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An Analysis of Option Set Size and Option Presentation Style on Consumer Choice and Perception

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ABSTRACT

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Previous studies support the existence of two phenomena: choice overload, where more choice options have negative effects for a consumer (Scheibehenne et al. 2010); and the pictorial superiority effect, stating that pictorial stimuli is more easily recognized than written text (Nelson et al. 1976). Townsend and Kahn (2014) studied these effects by examining different sized choice sets and stimuli types, specifically pictorial (visual) and textual (text-based). In this study, I extend the work of Townsend and Kahn (2014) by introducing a combination presentation of image-based and text-based elements in addition to the pictorial and textual presentations studied before. This study examines the effect of presentation of options (pictorial, textual, or combination) and choice set size (8 or 27) on choice overload, measured through opt-out decision, perceived variety, and perceived complexity which contribute to consumer experience of choice overload. I find significantly higher perceived complexity and perceived variety for 27 item choice sets compared to 8 item choice sets and for text-based presentation compared to image-based presentation. Since perceived variety and perceived complexity factor into consumer experience of choice overload, these results support the existence of choice overload. In addition, I find that perceived variety for the combination presentation of image-based and text-based elements is significantly higher than that of image-based presentation, and that perceived complexity for the combination presentation is marginally significantly higher than that of image-based presentation. These results are applicable to online businesses and online shopping platforms in regard to consumer purchasing behavior. By structuring online presentation of options in a way that is not highly complex and does not have high variety, consumers will be less likely to experience choice overload and more likely to buy items, therefore benefiting the online businesses and online shopping platforms.

An Analysis of Option Set Size and Option Presentation Style on Consumer Choice and Perception

1. Introduction

Amazon's stock has increased by 87 percent since the year 2020 began (Miranda 2020). Is this a coincidence? Likely not. Amidst the COVID-19 pandemic, lockdowns and social distancing have been enforced to prevent the spread of the Coronavirus. For this reason, and that of convenience, consumers are increasingly engaging in online shopping options as opposed to in person ones. With this shift in purchasing environment, product placement in 3-dimensional space has been traded for pictures and item names. Such a shift creates a new environment for consumer choice with a heavy focus on the visual system.

The visual system is used to sense and perceive the characteristics of stimuli in different environments, such as the presentation and number of options in purchasing situations. Given this, the visual system relates to the concepts of choice overload and the pictorial superiority effect. Choice overload is the notion that too many choices can actually be bad for the consumer (Scheibehenne et al. 2010). This contrasts the principles of rational decision making which state that more options are better for the consumer. As COVID-19 has encouraged consumers to purchase online, the opportunity for choice overload has become more prominent -- online businesses have the capacity to include seemingly unlimited options. Consumers can likely become overwhelmed by the number of options available, which may lead them to not make a purchase.

The pictorial superiority effect states that pictorially presented stimuli is more easily recognized compared to textually presented stimuli (Nelson et al. 1976). In the context of online shopping, the picture or text-based stimuli presented to the consumer may influence their purchasing tendencies. A textual only presentation may not suit the preference of the consumer, potentially resulting in a decision not to purchase. While the pictorial superiority

effect refers to pictorial only or textual only presentation types, it is important to consider a potential interaction between pictorial and textual presentations. This leads to the following research question: how does a combination presentation matter for consumer choice, perceived complexity, and perceived variety?

Consider Amazon, a common online shopping platform. On this platform, consumers see a collection of options generally characterized by a picture and a written name or description -- relevant for the pictorial superiority effect. Scrolling further down the page, consumers find more options and subsequent pages reveal even more options for them to consider -- relevant for the choice overload phenomenon. Given the rise in online shopping amidst the COVID-19 pandemic, it is important to consider how item presentation and number of options affects consumers. The consumer's decision to not make a choice and not purchase matters for both the consumer and the business. For the consumer, they either do or do not get the item that they needed or wanted. For the business, they either do or do not earn revenue from the sale. The findings of this study are pertinent to the success of both consumers and businesses in the online purchasing environment.

This study examines the effect of presentation of options as pictorial, textual, or combination and number of choice options in the context of choice overload. Using this framework, I answer the question: does the number of items presented to the consumer and the type of presentation impact perceived complexity, perceived variety, and selection decision which contribute to consumer experience of choice overload? I employ a 2 (number of choice set options: 8, 27) x 3 (presentation format: pictorial, textual, combination) between subjects design with random assignment to one of the six conditions. Participants view their randomly assigned choice set, rate its complexity and variety, then view the choice set again

before responding whether they would select “one option, more than one option, or ‘none of the above.’” (Townsend and Kahn 2014, 1007). This is followed by a short survey collecting shopping patterns and demographic information. The findings embed the pictorial superiority effect and support the construct of choice overload. I find that 27 option choice sets have higher perceived complexity and higher perceived variety than 8 option choice sets. In support of the pictorial superiority effect, I find that textual presentation has higher perceived complexity and higher perceived variety than pictorial presentation. I also find a significant difference in perceived variety of combination presentation and pictorial presentation, and a marginally significant difference in perceived complexity of combination presentation and pictorial presentation.

The next section discusses the existing literature on choice overload and presentation of stimuli. The following sections present the methodology and data used for the empirical findings. This is followed by a discussion of the findings and a final section which concludes.

2. Literature Review

2.1 Choice Overload

Rational decision making assumes that more choices are better for a consumer. The model of choice overload is a violation of this principle, highlighting that too many choices can actually be worse for the consumer, stalling their choice selection process or even causing decision paralysis where the consumer does not make a choice (Chernev et al. 2015).

Choice overload is exemplified by key papers focusing on the number of choice set options. Iyengar and Lepper (2000) use a jam tasting booth to find that more participants approach the 24 item choice set but more participants actually purchase from the 6 option

choice set. Also supporting choice overload, Malhotra (1982) finds that choice overload functions for choice sets consisting of 10 or more options or when the options contain 15 or more attributes. In this context, attributes are details of information for a given choice set item.

Not only are the number of options, or alternatives, important in choice overload and complexity, the attributes are too. Huffman and Kahn (1998) find that consumers who indicate their opinions of attributes report higher satisfaction and lower complexity for the choice set. On the other hand, Lee and Lee (2004) find that attributes, numerically and as descriptors of the items of the choice set, have a prominent influence on choice overload. Their experiment highlights decreased participant satisfaction in the online choice overload environment. In either case, attributes matter for choice overload. Another negative consequence of choice overload is decision paralysis -- consumers not making a choice, or opting-out. Dhar (1997) finds that consumers are more likely to opt-out of choice if a similarly attractive option is added, and are less likely to opt-out of choice if an added item is distinctly less attractive. This identifies one of many possible situations when choice overload is more likely to occur.

A broad assessment of the choice overload literature includes opposing perspectives. Scheibehenne et al. (2010) highlights perspectives both supporting and disputing the existence of choice overload, ultimately finding that there is not strong evidence to support choice overload. Despite this, Scheibehenne et al. (2010) recognizes possible conditions for choice overload including ability for items to be categorized, trade-offs between different choice set options, complexity for choice set items, and time constraints on decision making (Scheibehenne et al. 2010). Other situations where choice overload include those concerning

the options in the choice set. If a consumer does not have any identified preferences for certain options in the choice set, choice overload is more likely to occur (Scheibehenne et al. 2010). Additionally, choice overload is more likely to occur when there is not an obviously superior option within the choice set (Scheibehenne et al. 2010).

Engaging in a meta analytic review of choice overload, Chernev et al. (2015) establish what is known across the literature regarding choice overload. They find that task difficulty, choice set complexity, individual preference uncertainty, and individual decision goal predict choice overload through choice set size (Chernev et al. 2015). Aggregating across the literature, they also find that that choice overload can be measured by "assortment choice and option selection" in addition to "satisfaction/confidence, choice deferral, switching likelihood, and regret", where the latter four reflect choice overload in a similar way (Chernev et al. 2015, 352).

2.2 Presentation of Stimuli

In this section, pictorial presentation is also referred to as image-based or visual while textual presentation is also referred to as text-based or verbal. Sensory modalities process the characteristics of different choice set options, thus linking sensation to decision making from an evaluative perspective. Seo (2020) acknowledges the different sensory modalities and engages multiple sensory systems in the context of nudges. Seo (2020) identifies color, packaging, and placement as product characteristics encoded by the visual system which can have nudge effects on consumer choice. Though nudges are not a major element of this study, elements of encoding of information suggested by Seo (2020) can be applied to a general approach of consumer choice. In this way, this study involves the visual system in its ability to process sensory input and connects it with choice overload.

Information processing systems play a larger-scale role in the encoding of stimuli and its characteristics. Expanding upon the idea of processing sensory information, Childers et al. (1985) involves processing style (visual or verbal) in a study which includes the type of information which the visual system processes. This study expands upon the work done in determining a greater tendency or ease for processing image based stimuli. Specifically, the researchers evaluate prior measurements for ability and preference of processing style, and contribute to the literature by developing a new scale for processing style where participants respond in terms of how true a statement item is for them in their life.

Similar to processing styles, cognitive styles relate to the ways in which people handle and process information. Information processing is relevant to the way in which people interact with different forms of stimuli, suggesting relevant relationships to the current methodology. Wang and Kuo (2017) exemplify how visual as opposed to verbal processing styles can matter for searching behavior. In their study, participants researched bullying online to gather the information to complete a worksheet. Participants later filled out a questionnaire for cognitive style, self efficacy, and searching strategies. Wang and Kuo (2017) found that, in the text conditions, participants with high scores for verbal cognitive styles tended to involve more in depth searching strategies and fewer speedy, surface level searching strategies. In summary, they find that the verbal cognitive style connects to a deeper searching technique when information is in a word format. This relates to decision making and choice overload through the evaluation of information. In the current study, presentation style of stimuli will serve as an independent variable as pictorial only, textual only, or combination presentation. Ultimately, Wang and Kuo (2017) provide insight for

information processing, identifying how individuals with verbal cognitive styles may respond to the verbal presentations.

Visual and verbal processing of information relate to the pictorial superiority effect, a foundational pillar of the current study. Carr et al. (1982) used a priming methodology where participants identified each of the pictorial and word priming stimuli. The following day, the participants were shown two stimuli, both either word or pictorial. Participants were asked to name the second stimulus and, if possible, the first as well. Carr et al. (1982) find that pictorial based stimuli are more easily and quickly determined semantically, as opposed to naming, while the opposite is true for word based stimuli. These findings illustrate a connection to the pictorial superiority effect, where stimuli presented through pictures is more easily recognized compared to text (Nelson et al. 1976). This serves as a foundational element for the current study which engages pictorial only, verbal only, and combination presentation of stimuli in relation to choice overload.

Further exploring the pictorial superiority effect, Nelson et al. (1976) tests this effect. They use stimuli of varying schematic similarity (high or low) and varying conceptual similarity (high or low). Specifically, they identify schematic similarity as the same general shape and orientation of stimuli (high) as opposed to completely different shapes and orientations of stimuli (low). They identify conceptual similarity as the stimuli relating to the same category (high) or when the stimuli are completely unrelated to a common category (low). An example of high conceptual similarity would be a duck and a cow because they are both animals. In the study, participants are presented with a series of pictorial or label stimuli for either 1.1 seconds or 2.1 seconds and a word which is unrelated to the stimulus. Participants respond verbally with the correct word associated with the presented pictorial or

label stimuli. Nelson et al. (1976) find that there is no significant difference in errors for stimulus type. But in the conditions of low schematic and low conceptual similarity, the pictorial superiority effect came through with fewer mean errors for pictorial stimuli. However, there were more mean errors for pictorial stimuli in the high schematic similarity condition and the same in the high conceptual similarity condition compared to the label stimuli. These relationships depend on the duration of presentation, where pictorial stimuli had more errors when presented quicker (1.1 seconds). This study illustrates that the schematic and conceptual relationships of presented stimuli and duration of presentation matter for the pictorial superiority effect.

The pictorial superiority effect has been embedded in previous work which relates to the current methodology. Holbrook and Moore (1981) research the difference between verbal and pictorial stimuli in terms of feature interactions for presentation to consumers. This research is motivated by different forms of processing which apply to consumers' viewing of options, therefore relating to choice overload. Holbrook and Moore (1981) hypothesize more feature interactions of pictorial (image) stimuli as opposed to verbal (words). Specifically, participants are presented with either a verbal or pictorial choice set of sweaters where they give judgements of the choice set using paired descriptors each with a 7 item scale (Holbrook and Moore 1981). Initially, the researchers find nonsignificant results for pictorial presentation having less feature interactions. (Holbrook and Moore 1981). However, the hypothesis is later validated after controlling for mental imaging -- ultimately finding more feature interactions of pictorially presented choice set options (Holbrook and Moore 1981). This methodology and results are valuable to the current study which employs presentation

of choice set items as images and words. However, Holbrook and Moore (1981) do not involve a combination presentation which the current methodology does.

The above discussion has considered choice overload and the pictorial superiority effect separately. Townsend and Kahn (2014) explore how choice set size and presentation of stimuli function in consumer choice. Specifically, Townsend and Kahn (2014) build upon the constructs of processing style and choice overload -- processing as visual (pictorial) versus verbal (textual description) and choice overload through variety and complexity. The researchers collect data using a 2x2 between subjects design for choice set size (8, 27) and presentation form (verbal, visual). Participants are asked to view a set of crackers and rate the variety and complexity of the choice. Ultimately, the participants pick one option, multiple options, or none of the options presented to them. Participants also respond to individual difference scales and a demographic survey for gender and age (Townsend and Kahn 2014, 1007). Townsend and Kahn (2014) find that the number of choice set items and presentation format does not matter for participant opt-out, but the interaction does matter. For 8 choice options, opting-out was not significantly different between visual and verbal presentation, but for 27 choice options, there was more opting-out for visual presentation as opposed to verbal (Townsend and Kahn 2014). As a result, they found that, for visual presentation, there was more choice overload for 27 options than 8 options as well as more opting-out of choice (Townsend and Kahn 2014). Additionally, Townsend and Kahn (2014) find greater variety and complexity ratings for 27 options as opposed to 8 option choice sets (Townsend and Kahn 2014). They find higher variety ratings for visual presentation and higher complexity ratings in 27 item choice sets for visual presentation (Townsend and Kahn 2014). Townsend

and Kahn (2014) recognize that they use image only and textual only presentations, without including a combination of the two as a presentation group.

Given the gap in the literature, I employ a combination presentation of image-based and text-based elements to expand upon the work of Townsend and Kahn (2014). I perform this research in the context of choice overload with influence from the pictorial superiority effect. I employ a methodology that mirrors that of Townsend and Kahn (2014) to determine the effect of a combination presentation on perceived complexity and perceived variety, which contribute to consumer experience of choice overload. The current research provides insight for online sellers on how to best present their products so as not to induce choice overload through high perceived complexity and high perceived variety of option sets.

I expect to replicate the key findings of Townsend and Kahn (2014) in regard to choice size, but not in regard to presentation style. I hypothesize that participants will rate 27 option choice sets with higher perceived complexity and higher perceived variety than 8 option choice sets. Unlike Townsend and Kahn (2014), who find higher ratings in complexity and variety for visual presentation, I hypothesize that participants viewing pictorial stimuli will indicate lower perceived complexity and lower perceived variety than for textual presentation. If the pictorial superiority effect holds, participants should have an easier time viewing and interacting with the pictorial choice sets, rating pictorial stimuli with lower perceived complexity and lower perceived variety. By combining the pictorial superiority effect with the choice overload literature, I hypothesize that the pictorial superiority effect should make choice easier, meaning lower perceived complexity and lower perceived variety, indicating less choice overload. Moreover, I hypothesize that combination presentation of pictorial and textual stimuli will be rated higher on perceived complexity, higher on

perceived variety, and participants will have a greater tendency to opt-out of choice in a 27 item choice set as opposed to an 8 item choice set. I hypothesize that combination presentation will have higher perceived complexity and higher perceived variety than either pictorial or textual presentation.

3. Methods

3.1 Participants

309 participants took part in the study through Amazon Mechanical Turk. Each participant was compensated $1.00 for completing the survey. The sample includes: 198 males, 108 females, 1 individual identifying as non-binary/ third gender, and 2 individuals who prefer not to say. The mean age is 38 years. 77.67% of participants are white and 77.02% of participants are employed full time. Descriptive statistics for the sample are shown in Table 1.

3.2 Procedure

The study employs a between subjects design with 2 sizes of choice sets (8, 27) and 3 presentation formats (pictorial, textual, combination)[1]. Participants were told to imagine themselves shopping on an online platform such as Amazon for sweaters to wear to a dinner party in two weeks. In this way, the stimuli is similar to that of Holbrook and Moore (1981). After confirming their consent, participants were randomly assigned to presentation (pictorial, textual, combination) and number of choice set options (8, 27)[2]. Participants were

[1] The procedure involved in this study closely mirrors that of Townsend and Kahn's (2014) Study 5.
[2] Please note that this differs from Townsend and Kahn's (2014) Study 1 methodology where participants indicated whether they would prefer to be presented with options in an image based format or a word based format.

shown an informational graphic exemplifying the characteristics and potential presentations of the sweater stimuli. They were then presented with the choice set of sweater stimuli according to the randomly assigned choice set option and presentation conditions. The 8 option choice sets shown to participants are illustrated in Figure 1. - Figure 3. The 27 option choice sets shown to participants have the same structure as Figure 1. - Figure 3. with more options. Participants rated the presented choice set on its variety using a 5 point scale and the following statements, adapted from Townsend and Kahn (2014): “How much variety do you think there is in this assortment?”, “This assortment of sweaters offers a lot of variety.”, “This assortment of sweaters gives me at least one option I like.”, “This assortment of sweaters is too complex to consider.”, “It is difficult to keep track of all the various options in this sweater assortment.”, and “There are too many options in this assortment of sweaters.” Participants viewed their same choice set and responded to whether they would select “one option, more than one option, or ‘none of the above.’”(Townsend and Kahn 2014, 1007). Participants answered a short survey on demographics and online shopping behavior and were debriefed.

Figure 1. Pictorial Presentation of 8 Option Stimuli Set

V-neck **Gridded pattern** **Red**	**Turtleneck** **Solid color** **Green**	**Turtleneck** **Striped pattern** **Blue**
V-neck **Solid color** **Blue**	**Turtleneck** **Gridded pattern** **Green**	**Crew neck** **Striped pattern** **Red**
Crew neck **Solid color** **Green**	**Crew neck** **Gridded pattern** **Blue**	

Figure 2. Textual Presentation of 8 Option Stimuli Set

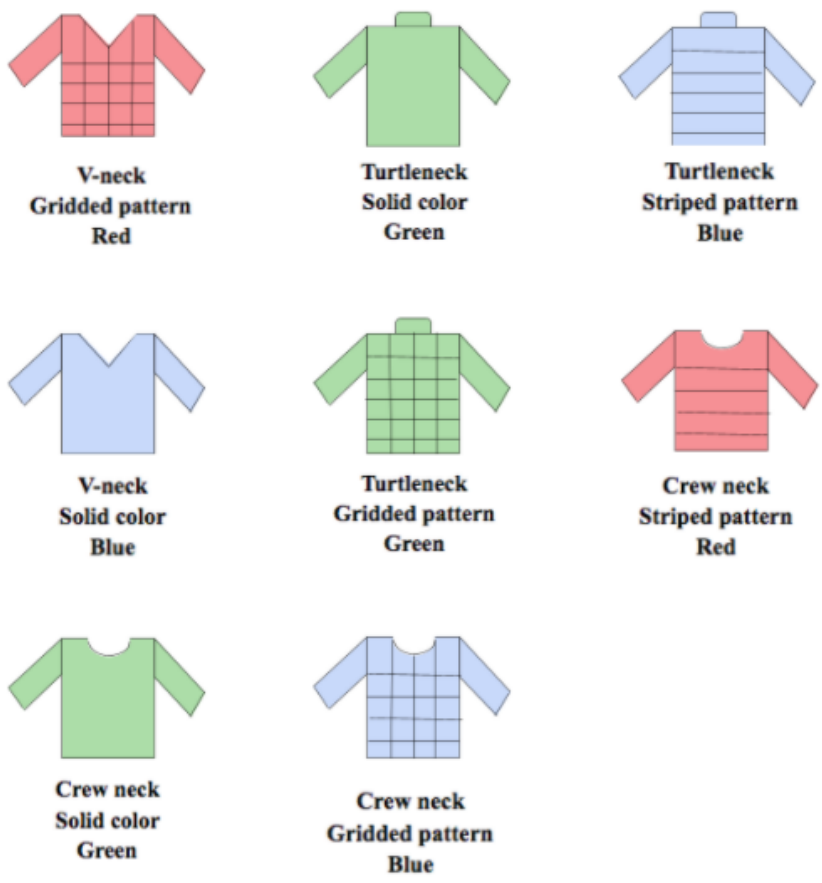

Figure 3. Combination Presentation of 8 Option Stimuli Set

4. Data and Empirical Strategy

4.1 Description of Data

Data was collected through the procedure described above. Each participant was randomly assigned to condition in a between subjects design. The conditions included number of choice set options (8, 27) and presentation (pictorial, textual, combination). 309 participants were split across 6 randomly assigned experimental conditions: 49 participants in the 8 options with pictorial presentation, 47 participants in the 8 options with textual presentation, 52 participants in the 8 options with combination presentation, 53 participants in the 27 options with pictorial presentation, 55 participants in the 27 options textual presentation, and 53 participants in the 27 options combination presentation. The resulting

data represents 309 participants each with information collected regarding demographics and individual preferences.

4.2 Economic Model and Empirical Strategy

This study examines both choice overload and the pictorial superiority effect. Choice overload is implemented via the number of choice set options condition (8, 27), where 8 represents the small choice set and 27 represents the large choice set. Previous research finds the large choice set size leads to choice overload for participants and a tendency to opt-out of choice. The pictorial superiority effect is implemented via the presentation of options (pictorial, textual, combination), where the combination presentation contains image-based and text-based elements. Previous studies show that people recognize pictorial stimuli easier than textual stimuli (Nelson et al. 1976). In this study, I add the combination presentation to determine how it interacts with the number of choice set options in relation to perceived complexity and perceived variety as contributors to consumer experience of choice overload.

Independent t-tests

I perform individual t-tests on the proportion of participants choosing no option, perceived variety, and perceived complexity by option size for the full sample and by presentation style.

ANOVA

I perform analysis of variance tests on perceived variety and perceived complexity by presentation style for the full sample and by number of options.

Regression Analysis

I employ a regression analysis on the data to include the online shopping variables and demographic variables using the following regression framework.

$$Choice\ Overload\ =\ \beta_0\ +\ \beta_1 NumOptions\ +\ \beta_2 Presentation\ +\ \beta_3 NumOptions\ *\ Presentation$$

Where Choice Overload is (i) No Option Choice, also referred to as Opt-Out, (ii) Perceived Variety (iii) Perceived Complexity; NumOptions is a binary variable for the number of options in the selection; Presentation is a categorical variable for pictorial, textual, or combination and *X* is a vector of variables including online shopping comfort, online shopping frequency, and demographic variables of age, gender, ethnicity, education, employment, and income.

5. Empirical Results

Option Choice

I use individual t-tests to determine the differences in participant option choices, where participants are asked if they would select "one option, more than one option, or 'none of the above'" from their presented choice set (Townsend and Kahn 2014, 1007). I refer to the 'none of the above' option as the decision to opt-out of choice, whereas the decision to select "one option" or "more than one option" is not opting-out of choice (Townsend and Kahn 2014, 1007). Decision to opt-out did not differ as a function of option size t(307)= 0.62, p= 0.53, such that participants who viewed 8 option (M= 0.13, SE= 0.03) and 27 option choice sets (M= 0.11, SE= 0.02) had equivalent tendencies to opt-out of choice. Decision to opt-out did not differ as a function of option size for participants viewing pictorial stimuli t(100)= 0.16, p= 0.88, such that participants who viewed 8 option (M= 0.14, SE= 0.05) and 27 option choice sets (M= 0.13, SE= 0.05) had equivalent tendencies to opt-out of choice. Decision to opt-out did not differ as a function of option size for participants viewing textual stimuli t(100)= 0.92, p= 0.36, such that participants who viewed 8 option (M= 0.13, SE=

0.05) and 27 option choice sets (M= 0.07, SE= 0.04) had equivalent tendencies to opt-out of choice. Decision to opt-out did not differ as a function of option size for participants viewing combination stimuli t(103)= 0.03, p= 0.97, such that participants who viewed 8 option (M= 0.12, SE= 0.04) and 27 option choice sets (M= 0.11, SE= 0.04) had equivalent tendencies to opt-out of choice. There was no difference in participant tendency to opt-out between visual and textual presentation for 8 choice set options.

In the first regression of Table 5., I regress opt-out on option size of 8 items, pictorial presentation style, combination presentation style, the interactions between option size and presentation styles, online shopping comfort, online shopping frequency, age, and a number of demographic variables. In this regression, online shopping frequency is positive and significant. With all else held constant, a one unit increase in online shopping frequency is associated with about a 0.03 unit increase in tendency opt-out. This means that people who shop online more times in a one month period are more likely to opt-out of choice. Education level of 'Some college', a '2 year degree' and a '4 year degree' are negatively and significantly related to opt-out indicating that participants with these levels of education were less likely to opt-out of choice relative to those with education levels of "High school graduate". Income ranges of "$10,000 - $19,999" and "$100,000 - $149,999" are positively and significantly related to opt-out indicating that participants with these levels of income were more likely to opt-out of choice relative to those with "Less than $10,000".

Perceived Variety and Complexity

The perceived complexity variable is composed of the mean value of responses to the following statements: "This assortment of sweaters is too complex to consider.", "It is difficult to keep track of all the various options in this sweater assortment.", and "There are

too many options in this assortment of sweaters." The perceived variety variable is composed of the mean value of responses to following statements: "How much variety do you think there is in this assortment?", "This assortment of sweaters offers a lot of variety.", and "This assortment of sweaters gives me at least one option I like."

Cronbach's alpha determined the internal consistency of the perceived complexity variable (Scale reliability coefficient= 0.91) and the perceived variety variable (Scale reliability coefficient= 0.73). These measures confirm that the items composing the perceived complexity and perceived variety variables are highly related and can, therefore, form cohesive variables respectively.

I analyze the differences in perceived complexity and perceived variety by option sizes using individual t-tests. Perceived complexity differed as a function of option size $t(307)= -3.89$, $p= 0.0001$, such that 27 options were perceived to have higher complexity (M= 2.65, SE= 0.10) than 8 options (M= 2.12, SE= 0.09) (See Figure 4.). Perceived complexity did not differ as a function of option size for participants viewing pictorial stimuli $t(100)= -1.71$, $p= 0.09$, such that participants who viewed 8 option (M= 1.90, SE= 0.14) and 27 option choice sets (M= 2.26, SE= 0.16) had equivalent perceptions of complexity. However, this result can be viewed as marginally significant. Perceived complexity differed as a function of option size for participants viewing textual stimuli $t(100)= -3.25$, $p= 0.002$, such that 27 options were perceived to have higher complexity (M= 3.02, SE= 0.17) than 8 options (M= 2.24, SE= 0.17). Perceived complexity did not differ as a function of option size for participants viewing combination stimuli $t(103)= -1.77$, $p= 0.08$, such that participants who viewed 8 option (M= 2.22, SE= 0.17) and 27 option choice sets (M= 2.65, SE= 0.17)

had equivalent perceptions of complexity. This result can also be interpreted as marginally significant.

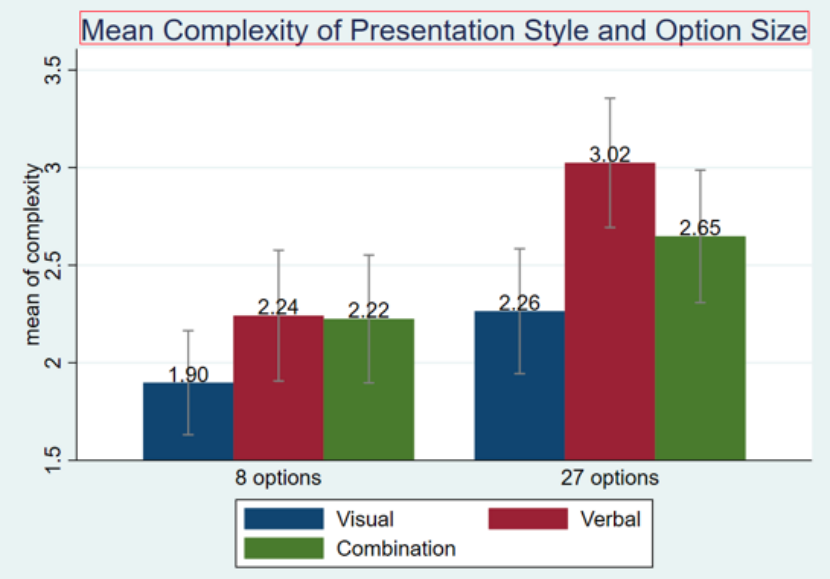

Figure 4. Mean Complexity of Presentation Style and Option Size

Finds higher perceived complexity of 27 option choice sets as opposed to 8 option choice sets. Figure 4. breaks down the option size means for perceived complexity into means for individual presentation styles for perceived complexity.

Perceived variety differed as a function of option size t(307)= -3.28, p= 0.001, such that 27 options were perceived to have more variety (M= 3.87, SE= 0.06) than 8 options (M= 3.57, SE= 0.07) (See Figure 5.). Perceived variety did not differ as a function of option size for participants viewing pictorial stimuli t(100)= -0.38, p= 0.71, such that participants who viewed 8 option (M= 3.50, SE= 0.11) and 27 option choice sets (M= 3.57, SE= 0.12) had equivalent perceptions of variety. Perceived variety differed as a function of option size for participants viewing textual stimuli t(100)= -4.34, p< 0.001, such that 27 options were perceived to have more variety (M= 4.10, SE= 0.07) than 8 options (M= 3.52, SE= 0.12). Perceived variety did not differ as a function of option size for participants viewing

combination stimuli t(103)= -1.51, *p*= 0.14, such that participants who viewed 8 option (M= 3.68, SE= 0.11) and 27 option choice sets (M= 3.92, SE= 0.11) had equivalent perceptions of variety.

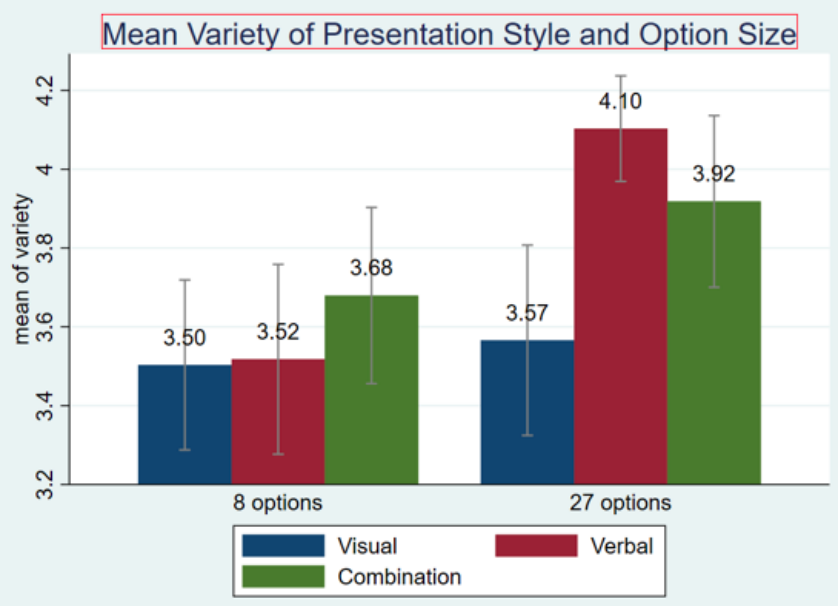

Figure 5. Mean Variety of Presentation Style and Option Size

Finds higher perceived variety of 27 option choice sets as opposed to 8 option choice sets. Figure 5. breaks down the option size means for perceived variety into means for individual presentation styles for perceived variety.

I analyzed the differences in perceived complexity and perceived variety by presentation styles using ANOVA. Perceived complexity differed as a function of presentation style F(309)= 5.93, *p*= 0.003. Post hoc Tukey tests revealed that textual presentation (M= 2.66, SE= 0.13) had higher complexity ratings than pictorial presentation (M= 2.09, SE= 0.11). No comparisons with combination presentation (M= 2.44, SE= 0.12) were statistically significant at *p*= 0.05. However, there was marginal significance (*p*= 0.093*)* for the comparison between combination presentation and pictorial presentation, where combination presentation (M= 2.44, SE= 0.12) had higher complexity ratings than did

pictorial presentation (M= 2.09, SE= 0.11) (See Figure 6.). Perceived complexity did not differ as a function of presentation style for participants viewing option sets of 8 F(148)= 1.48, p= 0.23). However, perceived complexity differed as a function of presentation style for participants viewing option sets of 27 F(161)= 5.15, p= 0.007. Post hoc Tukey tests revealed that textual presentation (M= 3.02, SE= 0.17) had higher complexity ratings than pictorial presentation (M= 2.26, SE= 0.16). No comparisons with combination presentation (M= 2.65, SE= 0.17) were statistically significant at p= 0.05.

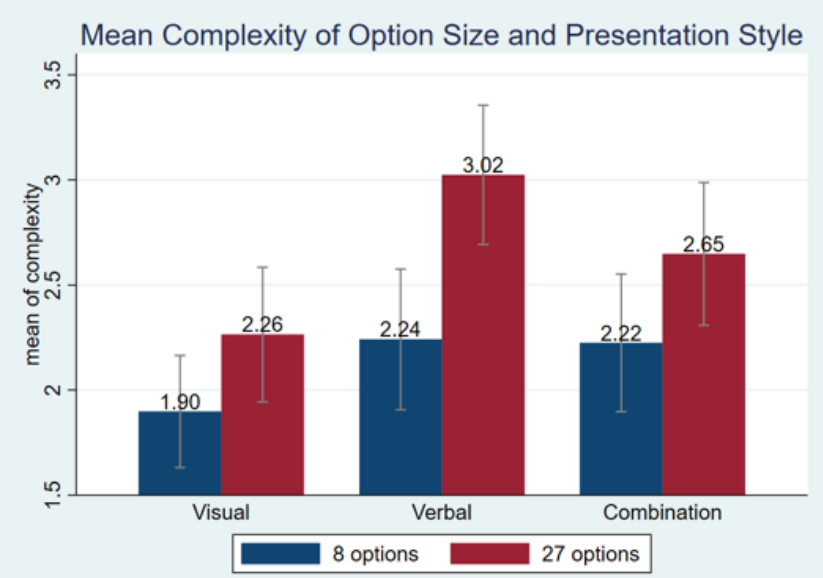

Figure 6. Mean Complexity of Option Size and Presentation Style

Finds higher perceived complexity of textual presentation style as opposed to pictorial presentation and marginally significant higher perceived complexity of combination presentation style as opposed to pictorial presentation. Figure 6. breaks down the presentation style means for perceived complexity into means for individual option sizes for perceived complexity.

Perceived variety differed as a function of presentation style F(309)= 4.28, p= 0.015. Post hoc Tukey tests revealed that textual presentation (M= 3.83, SE= 0.07) had higher perceived variety than pictorial presentation (M= 3.54, SE= 0.08). Additionally, combination

presentation (M= 3.8, SE= 0.08) had higher perceived variety than pictorial presentation (M= 3.54, SE= 0.08). The comparison between combination presentation (M= 3.8, SE= 0.08) and textual presentation (M= 3.83, SE= 0.07) was insignificant (See Figure 7.). Perceived variety did not differ as a function of presentation style for participants viewing option sets of 8 $F(148)= 0.74$, $p= 0.48$. However, perceived variety differed as a function of presentation style for participants viewing option sets of 27 $F(161)= 7.11$, $p= 0.001$. Post hoc Tukey tests revealed that textual presentation (M= 4.10, SE= 0.07) had higher variety ratings than pictorial presentation (M= 3.57, SE= 0.12). Additionally, combination presentation (M= 3.92, SE= 0.11) had higher variety ratings than pictorial presentation (M= 3.57, SE= 0.12). The comparison between combination presentation (M= 3.92, SE= 0.11) and textual presentation (M= 4.10, SE= 0.07) was insignificant.

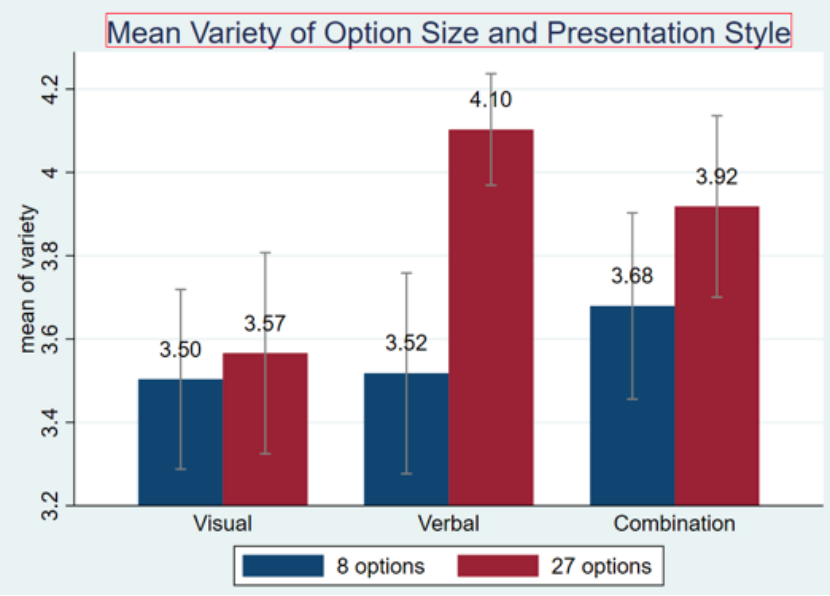

Figure 7. Mean Variety of Option Size and Presentation Style

Finds higher perceived variety of textual presentation style as opposed to pictorial presentation and higher perceived variety of combination presentation style as opposed to pictorial presentation. Figure

7. breaks down the presentation style means for perceived variety into means for individual option sizes for perceived variety.

Regression analysis supports the t-test and ANOVA results. In the second regression of Table 5., I regress perceived complexity, on option size, presentation style, presentation style, the interactions between option size and presentation styles, online shopping comfort, online shopping frequency, age, and a number of demographic variables. The coefficient of option size is positive and significant in this regression model, indicating that participants in the textual group of 27 options rated mean complexity higher by 0.98 units. In this way, this regression supports the earlier findings that more options will be rated as more complex, contributing to choice overload. The coefficient for the interaction between 27 item option size and pictorial presentation is negative and significant, indicating that the effect on mean complexity of pictorial presentation style is more negative for the 27 option choice set than it is for the 8 option choice set. The coefficient for the interaction between the 27 item option size and combination presentation is negative and significant, indicating that the effect on mean complexity of combination presentation style is more negative for the 27 option choice set than it is for the 8 option choice set. Online shopping comfort is negatively and significantly associated with mean complexity, where a one unit increase in online shopping comfort results in a 0.54 unit decrease in mean complexity. This means that the more comfortable a participant is with online shopping, the lower their perceived complexity. Age is negatively and significantly associated with mean complexity, where a one year increase in age is associated with a 0.03 unit decrease in mean complexity. Education levels of ‘4 year degree’ and ‘Professional degree’ are positively and significantly related to mean complexity indicating that participants with these levels of education rated the choice set as more

complex than those with education levels of “High school graduate”. The income range of “$50,000 - $59,999” and the constant is also positively and significantly related to mean complexity, indicating that participants with these income levels rated the choice set as more complex than those with “Less than $10,000”.

In the third regression of Table 5., I regress perceived variety on option size, presentation style, the interactions between option size and presentation styles, online shopping comfort, online shopping frequency, age, and a number of demographic variables. 27 option size remains positive and significant in this regression model, indicating that participants in the textual group of 27 options rated mean variety higher by 0.64 units. Similar to the perceived complexity regression, the coefficient for the interaction between 27 item option size and pictorial presentation remains negative and significant, as does the coefficient for the interaction between the 27 item option size and combination presentation. The income ranges of “$20,000 - $29,999”, “$30,000 - $39,999”, “$90,000 - $99,999” and the constant are positively and significantly related to mean variety, indicating that participants with these income levels rated the choice set as having more variety than those with “Less than $10,000”..

6. Discussion

6.1 Discussion and Application of Results

Overall, I find support for my hypotheses regarding choice set size and pictorial as opposed to textual presentation. Thus, the results confirm choice overload and contrast Townsend and Kahn (2014). I also provide a new finding regarding combination

presentation of image-based and text-based presentation, though it goes against my hypothesis.

I find a significant difference in perceived complexity between 8 and 27 option set sizes. Specifically, participants who view choice sets of 27 options give higher complexity ratings for their choice set than do participants who view choice sets of 8 options. Therefore, these results suggest that more options have higher perceived complexity than fewer options. Similarly, there is a significant difference in perceived variety between 8 and 27 options. Specifically, participants who view choice sets of 27 options give higher variety ratings for their choice set than do participants who view choice sets of 8 options. These results suggest that more options have high perceived variety than fewer options. As a result, I find that option size matters for both perceived complexity and perceived variety. Since complexity and variety of choice sets contribute to higher choice overload by overwhelming a consumer, these findings support the concept of choice overload.

In contrast with Townsend and Kahn (2014), there is a significant difference in perceived complexity between text-based (textual) presentation and image-based (pictorial) presentation. This means that participants who view text-based presentation rate the choice set as having higher complexity than do participants who view image-based presentation. Similarly, there is a significant difference in perceived variety between text-based (textual) presentation and image-based (pictorial) presentation. This means that participants who view text-based presentation rate the choice set as having higher variety than do participants who view image-based presentation. Ultimately, these findings highlight lower perceived complexity and lower perceived variety for image-based presentation, reflecting the pictorial superiority effect and indicating less choice overload for pictorial stimuli.

There is a marginally significant difference in perceived complexity between combination presentation of text-based and image-based (combination) presentation and image-based (pictorial) presentation. This means that participants who view combination presentation of text-based and image-based stimuli rate the choice set as having higher complexity than do participants who view image-based presentation. Additionally, there is a significant difference in perceived variety between combination presentation of text-based and image-based (combination) presentation and image-based presentation (pictorial). This means that participants who view combination presentation of text-based and image-based stimuli rate the choice set as having higher variety than do participants who view image-based presentation. Such findings illustrate a new derivative of the pictorial superiority effect where image-based (pictorial) stimuli is recognized more easily in comparison to the combination presentation of text-based and image-based stimuli. In conjunction with the presentation style findings described above, these results confirm that presentation style matters for both perceived complexity and perceived variety.

Both perceived complexity and perceived variety differ as a function of presentation style for participants viewing option sets of 27 but not those viewing the option set of 8. Additionally, both perceived complexity and perceived variety differ as a function of optonsize for participants viewing textual stimuli. Therefore, the larger choice sets and textual presentation are the primary drivers of the overall significant differences in perceived complexity and perceived variety. This suggests that there are conditions under which choice overload exists.

Overall, the current study confirms choice overload through significant differences in perceived variety and perceived complexity between 8 and 27 item option sizes. Though the

findings on presentation style differ from those of Townsend and Kahn (2014), it is important to recognize the difference in stimuli -- Townsend and Kahn (2014) use crackers as their stimuli whereas the current methodology employs sweaters as stimuli. Ultimately, the results regarding image-based (pictorial) and ext-based (textual) presentation align with my hypothesis and empirically confirm the pictorial superiority effect through significant differences in perceived variety and perceived complexity. This study contributes new findings on combination presentation, finding marginally significant and significant differences in perceived complexity and perceived variety respectively, between combination presentation of text-based and image-based (combination) presentation and image-based (pictorial) presentation.

6.2 Limitations and Extensions

This study is limited by its hypothetical nature and in its operationalization of the opt-out variable. As instructed, participants viewed their choice set with the intent of finding a sweater to wear to a dinner party in two weeks. However, this situation was hypothetical and participants did not have to select or purchase an option with the reality of a dinner party approaching. Given this hypothetical situation, the results of this study may not fully capture the true results of choice overload. Additionally, I operationalize opting-out of choice as selecting no option out of the presented choice set. However, no choice is not necessarily synonymous with opting-out of choice. The results of this study cannot discern the difference between a participant who was experiencing choice overload and did not choose because of choice overload, and a participant who was not experiencing choice overload and simply did not like any of the options.

This study is also limited in its scope, specifically in how I measure choice overload. I utilize participant decision to opt-out of choice, perceived variety, and perceived complexity to measure choice overload, but there are many aspects of choice overload that are not included, such as choice satisfaction and regret. Similarly, I consider only 3 attributes of choice in this study. This is not fully applicable to real world decision making which involves more factors including time and money. Future studies should include more variables which influence choice to improve the external validity of the study to more accurately portray decision making and choice in the real world.

Future research should also engage different stimuli and characteristics of stimuli. Specifically, Townsend and Kahn (2014) use cracker stimuli with characteristics of shape (circle, square, triangle), flavor (plain, pumpernickel, wheat), and topping (none, salt, poppy seeds). The current study uses sweaters as stimuli with characteristics of color (blue, red, green), style (crew neck, v-neck, turtleneck), and pattern (solid color, striped pattern, gridded pattern). Expanding the stimuli and characteristics of the choice sets while maintaining the current methodology involving perceived complexity and perceived variety will determine the generalizability and application of the results.

Additionally, future research should exercise different measures of perceived complexity and perceived variety. The current methodology is an extension of Townsend and Kahn (2014) and uses the same stem statements for perceived complexity and perceived variety. Though these results confirm the existence of choice overload and the pictorial superiority effect, highlighting differences between combination presentation and image-based presentation, these results may be linked to the perceived complexity and perceived variety variables. To confirm the conceptual findings of this study regarding choice

overload with the pictorial superiority effect and differences between combination presentation and image-based presentation, future research should identify internally reliable measures of complexity and variety and replicate the current study using the same methodology.

Extensions of this study may include risk preferences and willingness to gamble. Specifically, future research could utilize the current methodology and analyze perceived complexity and perceived variety in relationship to risk aversion, risk neutrality, and risk loving behavior. A future direction answers the following question: are individuals who do not align with typical choice overload and pictorial superiority concepts risk-loving? Since risk-loving individuals may participate excessively in gambling and not subscribe to typical constructs such as sunk cost, it is possible that they may be less susceptible to choice overload and/ or the pictorial superiority effect.

7. Conclusion

In conclusion, this study successfully confirmed the existence of choice overload and the pictorial superiority effect. I found similar findings to those of Townsend and Kahn (2014) in terms of choice set size, but found contrasting evidence for the perceived variety and complexity of pictorial versus textual presentation. The difference in results may stem from the difference in stimuli. Crackers are a good that relies on taste to be sensed, yet Townsend and Kahn (2014) use attributes which are visually encoded such as shape, topping, and flavor. On the other hand, sweaters are a visually sensed retail good and the attributes of color, style, and pattern align with this type of sensory encoding. Additionally, I found a marginally significant difference in perceived complexity and a significant difference in

perceived variety between combination presentation and image-based presentation. This study functions to extend the research done on consumer choices, specifically in an online environment. Given the impact of the Coronavirus in limiting in-person shopping, this study is of significant importance for the current success of online shopping platforms such as Amazon. Given my findings, online businesses should prioritize fewer options and image-based presentation to reduce consumers' perceived complexity and perceived variety, therefore lessening their potential experience of choice overload and lessening the potential for consumers to not purchase.

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TABLES

Table 1: Descriptive Statistics

Variable	Proportion (Frequency)/ Mean	Std. Dev	Min	Max
Choice				
One option	0.5113 (158)			
More than one option	0.3722 (115)			
No option	0.1165 (36)			
Mean variety	3.724	0.805	1	5
Overall variety	3.194	0.933	1	5
Assortment variety	3.728	1.124	1	5
Options I like	4.249	0.918	1	5
Complexity	2.397	1.221	1	5
Too complex	2.197	1.207	1	5
Difficult to track	2.505	1.367	1	5
Too many options	2.489	1.392	1	5
Online Shopping Comfort	4.683	0.567	1	5
Online Shopping Frequency	3.453	1.190	1	5
Age	37.64	9.87	20	69
Gender				
Male	0.641 (198)			
Female	0.350 (108)			
Non-binary/Third Gender	0.003 (1)			
Prefer not to say	0.007 (2)			
Ethnicity				
White	0.777 (240)			
Black or African American	0.117 (36)			
American Indian or Alaska Native	0.013 (4)			
Asian	0.074 (23)			
Other	0.019 (6)			
Education				
High School Graduate	0.104 (32)			
Some College	0.181 (56)			
2 Year Degree	0.091 (28)			
4 Year Degree	0.495 (153)			

Professional Degree	0.113 (35)			
Doctorate	0.016 (5)			
Employment				
Employed Full Time	0.770 (238)			
Employed Part Time	0.107 (33)			
Unemployed Looking for Work	0.049 (15)			
Unemployed Not Looking for Work	0.045 (14)			
Retired	0.019 (6)			
Student	0.010 (3)			
Income				
Less than $10,000	0.062 (19)			
$10,000 - $19,999	0.100 (31)			
$20,000 - $29,999	0.168 (52)			
$30,000 - $39,999	0.123 (38)			
$40,000 - $49,999	0.107 (33)			
$50,000 - $59,999	0.162 (50)			
$60,000 - $69,999	0.078 (24)			
$70,000 - $79,999	0.058 (18)			
$80,000 - $89,999	0.032 (10)			
$90,000 - $99,999	0.032 (10)			
$100,000 - $149,999	0.058 (18)			
More than $150,000	0.019 (6)			

Table 2: Independent T-Tests by Number of Options

PANEL A: PERCENTAGE OF RESPONDENTS CHOOSING "NO OPTION"				
	Number of Options		**Difference**	**p-value**
Presentation Style	*8*	*27*		
All	12.8%	10.5%	2.2%	0.5343
Image-based	14.3%	13.2%	1.1%	0.8759
Text-based	12.8%	7.3%	5.5%	0.3573
Combination	11.5%	11.3%	0.2%	0.9724
PANEL B: PERCEIVED VARIETY				
	Number of Options		**Difference**	**p-value**
Presentation Style	*8*	*27*		
All	3.57	3.87	-0.296	0.0012***
Image-based	3.50	3.57	-0.067	0.7058
ord-based	3.52	4.10	-0.585	0.0000***
Combination	3.68	3.92	-0.239	0.1352
PANEL C: PERCEIVED COMPLEXITY				
	Number of Options		**Difference**	**p-value**
Presentation Style	*8*	*27*		
All	2.12	2.65	-0.528	0.0001***
Image-based	1.90	2.26	-0.366	0.0895*
Text-based	2.24	3.02	-0.783	0.0017***
Combination	2.22	2.65	-0.423	0.0805*
*** p<0.01, ** p<0.05, * p<0.1				

Table 3: Analysis of Variance for Perceived Variety with Post Hoc Analysis

PANEL A: FULL SAMPLE		
ANOVA	F-Stat	p-value
Overall Model	5.93	0.0030***
Pairwise Comparisons *(Means in Parentheses)*	Difference	Tukey p-value
Image based *(2.088)* vs Word based *(2.663)*	-0.575	0.002***
Image based *(2.088)* vs Combination *(2.438)*	-0.350	0.093*
Word based *(2.663)* vs Combination *(2.438)*	0.225	0.370
PANEL B: 8 OPTION SIZE SAMPLE		
ANOVA	F-Stat	p-value
Overall Model	1.48	0.2299
Pairwise Comparisons *(Means in Parentheses)*	Difference	Tukey p-value
Image based *(1.898)* vs Word based *(2.241)*	-0.343	0.288
Image based *(1.898)* vs Combination *(2.224)*	-0.326	0.306
Word based *(2.241)* vs Combination *(2.224)*	0.017	0.997
PANEL C: 27 OPTION SIZE SAMPLE		
ANOVA	F-Stat	p-value
Overall Model	5.15	0.0068***
Pairwise Comparisons *(Means in Parentheses)*	Difference	Tukey p-value
Image based *(2.264)* vs Word based *(3.024)*	-0.760	0.005***
Image based *(2.264)* vs Combination *(2.648)*	-0.384	0.247
Word based *(3.024)* vs Combination *(2.648)*	0.376	0.253
*** p<0.01, ** p<0.05, * p<0.1		

Table 4: Analysis of Variance for Perceived Variety with Post Hoc Analysis

PANEL A: FULL SAMPLE		
ANOVA	F-Stat	p-value
Overall Model	4.28	0.0146**
Pairwise Comparisons *(Means in Parentheses)*	Difference	Tukey p-value
Image based *(3.536)* vs Text-based *(3.833)*	-0.297	0.022**
Image based *(3.536)* vs Combination *(3.800)*	-0.264	0.046**
Word based *(3.833)* vs Combination *(3.800)*	0.033	0.951
PANEL B: 8 OPTION SIZE SAMPLE		
ANOVA	F-Stat	p-value
Overall Model	0.74	0.4786
Pairwise Comparisons *(Means in Parentheses)*	Difference	Tukey p-value
Image based *(3.503)* vs Text-based *(3.517)*	-0.014	0.996
Image based *(3.503)* vs Combination *(3.679)*	-0.176	0.520
Word based *(3.517)* vs Combination *(3.679)*	0.162	0.582
PANEL C: 27 OPTION SIZE SAMPLE		
ANOVA	F-Stat	p-value
Overall Model	7.11	0.0011***
Pairwise Comparisons *(Means in Parentheses)*	Difference	Tukey p-value
Image based *(3.566)* vs Word based *(4.103)*	-0.537	0.001***
Image based *(3.566)* vs Combination *(3.918)*	-0.352	0.044**
Word based *(4.103)* vs Combination *(3.918)*	0.185	0.409
*** p<0.01, ** p<0.05, * p<0.1		

Table 5: Regression Analyses for Optout, Mean Complexity, and Mean Variety

VARIABLES	(1) Opt-out	(2) Mean Complexity	(3) Mean Variety
27 Option Size[$]	-0.053	0.976***	0.637***
	(0.065)	(0.221)	(0.161)
Visual Presentation[&]	0.011	-0.024	-0.018
	(0.066)	(0.224)	(0.163)
Combination Presentation[&]	-0.002	0.279	0.177
	(0.066)	(0.224)	(0.163)
27 Options * Visual	0.020	-0.605*	-0.564**
	(0.091)	(0.309)	(0.225)
27 Options * Combination	0.073	-0.530*	-0.475**
	(0.091)	(0.309)	(0.225)
Online Shopping Comfort	-0.033	-0.536***	0.105
	(0.034)	(0.114)	(0.083)
Online Shopping Frequency	0.027*	0.075	-0.019
	(0.016)	(0.055)	(0.040)
Age	0.001	-0.025***	-0.006
	(0.002)	(0.007)	(0.005)
Gender (Male = 1)	-0.014	0.094	-0.099
	(0.041)	(0.138)	(0.101)
Race (White = 1)	-0.025	0.199	-0.084
	(0.047)	(0.159)	(0.116)
Employment Status (Employed full time = 1)	0.074	0.161	-0.024
	(0.060)	(0.203)	(0.148)
Education -- Some college[#]	-0.125*	0.116	-0.072
	(0.073)	(0.246)	(0.179)
Education -- 2 year degree[#]	-0.224**	0.300	0.170
	(0.087)	(0.296)	(0.216)
Education -- 4 year degree[#]	-0.199***	0.406*	0.101
	(0.066)	(0.225)	(0.163)
Education -- Professional degree[#]	-0.133	0.729**	0.065
	(0.086)	(0.291)	(0.212)

Education -- Doctorate[#]	-0.274	0.756	0.415
	(0.177)	(0.600)	(0.437)
Income -- $10,000 - $19,999[^]	0.207**	0.381	0.213
	(0.095)	(0.324)	(0.236)
Income -- $20,000 - $29,999[^]	-0.037	0.271	0.452**
	(0.089)	(0.301)	(0.219)
Income -- $30,000 - $39,999[^]	0.034	0.410	0.477**
	(0.093)	(0.313)	(0.228)
Income -- $40,000 - $49,999[^]	0.103	0.416	0.263
	(0.097)	(0.328)	(0.239)
Income -- $50,000 - $59,999[^]	0.065	0.705**	0.493**
	(0.091)	(0.308)	(0.224)
Income -- $60,000 - $69,999[^]	-0.028	0.428	0.380
	(0.104)	(0.351)	(0.255)
Income -- $70,000 - $79,999[^]	-0.009	0.471	0.505*
	(0.111)	(0.375)	(0.273)
Income -- $80,000 - $89,999[^]	-0.090	0.487	0.464
	(0.131)	(0.442)	(0.322)
Income -- $90,000 - $99,999[^]	-0.089	0.480	0.625*
	(0.130)	(0.440)	(0.321)
Income -- $100,000 - $149,999[^]	0.204*	-0.066	-0.225
	(0.110)	(0.372)	(0.271)
Income -- More than $150,000[^]	0.106	0.812	0.268
	(0.156)	(0.527)	(0.384)
Constant	0.229	4.101***	3.053***
	(0.203)	(0.687)	(0.500)
Observations	307	307	307
R-squared	0.133	0.305	0.159

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[$]Omitted Category is 8 Option Size. [&]Omitted Category is Textual Presentation Style. [#]Omitted Category is High school graduate. [^]Omitted Category is Less than $10,000.