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# Website interactivity may compensate for consumers' reduced control in E-Commerce

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ABSTRACT

Existing research has confirmed that consumers may experience reduced control over product consumption when facing new products or limited product choices. This research predicts that interactivity of a retailing website may compensate for consumers' reduced control in E-Commerce. To test this prediction, two studies were conducted to analyze the influence of interactivity on product evaluation in situations of reduced control. Study 1 discovered that participants primed with a strong desire for control expressed more favorable attitudes toward a new product when interactivity was high versus low. In Study 2, participants with a strong desire for control evaluated a small choice set more favorably when interactivity was high versus low. Both studies also identified the positive main effect of interactivity on product attitude. The theoretical and practical implications of these findings are discussed.

## 1. Introduction

Retailing websites are important platforms for contemporary E-Commerce practices. Despite the rapid growth of mobile commerce, desktop and laptop computers are still the preferred digital devices for online purchases (Statista, 2018). Competition is huge for retailing websites (Johanson, 2015). To stand out from the clutter, E-Retailers have to improve the quality of their websites and increase the investment in interface design (Éthier et al., 2006). Interactivity has been identified as a key factor of website quality. Previous research has shown that interactivity positively influences consumer responses during electronic shopping, in ways such as improving attitudes, motivating web browsing, and encouraging more purchases (Beuckels and Hudders, 2016; Fiore and Jin, 2003; Fiore et al., 2005). Accordingly, interactivity seems to be the magic answer for E-Retailers to improve their competitiveness.

However, the mere focus on interactivity may not guarantee an E-Retailer's success. Consumer responses to E-Commerce are complicated. According to the Stimulus-Organism-Response model (S-O-R; Owen, 2002), to fully understand people's responses, one should not only focus on the external stimuli (e.g., interactivity of a retailing website), but also investigate "the experience aroused within the organism that intervenes the stimulus inputs and response outputs" (Fiore et al., 2005, p. 42). Existing research of E-Commerce has emphasized the importance of creating optimal consumption experience to the success of a retailing website (Li et al., 2001). Therefore, research of interactivity in E-Commerce should incorporate a deep analysis on consumer experience.

A common experience during the consumption process is the experience of reduced control. Previous research of consumer psychology has confirmed that people tend to feel reduced control associated with the potential consumption of new products or with selecting from small sets of product choices (Faraji-Rad et al., 2017; Inesi et al., 2011). Since perceived reduced control represents an undesired psychological state, it may hinder the formation of optimal consumption experience (Lunardo and Mbengue, 2009), leading to low acceptance rate of new products and dissatisfaction with small choice sets. Such phenomena are relatively more salient among consumers with a strong desire for control (Faraji-Rad et al., 2017; Inesi et al., 2011).

This research proposes that the interactivity of a retailing website may help consumers deal with their reduced control over product consumption. The relationship between interactivity and reduced control is rooted in the Compensatory Control Theory (CCT), which suggests that people's reduced control in one domain can be compensated for by gaining control from another domain (Landau et al., 2015). Interactivity has been confirmed to provide users with increased control over online information (Kalyanaraman and Wojdynski, 2015). Based on CCT, such information control is expected to increase individuals' perceptions of control over the consumption process, thus compensating for reduced control generated by product characteristics (e.g.,

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new products or limited choice). These expected effects may be more pronounced among consumers with a strong desire for control.

Based on the S-O-R model, the present research was designed to test whether interactivity of a retailing website (i.e., stimulus) would influence product attitude (i.e., response) among consumers with a high desire for control (i.e., organism) via dealing with the experience of reduced control when they face a new product (Study 1) or a small choice set (Study 2). Theoretically, the current investigations help identify the boundary conditions of the effects of website interactivity in E-Retailing. Combining the theoretical frameworks from social psychology and communication technology, the present research is believed to provide a deeper conceptual understanding of how website interactivity facilitates consumer experiences in E-Commerce. Practically, retailing professionals will get some useful insights from this research in terms of how to promote new products and limited choices among consumers with a strong desire for control in the online environment.

## 2. Conceptual background

### 2.1. Interactivity

As a defining characteristic of digital media, interactivity has been conceptualized in various ways (see Bucy and Tao, 2007; Liu and Shrum, 2002; Yang and Shen, 2017). Despite the variety of conceptualizations, there is a consensus in the literature on information control as the fundamental conceptual component of interactivity (Coyle and Thorson, 2001; Kalyanaraman and Sundar, 2008; Sutcliffe and Hart, 2017). Information control in human-computer interaction refers to users' ability of actively modifying the presentation of online information (Kirk et al., 2015; Yang and Shen, 2017). Specifically, information control indicates users' "control over what information will be presented, for how long it will be presented, and what information will follow" (Ariely, 2000, p. 233). In other words, information control is essentially about user control over the information flow on digital interface, such as websites (Chakraborty et al., 2003; Kirk et al., 2015).

The theoretical importance of information control manifests in some major definitions of interactivity from the literature of human-computer interactions. For example, Steuer (1992) defined interactivity as "the extent to which users can participate in modifying the form and content of the mediated environment in real time" (p. 84). Jensen (1998) defined interactivity as "a measure of a media's potential ability to let the user exert an influence on the content and/or form of the mediated communication" (p. 201). Similarly, Oh (2017) conceptualized interactivity as "an attribute of technology that allows users to change the form and content of" the online information (p. 846). The E-Commerce literature has also emphasized the prominence of information control in conceptualizing interactivity of online product presentation. According to Jiang and Benbasat (2004), interactivity is generated by the technological features of direct manipulation and multimedia on a retailing website, providing consumers with increased virtual control over the products. Later, Jiang and Benbasat (2007) suggested that the interactivity of digital product exhibition is decided by consumers' autonomy of selectively viewing their interested product information as well as the freedom of viewing the information at their own speed. In a similar manner, Fiore et al. (2005) conceptualized image interactivity as the degree to which consumers could manipulate product images on retailing websites.

The aforementioned emphasis on information control in previous conceptualizations of interactivity is embodied in the interactivity-as-information-control perspective (Kalyanaraman and Wojdynski, 2015). The structure of information is normally nonlinear on the Internet (Hoffman and Novak, 1996). With sufficient information control, a user could go through such nonlinear information in the way that best fits his/her informational needs, making it easy to locate the most relevant information. As a result, this theoretical perspective is believed to well capture the essential connotation of how interactivity influences people's online information processing. Since "the key psychological appeal of interactivity is that it provides greater user control" (Oh, 2017, p. 846), the present research adopts the interactivity-as-information-control perspective in conceptualizing interactivity of retailing websites. In particular, interactivity is defined as the extent to which consumers employ control over the presentation of product information on a retailer's website. Following previous studies (e.g., Kalyanaraman et al., 2009; Teo et al., 2003; Wojdynski, 2015), website interactivity in the current research will be operationalized based on Kristof and Satran's (2002) guideline of web design.

### 2.2. Compensatory control

The compensatory control theory focuses on explaining how people deal with the circumstances that diminish their perceptions of control (Landau et al., 2015). Individuals in general have an innate motivation to be in control of their environment (Chen et al., 2017; Langer, 1975). Situations of reduced control are undesirable (Lunardo and Mbengue, 2009). People "respond to events … that reduce control with compensatory strategies for restoring perceived control to baseline levels" (Landau et al., 2015, p. 694). These compensatory strategies may not be directly related to the sources of control reduction (Kay et al., 2008). In other words, people could cope with reduced control in one domain by restoring control from another domain. The compensatory control theory implies that individuals' perceived control can be restored when they get access to "an external agent" which affords them actual control or even just illusions of control (Chen et al., 2017; Cutright, 2011). For example, previous research has confirmed that people express strong beliefs in God or great dependence on powerful governments when they are in the situations of reduced control (Kay et al., 2008).

The notion of compensatory control or "secondary control" (see Heckhausen and Schulz, 1995) provides the theoretical foundation for the present research. In the shopping process, consumers may experience reduced control over product consumption because of certain product characteristics. The perceptions of reduced control have an adverse effect on one's consumption experience, especially in the online environment where consumers do not have direct interactions with the real products. Given that high levels of interactivity offer users considerable control over going through online information, this research predicts that the interactivity of a retailing website may compensate for consumers' reduced control. According to Jiang and Benbasat (2007), interactivity allows consumers to directly manipulate online product exhibition. As a result, consumers feel a strong sense of (virtual) control over the products. Similarly, Ariely (2000) argues that interactivity facilitates a personalized manner of browsing product information online, leading to an increased sense of control. More importantly, the prediction that interactivity helps consumers cope with their sense of reduced control is rooted in the theoretical foundation of the Stimulus-Organism-Response model (S-O-R; Owen, 2002), as interactivity represents the external stimulus and perceptions of reduced control are the experience within the organism. Accordingly, the present research examines the impact of interactivity in two scenarios of reduced control for consumers: facing new products and limited product choices.

### 2.3. New products

A new product is "perceived as novel or unfamiliar by an individual consumer" (Faraji-Rad et al., 2017, p. 347). While developing new products helps expand businesses, encouraging consumers to accept new products is a big challenge (Castellion and Markham, 2013). Failure rates of new products across industries are surprisingly high overtime—about 40%–90% of new products fail (Dillon and Lafley, 2011; Gourville, 2006). Researchers who attempt to determine the causes of such high failure rates have suggested that new products insert a different psychological impact on consumers compared to classic

products that consumers are familiar with (Hoeffler, 2003; Moreau et al., 2001). As discovered by Faraji-Rad et al. (2017), consumers perceive "a loss of control associated with the potential consumption of a new product" (p. 347). New products tend to be less congruent with consumers' existing mental schema than classic products (Hoeffler, 2003; Moreau et al., 2001). Consumers may find it difficult to use their existing product knowledge to understand new products or to match their perceptions of new products with established mental schema (Jhang et al., 2012). Moreover, a new product often signifies alterations in consumers' daily routines (Hoeffler, 2003). Therefore, thinking of consuming a new product may result in perceptions of reduced control over one's environment (Faraji-Rad et al., 2017).

Consistent with the above reasoning, Faraji-Rad et al. (2017) found that consumers with a strong desire for control evaluated a new product less favorably than their counterparts who had a weak desire for control. Based on Faraji-Rad et al.'s (2017) findings, the present research predicts that a high level of interactivity may benefit the evaluation of a new product among consumers with a strong desire for control, because high levels of interactivity provide consumers with increased information control. According to CCT, such information control may compensate for consumers' perceptions of reduced control over the potential consumption of a new product. Since consumers with a strong desire for control are more sensitive to control reduction and more eager to restore control than those who do not have such a desire (Burger, 2013; Hui and Bateson, 1991), the positive influence of interactivity on evaluating a new product is only expected among consumers whose desire for control is strong. Formally, the following hypothesis is proposed:

**H1.** Consumers with a strong desire for control will express more favorable attitudes toward a new product when interactivity of a retailing website is high versus low.

### 2.4. Product choices

Facing new products is not the only situation in which consumers may feel reduced control over potential product consumption. Existing research has revealed that perceptions of reduced control may also be induced by limited choices (Ariely and Norton, 2008; Averill, 1973). According to Leotti et al. (2010), "individuals exercise control over the environment by making choices" (p. 457). When choosing from different options, people tend to feel that the outcomes depend on their own behavior and they have an increased chance to obtain what they want (Leotti et al., 2010). Being presented with different options reinforces the feeling that one is in control of a situation, whereas the lack of choice strengthens the perceptions of reduced control (Langer and Rodin, 1976; Leotti and Delgado, 2011). The connection between choice and control has been widely noted in the existing consumer research. Consumers normally perceive enhanced control over the consumption process when provided with a large set of product choices (Inesi et al., 2011; Hui and Bateson, 1991). By contrast, consumers may feel diminished control when offered limited options or a small set of product choices, leading to less favorable attitudes (Cordova and Lepper, 1996; Inesi et al., 2011).

Since individuals with a strong desire for control are motivated to stay in control of their environment (Burger, 2013), they may be more likely to resist a small choice set. According to the same reasoning that led to the proposal of the first hypothesis (i.e., interactivity provides information control that may compensate for the reduced control over product consumption), the present research expects that interactivity of a retailing website may positively influence the evaluation of a small choice set among consumers with a strong desire for control. Formally, the following hypothesis is proposed:

**H2.** Consumers with a strong desire for control will express more favorable attitudes toward a small choice set when interactivity of a retailing website is high versus low.

## 3. Overview of the studies

To test the overall prediction that interactivity of a retailing website will compensate for the perceptions of reduced control over potential product consumption among consumers with a high desire for control, two studies are conducted with each representing a common situation of control reduction due to certain product characteristics (i.e., new products and limited choices). Study 1 investigates how website interactivity influences the evaluation of a new product among participants primed with a strong or weak desire for control and thus tests hypothesis 1. In Study 2, the impact of interactivity is examined when participants primed with different levels of desire for control are exposed to a small set of product choices. Therefore, hypothesis 2 is tested in Study 2.

## 4. Study 1: evaluating a new product

### 4.1. Method

#### 4.1.1. Study design

An online experiment was conducted to test hypothesis 1. This experiment adopted a 2 (interactivity: high vs. low) × 2 (product type: new vs. classic) × 2 (desire for control: strong vs. weak) between-subjects factorial design. All three independent variables were manipulated. Participants were randomly assigned to one of the eight experimental conditions.

#### 4.1.2. Participants

Two hundred and forty participants ($N$ = 240) who were American residents were recruited from *Amazon Mechanical Turk (MTurk)* to take part in this study. Among these participants, 52.1% ($N_{male}$ = 125) were male, and 47.9% ($N_{female}$ = 115) were female. The mean age was 36.43 (SD = 10.98). As for race, 79.6% ($N_{White}$ = 191) were White, 9.6% ($N_{African\ American}$ = 23) were African American, and 7.9% ($N_{Asian}$ = 19) were Asian. As for education, 40.8% ($N_{Bachelor's}$ = 98) had Bachelor's degree, 22.1% ($N_{college\_credit}$ = 53) had some college credit, 12.1% ($N_{Associate}$ = 29) had Associate degree, 10.8% ($N_{Master's}$ = 26) had Master's degree, and 7.5% ($N_{high\_school}$ = 18) had high school diploma.

#### 4.1.3. Stimulus materials

The stimuli were four versions of a website for a fictitious energy drink brand specially designed for this study. Energy drinks were featured in the stimuli because previous research has confirmed that "new and innovative product launches" (p. 304) largely benefit market expansion for energy drink brands (Heckman et al., 2010). Interactivity was manipulated based on Kristof and Satran's (2002) guideline of control over pace, sequence, media, variables, and transaction. This guideline has been adopted by previous research to successfully create different levels of interactivity (e.g., Kalyanaraman et al., 2009; Teo et al., 2003; Wojdynski, 2015). Control over pace means that users can decide when to move forward—for instance, clicking to see the next page on a website; control over sequence indicates that users can decide where to go—for instance, going to a certain webpage; control over media refers to operating some media features; control over variables denotes changing the outcome of a chart; control over transaction means that users can pay bills or send out messages on the interface (Kristof and Satran, 2002).

In the current study, participants in the low interactivity condition only had control over pace (see Appendix A), meaning that they could go to the next page when they wanted to, but they could only go through different webpages sequentially as they did not have control over sequence. In the high interactivity condition, participants had control over the five content dimensions (i.e., pace, sequence, media,

variables, and transaction; see Appendix B). These participants could not only go to the next page at will (i.e., control over pace), but could also go through different pages in a non-sequential way (i.e., control over sequence). They could also start, stop, forward, and rewind a slideshow of pictures (i.e., control over media), whereas this slideshow was uncontrollable and automatically played in the low interactivity condition. Control over variables in the high interactivity condition was realized by having participants interact with a clickable chart and a poll, while these elements were static and non-clickable in the low interactivity condition. In the high interactivity condition, participants could send out messages by using the comment box (i.e., control over transaction), whereas this feature was not provided in the low interactivity condition. A pretest ($N = 62$) was conducted to check the manipulation of interactivity. The results indicated that the manipulation had a significant effect on perceived interactivity, such that participants in the high interactivity condition ($M = 7.04$, SD = 1.21) experienced greater perceived interactivity than those in the low interactivity condition ($M = 5.71$, SD = 1.82), $t(60) = 3.35$, $p < .01$.

Product type (new vs. classic) was manipulated following Faraji-Rad et al. (2017). Specifically, the new product description emphasized that the product was novel and consumers were unfamiliar with it, while the classic product description highlighted that the product was classic and consumers were very familiar with it. In order to strengthen the manipulation, an existing brand, *Red Bull*, was used as a reference since it is the most common brand of energy drinks in the U.S. market and has the largest market share (O'Connor, 2018). In brief, the fictitious brand, *PowerUP*, was described as the affiliate of *Red Bull* in Europe which would expand to the U.S. market soon. In the new product condition, participants were told that *PowerUP* was totally different from *Red Bull* in all aspects, while in the classic product condition, participants were told the products of the two brands were very much similar. A pretest ($N = 40$) was conducted to check this manipulation. A series of one-way ANOVA tests indicated that participants perceived the new product ($M = 6.80$, SD = 1.51) as newer than the classic product ($M = 4.00$, SD = 2.49), $F(1, 38) = 18.48$, $p < .01$, $\omega_p^2 = 0.30$, and participants were more familiar with the classic product ($M = 6.35$, SD = 2.54) than the new product ($M = 4.65$, SD = 2.18), $F(1, 38) = 5.15$, $p < .05$, $\omega_p^2 = 0.09$. In addition, the manipulation had no effect on perceived product status or perceived product quality, $ps > .05$.

Desire for control was manipulated by having participants complete a priming task before browsing the website. In the condition of strong desire for control, participants were asked to write about a situation in which they possessed no control over the environment, while participants in the condition of weak desire for control were asked to write about a situation in which they had complete control over the environment. This manipulation has been successfully employed by a number of previous studies (e.g., Faraji-Rad et al., 2017; Galinsky et al., 2003).

#### 4.1.4. Procedure

This experiment was conducted online (*Qualtrics*). At the beginning of the experiment, participants completed the priming task of desire for control. They were informed that this task aimed to collect people's daily experiences for another study. Participants were given 3 min to recall and write down their own experiences. Afterwards, they were asked about their desire for control and self-efficacy. Participants then browsed the website. They were told that this was a separate study for testing a beta version of a microsite for an energy drink brand and that their opinions were extremely important for the company to finalize the website, which would be launched in the U.S. market soon. Participants were also instructed to browse all the webpages, read all the information, and try all the functions provided on the website. They were given 8 min to browse the website. Participants then reported their attitude toward the product, their perceived interactivity, their perceived newness and familiarity with the product, their attitude toward *Red Bull* and their demographic information. The entire process took approximately 20 min.

#### 4.1.5. Measures in the pretests

*Perceived interactivity* ($\alpha = 0.91$) was measured adopting items from Liu (2003), Song and Zinkhan (2008), and Sundar et al. (2003). The scale included nine nine-point items. An example item was "While I was on the website, I could choose freely what I wanted to see." Following Faraji-Rad et al. (2017), *perceived product newness* and *familiarity* were measured by asking participants to answer "How would you rate the newness of the product depicted on the website?" and "Does this product seem familiar?" on a nine-point scale. *Perceived product quality* was measured using one nine-point item (i.e., "How high quality is the product?") and *perceived product status* was measured using another nine-point item (i.e., "How high status is the product?"). These two items were adopted from Faraji-Rad et al. (2017) for ensuring that the manipulation of product type did not influence participants' perceptions of product quality and status.

#### 4.1.6. Measures in the main experiment

Consistent with Faraji-Rad et al. (2017), *desire for control* was measured by asking participants to rate their agreement with the statement "I would enjoy more control over my own destiny" on a nine-point scale; *self-efficacy* was measured using another nine-point item (i.e., "When I make plans, I am certain I can make them work."). Self-efficacy was added as a confounding check (see Perdue and Summers, 1986). The purpose was to ensure that the manipulation of desire for control would not influence this related but different variable. *Attitude toward the product* ($\alpha = 0.91$) was measured adopting a three-item nine-point scale from Faraji-Rad et al. (2017). The items were "How favorable or unfavorable is your attitude towards the product depicted on the website?" "Is the product depicted on the website a good or bad choice for you?" and "How much do you like or dislike the product depicted on the website?" *Attitude toward Red Bull* ($\alpha = 0.96$) was measured as a covariate (because *Red Bull* was used as a reference to manipulate participants' perceptions of new versus classic products) using six nine-point items from Li and Kalyanaraman (2012). Some example items included "appealing/unappealing," "good/bad," and "favorable/unfavorable." *Perceived interactivity* ($\alpha = 0.90$), *perceived product newness* and *familiarity* were measured in the identical way as in the pretests.

### 4.2. Results

#### 4.2.1. Measurement validation

In order to check the discriminant validity between variables measured in the main experiment, the correlations between all the measured variables were tested (see Table 1). A scrutiny of the correlation table indicated that none of the correlation coefficients exceeded 0.70 (i.e., the maximum correlation coefficient is 0.507 between product attitude and attitude toward *Red Bull*). Since a correlation coefficient greater than 0.70 indicates a majority of shared variance ($0.70 \times 0.70 = 49\%$ shared variance) (Ibrahim et al., 2015), the discriminant validity of the measures in the main experiment of Study 1 was acceptable.

#### 4.2.2. Manipulation checks in the main experiment

A series of three-way ANOVA tests indicated that the manipulation of desire for control was successful, such that participants who wrote about past situations of no control ($M = 7.73$, SD = 1.49) reported greater desire for control than those writing about having control in a situation ($M = 7.12$, SD = 1.96), $F(1, 232) = 7.09$, $p < .01$, $\omega_p^2 = 0.03$. No other effects were found on desire for control, $ps > .05$. In addition, the ANOVA tests did not find any significant effects on self-efficacy, $ps > .05$.

A three-way ANOVA test indicated that the manipulation of interactivity had a significant effect on participants' perceived interactivity, such that those in the high interactivity condition ($M = 7.04$,

**Table 1**
Correlation matrix of variables in Study 1.

| | Desire for control | Self-efficacy | Product newness | Product familiarity | Product attitude | Perceived interactivity | Attitude toward Red Bull |
|---|---|---|---|---|---|---|---|
| Desire for control | 1 | | | | | | |
| Self-efficacy | −0.025 | 1 | | | | | |
| Product newness | 0.098 | −0.093 | 1 | | | | |
| Product familiarity | −0.010 | 0.035 | −0.423** | 1 | | | |
| Product attitude | 0.029 | 0.053 | 0.387** | −0.016 | 1 | | |
| Perceived interactivity | 0.147* | 0.245** | 0.115 | 0.076 | 0.256** | 1 | |
| Attitude toward Red Bull | 0.055 | 0.083 | 0.052 | 0.135* | 0.507** | 0.103 | 1 |
| Mean | 7.44 | 6.69 | 5.34 | 5.92 | 5.44 | 6.42 | 5.49 |
| SD | 1.75 | 1.82 | 2.42 | 2.33 | 1.66 | 1.67 | 2.08 |

Notes: $^{**}p < 0.01$; $^{*}p < 0.05$.

SD = 1.39) experienced greater perceived interactivity than those in the low interactivity condition ($M = 5.75$, SD = 1.70), $F(1, 232) = 40.38$, $p < .001$, $\omega_p^2 = 0.14$. No other effects were found on perceived interactivity, $ps > .05$.

A three-way ANOVA test indicated that the manipulation of product type had a significant effect on participants' perceived product newness, such that participants perceived the new product ($M = 5.92$, SD = 2.34) as newer than the classic product ($M = 4.78$, SD = 2.37), $F(1, 232) = 14.19$, $p < .001$, $\omega_p^2 = 0.05$. No other effects were found on perceived newness, $ps > .05$. Another three-way ANOVA test indicated that the manipulation also had a significant effect on participants' perceived product familiarity, such that participants perceived the classic product ($M = 6.32$, SD = 2.25) as more familiar than the new product ($M = 5.50$, SD = 2.35), $F(1, 232) = 8.01$, $p < .01$, $\omega_p^2 = 0.03$. No other effects were found on perceived familiarity, $ps > .05$.

#### 4.2.3. Hypothesis 1 testing

Hypothesis 1 predicts an interaction effect between interactivity, desire for control, and product type on product attitude. A three-way ANCOVA test was conducted using attitude toward *Red Bull* as the covariate. The results indicated that interactivity had a significant main effect on product attitude, such that participants in the high interactivity condition ($M = 5.80$, SE = 0.13) reported more favorable product attitudes than those in the low interactivity condition ($M = 5.05$, SE = 0.13), $F(1, 231) = 17.76$, $p < .001$, $\omega_p^2 = 0.07$. There was a significant three-way interaction effect between interactivity, desire for control, and product type on product attitude, $F(1, 231) = 7.34$, $p < .01$, $\omega_p^2 = 0.03$ (see Fig. 1). Participants with a strong desire for control expressed more favorable attitudes toward the new product when interactivity was high ($M = 6.08$, SE = 0.26) versus low ($M = 4.48$, SE = 0.26), $p < .001$, but they expressed similar attitudes toward the classic product when interactivity was high ($M = 5.46$, SE = 0.23) and low ($M = 5.57$, SE = 0.24), $p > .05$. Therefore, H1 was supported. Participants with a weak desire for control expressed similar attitudes toward the new product when interactivity was high ($M = 5.91$, SE = 0.23) and low ($M = 5.26$, SE = 0.27), $p > .05$, but they expressed more favorable attitude toward the classic product when interactivity was high ($M = 5.77$, SE = 0.28) versus low ($M = 4.90$, SE = 0.26), $p < .05$.

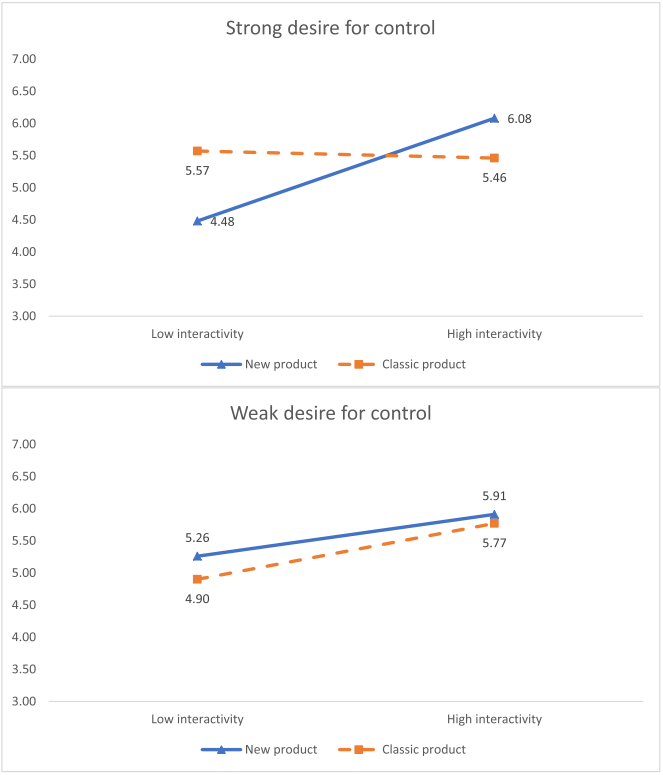


**Fig. 1.** The three-way interaction effect between interactivity, desire for control, and product type on product attitude (Study 1).

### 4.3. Study 1 discussion

This study investigated how interactivity influences the evaluation of a new product among consumers with different levels of desire for control. Specifically, participants with a strong desire for control expressed more favorable attitudes toward a new product when interactivity was high versus low, but interactivity did not influence their attitudes toward a classic product. Such findings contribute to the literature by demonstrating that the interface of retailing websites can influence consumers' evaluations of new products. Although previous research has identified a number of strategies to promote the acceptance of new products (Dahl and Hoeffler, 2004; Jhang et al., 2012; Zhao et al., 2009), limited effort has been taken to incorporate retailing websites into those strategies. To the author's best knowledge, this study is the first one that showcases the power of digital interface in eliminating the barriers to new product adoption.

More importantly, this study provides preliminary evidence to support the overall hypothesis that interactivity of a retailing website compensates for consumers' reduced control over product consumption and identifies desire for control that is situationally induced as a moderator of such effects. To further validate the function of control compensation of interactivity, it is necessary to analyze the impact of interactivity in another situation of reduced control. Existing studies in consumer psychology have found that consumers normally feel diminished control when provided with a small set of product choices (e.g., Inesi et al., 2011). Accordingly, Study 2 was conducted to examine the effects of interactivity on consumers' evaluations of small choice sets.

## 5. Study 2: evaluating a small choice set

### 5.1. Method

#### 5.1.1. Study design

Another online experiment was conducted to test hypothesis 2. This experiment adopted a 2 (interactivity: high vs. low) × 2 (choice set: small vs. large) × 2 (desire for control: strong vs. weak) between-subjects factorial design. All three independent variables were manipulated. Participants were randomly assigned to one of the eight experimental conditions.

#### 5.1.2. Participants

Two hundred and thirty-eight participants ($N$ = 238) who were American residents were recruited from *MTurk* to take part in this study. Among these participants, 50% ($N_{male}$ = 119) were male, and 50% ($N_{female}$ = 119) were female. The mean age was 35.88 (SD = 11.67). As for race, 81.5% ($N_{White}$ = 194) were White, 9.2% ($N_{African\ American}$ = 22) were African American, and 5.5% ($N_{Asian}$ = 13) were Asian. As for education, 34.5% ($N_{Bachelor's}$ = 82) had Bachelor's degree, 24.8% ($N_{college\_credit}$ = 59) had some college credit, 12.6% ($N_{Associate}$ = 30) had Associate degree, 10.5% ($N_{Master's}$ = 25) had Master's degree, and 11.8% ($N_{high\_school}$ = 28) had high school diploma.

#### 5.1.3. Stimulus materials

The stimuli were four versions of a website for a fictitious wallet brand specially designed for this study. Wallets were presented in the stimuli because product options are important to the success of retailers of clothing accessories (e.g., wallets), and traditional retailers in this industry who provided relatively limited choices are facing severe competition from online retailers who offer much larger sets of product options (see Cohen, 2018). The manipulation of interactivity was exactly the same as in Study 1. In the low interactivity condition, participants only had control over pace (see Appendix C), while in the high interactivity condition, participants had control over all five content dimensions (i.e., pace, sequence, media, variables, and transaction; see Appendix D). A pretest ($N$ = 55) was conducted to check the manipulation of interactivity. The results indicated that the manipulation had a significant effect on perceived interactivity, such that participants in the high interactivity condition ($M$ = 6.84, SD = 1.37) experienced greater perceived interactivity than those in the low interactivity condition ($M$ = 5.56, SD = 1.62), $t(53) = 3.17$, $p < .01$.

Product choice (a small set vs. a large set) was manipulated by changing the number of products presented on the website. Following Inesi et al. (2011), the small choice set featured three products, while the large choice set featured 15 products. A pretest ($N$ = 55) was conducted to check this manipulation. A series of one-way ANOVA tests indicated that participants perceived the large choice set ($M$ = 5.85, SD = 2.07) as presenting more choices than the small choice set ($M$ = 3.96, SD = 1.96), $F(1, 53) = 11.92$, $p < .01$, $\omega_p^2 = 0.17$. In addition, the manipulation had no effect on perceived product quality or mental effort, $ps > .05$.

The manipulation of desire for control was identical to that in Study 1.

#### 5.1.4. Procedure

The procedure of this study was identical to that of Study 1, except for the different stimuli and a few different measures.

#### 5.1.5. Measures in the pretests

*Perceived interactivity* (α = 0.90) was measured in the same way as in Study 1. *Perceived choice* (r = 0.80, $p < .001$) was measured adopting items from Diehl and Poynor (2010) and Hui and Bateson (1991). The items were "The website provides … (1 = a very small selection; 9 = a very large selection)" and "How much choice do you think a consumer has when browsing this website? (1 = very little choice; 9 = very much choice)." *Product quality* was measured identically as in Study 1. *Mental effort* was measured using a one-item scale from Paas et al. (1994). The item was "To browse the website needs … (1 = very, very low mental effort; 9 = very, very high mental effort)." Product quality and mental effort were measured as confounding checks to ensure that the manipulation of product choice would not influence participants' perceptions of product quality and their experienced cognitive load. As previous research has indicated that product choice may lead to information overload that negatively influences consumer responses (see Lee and Lee, 2004), the pretest results helped rule out the confounding effect of information overload.

#### 5.1.6. Measures in the main experiment

*Desire for control*, *self-efficacy*, *attitude toward the product* (α = 0.90), and *perceived interactivity* (α = 0.92) were measured in the same way as in Study 1. *Perceived choice* (r = 0.83, $p < .001$) was measured identically as in the pretest. *Brand familiarity* (α = 0.94) was measured using a three-item nine-point scale from Kent and Allen (1993). The items were "familiar/unfamiliar," "inexperienced/experienced" and "knowledgeable/not knowledgeable." Brand familiarity was measured as a covariate for controlling the potential confounding effect caused by brand awareness.

### 5.2. Results

#### 5.2.1. Measurement validation

In order to check the discriminant validity between variables measured in the main experiment, the correlations between all the measured variables were tested (see Table 2). The correlation matrix indicated that the discriminant validity of the measures in the main experiment of Study 2 was acceptable.

#### 5.2.2. Manipulation checks in the main experiment

A series of three-way ANOVA tests indicated that the manipulation of desire for control was successful, such that participants who wrote about past situations of no control ($M$ = 7.89, SD = 1.39) reported greater desire for control than those writing about having control in a situation ($M$ = 7.15, SD = 1.66), $F(1, 230) = 14.16$, $p < .001$,

**Table 2**
Correlation matrix of variables in Study 2.

| | Desire for control | Self-efficacy | Product attitude | Perceived interactivity | Perceived choice | Brand familiarity |
|---|---|---|---|---|---|---|
| Desire for control | 1 | | | | | |
| Self-efficacy | 0.015 | 1 | | | | |
| Product attitude | 0.183** | 0.230** | 1 | | | |
| Perceived interactivity | 0.085 | 0.305** | 0.468** | 1 | | |
| Perceived choice | 0.080 | 0.039 | 0.305** | 0.137* | 1 | |
| Brand familiarity | −0.005 | −0.092 | 0.101 | −0.023 | 0.102 | 1 |
| Mean | 7.55 | 6.94 | 6.97 | 6.68 | 5.14 | 2.51 |
| SD | 1.56 | 1.68 | 1.26 | 1.68 | 2.28 | 2.16 |

Notes: $^{**}p < 0.01$; $^{*}p < 0.05$.

$\omega_p^2$ = 0.05. No other effects were found on desire for control, *ps* > .05. The ANOVA tests did not find any significant effects on self-efficacy as well, *ps* > .05.

A three-way ANOVA test indicated that the manipulation of interactivity had a significant effect on participants' perceived interactivity, such that those in the high interactivity condition ($M$ = 7.26, SD = 1.38) experienced greater perceived interactivity than those in the low interactivity condition ($M$ = 5.97, SD = 1.76), $F(1, 230) = 38.76$, $p < .001$, $\omega_p^2 = 0.14$. No other effects were found on perceived interactivity, *ps* > .05.

A three-way ANOVA test indicated that the manipulation of product choice had a significant effect on participants' perceived choice, such that participants' perceived the large choice set ($M$ = 6.35, SD = 1.79) as presenting more choices than the small choice set ($M$ = 3.74, SD = 1.97), $F(1, 230) = 106.28$, $p < .001$, $\omega_p^2 = 0.32$. No other effects were found on perceived choice, *ps* > .05.

#### 5.2.3. Hypothesis 2 testing

Hypothesis 2 predicts an interaction effect between interactivity, desire for control, and product choice on product attitude. A three-way ANCOVA test was conducted using brand familiarity as the covariate. The results indicated that interactivity had a significant main effect on product attitude, such that participants in the high interactivity condition ($M$ = 7.10, SE = 0.11) reported more favorable product attitude than those in the low interactivity condition ($M$ = 6.77, SE = 0.12), $F(1, 229) = 4.03$, $p < .05$, $\omega_p^2 = 0.01$. There was a significant three-way interaction effect between interactivity, desire for control, and product choice on product attitude, $F(1, 229) = 4.51$, $p < .05$, $\omega_p^2 = 0.02$ (see Fig. 2). Participants with a strong desire for control expressed more favorable attitudes toward a small choice set when interactivity was high ($M$ = 7.60, SE = 0.21) versus low ($M$ = 6.65, SE = 0.26), $p < .01$, but they expressed similar attitudes toward a large choice set when interactivity was high ($M$ = 7.13, SE = 0.19) and low ($M$ = 7.04, SE = 0.22), $p > .05$. Therefore, H2 was supported.


**Fig. 2.** The three-way interaction effect between interactivity, desire for control, and product choice on product attitude (Study 2).

Participants with a weak desire for control expressed similar attitudes to both a small and a large choice set across different interactivity conditions ($M_{small\text{-}high}$ = 6.57, $M_{small\text{-}low}$ = 6.70, $M_{large\text{-}high}$ = 7.08, $M_{large\text{-}low}$ = 6.69).

### 5.3. Study 2 discussion

This study investigated how interactivity influences the evaluation of different sizes of choice sets among consumers with varying levels of desire for control. Participants with a strong desire for control expressed more favorable attitudes toward a small choice set (i.e., three products) when interactivity was high versus low, but interactivity did not influence their attitudes toward a large choice set (i.e., 15 products). This study demonstrated the importance of digital interface in how consumers evaluate a small set of product choices. Retailers are often advised to expand product selection, as consumers do not favor limited choice in general (Oppewal and Koelemeijer, 2005). However, sometimes retailers still need to restrict product choices for the purpose of sustainable consumption (Gunn and Mont, 2014). When choice limitation is part of the marketing mix, retailers have to deal with consumers' perceptions of reduced control. This study provides online retailers a potential solution by presenting the power of digital interface in relieving the obstacles of accepting a small set of product choices.

## 6. General discussion

The present research confirmed the prediction that the interactivity of a retailing website compensates for consumers' reduced control over (potential) product consumption and identified context-induced desire for control as a moderator of such effects. Understanding the function of control compensation of interactivity is important, as retailers could utilize digital interface to deal with consumers' perceptions of reduced control caused by certain product features (e.g., new products and limited choices). Findings from the current studies are believed to contribute to both research and practices of digital retailing.

### 6.1. Theoretical contributions

Previous research of E-Commerce has demonstrated the importance of website interactivity to retailing outcomes (e.g., Fiore et al., 2005). However, interactivity is by no means the only factor that determines consumer responses in electronic shopping. Prior marketing studies (e.g., Li et al., 2001) suggested to focus on consumer experiences, as the S-O-R model (Owen, 2002) emphasizes the impact of experience aroused within the organism on the relationship between stimulus and response. Built on this theoretical foundation, the present research examined consumers' experience of reduced control and revealed that high interactivity of a retailing website may not always be beneficial when feelings of reduced control are salient. When facing new products or limited choices, high interactivity only matters when consumers are in great need for control. Therefore, one primary contribution of this research is to reveal the boundary conditions of the impact of interactivity in electronic retailing.

Individuals' innate desire for control has been found to play an important role in influencing consumer behavior (Faranda, 2001; Lunardo and Mbengue, 2009). The Compensatory Control Theory (CCT; Landau et al., 2015) from social psychology has been adopted as the key theoretical framework to explain the effects of control perceptions (Chen et al., 2017; Cutright and Samper, 2014). So far, limited attention in this research stream has been paid to digital interface. Despite the large revenues of E-Commerce, it remains unknown whether digital interface could facilitate consumers' control compensation. By demonstrating that information control brought about by interactivity could help consumers cope with their reduced control over (potential) product consumption, the present research makes two additional theoretical contributions. First, there is a lack of attention to digital media in

the literature of control compensation. This research supplements the theoretical framework of CCT by introducing the function of control compensation of digital interface. Second, this research also expands the application of CCT in the marketing/retailing literature. While existing consumer research guided by CCT has mainly focused on product features and consumer characteristics, this research suggests that media channels should not be ignored. Therefore, a comprehensive application of CCT in explaining online consumer behavior should take product, individual, and media factors into account.

The present research also supports the interactivity-as-information-control perspective (Kalyanaraman and Wojdynski, 2015). Participants in both studies reported distinctive perceptions of interactivity when provided with different levels of information control on retailing websites, supporting the notion that information control is the essential theoretical component of interactivity (see Coyle and Thorson, 2001; Kalyanaraman and Sundar, 2008; Oh, 2017; Steuer, 1992; Sutcliffe and Hart, 2017). Moreover, consistent with previous research (Kalyanaraman et al., 2009; Teo et al., 2003), the current results showed that interactivity positively influenced participants' attitudes (i.e., the main effects of interactivity), indicating that consumers may not be overwhelmed by high levels of information control. In other words, the exercise of control over web content may be beneficial to online information processing.

The interplay between interactivity and desire for control is an important proposition in Liu and Shrum's (2002) conceptual work. Liao and Keng (2013) experimentally tested such an effect on consumer responses to delivery delay, which is a post-purchase situation. The present research focused on consumers' information processing in advance of decision making, which is a totally different consumption situation compared to that in Liao and Keng's (2013) research. More importantly, this research demonstrated that the preference for a highly interactive website among consumers with a strong desire for control may not always be pronounced. Consumers who desire a high level of control may only prefer a highly interactive website when they experience reduced control caused by some product features. Therefore, this research supplements Liu and Shrum's (2002) theoretical framework by identifying the moderation effect of control reduction on the interplay between interactivity and desire for control.

### 6.2. Managerial implications

In addition to the theoretical contributions discussed above, several practical implications of the current findings exist. First, retailers who prefer to promote new products online should invest in the interface design of digital platforms, such as brand websites and branded apps. High levels of interactivity on these media platforms may be beneficial. Second, when providing a large set of product choices is not feasible or the restriction of choices is part of the marketing mix, making digital interface highly interactive can be an alternative strategy for digital retailers. Third, it is important for marketing and retailing professionals to identify consumers who desire increased control over the consumption process. Marketers and retailers may study consumers' social media profiles and activities that are publicly presented using big data analytics or artificial intelligence. For example, previous studies have suggested that people with a strong desire for control tend to enjoy hobbies that offer a sense of mastery, such as art painting or model building (Burger, 2013). Therefore, individuals who constantly post these types of content on social media may be identified as consumers who desire considerable control. With the help of programmatic advertising buying, retailers may precisely target consumers with high desire for control. Fourth, it is suggested that web designers who focus on interface interactivity follow the interactivity-as-information-control perspective and adopt the principles proposed by Kristof and Satran (2002), developing innovative means for users to control various dimensions of digital media content.

### 6.3. Limitations and future research

The studies reported here have some limitations that can be addressed by future investigations. First, both studies were online experiments, meaning that the researcher did not have absolute control over the environment in which participants completed the tasks and answered questions. Controlled lab experiments are recommended for future studies. However, the researcher exerted every possible effort to ensure that the participants completed all the tasks in the experiments. Online experiments also have their own benefits in terms of allowing participants to browse the websites in an environment that is close to their everyday life. According to Kees et al. (2017), data collected from *MTurk* are as good as student samples and professional panel samples. Therefore, it is believed that the online experiment setting is acceptable for this research. Second, several single-item measures were used in the current studies. Although these measures were adopted from previous research and mainly for the purpose of avoiding participants' fatigue, they potentially suffered from low construct validity. Therefore, future studies should adopt better measures for these constructs. Third, some variables that appeared in previous E-Commerce research, such as consumer confusion, purchase intention, and willingness to pay, were not included in the current studies, compressing the contributions of the present research. Future studies may want to include these variables. Fourth, the size of the identified interaction effects in this research was not very large, indicating that the magnitude of the phenomena explored may not be substantial in the real world. Therefore, one should be cautious when applying the findings to real-life situations.

In addition to the suggestions already mentioned above, some other directions for future research are provided. First, previous research has confirmed that the quality of a retailing website could influence consumers' emotions, such as joy, pride, and frustration (Éthier et al., 2006). Likewise, Jiang and Benbasat (2007) found that enjoyment as an emotional response is an important component of consumers' shopping experience and is influenced by interactivity. Thus, it is suggested that future investigations on the impact of interactivity in the situations of reduced control take consumers' emotions into account. Second, mental imagery has been identified as the underlying process of the impact of interactivity in the context of E-Commerce (Jiang and Benbasat, 2007; Schlosser, 2003). This is because high interactivity allows consumers to directly manipulate virtual products and gives them the illusion of "being there" (i.e., telepresence) in a virtual environment (Steuer, 1992). Since the underlying mechanisms of interactivity were not directly tested in the present research, it is suggested that future investigations examine whether mental imagery and telepresence would account for the impact of interactivity, especially when consumers feel reduced control. Finally, vividness of digital product presentation is associated with interactivity (Jiang and Benbasat, 2004). As vividness may increase people's cognition elaboration (see Nisbett and Ross, 1980) and/or affect consumers' emotions (see Jiang and Benbasat, 2007), it may be another mediator between interactivity and consumer responses. In conclusion, the present research hopes to encourage retailing scholars to examine various aspects of consumer experiences in E-Commerce and analyze the impact of interactivity on those aspects. Accumulated evidence from investigations considering media, content, and individuals all together is believed to ultimately benefit the theoretical augmentation in electronic retailing.

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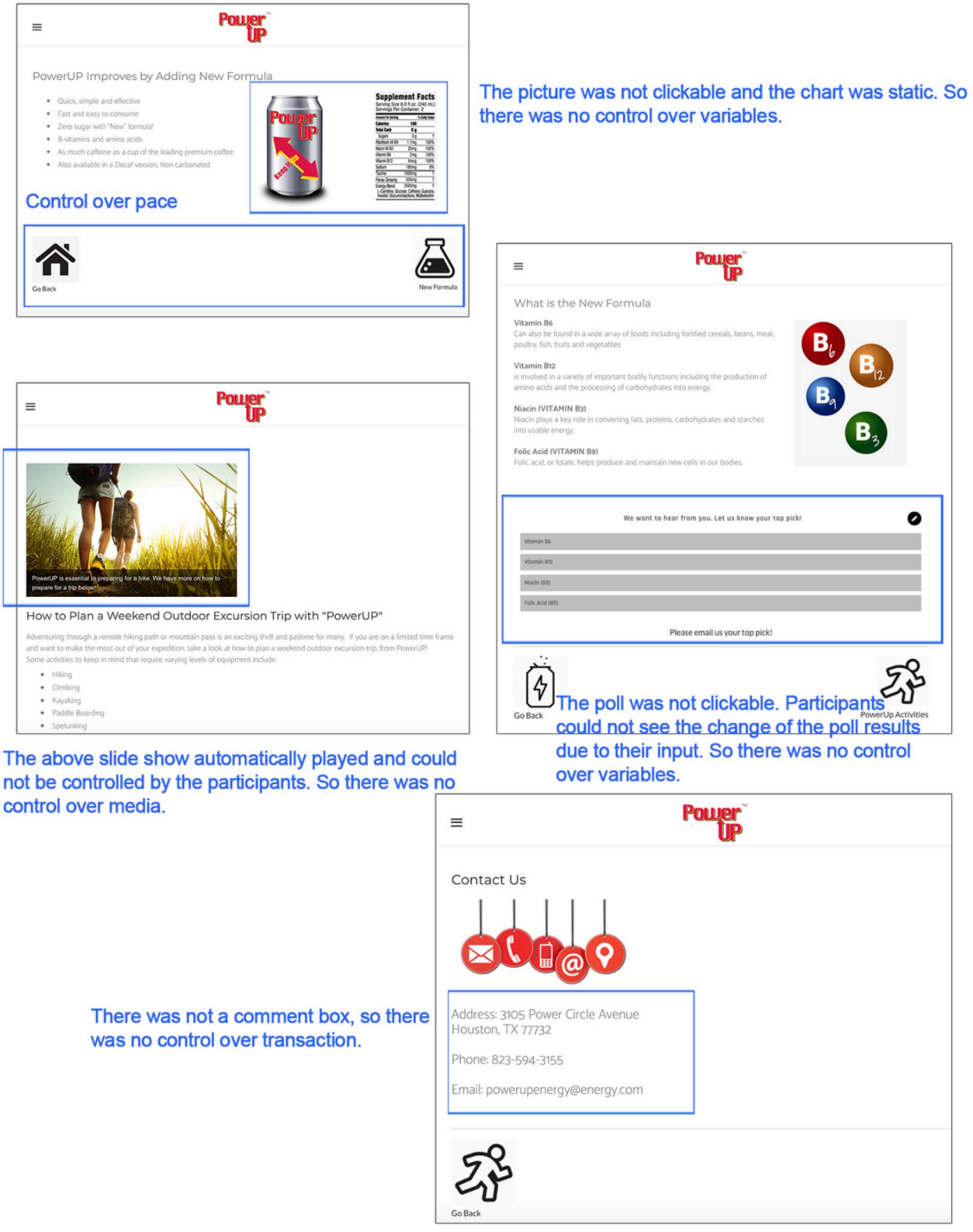
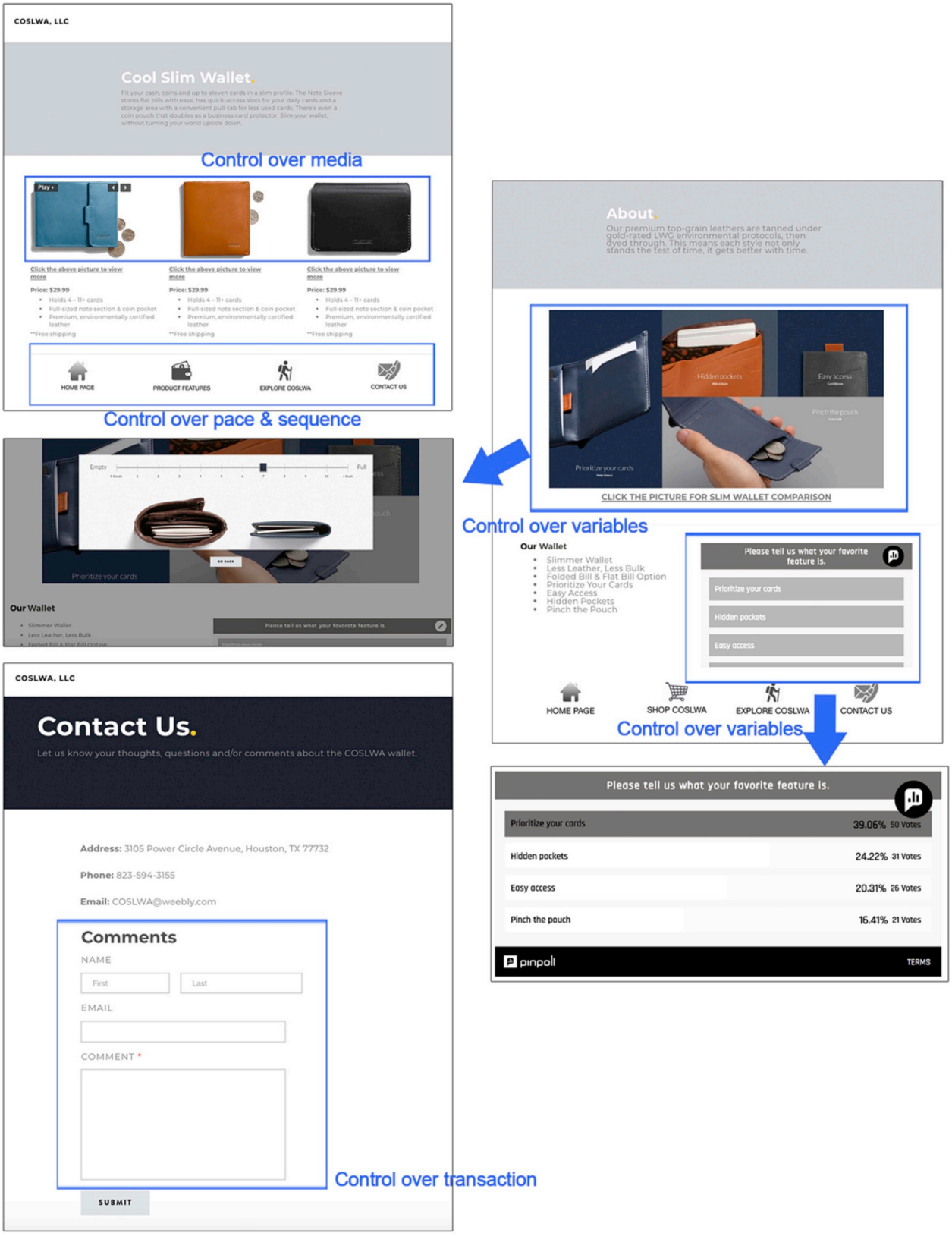
## Appendix A. Stimuli example (low interactivity) in Study 1



## Appendix B. Stimuli example (high interactivity) in Study 1

**Appendix C. Stimuli example (low interactivity) in Study 2**

## Appendix D. Stimuli example (high interactivity) in Study 2



## Appendix E. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jretconser.2019.04.003.

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