blue. In particular, red (vs. blue) decreases purchase incidence, increases purchase postponement, and decreases browsing and search. The authors argue that although red is physically more arousing relative to blue, blue confers more positive values (calm and cool) than red (tense) and thus influences buyer perceptions and behaviors favorably. Crowley (1993) shows that stores with blue (vs. red) colored walls are considered more relaxing and pleasant.

In spite of its importance, the effect of color on willingness-to-pay has received very little attention. The majority of research on shopping contexts studies consumers' evaluation of the store, with some focus on the qualitative evaluation of the product (Chebat and Morrin 2007). We demonstrate the effects of red and blue colors on willingness-to-pay in auctions and negotiations and investigate the role of arousal and aggression as mediators.

Effect of Color on Aggression

A significant amount of research documents the influence of red colors on aggression among animals (Cuthill et al. 1997). For instance, among red-collared widowbirds, the red-colored carotenoid collar signals status in male contests

(Pryke, Lawes, and Andersson 2001). Moreover, resident widowbirds, who fight in order to retain territorial controls, possess larger and redder collars than floaters who do not have a territory to protect (Andersson et al. 2002). Healey, Uller, and Olsson (2007) find that red-colored male lizards are more likely to win contests against yellow-colored compatriots. These results are consistent with other studies, conducted among the Gouldian finch (Pryke and Griffith 2006), widowbirds (Pryke and Andersson 2003), and cichlids (Evans and Norris 1996).

Similar effects of color have been observed for humans. For instance, Hill and Barton (2005) show that across a variety of Olympic sports, competitors who are randomly assigned red (vs. blue) uniforms are more likely to win. They suggest that this occurs because red (vs. blue) induces greater aggression. Little and Hill (2007) find that participants rate red (vs. blue) shapes as being more dominant and more likely to win physical competitions.

While the positive effect of red (vs. blue) on aggression has been demonstrated unequivocally, the reasons behind these effects are unclear. On the one hand, associations with color may be learned. Little and Hill (2007) note that metaphorical use of terms such as "red-colored fire" or "fiery-tempered" may create associations. And because anger turns individuals red and angry individuals often win, people associate red with dominance and aggression. On the other hand, fear of red may be innate. Pryke (2009) shows that birds instinctively fear birds with red heads, even when they have not learned to do so. This suggests that color associations are not learned but that the brain may be genetically hardwired to fear red.

From a physiological standpoint, higher autonomic and cardiovascular responses to stress (measured via skin conductance, blood pressure, and heart rate) lead to greater aggression (Lorber 2004; Patrick 2008; Suls and Wan 1993). Because red (vs. blue) increases autonomic and cardiovascular responses (Gerard 1957; Jacobs and Hustmyer 1974; Wilson 1966), these responses may induce greater aggression.

In summary, although the reasons for why red (vs. blue) is the signal of aggression are unclear, the effects are robust. Across a wide variety of species, red induces greater aggression relative to blue. Next we discuss the process through which color may affect aggression.

Mediating Processes for the Effect of Color on Aggression

Given the many ways in which aggression can be measured (e.g., physiological, psychological, physical), it is important to delineate what aggression means in selling contexts. In a recent review, Anderson and Bushman (2002, 28) define aggression as "any behavior directed toward another individual that is carried out with the proximate (immediate) intent to cause harm." The authors differentiate hostile behaviors (e.g., thoughtless unplanned behaviors incited by anger that are affective or reactive responses) from instrumental aggression (premeditated response). In prior research, Buss and Perry (1992) used a four-factor scale to measure aggression. The scale comprises items that measure physical aggression, verbal aggression, anger, and hostility. A shortened version of this scale, developed by Bryant and Smith (2001), uses 12 items that tap into these four factors. This is a widely used scale and is perhaps one of the most cited measures of aggression (Diamond and Magaletta 2006, 228). Because we do not have an a priori reason to expect one form of aggression (e.g., anger or hostility) to dominate the others, we use this four-factor structure to measure aggression.

Furthermore, Anderson and Bushman (2002), in their generalized model of aggression, suggest different routes through which aggression manifests itself. They argue that cognitions, affect, and arousal can incite aggression. Cognitions are hostile thoughts that occur when certain environmental variables trigger aggressive concepts in memory. Frequent associations can make these concepts chronically available such that when the environmental prime is presented, it activates hostile thoughts and triggers aggression. We do not expect color-induced aggression to occur via a cognitive route in purchase contexts because color is not likely to be linked to learned hostile thoughts in these situations. We do acknowledge that cognitions may act in cohort with affect or arousal and highlight this possibility in the General Discussion section.

Color-induced aggression may, however, occur via an affective route or through arousal. Indeed, research suggests that negative affect can lead to aggression (Anderson, Anderson, and Deuser 1996). For instance, a violent movie can increase hostile feelings and aggression (Anderson 1997). Arousal can also influence aggression. Anderson and Bushman (2002) argue that arousal can lead to aggression in three ways: it can activate aggressive tendencies, it can be misattributed to anger and therefore lead to aggression, or it might feel like an aversive state and consequently trigger aggression.

Of the two possible mediating processes—affect or arousal—we do not have an a priori reason to expect one route to dominate the other. We note, however, that the influence of red (vs. blue) colors on arousal is better documented than its effects on affect. Indeed, research consistently demonstrates that red is more arousing, both physiologically (Babbitt 1878; Gerard 1957) as well as psychologically (Dijkstra et al. 2008; Labrecque and Milne 2011). By contrast, research does not conclusively demonstrate a consistent influence of red versus blue color on affect. Hemphill (1996, 275) notes that only a "few studies have focused on color-emotion associations." Further, he finds that blue colors, as well as red, elicit positive responses, including happy, excited, relaxed, and positive feelings. Similarly, Hatta et al. (2002) find no differences in mood for red versus blue color. By contrast, Bellizzi and Hite (1992) find that red colors elicit more negative feelings relative to blue.

In summary, because we do not have a strong reason to expect an arousal-based route over an affect-based one, we

leave this as an empirical question to be answered in study 3, where we measure arousal and affect as two potential routes through which color may affect aggression.

Effect of Aggression on Willingness-to-Pay: Moderating Role of Selling Mechanism

What does aggression entail in purchase settings? On the one hand, an aggressive buyer may want to ensure acquisition of the sold item. In such situations, aggression would increase willingness-to-pay. On the other hand, an aggressive buyer may try and get the best deal possible from the seller. Such aggression would decrease willingness-to-pay. A priori, it is not obvious whether (or why) aggression would raise or lower willingness-to-pay.

We propose that the influence of aggression on willingness-to-pay may depend on the type of selling mechanism. This is because the mechanism determines whether the buyer competes primarily against other buyers or against the seller. In auctions with multiple bidders, aggressive buyers may want to ensure acquisition. Therefore, aggressive bidders might offer higher bid jumps to increase their chance of winning the auction. Indeed, Sinha and Greenleaf (2000) qualitatively label higher-magnitude bid jumps as more aggressive, although their work does not explicitly test the link between aggression and bids.

By contrast, buyers who negotiate with a seller (e.g., when buying a car) try to get the best deal possible. Aggressive buyers would make low offers in such a negotiation. Buyers, who are unwilling to raise their offer in a negotiation, instead seeking unilateral concessions from the seller, are often labeled as aggressive (Ganesan 1993; Pruitt 1981). However, the link between an individual-level measure of aggression and negotiation behavior as it relates to willingness-to-pay has not been demonstrated in prior literature.

Furthermore, it is also not directly evident whether the selling mechanism (auctions, negotiations) influences perceptions of locus of competition (other buyers or seller). Because the locus of competition is likely to affect how aggression influences consumer behavior in auctions and negotiations, we conducted a pretest. We asked 168 undergraduates (M_{age} = 20 years, 54% women) to complete a TV purchase scenario. We manipulated the selling mechanism, between subjects. Half the participants read that they would be bidding in an auction, while the remaining half expected to make an offer in a negotiation. We asked participants to choose whether they were primarily competing against other buyers or against the seller.

A logistic regression with the locus of competition as the dependent variable elicited a main effect of mechanism ($\chi^2(1) = 32.39$, $p < .0001$). While auction participants indicated that they were primarily competing against other buyers (78% other buyers, 22% seller; $\chi^2(1) = 24.01$, $p < .0001$), participants in the negotiation indicated that they were primarily competing against the seller (32% other buyers, 68% seller; $\chi^2(1) = 11.97$, $p < .001$).

This differential attention to other buyers or to the seller might affect how aggression influences behaviors as a function of the selling mechanism. Greater aggression in auctions may increase willingness-to-pay as buyers might try to outcompete other bidders. However, in negotiations, greater aggression might lead to a decrease in willingness-to-pay as the buyer is primarily competing with the seller. Thus, aggression may have opposing effects across auctions and negotiations. We now discuss how background color may affect willingness-to-pay in a manner consistent with these effects of aggression.

EFFECT OF COLOR ON WILLINGNESS-TO-PAY: MODERATING ROLE OF SELLING MECHANISM

Although the link between color and aggression has been primarily documented in physical contests and when studying physiological reactions, Bellizzi and Hite (1992) have shown some effects of color in fixed-price (e.g., in-store) situations. Consequently, we expect the influence of color to persist in consumer purchase settings such as auctions and negotiations. Specifically, as summarized in the literature review, we expect that exposure to red (vs. blue) color will increase aggression. The pretest revealed that individuals in auctions focus more on other bidders than on the seller. In auctions, aggressive bidders will therefore be likely to enter larger jumps in bids so that they can become the highest bidder and can beat out the competition. As exposure to red will increase aggression, we expect:

H1: In an auction, individuals who are exposed to red color will offer higher jumps in bids than individuals who are exposed to blue color.

In contrast to auctions, individuals in a negotiation focus more on competing against the seller. In this context, aggressive buyers are likely to make low offers so that they can get the best possible deal. Decreased willingness-to-pay would be consistent with the effect of color observed in fixed-price settings, where Bellizzi and Hite (1992) find lower purchase incidences for red versus blue colors. Hence, we hypothesize that:

H2: In a negotiation, individuals who are exposed to red color will make lower offers than individuals who are exposed to blue color.

We test these hypotheses in three studies. In study 1 we test the effect of color in actual eBay auctions. Study 2 investigates the effect of color on willingness-to-pay in a negotiation. Finally, study 3 compares auctions, negotiations, and fixed prices. We also explore the process through which color affects aggression. It is important to note that we expect color to increase the focal consumer's level of aggression and not how aggressive the consumer believes others are. Study 3 provides support for this assertion. Additionally, by including comparisons to gray and white color conditions, we speak to the relative effect of red versus blue hues.

STUDY 1: COLOR AFFECTS AGGRESSIVE BIDDING ON EBAY

Data Description

These data are from 28 eBay auctions for a Nintendo Wii bundle, listed from September 9 to 27, 2008. The seller and product bundle were identical across auctions; the auctions only differed in terms of the background color (16 red and 12 blue: see app. A). The minimum bid was \$0.99, while the final selling price ranged from \$360 to \$521. We use bid jumps (i.e., increment over the current bid) to measure bidder aggression. Calculating the jumps (in US dollars) for all the bids revealed a positive skew in the data (skewness = 4.24, kurtosis = 24.48; M = 20.10, median = 10.00, mode = 5.00; SD = 29.75). We submitted the jump measure to a log transformation to mitigate the excessive skewness. For ease of exposition we report the means in dollar amounts, along with the log-transformed values used in the actual analysis.

Results and Discussion

An ANOVA with the log-transformed jump as the dependent measure elicited a main effect of color, with higher bid jumps in the red (vs. blue) listings (M_{red} = \$20.82 vs. M_{blue} = \$19.22; in log-transformed values: M_{red} = 1.12 vs. M_{blue} = 1.06; $F(1, 923) = 5.61$, $p < .02$), supporting hypothesis 1. Thus, individuals who saw red backgrounds bid more aggressively.

Although the results support our expectations, we acknowledge that the red and the blue auctions may have differed on other factors (e.g., the number of individuals who viewed the listing or self-selection). In order to provide more conclusive evidence, we replicated this study in the lab, using the same product stimuli.

We recruited 78 undergraduates to take part in this Wii auction and randomly assigned them to the red or the blue condition. The current bid was \$225. We asked participants to enter their highest bid. Six participants entered bids that were three or more standard deviations from the mean and were therefore excluded. As in study 1, we subtracted the current bid (\$225) from the highest bid to calculate bid jumps. The red listing elicited higher bid jumps (M_{red} = \$63.17 vs. M_{blue} = \$35.13; $F(1, 70) = 7.10$, $p < .01$), supporting hypothesis 1. Importantly, color did not affect perceptions of product quality. As a manipulation check, participants indicated who they were competing against (other buyers or the seller). Most reported competing against other buyers (89% other buyers, 11% seller; $\chi^2(1) = 43.56$, $p < .0001$).

This lab replication helps us rule out alternate explanations, such as those based on differences in product assessments as a function of the background color. Thus, the pattern of results observed in the eBay auctions persists even when we randomly assign participants. In the next study, we investigate how color affects behaviors in negotiations.

STUDY 2: EFFECT OF COLOR ON WILLINGNESS-TO-PAY IN NEGOTIATIONS

Participants, Method, and Design

We recruited 89 people from an online panel to complete this study (M_{age} = 40 years, 60% women). We asked participants to imagine that they are looking for a reasonably priced vacation package to South Beach, FL. While searching online, they find a 4-day vacation package (including airfare and lodging). Although the package is listed for \$790, the seller asks consumers to make their best offer. The seller then decides whether to accept this offer. Each potential buyer can make only one offer.

All participants saw pictures of the hotel and its amenities on the next screen (see app. A). These pictures were presented in grayscale, with the background color manipulated between subjects to be red or blue. At the bottom of the page, all participants typed in their offer price. In summary, the study employed a single factor (color: red, blue) between-subjects design.

On the next screen, participants reported how much they liked the vacation (1 = do not like it at all; 7 = like it a lot). Liking marginally affected willingness-to-pay and is controlled for in the analyses. As a manipulation check, participants identified whether they were primarily competing against other buyers or against the seller. Most participants said they were competing against the seller (22% = other buyers, 78% = seller; $\chi^2(1) = 26.98$, $p < .0001$).

Results and Discussion

An ANOVA with willingness-to-pay as the dependent measure and color as the predictor reveals a significant main effect of color. Supporting hypothesis 2, participants who saw red (vs. blue) offered lower prices (M_{red} = \$684 vs. M_{blue} = \$712; $F(1, 86) = 6.90$, $p = .01$).

In study 3, we extend our investigation in four ways. First, we compare the effect of color in auctions and negotiations to fixed price contexts. We expect the pattern of colors' effects on purchase likelihood in the fixed price contexts to be consistent with how color affects willingness-to-pay in negotiations. In both these contexts, buyers compete against the seller. Because red (vs. blue) hues decrease willingness-to-pay in negotiations, purchase likelihoods should be lower with red (vs. blue) in the fixed price contexts. However, this pattern is directly opposite of how color affects willingness-to-pay in auctions.

Second, we investigate the process through which color affects aggression. Careful examination of prior research procedures reveals that extended exposure to the background color is necessary to observe lasting effects on emotion measures (Bellizzi and Hite 1992; Gorn et al. 2004). Therefore, we expose participants to colors for a longer duration by displaying a banner at the top of all the screens of the online survey. We then measure affect, arousal, and aggression.

Third, we try to hold constant consumer inferences about products and about other buyers. For instance, consumers may believe that buyers at an auction are more competitive than those at a negotiation or that products in an auction are more exclusive. Such beliefs may affect willingness-to-pay. To control for potentially varying inferences, we place study 3 in an eBay context and use different rules to manipulate auction, negotiation, and fixed price mechanisms.

Finally, we include two post hoc color conditions, gray and white. Gray is an "optimal control color because it allows lightness to be controlled" (Elliot et al. 2009, 368). Gray matches both red and blue colors on the lightness dimension, and it does not have a hue component. Thus, gray can be used to assess whether hue alone causes the observed differences (Elliot et al. 2009, 2010). We use white in the other control condition because white also lacks a hue component. With a lightness of 100%, however, white differs from the three other colors and may not be the best comparison standard. Including these two control conditions allows us to test whether our observed effects are driven by red or by blue, versus the control conditions.

STUDY 3: FIXED PRICE COMPARISONS AND PROCESS MEASURES

Participants, Method, and Design

We recruited 512 individuals from the Amazon MTurk panel to complete this study ($M_{age} = 37$ years, 59% women). We asked participants to imagine that they are looking to purchase a Wii video game console on eBay. Keeping the product attributes identical, we manipulated the banner color and the mechanism between subjects. Three-fourths of the participants saw a solid color banner (800 × 60 pixels) at the top of the web page. This banner appeared on all the screens, acting as a page header. The banner color was manipulated between subjects to be red, blue, or gray. The remaining quarter of the participants (those in the white condition) did not have a banner at the top of the page and only saw the white page background.

We also manipulated the selling mechanism (see app. B). Approximately a third of the people saw a typical eBay auction with a starting bid of $110. Bidders read that the auction would end in a few hours but that they would not be around at that time. Consequently, they should enter their maximum bid at this time, and the system would bid on their behalf up to this bid. Alternatively, they could pay the buy-it-now price of $149.99 and purchase the Wii right away. Participants then reported their highest bid. Another third of the people saw the negotiation condition. In this condition, participants could use the buy-it-now option at $149.99, or they could make their single best offer that the seller would either accept or reject. Participants then made their best offer. The remaining participants, who were in the fixed price condition, only saw a buy-it-now price of $149.99.

In summary, the study employed a 3 (mechanism: auction, negotiation, fixed price) × 4 (color: red, blue, gray, white) design. On the next screen, all participants reported the likelihood of purchasing the console at the buy-it-now price of $149.99 (1 = not at all; 7 = very likely). This measure allowed us to compare the effect of color across the three selling mechanisms. Participants also reported their perceptions of product quality and how much they liked the product. These measures were not affected by the manipulations and are therefore omitted from further discussion. Participants then reported their level of aggression using the Buss-Perry aggression questionnaire (Bryant and Smith 2001).

Participants also rated 24 items to describe the degrees of their feelings at that time (1 = not at all; 7 = very). These 24 items included three factors: energetic arousal, tense arousal, and hedonic tone (Mathews, Jones, and Chamberlain 1990). Eight items loaded on each of the three factors: energetic arousal (active, energetic, alert, vigorous, unenterprising, sluggish, tired, and passive; last four items reversed), tense arousal (anxious, jittery, tense, nervous, calm, restful, relaxed, and composed; last four items reversed), and hedonic tone (cheerful, contented, satisfied, happy, dissatisfied, depressed, sad, and sorry; last four items reversed). Color did not affect hedonic tone, and this factor did not mediate the effects of color on aggression. Further discussion of hedonic tone is therefore omitted. While color affects arousal, this effect is significant for energetic arousal but not for tense arousal. Because we have no a priori reason to expect this result, we report the arousal measure as an average of the energetic and tense arousal items (i.e., a 16-item arousal scale). We note that the reported results replicate, and they are stronger if we use only the energetic arousal items.

Results and Discussion

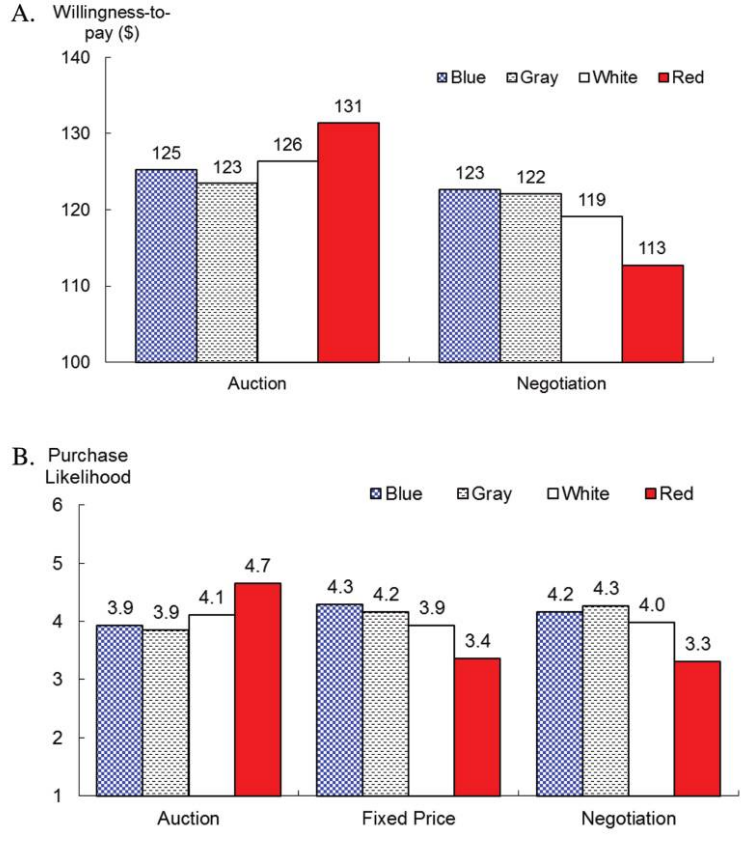
Willingness-to-Pay. Participants in the auction and negotiation conditions ($n = 340$) had reported dollar amounts for their highest bid and best offer, respectively. We used this amount as the dependent measure with mechanism (auction, negotiation) and color (red, blue, gray, and white) as predictors. The ANOVA revealed a main effect of mechanism; reported amounts were higher in auctions ($M_{auc} = \$127$ vs. $M_{nego} = \$119$; $F(1, 332) = 27.62$, $p < .0001$). This was likely a consequence of the auction bid being constrained between $110 and $149.99, while there was no lower bound for a negotiation offer. Importantly, the mechanism × color interaction was significant ($F(3, 332) = 7.66$, $p < .0001$; see fig. 1*A*).

In the auctions, people who saw a red (vs. blue) banner bid higher ($M_{red} = \$131$ vs. $M_{blue} = \$125$; $F(1, 332) = 4.71$, $p < .05$), supporting hypothesis 1. By contrast, in the negotiations, those who saw red (vs. blue) banners made lower offers ($M_{red} = \$113$ vs. $M_{blue} = \$123$; $F(1, 332) = 12.46$, $p < .0001$), consistent with hypothesis 2.

Furthermore, in auctions, participants' bids did not differ across the gray, the white, and the blue banner conditions ($M_{blue} = \$125$, $M_{gray} = \$123$, $M_{white} = \$126$; all pair-wise $F < 1$). Participants who saw a red banner, however, bid significantly higher than those who saw a gray banner

FIGURE 1

RED COLOR INCREASES WILLINGNESS-TO-PAY AND PURCHASE LIKELIHOOD IN AUCTIONS BUT DECREASES IT IN NEGOTIATIONS—STUDY 3



NOTE.—*A*, Willingness-to-pay in auctions versus negotiations; *B*, purchase likelihood for auctions, negotiations, and fixed prices.

(M_{red} = \$131 vs. M_{gray} = \$123; $F(1, 332) = 7.73$, $p < .01$) and marginally higher than those who saw white (M_{red} = \$131 vs. M_{white} = \$126; $F(1, 332) = 3.31$, $p < .10$). In negotiations, too, participants' offers did not differ across the gray, white, and blue banner conditions (M_{blue} = \$123, M_{gray} = \$122, M_{white} = \$119; all pair-wise $p > .20$). Participants who saw a red banner, however, made significantly lower offers than those who saw gray (M_{red} = \$113 vs. M_{gray} = \$122; $F(1, 332) = 10.24$, $p < .005$) or those who saw white (M_{red} = \$113 vs. M_{white} = \$119; $F(1, 332) = 5.29$, $p < .05$). Overall, participants in the control conditions (white and gray) behaved more like participants who saw a blue banner.

Purchase Likelihood. Participants in all conditions also reported how likely they were to buy the Wii for \$149.99. This allowed us to compare the auction and negotiation conditions with the fixed price condition ($n = 512$). An ANOVA with purchase likelihood as the dependent measure and mechanism (auction, negotiation, fixed price) and color (red, blue, gray, white) as predictors revealed a significant mechanism × color interaction ($F(6, 500) = 3.14$, $p = .005$; see fig. 1*B*). In the auction condition, participants who saw the red (vs. blue) banner were more likely to buy the console for \$149.99 ($M_{red} = 4.65$ vs. $M_{blue} = 3.93$; $F(1, 500) = 4.02$, $p < .05$). The effect of color was the opposite for participants in the negotiation condition ($M_{red} = 3.30$ vs. $M_{blue} = 4.16$; $F(1, 500) = 5.76$, $p < .05$) and for those in the fixed price condition ($M_{red} = 3.36$ vs. $M_{blue} = 4.29$; $F(1, 500) = 6.65$, $p = .01$).

As with willingness-to-pay, participants in the control conditions behaved like participants who saw a blue banner. In auctions, the purchase likelihoods in the blue, gray, and white conditions were no different from one another ($M_{blue} = 3.93$, $M_{gray} = 3.85$, $M_{white} = 4.11$; all pair-wise

$F < 1$). Participants who saw a red banner, however, were more likely to buy than those who saw gray ($M_{red} = 4.65$ vs. $M_{gray} = 3.85$; $F(1, 500) = 4.82$, $p < .05$) and directionally more likely to buy than those who saw white ($M_{red} = 4.65$ vs. $M_{white} = 4.11$; $F(1, 500) = 2.41$, $p = .12$).

In negotiations, participants' purchase likelihoods in the blue, gray, and white conditions were no different from one another ($M_{blue} = 4.16$, $M_{gray} = 4.27$, $M_{white} = 3.98$; all $F < 1$). Participants who saw a red banner, however, were significantly less likely to buy than those who saw a gray banner ($M_{red} = 3.30$ vs. $M_{gray} = 4.27$; $F(1, 500) = 6.76$, $p = .01$) and marginally less likely to buy than those who saw white ($M_{red} = 3.30$ vs. $M_{white} = 3.98$; $F(1, 500) = 3.65$, $p < .10$).

The pattern of results in the fixed price conditions was consistent with that for the negotiation conditions. Purchase likelihoods in the blue, gray, and white conditions were no different from one another ($M_{blue} = 4.29$, $M_{gray} = 4.16$, $M_{white} = 3.93$; all $p > .30$). Participants who saw a red banner, however, were significantly less likely to buy than those who saw a gray banner ($M_{red} = 3.36$ vs. $M_{gray} = 4.16$; $F(1, 500) = 5.02$, $p < .05$) and directionally less likely to buy than those who saw white ($M_{red} = 3.36$ vs. $M_{white} = 3.93$; $F(1, 500) = 2.57$, $p = .11$).

Comparing the control conditions across the three mechanisms (auction, negotiation, and fixed price), the purchase likelihood of participants who saw a red banner always differed significantly from that of participants who saw a gray banner, and it was directional or marginally different from participants who saw white. Furthermore, participants in the gray and white conditions behaved no differently from those who saw a blue banner.

Aggression. We conducted an ANOVA with the averaged 12-item aggression score ($\alpha = 0.87$) as the dependent measure and mechanism and color as the predictors. There was a significant main effect of color ($F(3, 500) = 9.98$, $p < .0001$). Red induced greater aggression relative to blue ($M_{red} = 2.94$ vs. $M_{blue} = 2.39$; $F(1, 500) = 20.28$, $p < .0001$). The red banner also elicited higher aggression than the gray ($M_{red} = 2.94$ vs. $M_{gray} = 2.37$; $F(1, 500) = 21.34$, $p < .0001$) and the white banners ($M_{red} = 2.94$ vs. $M_{white} = 2.44$; $F(1, 500) = 17.56$, $p < .0001$). The pair-wise differences between blue, gray, and white conditions were not significant. The main effects of mechanism and the mechanism × color interaction were also not significant. These results suggest that the difference in aggression between the red and blue conditions is driven primarily by the red hue (which induces higher aggression vs. the control conditions).

Arousal. We conducted an ANOVA with the 16-item arousal scale ($\alpha = 0.72$) as the dependent measure and mechanism and color as the predictors. There was a main effect of color ($F(3, 500) = 4.90$, $p < .005$). Participants who saw red reported greater arousal than those who saw blue ($M_{red} = 3.58$ vs. $M_{blue} = 3.31$; $F(1, 500) = 11.22$, $p < .001$). Participants in the gray condition also reported greater arousal than those in the blue condition ($M_{gray} = 3.57$ vs. $M_{blue} = 3.31$; $F(1, 500) = 10.43$, $p < .005$). Finally, participants in the white condition reported greater arousal than those who saw a blue banner ($M_{white} = 3.52$ vs. $M_{blue} = 3.31$; $F(1, 500) = 6.76$, $p = .001$). The pairwise differences between red, gray, and white conditions were not significant. The main effects of mechanism and the mechanism × color interaction were also not significant. These results suggest that exposure to blue hue leads to lower arousal versus red, with arousal in the latter condition being no different from arousal in the gray and no-banner conditions.

Process and Mediation Analysis. We estimated a covariance structural equation model that included the effects of color (red = 1; blue = −1), arousal, and aggression on willingness-to-pay. We simultaneously estimated these effects for participants in auctions versus negotiations. The overall model fit was good (comparative fit index = 0.87, root mean square error of approximation = 0.06, p of close fit = .09; see fig. 2).

For both groups, the effect of color on aggression is fully mediated by arousal. Furthermore, aggression mediates the effect of color on willingness-to-pay. We estimated the unstandardized direct versus indirect effects of color on willingness-to-pay for the two groups (auctions: indirect effect = 2.13, direct effect = 0.94; negotiations: indirect effect = −2.89, direct effect = −2.06). Notably, the direct effect of color on willingness-to-pay fails to achieve significance for both mechanisms (auctions: CR = 1.08, $p = .28$; negotiations: CR = −1.63, $p = .103$; CR is the critical ratio, similar to a t-statistic).

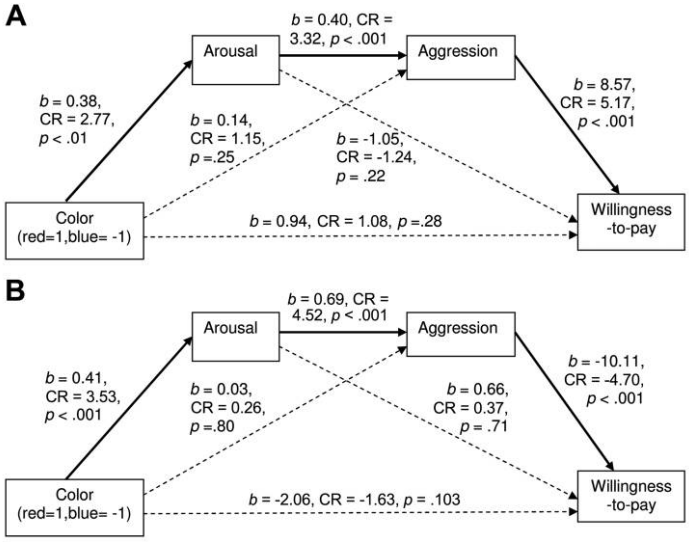
Simultaneous estimation for groups allowed us to contrast effects between auctions and negotiations. There was no difference in the effect of color on arousal between the two groups ($b_{auc} = 0.38$ vs. $b_{nego} = 0.41$; CR = 0.16, NS) or in the effect of arousal on aggression ($b_{auc} = 0.40$ vs. $b_{nego} = 0.69$; CR = 1.49, $p > .10$). The effect of aggression on willingness-to-pay was, however, different for the two groups ($b_{auc} = 8.57$ vs. $b_{nego} = -10.11$; CR = −6.88, $p < .001$). Thus, mechanism moderates the effect of aggression on willingness-to-pay.

Discussion. Study 3 allowed us to make several contributions. First, we replicate findings from earlier studies and show that while red (vs. blue) colors elicit higher bid jumps in auctions, they lead to lower offers in negotiations. We also measure purchase likelihood, to explore how color affects fixed price contexts. We find that color-induced aggression decreases purchase likelihood in fixed priced contexts and in negotiations. Given that buyers are competing with a seller in these contexts, greater aggression with red (vs. blue) lowers willingness-to-pay. However, higher aggression in auctions increases purchase likelihood, consistent with higher willingness-to-pay.

Second, we delve deeper into the process. While we did not find support for aggression induction via affect, we find that the effect of color on aggression is mediated by arousal, and aggression influences willingness-to-pay. Furthermore,

FIGURE 2

AROUSAL AND AGGRESSION MEDIATE THE EFFECT OF COLOR ON WILLINGNESS-TO-PAY—STUDY 3



NOTE.—*A*, Auction; *B*, negotiation. CR = critical ratio.

the effect of red versus blue on arousal, and the effect of arousal on aggression, is similar across auctions and negotiations. Importantly—and as we predicted—the effect of aggression on willingness-to-pay is different across the two selling mechanisms.

Study 3 also allowed us to test whether the observed effects are primarily driven by red or blue colors. We included two other colors, gray and white. We find that the effects of color-induced aggression on willingness-to-pay are primarily driven by red. Specifically, although using a red, gray, or white color leads to greater arousal relative to blue, it is only red that elicits greater aggression. Thus, color-induced arousal does not always lead to aggression. Instead, there is something innate about the color red that affects aggression and willingness-to-pay.

GENERAL DISCUSSION

Summary of Results

We investigate the influence of red versus blue colors in auctions and negotiations. Buyers perceive that they are competing against other bidders in auctions but against the seller in negotiations. Thus, in auctions, an aggressive bidder tries to win the auctioned product by outbidding other potential buyers and, therefore, offers higher bid jumps. Because red induces greater aggression relative to blue, we expect buyers to offer higher bid jumps in red environments. We show these effects in actual eBay auctions (study 1) as well as in the lab (study 3). By contrast, the buyer negotiates one-on-one with a seller in negotiations. Aggressive buyers make lower offers because they want to get the best deal possible. Consequently, red color reduces buyers' willingness-to-pay relative to blue (studies 2 and 3).

Attesting to the process, we show that red increases aggression relative to blue. Exposure to red (vs. blue) increases arousal, which affects aggression. Aggression mediates the effect of color on willingness-to-pay. Comparing auctions and negotiations to fixed prices, we find that the effect of color on purchase likelihood is similar across negotiation and fixed price conditions.

Contribution and Implications

We strive to make three important contributions with this research. First, we demonstrate differential effects of red versus blue colors on willingness-to-pay in auctions and negotiations. Specifically, the selling mechanism moderates the effects of color on consumers' willingness-to-pay. By focusing on willingness-to-pay, we add to prior work that studies influence of colors on consumers' perceptions of product quality (Chebat and Morrin 2007), ads (Gorn et al. 1997), and brand evaluations (Labrecque and Milne 2011).

Second, we identify arousal-induced aggression as the mediating mechanism through which color affects willingness-to-pay. Two important caveats are in order. In this research, we did not consider a cognitive route (e.g., learned hostile thoughts) via which color might induce aggression. This is because we did not expect consumers to have well-constructed color-based hostile cognitions in purchase con-

texts. Although less likely, one possibility may be that people do have such associations. Alternately, it is possible that cognitions may act in cohort with arousal. For instance, a particular price in the auction or negotiation context may induce hostile thoughts, which the color-induced arousal may magnify. This is an avenue that can be explored in future research. Additionally, we note that we used the Buss-Perry aggression questionnaire (Bryant and Smith 2001) to measure aggression. This scale primarily provides a trait-level measure of aggression. Although some of the questions (e.g., "Given enough provocation, I may hit another person") do indeed provide state-level impressions, it may be instructive to use state-level measures of aggression in future investigations.

Third, we contribute to the literatures on auctions and negotiations by demonstrating that the influence of aggression on consumers' willingness-to-pay varies with mechanism; greater aggression increases willingness-to-pay in auctions but decreases willingness-to-pay in negotiations. Indeed, changes in selling mechanisms that decrease the focus of a buyer on other bidders and increase the focus on the seller (such as when buyers are invited to make their best offer in study 3) reverse the effect of color-induced aggression on willingness-to-pay. By contrast, creating a perception of scarcity in a fixed price setting may induce higher willingness-to-pay when dealing with aggressive consumers. When negotiating one-on-one with a consumer, too, drawing attention to potential competition from other buyers could increase seller surplus.

Our results suggest that incidental exposure to color on web page backgrounds or on walls in brick-and-mortar stores can affect willingness-to-pay. Our findings therefore have important implications for website and store design. It is fairly straightforward to change background colors of websites, and firms could even customize colors on the basis of the selling mechanism and product characteristics. For instance, in situations in which consumers compete with each other to buy a scarce or a limited-edition product, firms may increase consumers' willingness-to-pay by exposure to red versus blue backgrounds. By contrast, in situations in which a product is readily available and the consumer competes with the seller to get a lower price through extended price search or through haggling, consumers' willingness-to-pay may be enhanced via exposure to blue versus red color backgrounds.

Consistent with physiological literature on the effects of color, we find that exposure to red colors increases aggression. However, the instrument used to manipulate color in our research—the background—could not be used as a signal of seller characteristics. It is conceivable that if the color were associated with the seller, it could lead to a different pattern of results. For instance, a seller with a red versus a blue logo could be judged as more aggressive. As a consequence, buyers may be more defensive against sellers who explicitly choose red (as this choice will be used to judge seller aggression) relative to those who explicitly choose blue.

The current research used only US-based participants; it is not clear whether the results generalize across cultures. The associations with red versus blue may be physiological as well as cultural. On the one hand, Gorn et al. (1997) present a framework based on physiological characteristics, suggesting that color influences should not be affected by culture. On the other hand, associations with color differ across cultures (Aslam 2006; Chattopadhyay, Gorn, and Darke 2010; Madden, Hewett, and Roth 2000) and affect evaluations (Chebat and Morrin 2007). In addition to cultural variations, consumers may differ at an individual level in terms of their susceptibility to influence by background color. Dijkstra et al. (2008) find that individual ability to screen out complexity in the environment moderates the influence of color on physiological reactions, with high screening ability attenuating the effect of background color. This dimension of ability may be useful to study in further research.

In conclusion, color is ubiquitous in our environment. However, its influence on aggression and on consumers' willingness-to-pay in purchase contexts remains an under-researched area. The current research is a first step to better understand consumers' behaviors in these purchase contexts, with important implications for academics, consumers, and businesses.

APPENDIX A
COLOR STIMULI

1. Study 1

Red Background

Blue Background

2. Study 2

Red Background

Blue Background

3. Color Classification

Red Color

Hue = 0, Saturation = 240 (100%),
Lightness = 120 (50%)
Red = 255, Green = 0, Blue = 0

Blue Color

Hue = 160, Saturation = 240 (100%),
Lightness = 120 (50%)
Red = 0, Green = 0, Blue = 255

Gray Color (Study 3)

Hue = 0, Saturation = 0 (0%),
Lightness = 120 (50%)
Red = 128, Green = 128, Blue = 128

White Color (Study 3)

Hue = 0, Saturation = 0 (0%),
Lightness = 240 (100%)
Red = 255, Green = 255, Blue = 255

APPENDIX B
STUDY 3 STIMULI

1. Auction condition

2. Negotiation condition

3. Fixed price condition

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